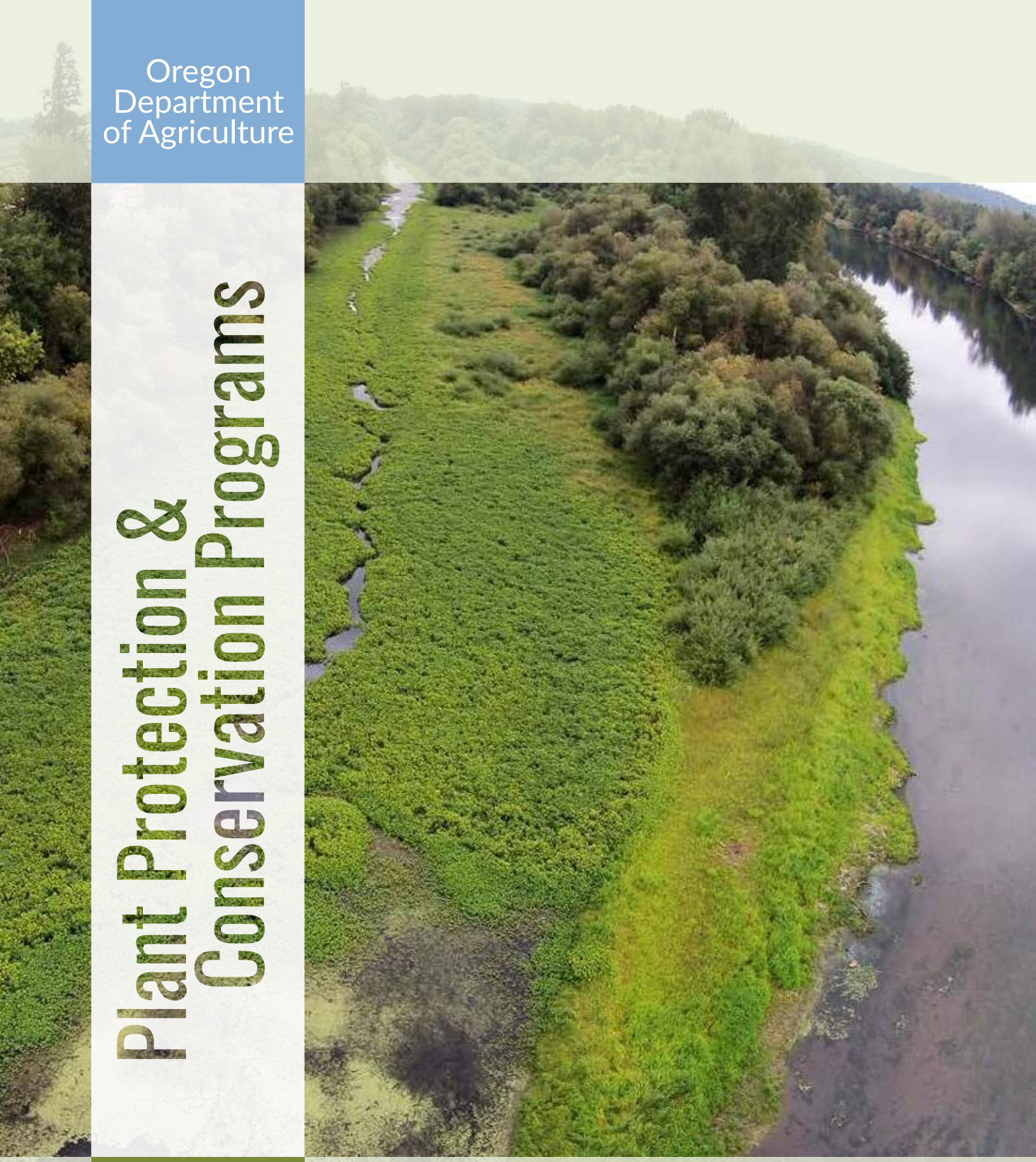
Oregon Department of Agriculture

Plant Protection & Conservation Programs



2015

Annual Report

Plant Protection & Conservation Programs

Oregon Department of Agriculture

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Cover photo: An aerial photo of Black Dog Landing on the Willamette River in Benton County showing infestation of aquatic noxious weed water primrose, *Ludwigia* spp. Photo by Travis Williams, Willamette Riverkeeper, August 2015.

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Administration

Director's View

This first year of my new assignment has sped by. It is amazing how quickly time passes when you are fully occupied with new tasks and duties associated with the director's position. As a trained entomologist, I had to break out of my limited exoskeleton world and take a crash course in noxious weeds, plant pathogens, threatened native and endangered plants, the nursery business, the Oregon Invasive Species Council, and of course, the administrative duties running the Plant Programs. The sharp learning curve required for this position makes it really interesting because there is never a dull moment. I am especially fortunate that I can rely on the assistance and support of my great colleagues.

So, what were noteworthy events during this past year?

One important change, was the renaming of our program area. We agreed on Plant Protection and Conservation Programs, a name that is in line with the mission of all of our programs.

Another important event was hiring a new lead for the Insect Pest Prevention and Management (IPPM) Program. Clint Burfitt had been with the Utah Department of Agriculture for years, managing the insect program. One of his many career highlights was the eradication of a large Japanese beetle population in Orem, Utah. For this work, Clint was awarded the highly prestigious National Plant Board Award. Welcome to Oregon, Clint!

After several biennia without general funds, our Native Plant Conservation Program once again received state funding for the new biennium.

The biggest news, however, was the detection of several incipient Gypsy moth (GM) populations in Oregon. After 6 years of very low GM detections and no GM eradication projects, the dry spell is officially over. Our IPPM Program will be tasked with the third largest GM eradication in the program's history. Making things even more challenging, we are dealing with the flight capable Asian strain of the Gypsy moth. This will require a challenging aerial treatment project in the Forest Park area, in the port environments, and in the St. Johns neighborhood of Northwest Portland. A second incipient GM population, a non-flight capable European strain, was confirmed in the Grants Pass area. IPPM has decided to postpone the Grant's Pass eradication until 2017 in order to focus on the almost 9,000 acre GM eradication in Portland in 2016.

Dr. Helmuth Rogg, Director Plant Protection and Conservation Programs

Also of high importance, is the topic of climate change, which was an evident theme this last year. Following a record warm winter with almost no snowpack in the mountains, we experienced record-breaking hot days all summer long. Why do I bring up this sometimes politically charged topic of climate change? We have seen record numbers of brown marmorated stink bugs (BMSB), azalea lace bugs, western thrips, and other invasive pests across Oregon. Warm winters and hot summers are a perfect combination to drive up insect populations. For the first time since we detected BMSB in 2004, citizens from both urban and rural areas have reported hundreds, even thousands, of BMSB inside their homes. Even on my farm, miles away from suitable hosts, BMSB has become one of the most dominant insects. They were all over the barn on sunny fall days and we continue to find them almost daily hiding inside our home.

Another likely example of the effects of climate change is the newly detected pathogen, *Xylella fastidiosa*. Although just recently confirmed, the pathogen *Xylella fastidiosa* may have been here in Oregon for decades, but the disease symptoms had previously been "controlled" by the temperate climate in our region. Increasing temperatures, as we witnessed last year, may have contributed to the "easier" detection of the disease that *Xylella* expresses in pears.

Following the same theme, Jim LaBonte reported a record number of new detections of invasive pests in 2015. Last year, our IPPM taxonomists identified 20 new exotic pest species, which is a 100% increase compared to the previous year.

Additionally, our Noxious Weeds Program was faced with a "beetle-geddon" story in late summer in the Sellwood/Portland area, which may also be attributed to the global climate change phenomenon. The biocontrol agent, *Galerucella calmariensis*, a leaf beetle, was released by USDA APHIS in collaboration with the

City of Portland and ODA several years ago to control the purple loosestrife weed. Last summer the beetle took advantage of the perfect climatic and ecological storm and multiplied in masses. After running out of their host plant, the beetles moved out in search of food and also attacked non-host plants in the Sellwood neighborhood causing a great deal of concern to residents. Beth Myers and Tim Butler, in collaboration with Clint Burfitt, Bruce Pokarney, and others, were able to explain the phenomenon and address the numerous phone calls the Noxious Weeds Program received. As predicted, the beetles died off after a few days when their food supply ran short.

The outcome of the 2015 Christmas tree shipping season also ties into the theme of climate change. Unfortunately, businesses shipping to Mexico saw an increase in rejections at the border. High demand for Christmas trees in Mexico, along with low tree availability this year, may have caused lower quality trees to enter the Mexican market. In addition, the extended drought conditions last year may have contributed to a high population pressure on the Douglas-fir twig weevil, *Cylindrocopturus furnissi*, and caused subsequent rejections of infected trees at the Mexican borders.

Fortunately, the businesses shipping to Hawaii reported that the Christmas tree season ran very smoothly in comparison to past years. Our efforts working with the Oregon Christmas tree industry to implement best management practices have paid off.

Interesting items from 2015:

- If you are a soccer fan, you may know that our Oregon soccer team, the Portland Timbers, made it to the national Major League Soccer final. You may also know that the Timbers have a serious tradition: the official Timber mascot, Timber Joey, cuts a slice off a log every time the Timbers score a goal. The team wanted to take their famous log of Oregon wood to the final game in Columbus, Ohio. This caused some very interesting social media stir. Columbus fans demanded that the log not be allowed entry into Ohio due to the risk of invasive pests. I received a call from my counterpart with the Ohio Department of Agriculture inquiring what kind of tree the Timbers planned to bring. Even USDA APHIS got involved, but they did not find any federal quarantine violation. After all the efforts, Timber Joey had to leave his chainsaw outside of the stadium, but the Timbers still won the final and no invasive wood pests were introduced to Ohio.
- Jim LaBonte presented an interesting case of an ambrosia beetle that bores into plastic gas cans. A request from Louisiana was sent to Jim with images of boreholes in a typical red plastic gas canister. Jim identified the beetle as *Cnestus mutilatus*, an exotic ambrosia beetle, luckily not known from Oregon. The beetle is likely attracted by the ethanol used in the biofuel gasoline, but drowns in the gasoline after boring through the plastic hull. The damage can cause leakage in gas canisters.

Several key positions affecting our programs were filled this year:

- After an extended period of temporary duty assignments, the position of the USDA APHIS PPQ State Plant Health Director (SPHD) was finally filled early in 2015. Christopher Deegan was selected as the new SPHD for Oregon. In one of his last assignments, Christopher served as the SPRO (State Plant Regulatory Official) for the State of Wisconsin. Christopher has also worked for PPQ in the past, bringing federal and state experience to his new position.
- Also in early 2015, the Oregon Invasive Species Council selected the new OISC Coordinator. In fact, it is a group of five coordinators each bringing a unique experience to the council.

As a final note, we are indeed facing financial challenges. We overspent our programs' general and lottery biennial budget by about 3.4%. The new biennium will bring increased personnel costs (COLA increases, PERS adjustment) and flat revenues, which may likely translate into an even greater imbalance of our programs' budget. To overcome these challenges, we are working closely with our directors and stakeholders to emphasize the importance of our programs, the importance of our services, and the impact our programs have on the wider agricultural community and the protection of our natural resources.

I am very optimistic that we will be successful in continuing the important and high quality work our programs provide, due to the strong commitment and support of our professional staff.

Plant Protection and Conservation Programs Staff

Plant Protection & Conservation Programs Director
Dr. Helmuth Rogg

Office Support
Leslie Shaffer, Office Manager

Program Assistants
Sue Nash, Nursery/Christmas Tree
Jo Davis, Noxious Weed & IPPM

Insect Pest Prevention and Management Program

Program Manager
Clint Burfitt

Entomologists
Todd Adams
Dr. Barry Bai
Dr. Paul Blom
Dan Clark
Chris Hedstrom
Dr. Diana Kearns
Sarah Kincaid
Jim LaBonte
Pat Mitchell
Kerri Schwarz
Josh Vlach
Richard Worth

Imaging Specialist
Thomas Shanan

PCR Specialist
Tom Valente

Volunteers
Rick Westcott (retired taxonomist)

Native Plant Conservation Program

Program Leader
Dr. Bob Meinke

Conservation Biologists
Kelly Amsberry, Research Coordinator
Jordan Brown, Field Botanist/Crew Leader

Noxious Weed Control Program

Program Manager
Tim Butler

Biological Control Entomologist
Eric Coombs

Projects Coordinator
Tom Forney

Integrated Weed Management Specialists
Mike Crumrine
Glenn Miller
Carri Pirosko
Mark Porter
Bonnie Rasmussen

Grant Program & Special Project Coordinator
Tristen Berg

Integrated Weed Management Technician
Sarah (“Beth”) Myers-Shenai

Nursery and Christmas Tree Program

Program Manager
Gary McAninch

Lead Horticulturist
Jan Hedberg

Horticulturists
Christy Brown
Beverly Clark
Debbie Driesner
Sherree Lewis
Melissa Lujan
Karl Puls
Lisa Rehms
Eric Reusche
Scott Rose
Susan Schouten

Nursery and Christmas Tree Program

Nursery Program staff (left to right)
Back: Melissa Lujan, Gary McAninch, Christy Brown.
Middle: Karl Puls, Sherree Lewis, Eric Reusche, Lisa Rehms, Bev Clark, Debbie Driesner, Scott Rose. Front: Susan Schouten, Sue Nash.

Nursery Program

Goals and objectives

The Nursery and Christmas Tree Program assists the nursery and Christmas tree industries in the production, marketing, and protection from pests and diseases of Oregon nursery stock and Christmas trees. We accomplish this by:

- Assisting nurseries in providing nursery stock that is free of dangerous pests and diseases.
- Providing pest and disease management information to the Christmas tree and nursery industries.
- Providing inspection and certification of nursery stock and Christmas trees grown and shipped from Oregon.
- Preventing the spread of injurious pests, plant diseases, and noxious weeds within the state of Oregon.
- Inspecting incoming shipments of plant material for compliance with Oregon and US quarantines.
- Making information available to all licensed Christmas tree growers and nurseries relative to importation requirements of other states and countries.

Highlights

- Program staff performed inspection and export certification services for Oregon's $110 million Christmas tree and $863 million nursery industries.
- Nursery Program horticulturists issued 6,458 (down from 7,050 in 2014) state and federal phytosanitary certificates. All certificates were issued using the USDA's electronic Phytosanitary Certificate Issuance and Tracking (PCIT) system.
- Oregon nursery stock and Christmas trees were exported to 63 foreign countries.
- Three Oregon nurseries participated in the United States Nursery Certification Program (USNCP).
- Program personnel continue to certify logs and wood chip shipments to China leaving the Port of Coos Bay.
- The Nursery Research Assessment Fund collected and made available approximately $203,000 for nursery-related research grants.
- Nursery and Christmas Tree Program personnel staffed a booth at the Farwest Show, Oregon's largest nursery trade show.
- One hundred forty-seven Christmas tree and nursery stock growers participated in this year's European Pine Shoot Moth (EPSM) trapping program. EPSM traps were placed at 262 separate growing grounds.

Karen Suslow and Karl Puls at the joint ODA and National Plant Board Booth at Farwest Show.

Dallas High School student job shadows with Debbie Driesner.

- In order to meet the requirements of the federal *Phytophthora ramorum* order, 2,088 inspections were conducted in Oregon nurseries.
- Eleven nurseries, with a recent history of *P. ramorum* infestations, were required to go through an enhanced federal certification process. Four nurseries were required to go through a state certification process.
- Twelve Oregon nurseries were confirmed positive for *P. ramorum*.
- Sixteen nurseries participated in Oregon's Plant Cleanliness Program for boxwood blight.
- Fourteen Oregon nurseries participated in the Grower Assisted Inspection Program (GAIP).
- The Nursery Information Management System (NIMS) saw extensive use in documenting the staff's daily activities and as a tool for managing the *P. ramorum* certification program.
- Program staff cooperated with the Plant Health Unit in collecting data at 18 nurseries participating in a pilot test of a blueberry certification program.
- Hawaii Department of Agriculture inspectors spent three weeks in Oregon assisting in the inspection and certification of Oregon Christmas trees destined for the Hawaii market.

Dennis Magnello, Nursery Program retiree.

Staffing

The Nursery and Christmas Tree Program staff currently includes 10 horticulturists, one lead horticulturist, one nursery auditor, one administrative specialist, and one program manager. Two horticulturist positions are vacant at this time. The program is largely funded through nursery and Christmas tree license fees with federal funds supporting the *P. ramorum* certification program.

Dennis Magnello retires

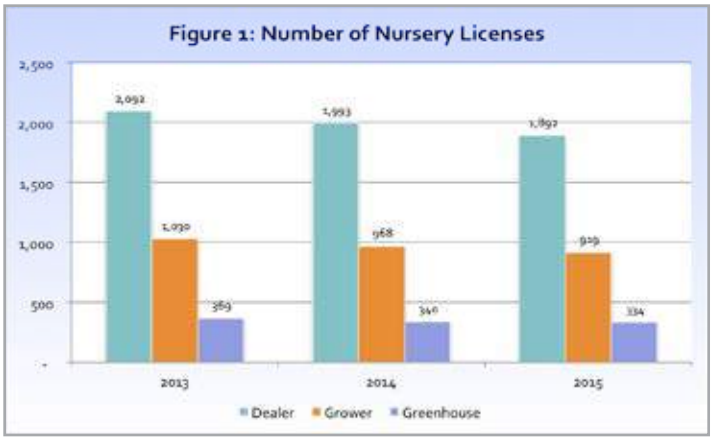
Dennis Magnello retired in March after 20 years of service with ODA. Originally from Pittsburgh, Pennsylvania, Dennis worked for the Missouri Cooperative Extension Service, the USDA-ARS, and Northwoods Nursery before coming to ODA. His primary responsibilities were inspecting and certifying grower and retail nurseries in Marion County. Through the years, Dennis developed good relationships within both the nursery and Christmas tree industries. We wish Dennis and his family well in his retirement.

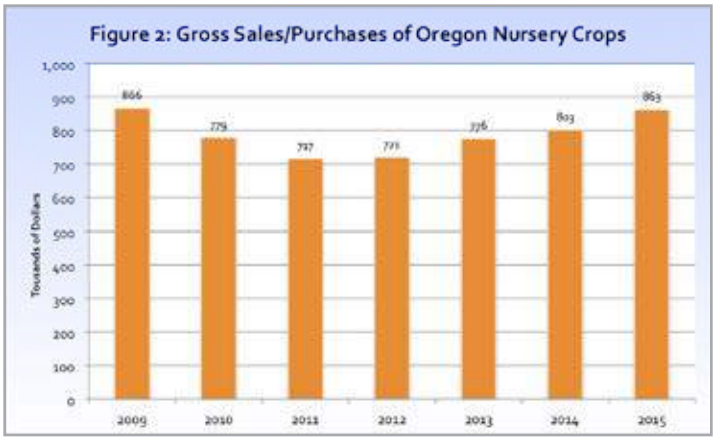
General information

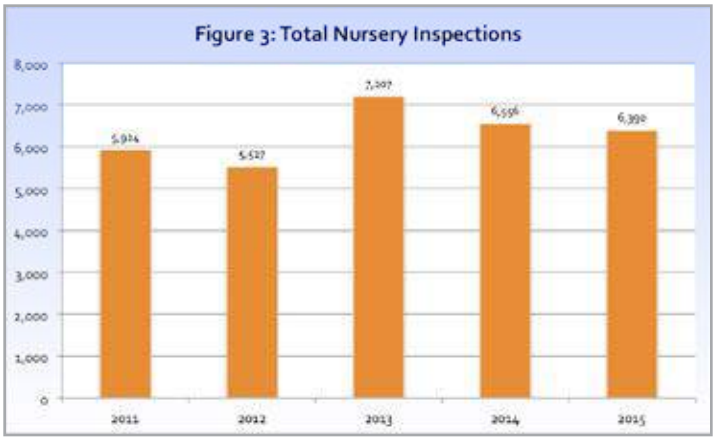
The nursery industry continues to be one of the largest agricultural commodity groups in Oregon. ODA's Nursery Inspection Program is funded almost entirely from nursery license and certification fees. Three different nursery license types are issued depending on the nature of the nursery business.

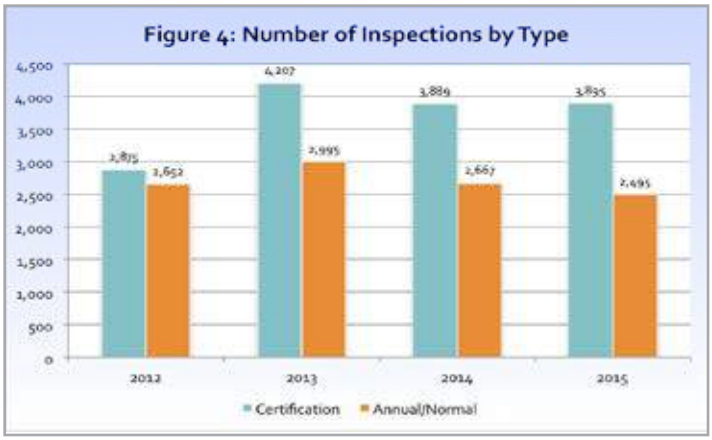
Sherree Lewis collects *Xylella fastidiosa* survey samples

A dealer's license is required for businesses that buy and re-sell nursery stock. Garden centers, retail stores, florists,









and landscapers are required to have dealer licenses. Dealer license fees are based on the purchase price (wholesale cost) of nursery stock. Cut flowers are exempt from the licensing program.

Two types of nursery grower licenses are available through the Nursery Program: a license specific for growers of greenhouse grown herbaceous plants and a license for all other nursery crops as well as collectors of native plants. Nursery grower license fees are based on the wholesale value of nursery stock sold.

During the 2015 calendar year, the Nursery Program issued 1,892 dealer licenses ($192 million reported purchases); 334 licenses to greenhouse growers of herbaceous plants ($114 million reported sales); and 919 licenses to nursery stock growers and collectors of native plants ($557 million reported sales). The total value of nursery stock purchases and sales reported to the Nursery Program in 2015 was $863 million. During this time, the Nursery Program conducted 6,390 inspections. Inspections are divided into two general categories: routine and requested inspections (2,495) and certification inspections (3,895).

Figure 5: 2015 Nursery Research Projects

Project #	Title	Investigator	Total ($)
2015-01	An improved method for rapid and accurate detetion of crown gall...	Putnam	14,877
2015-04	Host range of Azalea lace bug	Lee, et al	16,500
2015-05	OSU NWREC nursery internship	Landgren	16,936
2015-09	Improved mineral nutrition for Hazelnut	Wada, et al	24,000
2015-11	Soil solarization for improved growth and root health of field-grown...	Parke	21,173
2015-12	Developing sterile forms of economically important nursery crops	Contreras	23,225
2015-13	Surfactants and anti-transpirants to prevent Phytophthora foliar blight	Parke	15,700
2015-14	Devloping novel, disease resistant forms of nursery stock	Contreras	19,100
2014-10	Administrative fee for eight projects above	PNWCTA	8,301

The Nursery and Christmas Tree Program field staff issued 3,551 state and federal phytosanitary certificates for consignment of nursery stock to foreign countries. In addition, 732 federal phytosanitary certificates were issued by nursery inspection staff for shipments of lumber, logs, and wood chips.

Nursery research assessment fund

The Nursery Program received 14 nursery research proposals for the 2015 grant year. Proposals were competing for approximately $202,000, which was collected through nursery research assessment fees. The Nursery Research and Advisory Committee, in cooperation with the Oregon Association of Nurseries Research Committee, selected eight research projects for funding. Several research projects that were not funded, or only partially funded by Nursery Program grant dollars, were recommended to receive funding from independent private sources. The Nursery Program contracted with the Pacific Northwest Christmas Tree Association (PNWCTA) to act as the agency's liaison with the Agricultural Research Foundation at Oregon State University. PNWCTA was paid a 5% administrative fee for this service.

Plant importation notification rule

In 2004, ODA adopted Oregon Administrative Rule 603-054-0027 also known as the plant importation notification rule. The rule requires recipients of imported nursery stock to provide the Nursery Program notification of the arriving shipment within two business days by email, phone, or fax. This allows inspectors the opportunity to inspect shipments of high-risk nursery stock shortly after arrival. The notification must include the species, source, copies of certifications for the plant material, and the shippers contact information.

Upon notification of the incoming plant material, the Nursery Program will contact any nursery where an inspection is needed and ask the nursery to set aside the plant material in question. Inspections are performed for one or more of the following reasons: proper certification is missing, plant material is prohibited or restricted, or the material is high risk and should receive an inspection to ensure the safety of the nursery and industry.

Once inspected, plant material may be sampled and submitted to the ODA plant pathology lab for further analysis. Plant material may also be: released upon visual inspection, accepted but only with treatment, or rejected resulting in either a return of the material to the shipper or destruction. During 2015, the Nursery Program received notification of 514 shipments of out-of-state nursery stock to Oregon nurseries. Of those shipments, 258 were determined to be high-risk and were inspected by Nursery Program horticulturists.

Gary Roemhildt inspects nursery stock.

Phytophthora ramorum 2015 highlights

On March 31, 2014, APHIS revised its *P. ramorum* domestic quarantine regulations. The revision required those nurseries in which *P. ramorum* had been detected within the past three years to enter into an enhanced inspection and certification program. Certification requirements for all other nurseries growing host plants and shipping out-of-state were relaxed with mandatory plant sampling no longer required unless symptoms were noted.

A total of eleven nurseries are currently participating in the APHIS enhanced *P. ramorum* certification and inspection program. Five nurseries that were found positive for *P. ramorum* within the past three years, but do not ship out-of-state, fall under state certification requirements for *P. ramorum*. The eleven nurseries remaining in the enhanced inspection and certification program are required to:

- Be sampled twice yearly with approximately 200 plant samples collected and analyzed during each sampling period.
- Conduct a critical control point assessment and adopt related best management practices if *P. ramorum* is found, with the goal of eliminating plant infections at the nursery.
- Enter into a compliance agreement between the nursery, APHIS, and the Nursery Program.
- Pre-notify receiving states of shipments.
- Be listed on ODA's website as being certified to ship out-of-state.
- Attach an APHIS *P. ramorum* certificate to all out-of-state shipments.

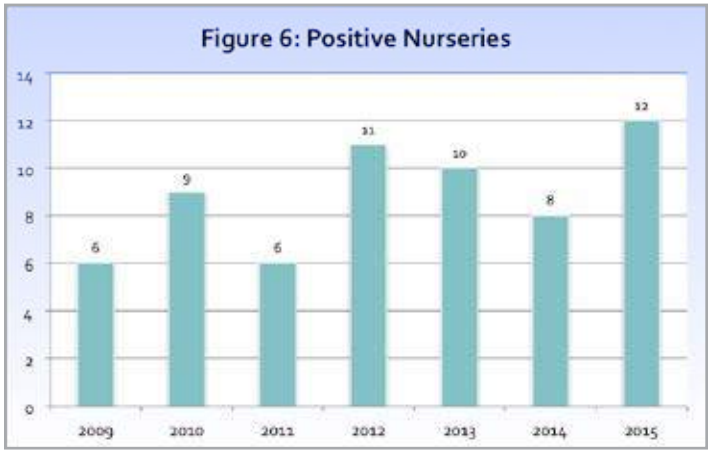
The five nurseries that chose to "opt-out" of the APHIS enhanced certification program and no longer ship host stock out-of-state are required to enter into a Nursery Program enhanced inspection and certification program that mirrors the federal program.

Melissa Lujan and Sarah Navarro prepare *P. ramorum* infected landscape for solarization treatment.

All other nurseries that grow host plants, ship out-of-state, and were *P. ramorum* free since 2011 were able to ship out of state under less stringent federal certification rules. A total of 460 nurseries qualified for certification under the "less stringent" certification process. Those nurseries are required to:

- Be visually inspected annually by Nursery Program inspectors for symptoms of *P. ramorum*.
- Sample and analyze plants exhibiting *P. ramorum* symptoms.
- Enter into the APHIS enhanced certification program if infested.
- Be listed on ODA's website as being certified to ship out-of-state.

A total of twelve nurseries were found positive in 2015: six under the APHIS enhanced nursery certification process, five under the Nursery Program's "opt-out" certification process, and one as the result of our normal nursery inspection program. Plants found positive in 2015 include: *Camellia*, *Gaultheria*, *Pieris*, and *Rhododendron*. The required USDA-APHIS Confirmed Nursery Protocol was instituted at all positive nurseries.



Boxwood blight symptoms.

Boxwood blight

Boxwood blight (also called "box blight" in Europe), caused by the fungal pathogen *Cylindrocladium pseudonaviculatum* (syn. *C. buxicola*), was reported for the first time in the US at two North Carolina production nurseries in October 2011. Following this initial discovery, the disease was found in nurseries and landscapes in many eastern states, at least one Canadian province, and seven production nurseries in Oregon. In 2015, plants infected with boxwood blight were found at two Oregon nurseries that were not previously known to be infected. In addition, infected plants were found at several landscapes in the Portland area. Positive nurseries, in cooperation with Nursery Program officials, developed and implemented procedures aimed at aggressively removing the pathogen from their operations and stopping the spread of this disease into landscapes and other nurseries.

In cooperation with the National Plant Board and the Nursery Industry, the Nursery Program initiated the Nursery Cleanliness Program for boxwood blight in 2012. This is a voluntary program of inspections and best management procedures designed to help nurseries provide clean boxwood nursery stock to their customers. There are currently 16 Oregon nurseries in the program. Nurseries participating in the program must meet several requirements. Examples of these requirements include:

- Enter into a compliance agreement with the Nursery Program.
- Purchase boxwood plants from nurseries participating in an approved cleanliness program.
- Scout regularly for the disease.
- Remove and destroy leaf debris from boxwood plant growing areas monthly.
- Take action to eradicate boxwood blight, should it be found at the nursery.
- Maintain shipping records for a minimum of 12 months.
- Allow Nursery Program inspectors access to inspect boxwood plants for presence of the disease.
- Participate with the Nursery Program in audits to ensure compliance with program requirements.

Nurseries wishing to participate in this voluntary program can get more information by contacting the Nursery Program.

Grower Assisted Inspection Program (GAIP)

The GAIP program continues to work with fourteen Oregon nurseries incorporating best management practices (BMPs) into their facilities to avoid *Phytophthora* spp. Participating nurseries have been incorporating BMPs into their production systems and their efforts are paying off. Employee education, communication, sanitation in key areas, and cleaning up growing areas are now part of daily routines. Overall plant health and nursery cleanliness improves each year. Many even report a reduction in other pests or weeds as a result of changes they have made. As the economy recovers, opportunities have opened up for nurseries to make plans to build steam chambers for pasteurization of used containers and to install water treatment systems.

The past year was the sixth for Melissa Lujan as GAIP auditor. In addition to her auditing duties at GAIP nurseries, Melissa also coordinated the program's inspection and sampling efforts at Oregon nurseries in the APHIS enhanced inspection and certification program for *P. ramorum* positive nurseries.

Nursery Information Management System (NIMS)

During the past year, the program's NIMS development group made great strides in making mobile NIMS more usable in the field. Mobile NIMS is a FileMaker Go application for use with the iPhone. With this application, staff can access information from the field such as: real-time license status, licensee contact information, customized reports such as licensee lists by type and overdue inspections, and date of last contact and activity. Staff can also add activities in the field as desired.

Recent developments include:

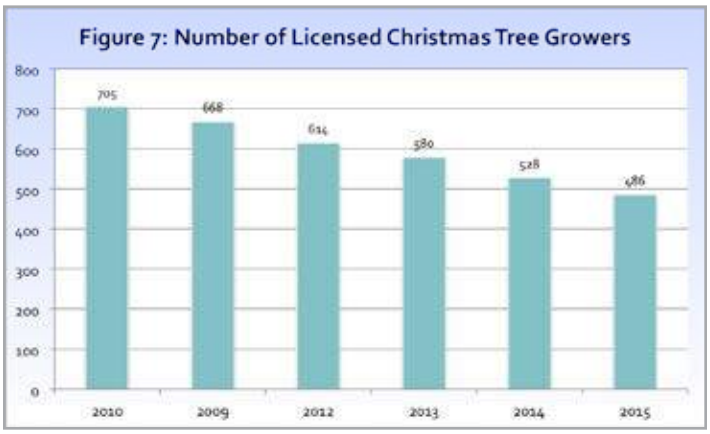
- Adding an electronic inspection report for use on mobile digital devices such as iPhone/iPad. In addition, adding the capability of e-mailing the report directly to the grower.
- Larger format for the larger iPhone 6 screen.
- More sort options, such as by city/zip.
- Capability of adding and accessing inspector notes.
- Quicker connection and sync speeds.

Mobile NIMS home screen.

Christmas Tree Program

In 2015, the Christmas Tree Program issued 486 Christmas tree grower licenses. License fees were used to fund 1.5 FTE (field staff) and two 0.14 FTE (program supervisor and program assistant). The Christmas Tree Program provides inspection services to assist growers in the production of high quality Christmas trees. Because 90 percent of Oregon's Christmas trees are sold out of state, the main activity of the program is to certify trees destined for foreign and domestic markets.

Christmas tree growers harvest approximately 7 million trees annually from about 30,000 planted acres. During the year, almost 1 million trees were certified and shipped to foreign countries. The table on the next page shows the number of phytosanitary certificates issued over the past four years for Christmas trees going to foreign destinations and Hawaii.



Christmas tree shipping

Mexico

During the 2015 Christmas tree shipping season approximately 1,838 trucks with a total of 985,610 Christmas trees crossed the border into Mexico. Of these, twenty-eight with 18,164 trees were identified at the Mexico border as being infested with regulated pests. Mexican regulatory authorities reported intercepting *Cylindrocopturus furnissi* (15), *Sciopithes obscures* (3), *Vespula germanica* (2), *Polistes dominula* (2), *Pyralidae* sp. (2), *Nemocestes puncticolis* (2), *Pissodes strobi* (1), *Contarinia constricta* (1), *Synanthedon* sp. (1), *Otiorhynchus rugostriatus* (1), and *Disiobus lecontei* (1) in twenty-eight rejected shipments. Christmas Tree Program inspectors will work with growers to help eliminate these issues in the future.

Hawaii

Oregon Christmas tree shipments to Hawaii went very well during the 2015 shipping season. Enhanced phytosanitary measures adopted by the shippers and inspection staff from ODA and Hawaii Department of Agriculture (HDOA) seem to be paying off. Although unwanted pests were still found on approximately 3% of the 249 Christmas tree shipments going to Hawaii in 2015, that was significantly better than 2014 when approximately 13% were found infested. HDOA found seven containers infested, five contained slugs and two contained yellowjackets. Despite the fact that these regulated pests were still being found, HDOA officials were pleased with this year's results. Trees infested with regulated pests were treated by HDOA to remove the unwanted hitchhikers. All expenses related to the pest mitigation measures conducted by HDOA in Hawaii were born by the importer.

Bev Clark and a HDOA Inspector look for regulated pests at a Christmas tree loading yard.

During the 2015 shipping season, HDOA inspectors again traveled to Oregon to work with ODA inspectors to certify Christmas trees bound for Hawaii. HDOA inspectors were able to see best management practices Oregon growers are using to mitigate against hitchhiking pests on Christmas trees.

HDOA inspectors also saw the enhanced certification process that Christmas Tree Program inspectors adopted in 2013 to certify Hawaii bound trees. The inspection protocols were essentially the same as those used by HDOA when inspecting trees upon arrival in Hawaii. These protocols included:

- Randomly selecting three to six trees for inspection immediately prior to loading onto the shipping containers.
- Un-baling the trees and banging them on a hard surface to dislodge any hitchhiking pests that may be present.
- If regulated pests were found, the entire container of trees were required to be un-baled and re-shaken.
- The trees then were re-inspected and a certificate was issued only when the trees were able to "pass" the certification process.

Other foreign shipments

Christmas Tree Program inspectors issued certificates to the following countries with no phytosanitary issues noted: Singapore (25), Hong Kong (23), Canada (18), Japan (7), Malaysia (2), Guatemala (3), United Arab Emirates (3), China (2), The Philippines (2), Poland (1), Panama (1), Palau (1), and Viet Nam.

Domestic shipments

No major issues noted for domestic Christmas tree shipments in 2015.

Insect Pest Prevention and Management Program

Introduction

Oregon faces the continuing and increasing threat of introduced, exotic terrestrial invertebrates. The effects of this threat include losses in native biodiversity, damage to natural resources and water quality, increases in pesticide use, and threats to access to out-of-state and foreign markets for agricultural and natural resource–based commodities. Because of this threat, the Insect Pest Prevention and Management (IPPM) Program takes a three-pronged approach to accomplish its mission of protecting Oregon's agricultural and natural resources from the negative effects of exotic terrestrial invertebrates:

1. **Early detection and rapid response:** These activities include deploying an extensive array of detection surveys statewide and conducting safe and effective eradication activities when feasible.
2. **Diagnostic services:** Our high-performing group of diagnosticians specialize in diverse groups of biota and use a range of methods and techniques to identify an increasing variety of terrestrial invertebrates.
3. **Biological controls:** Proactively and responsibly applying biological control results in decreased pest populations and diminishes pesticide use in Oregon's agricultural, urban, and natural environments.

2015 was an eventful year for Oregon's IPPM Program; the results of high-density trapping in and near the Port of Portland resulted in the detection of two Asian gypsy moths. Although two moths may seem insignificant, these detections represent the first time multiple Asian gypsy moths were detected in a single season. Further, these are the first detections of this pest species in 13 years. These detections have resulted in mitigation plans that represent the third largest eradication effort in Oregon's history for this destructive pest. In 2015, the IPPM Program documented 20 species of exotic terrestrial invertebrates in Oregon, representing an increase of 100% compared to 2014.

The IPPM Program's team consists of 13 entomologists and approximately 30 seasonal insect technicians who collectively monitored approximately 18,000 sites for 140 target pests and deployed approximately 20,000 traps in 2015. The IPPM team conducted a rapid response eradication project for the Japanese beetle at the Portland Airport and continued to conduct high-density trapping to locate the source of an incipient European gypsy moth infestation in the Grants Pass area. In 2015, the IPPM team also evaluated an egg parasitoid for the brown marmorated stink bug and documented the presence of parasitoids for linden tree aphids and ash white fly.

IPPM Program staff (left to right)
Back: Chris Hedstrom, Jo Davis, Todd Adams, Thomas Shahan. Middle: Dr. Diana Kearns, Clint Burfitt, Dan Clark, Dr. Paul Bloom, Josh Vlach. Front: Dr. Barry Bai, Tom Valente, Pat Mitchell, Sarah Maxfield-Taylor (center), Jim LaBonte, Rich Worth, Kerri Schwarz.

The cumulative result of these activities decreases the need for pesticide use in urban and agricultural environments, protects natural resources and water quality, and allows Oregon's agricultural producers access to out-of-state and foreign markets. Because of the documented increase in introduced species into Oregon and the decrease in resources available to proactively mitigate these potential pests, the IPPM team takes a targeted approach for conducting early detection and rapid response activities. By prioritizing high-value specialty crop commodities and identifying areas that are at high risk for introducing exotic pest species, the IPPM team is able to fulfill its mission of protecting Oregon's diverse agricultural and natural resources. Most importantly, the IPPM Program cooperates and leverages resources and collaborates with numerous groups of stakeholders, which results in its ability to accomplish the ever-growing and pertinent mission of invasive species mitigation.

IPPM owes much gratitude for partnership with the US Department of Agriculture Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA APHIS PPQ), USDA Forest Service Forest Health Protection, Oregon Department of Forestry, Oregon Invasive Species Council, and many other governmental and non-governmental organizations. These strategic partnerships create the framework for the numerous and varied accomplishments of the IPPM program and its affiliates.

Clinton Burfitt
IPPM Program Manager

2015 Program Highlights

	Gypsy moths (GM and AGM): 14,754 traps were placed statewide. Seven GM were caught in the Grants Pass area, following catches in 2013 (2 moths) and 2014 (4 moths). Five single GM were caught in the greater Portland area. Two AGM were caught this year, one in Forest Park (Portland) and one near Terminal 4 in the St. Johns area (NW Portland). An eradication is planned for 2016, the first since 2009.
	Japanese beetles: 2,290 traps were placed throughout western Oregon and some higher-risk areas in eastern Oregon. Only four JB were caught this year. Three were at Portland International Airport and one was located less than a mile south of the airport.
	Grasshoppers: Economically infested grasshopper acreage has started to increase since 2012. Approximately 2.5 million acres across 17 central and eastern Oregon counties had economic levels of infestations. Inspections at 1,712 sites suggest that a number of areas in eastern Oregon should be closely monitored in 2016.
	Vineyard and orchard pests: We surveyed 26 vineyards across 12 counties and 52 fruit orchards across 15 counties. We placed 912 traps targeting 13 pest species. An additional 100 traps were placed for the Light Brown Apple Moth in Polk County, after two moths were trapped at a nursery. LBAM image: Todd M. Gilligan and Marc E. Epstein, TortAI: Tortricids of Agricultural Importance, USDA APHIS ITP, Bugwood.org
	Ash Whitefly: High populations of ash whitefly, a serious pest of ornamental plants, were reported in Portland and the surrounding area this summer. Two exotic natural enemies, a predator and a parasitoid, were also collected from the ash whitefly populations. The parasitoid is being maintained in a colony at ODA's Hawthorne facility and will be released in large numbers in 2016 for biological control.
	Exotic Woodboring Insects: The exotic woodboring insects program is multifaceted. IPPM taxonomists identified 20,030 specimens for EDRR, EWBI, and the Regional Identification Center. The granulate ambrosia beetle monitoring program in The Dalles yielded 42,164 specimens. Two granulate ambrosia beetles were caught on the facility premises and more delimitation traps will be placed in 2016.
	Native Bees: 40,522 individual bees in 27 genera and 56 species or subgenera were collected from crop fields for IPPM's native bee pollinator project. An image-based guide to the identification of common native bee pollinators and bumblebees in the Willamette Valley was completed in 2015.
	New Records: IPPM documented 21 exotic species new to Oregon in 2015. Of these, three are known significant pests: the European chafer, the garden slug, and the oak lace bug. Two are beneficial species, the ash whitefly ladybird beetle and the ash whitefly wasp. This makes a total of 91 since 2007, most of which were initially detected by ODA.

Gypsy Moth Program

Barry B. Bai

IPPM placed 5,417 Gypsy Moth (GM, Lymantria dispar) and 9,337 Asian Gypsy Moth (AGM) traps for a total of 14,754 traps throughout Oregon in 2015. All 36 counties were trapped either for GM or AGM, or both. In addition, the Oregon Department of Forestry (ODF), USDA Forest Service (USFS) and USDA APHIS PPQ placed a combined total of 321 GM traps. This is the third year in which other state and federal agencies in Oregon assisted IPPM in placing additional GM traps because of reduced funding. Seven GM were caught in four traps placed by IPPM in Grants Pass, Josephine County. These seven moths were trapped near the southwest edge of the delimitation grid placed in response to 2014's positive catch of four Gypsy moths in three traps and 2013's positive catch of two Gypsy moths in a single trap. IPPM staff canvassed the area, interviewed residents, and distributed Gypsy moth flyers. We identified a potential local source (farm equipment moved from an eastern infested state), but did not find any GM life stages. We caught five single GM this year in the Tri-County area in and around Portland metro. These included one in a residential area in West Linn (Clackamas County), one in Forest Grove (Washington County), one in Northwest Portland (Washington County), one west of Forest Park (Multnomah County), and one near the Port of Portland's Terminal 5 (Multnomah County). Delimitation trapping will be conducted in 2016 at all sites where Gypsy moths were caught in 2014 and 2015.

AGM populations in Asia and the Russian Far East continue to pose a threat to the US and Oregon. International trade and commerce activities increase the likelihood of new introductions. US Customs and Border Protection (Department of Homeland Security) intercepted high numbers of AGM egg masses from ships originating from Asia in the past three years, although the interception numbers were relatively low in 2015.

Oregon's AGM trapping program included major cities, ports, highways, and railroads receiving or transporting cargo and containers originating from Asia. We also used the USDA APHIS AGM risk map to prioritize trapping areas. Major ports and waterways at risk from ships carrying AGM egg masses were trapped, including about 90 miles of the Columbia River (from Astoria to Portland), the Port of Portland, and the Port of Coos Bay (Coos County). We caught two AGM, one in Forest Park and another near the Port of Portland's Terminal 4 in the St. Johns area in northwest Portland. These two AGM catches were about two miles apart and separated by the Willamette River. Washington State caught another AGM at the Port of Vancouver on the Columbia River. The Vancouver AGM was about four miles northeast of the St. Johns AGM catch.

USDA APHIS convened an AGM Technical Working Group (TWG) to discuss the AGM catches associated with the Ports of Portland and Vancouver and to develop a response plan. The TWG recommended that the area where three AGM and two GM were caught near the Ports of Portland and Vancouver should be treated aerially with the organic biopesticide *Bacillus thuringiensis* var. *kurstaki* to mitigate the risks of AGM and GM establishment. An AGM eradication program of about 8,674 acres in northwest Portland is being planned for the spring of 2016. This will be the third largest GM/AGM eradication program in Oregon's history. The last GM eradication program in Oregon was conducted in Eugene in 2009.

Japanese Beetle Program

Barry B. Bai

Oregon continues to experience introductions of the Japanese beetle (JB, *Popillia japonica*) from infested states in the eastern US. Major pathways include cargo planes originating from airports in states with established JB populations and trucks from those JB infested states. In order to protect Oregon's nurseries, fruit production areas, the grass seed industry, and other natural resources, IPPM continues to implement an intensive JB detection program that complies with the national JB harmonization plan. In addition, IPPM enforces a strict exterior JB quarantine rule to prevent new introductions from infested states via nursery stock.

IPPM conducts eradication programs whenever a breeding population of JB is detected. Since the beginning of the JB program in 1988, IPPM has trapped 403 JB and conducted seven successful JB eradication programs. In addition, treatments at the Portland International Airport and vicinity have been ongoing for the past decade.

Trapping

IPPM placed 2,990 JB traps in 35 of 36 Oregon counties in 2015. About 964 of these traps were delimitation traps placed in the Portland metro area and in Troutdale, where JB were caught in previous years. The remaining 2,026 traps were detection traps deployed at high-risk sites in cities, towns, and rural areas throughout the state. This year, IPPM caught four Japanese beetles statewide, all from the Portland International Airport (PDX) and vicinity. No beetles were caught along Airport Way at PDX and Argyle Street where eight and six JB were trapped, respectively, in 2013. After two years of negative trapping, we can declare that these sites are free of JB. The positive JB sites in PDX and vicinity will be trapped with a delimitation grid in 2016.

Stable Isotope Analysis of Japanese beetles

Diana N. Kearns

The four Japanese beetles (JB) caught in 2015 were sent to a stable isotope laboratory at Northern Arizona University (Flagstaff, AZ) for analysis. Three of the beetles caught around Airtrans Center and Perimeter Road at PDX had eastern hydrogen isotope signatures, indicating their introduction this year from an eastern region in the continental US. The fourth beetle, caught outside of the airport area on NE 47th Avenue, had a northwestern isotope signature, indicating it had been in the area for longer than 6 weeks.

Eradication

This year, IPPM conducted a JB eradication program at one site, PDX Airtrans Center (about 62 acres). IPPM caught 12 JB at this site in 2014. IPPM also caught JB at this site over the last several years. The ground was treated with the pesticide Acelepryn in May to eradicate JB larvae. All turf and landscape beds received one application that was irrigated into soil by either rainwater or the irrigation system on-site.

Since 2008, IPPM has worked closely with the Port of Portland Authority on the JB prevention and eradication efforts at PDX. The Port of Portland has also contributed to the treatment costs at PDX properties and has assisted with the outreach efforts by distributing maps, posters, signs, pesticide information, and treatment schedules to business tenants.

Airplane inspections

In 2015, USDA APHIS reduced again JB airport monitoring due to budget cuts. USDA APHIS regulated three airports in three states for JB. When JB populations at airports in eastern states reach levels that pose a risk of live beetles entering aircrafts, the airport becomes regulated and JB exclusion methods or chemical treatments of airplanes are required. Several eastern US airports were no longer regulated by APHIS, including Madison, Wisconsin, and Peoria, Illinois. Some of those airports may be on the route of courier planes that eventually make their way to Oregon.

A biweekly national conference call was set up by USDA APHIS to share JB information among all stakeholders. IPPM personnel conducted 10 cargo plane inspections and found no dead or live beetles this season. We started our inspections on July 6th, 2015 and ended our inspections on August 28th, 2015. Inspected cargo carriers included FedEx (3 inspections) from Indianapolis, IN and UPS (7 inspections) from Louisville, KY. These two carriers have direct flights from infested states to Oregon.

Continued cooperation, monitoring, information sharing, and commitment among state and federal regulators, industry representatives, and private citizens are critical to reducing the risk of introduction and establishment of JB in Oregon.

Grasshoppers Program

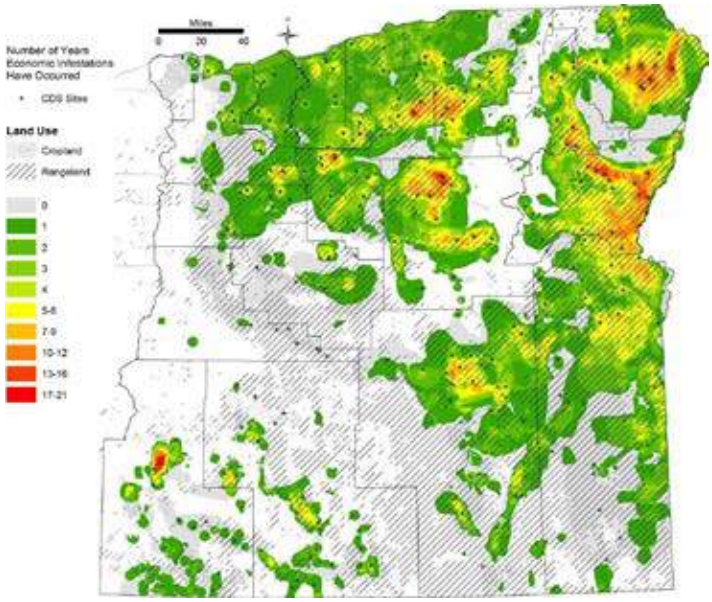
Paul E. Blom

The 2015 Oregon grasshopper survey season, conducted by IPPM in cooperation with the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ) office, showed that the Oregon grasshopper population is continuing to increase from its recent low in 2012. Surveying began on April 28th and was completed August 19th. Nymphal survey takes place early in the season and is used to locate potential outbreak areas for the current year. Adult survey (this year July 6th – August 19th) is used by IPPM and APHIS to make predictions for the following season, estimating economic levels as 8 or more grasshoppers per square yard. In 2015, 1,712

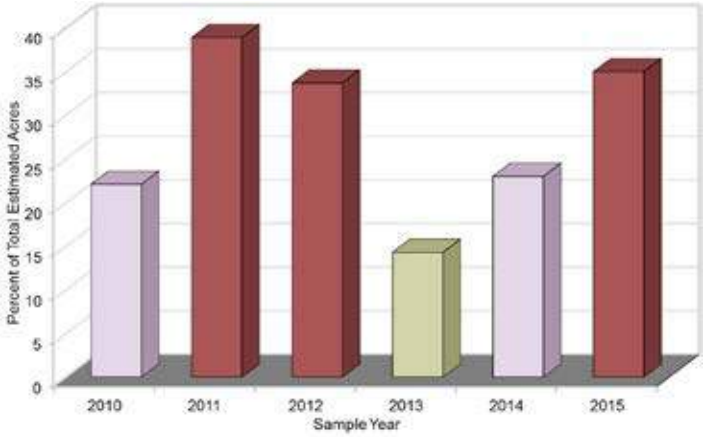
Oregon Grasshopper Survey Statistics from 2005 through 2015. Economic infestation >=8 grasshoppers / yd^2.

		Acres of Infestation							Sites Surveyed						
Year	Counties Infested	Total Surveyed	Economic		Non-Economic		No Grasshoppers		Total	Nymph	Adult	Treatment	With Economic	Mean GH / yd^{2*}	No. of GH Surveyors
2015	17	7,155,322	2,495,073	35	2,860,304	40	1,799,945	25	1,712	803	909	0	437	25	3
2014	19	4,459,390	1,031,674	23	1,722,069	39	1,705,647	38	1,761	912	849	0	334	29	3
2013	15	6,093,998	869,856	14	2,352,182	39	2,871,960	47	1,397	462	935	92	280	50	2.5
2012	17	3,503,235	1,178,872	34	1,639,468	47	684,895	20	1,135	387	748	34	526	34	2.5
2011	18	7,422,908	2,888,455	39	3,220,585	43	1,313,868	18	3,150	1,880	914	345	1,093	20	6
2010	12	7,622,359	1,681,726	22	2,929,185	38	3,011,448	40	1,905	795	750	360	488	21	6
2009	11	151,974	151,974	100		0		0	998	491	507		108	18	4
2008	12	1,129,820	1,129,820	100		0		0	2,722	1,116	1,606		360	29	6
2007	13	798,358	798,358	100		0		0	1,585	706	870		298	18	6
2006	14	97,399	97,399	100		0		0	1,368	750	618		100	16	6
2005	9	64,751	64,751	100		0		0	859	306	423		115	15	5

* Mean of economically infested samples



Areas of high density are loosely consistent with the historical pattern.



Percentage of surveyed area estimated to be at an economic density.

sites were visited. Of these, 803 were visited during the period for nymphal grasshopper survey and 909 were visited during the adult period. Approximately 2.5 million acres across 17 counties in eastern Oregon were estimated to have economically infested locations. Four of these 17 counties (Deschutes, Sherman, Crook, and Wheeler) have had five or fewer locations above the threshold, and less than an estimated 50,000 acres. Conversely, three of the 17 counties were estimated to have greater than 250,000 economically infested acres.

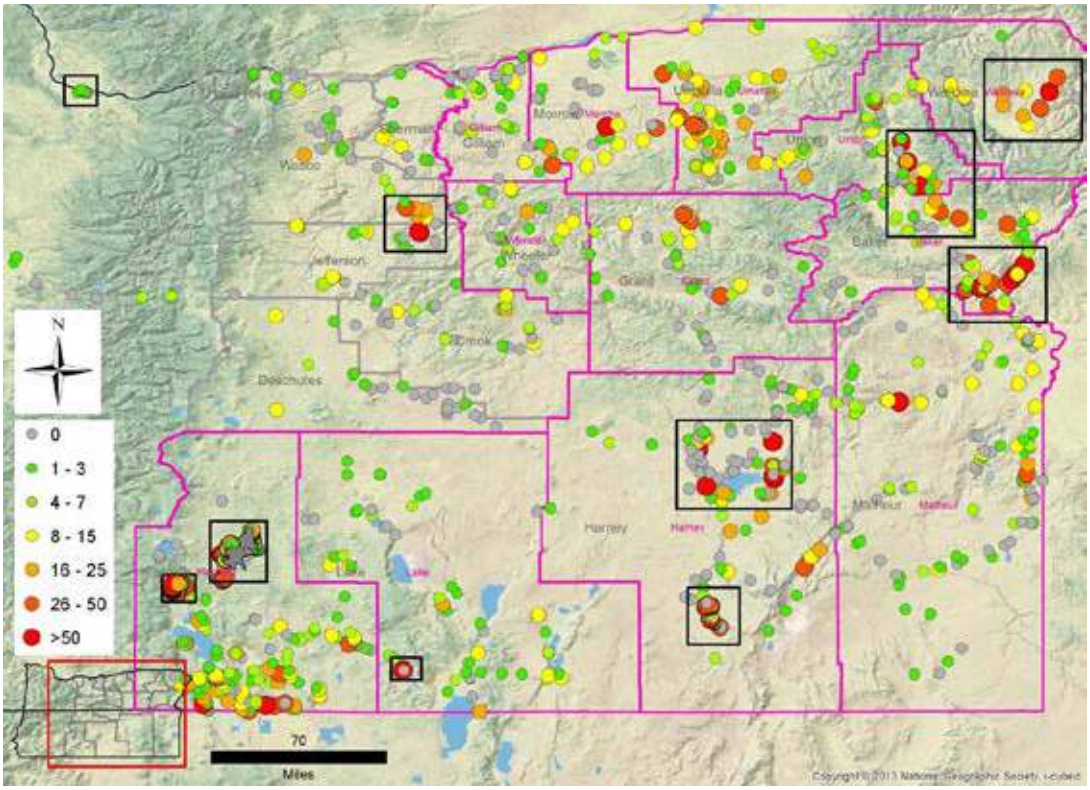
Because survey resources have been reduced since 2011, the percent of economically infested acreage to the total surveyed acreage is used to compare trends in population densities between years. This comparison shows a resurgence in eastern Oregon grasshopper population densities from 2013 to 2015.

Though the resurgence is not evident across all of eastern Oregon, this year more regions are showing the density increase. Several of these regions will be examined more closely, see Areas of Special Mention.

Areas of special mention

Klamath Marsh (National Wildlife Refuge, KMNWR)

IPPM continues to focus a great deal of the survey resources on the clear-winged grasshopper, *Camnula pellucida*, population at the Klamath Marsh (Klamath County). While population numbers have been down in and around the refuge this year, we saw density increases in several areas. The predominance of the high densities were in the properties bordering the refuge, though significant increases occurred within the refuge boundary as well. Adjacent land managers should watch these areas closely in early 2016 and IPPM will pay close attention to areas on the refuge that had increasing densities in 2015.



2015 survey densities (/yd2) classified to seven levels.

IPPM did not participate in a suppression program at the Klamath Marsh this year and no known treatments were applied by adjacent private land owners.

Fort Klamath basin

Population densities in the Fort Klamath basin have been building over the last three years. These increasing densities have occurred primarily along the western edge of the basin, but this year significant population densities were found basin-wide. Land owners and managers should watch for, and monitor, early season hatch and should be prepared for suppression efforts in 2016.

Lower Lake County, Drews Valley Ranch

In 2013, we were contacted by the owner of Drews Valley Ranch concerning the initial phases of a grasshopper outbreak in the valley. In March 2014, all concerned landowners met in Lakeview to review grasshopper biology, sampling protocols and timing, and possible strategies for intervention. With the start of egg hatch, the area was scouted and the ranch was advised on targeting egg beds for treatment. By the end of the season, only one area of adults with a reasonably high density was found. After scouting at hatch time in 2015, only this one area had an egg bed of concern. These efficient, targeted efforts at managing the grasshopper population proved very successful for the ranch.

Catlow Valley, Roaring Springs Ranch, Harney County

In 2014, Roaring Springs Ranch reported an outbreak exceeding 7,000 acres. Unfortunately, it was too late to intervene for any benefit in the 2015 season. All individuals were adults and oviposition was in progress. IPPM received a call from the ranch early in May this year and was able to assist with assessing the early hatch period encompassing an estimated 7,000–14,000 acres. The population was dominated by 1st and 2nd instars and the ranch decided to apply Dimilin.

North of Malheur National Wildlife Refuge

In 2014, calls were received from several landowners to the north of the Malheur National Wildlife Refuge. At the time, the populations were either composed primarily of adults or individuals well on their way to that life stage. It appeared from our conversations that there were many individual treatment efforts going on in the area. We advised that a grasshopper management committee be formed during the 2014-2015 winter months with the intent of developing a regional response to a probable outbreak that would cross individual ownership areas and would need a larger scale approach. In 2015, scouts returned to many of the same areas visited in 2014 and found most still had high density populations. We did not hear from owners during the 2015 season, but these population levels could certainly complicate management objectives.

SE Baker County

The majority of stops in the SE corner of Baker County had density levels of concern. If local ranching interests did not notice the impact this year, they likely will in 2016.

Baker-Union County corridor

This SE-NW corridor has been prone to developing large grasshopper populations. Again, though recently 'quiet,' we have been finding pockets of increasing densities over the past couple of years. We will be monitoring this stretch of grasshopper habitat in 2016 and ranchers would do well to watch for the spring hatch.

Central Wallowa County

Historically (over the past 60 years), this area has been prone to high economic levels of infestation. However, during recent years densities have been found well below levels of concern. This year's survey indicates populations are returning to noticeable densities. Growers and ranchers in this region will want to watch the 2016 spring hatch.

Jefferson-Wasco County border

The region from Hood River County SE to Crook County had the lowest grasshopper densities for eastern Oregon except for a sizable area straddling the Jefferson-Wasco counties border. Local land managers in this area would do well to watch for the 2016 hatch and get an assessment of the population as soon as possible.

Portland International Airport (PDX)

After successfully treating a problematic grasshopper population at the Portland International Airport (PDX) using Dimilin in 2009, the Port of Portland continues to enjoy positive effects of that suppression. The grasshopper outbreak was attracting birds to the airport grounds which created a dangerous situation for aircraft. 2015 grasshopper densities, while showing a slight increase from the previous year, continue to be well under the 'economic' level for rangeland or pasture standards. No suppression efforts were made at PDX this year.

Tribal lands

The grasshopper survey intersected tribal holdings at a few locations (approx. 60,400 acres), primarily along the Columbia River, and with the Burns, Umatilla, and Warm Springs Reservations. Most survey acreage had either no grasshoppers or densities below the economic threshold.

Economic densities were found in three of the six jurisdictions. The Umatilla Indian Reservation (Umatilla County) and the Warm Springs Reservation (Jefferson and Wasco counties) were the only two that had significant acreage with economic densities.

Mormon Crickets

Paul E. Blom

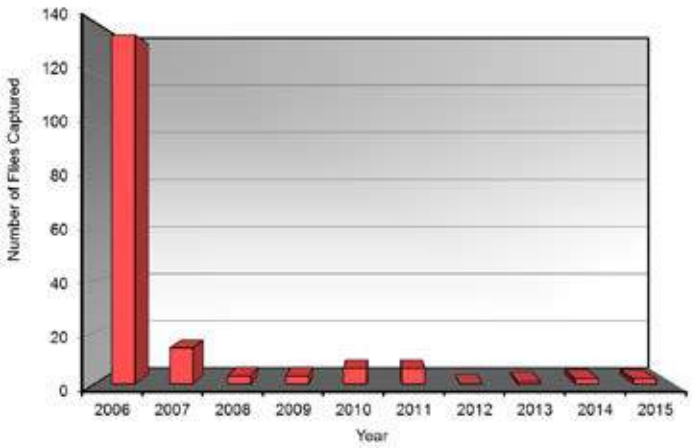
For the last few years, Mormon Crickets (MC) have been on the decline. We looked for MC at all of our grasshopper stops, but found only one infested area in the northern reaches of Gilliam County. This included a very dense population in Blalock Canyon. We worked with a local grower in this area to monitor that population because of its proximity to several wheat fields nearing harvest. The population never moved above the canyon rim in any significant numbers. Early season monitoring of the canyon will be needed in 2016 to assess the need for any suppression effort.

Apple Maggot Program

Paul E. Blom

Captures of apple maggot, *Rhagoletis pomonella* (Walsh), in eastern Oregon have dropped to very low levels since the start of our Pendleton eradication program in 2006.

There were no fly captures in 2012. Unfortunately, over the past three years 1 fly was captured in 2013, 2 flies in 2014, and 2 flies this year (2015) in Pendleton. The Milton-Freewater and Ontario areas remain apple maggot free. In 2015, we sampled 410 sites between Umatilla and Malheur counties.

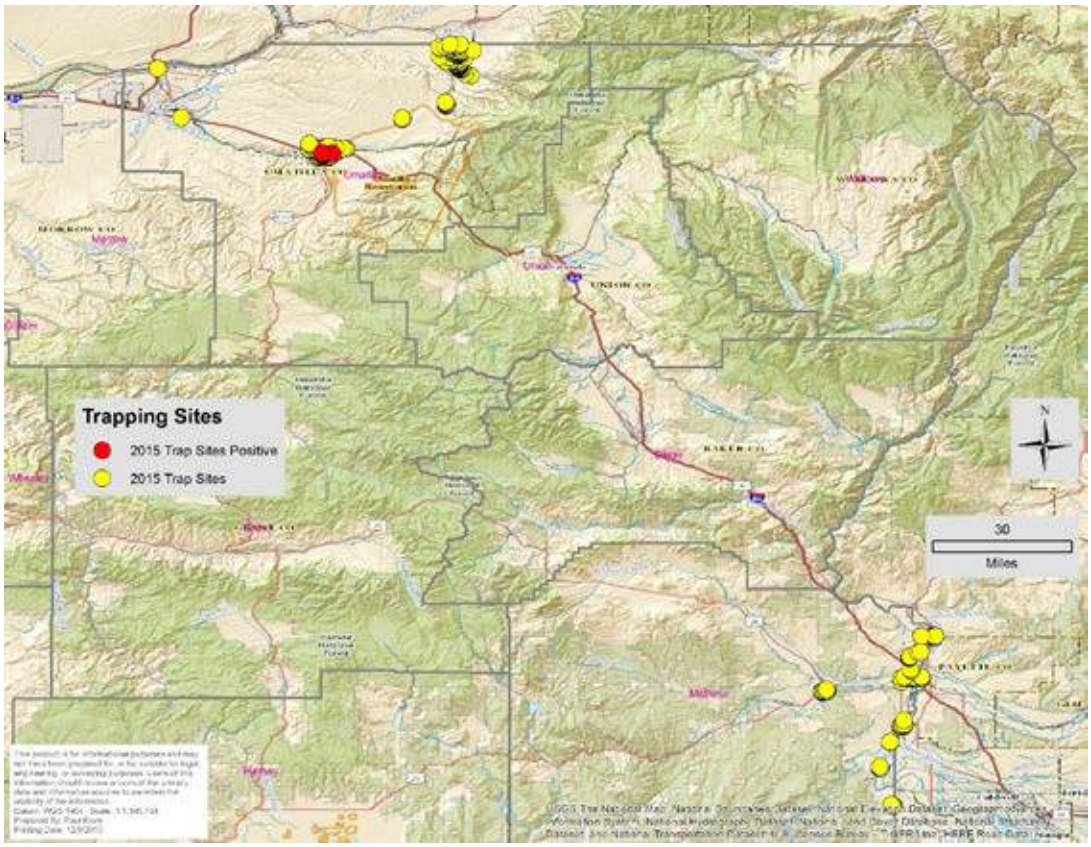


Number of apple maggot trapped during the last ten field seasons.

Pendleton area

Work has continued within Pendleton and the surrounding area since 2006 to eradicate the small population that showed up in the early 2000s. The trapping effort was expanded in 2011 to levels used in 2006, at the start of the eradication program. Each season approximately 200 traps are deployed across the Pendleton area. This year, 196 were deployed throughout the Pendleton environs.

Of the 410 traps deployed during 2015, two traps in Pendleton, each with one fly, were positive for apple maggot. These captures were south of Interstate 84,



Apple Maggot trapping locations in eastern Oregon 2015.

one on the WNW edge of the Blue Mountain Village Apartments (BMVA) and the other in a hotel-RV area to the east. Focus on Pendleton will continue in the 2016 season, including the BMVA, though removal of all the host trees from that facility was completed in 2014. Since the pupae can delay many seasons before emergence, the BMVA will be monitored for several more years.

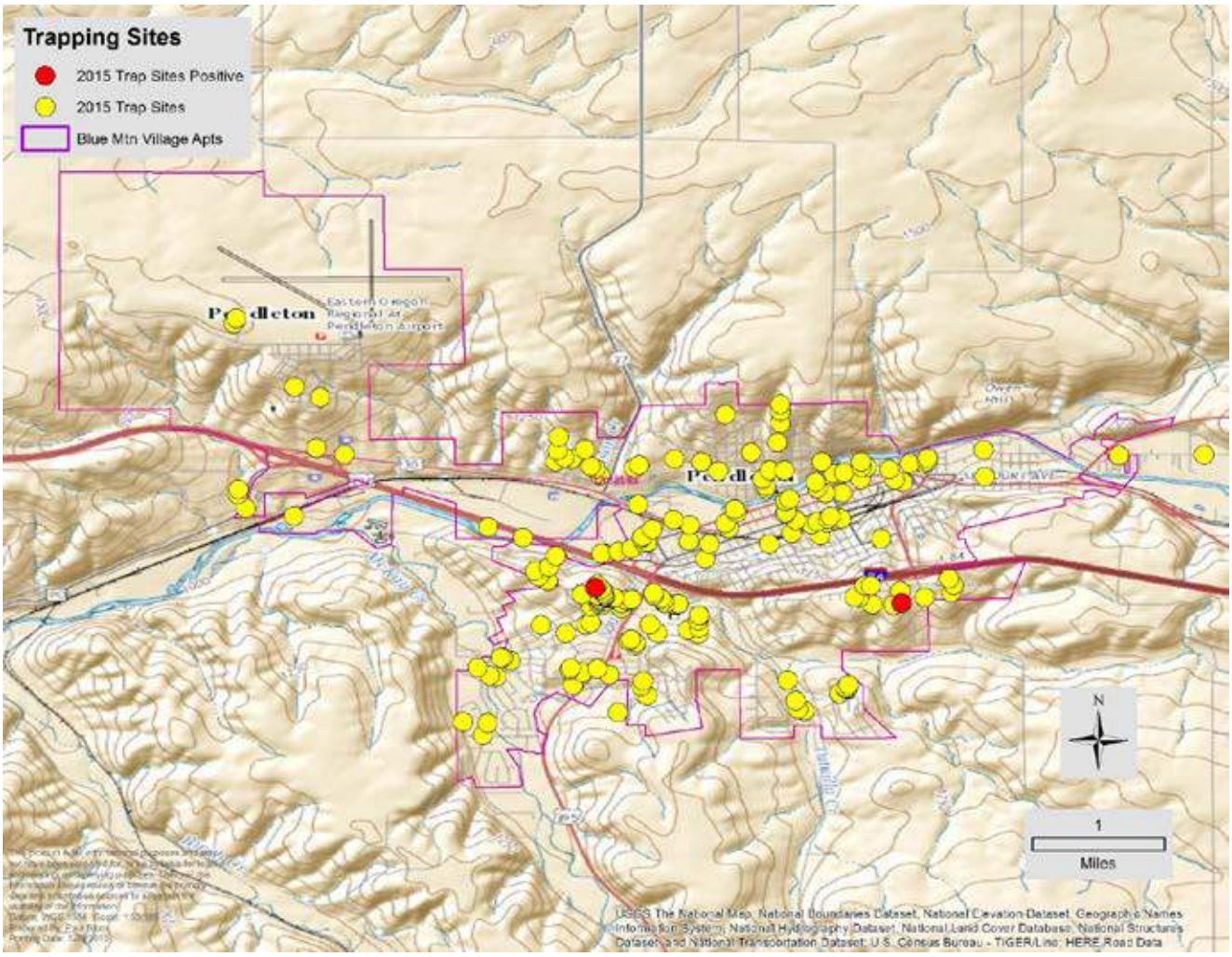
Milton-Freewater area

Trapping in Milton-Freewater and the general region continued this year with 114 traps deployed. Fortunately for this area, given the potential pest pressure from the north in Washington state, no flies were captured.

Ontario area

Monitoring of 100 sites continued in the Ontario area this year. No apple maggots were found in any of these traps. We will continue trapping in and around Ontario during 2016.

Location of the positive apple maggot traps in Pendleton.



Apple maggot trap locations in the Pendleton area.

CAPS/Farm Bill Commodity Pest Survey Program

Richard A. Worth

This group of survey programs include the individual commodity surveys listed below. The commodity groups have an estimated combined value of $573 million. Collectively, these surveys cover all major agricultural areas of the state and they are largely focused on detecting federally targeted exotic Lepidoptera (moths) that are twig, shoot, trunk, root, bud, fruit, or seed borers and defoliators. The nut survey also includes target Coleoptera (beetles/weevils) and Heteroptera (true bugs and sucking insects). An estimated 4,740 samples were generated. Of those around 2,250 have been processed with nearly 14,000 specimens identified to date for a current total of about 360 species. Species identified were mostly in the economically important moth families of Noctuidae, Tortricidae, and Pyralidae/Crambidae. Samples are screened for target species and important non-targets. One example is the attraction of the Tufted apple bud moth (TABM), *Platynota idaeusalis* (Tortricidae), to the Chilean leaf roller lure (CLR), a target in the orchard commodity survey. TABM is an eastern US native, but it is the second worst apple pest in that region after the notorious codling moth. Prior to 2013, it was only known from a few old specimens collected from Umatilla and possibly Baker counties. It is now known from several specimens and six counties, including Baker, Grant, Hood River, Malheur, Umatilla, and Wasco.

Grape commodity pest survey

Barry B. Bai & Diana N. Kearns

Grape and wine production is a growing industry sector in Oregon and grapes ranked 10th among agricultural commodities in the state in 2014. Oregon ranked 6th of all states in grape production, with a value of $118 million. Trapping surveys for grape pests in 2015 were conducted in 26 vineyards in 12 counties throughout Oregon. Target species included the grape tortrix (GT, *Argyrotaenia ljungiana*) (52 traps), the grape shoot moth (GSM, *Sparganothis pilleriana*) (52 traps), the European grape berry moth (EGBM, *Eupoecilia ambiguella*) (52 traps), the grape berry moth (GBM, *Paralobesia viteana*) (52 traps), and the European grape vine moth (EGVM, *Lobesia botrana*) (106 traps). Additionally, *Copitarsia* moth (Noctuidae), were surveyed in vineyards by UV light traps.

The European grape vine moth is a pest of national concern. It is a serious threat to the vineyard and grape industries of Oregon. In 2009, EGVM was first detected in California where intensive delimitation and eradication efforts are currently underway. Continuous shipments of grapes from infested counties in California into Oregon warrant an intensive survey of Oregon vineyards for this species and other invasive pests mentioned above. In 2015, IPPM's grape commodity pest survey did not detect EGVM or other target species; however, about half of the UV samples await processing with approximately 7,000 specimens currently identified.

Orchard fruit pest survey

Barry B. Bai & Diana N. Kearns

Orchard fruits such as cherries, peaches, and plums are important to Oregon agriculture. Cherries ranked #14 in agricultural commodities in Oregon in 2014 with a value of $82.7 million. Trapping surveys for orchard fruit pests in 2015 were conducted in 52 fruit orchards in 15 counties throughout Oregon. Target species included the light brown apple moth (LBAM, *Epiphyas postvittana*) (236 traps, including 100 delimitation traps), the summer fruit tortrix (SFT, *Adoxophyes orana*) (52 traps), the plum fruit moth (PFM, *Grapholita funebrana*) (52 traps), the cherry bark tortrix (CBT, *Enarmonia formosana*) (67 traps), the peach fruit moth (PCHM, *Carposina niponensis*) (48 traps), the European grape vine moth (EGVM, *Lobesia botrana*) (127 traps), Chilean leafrollers (CLR, *Proeulia* spp., i.e. *Proeulia apospata* and *P. auraria*, *P. chrysopteris*, and *P. triquetra*) (50 traps), and the cherry blossom moth (CBM, *Argyresthia pruniella*) (66 traps).

The light brown apple moth is a destructive pest that feeds on a wide range of fruits and many other plants. The first LBAM in Oregon was caught in 2010 at a nursery in Polk County. This regulatory incident resulted in a delimitation survey there for three years that was negative for the target species. In 2015, two more LBAM were caught in the same nursery. These catches resulted in an intensive delimitation program, but the exact number of LBAM caught is not definitely known, as some issues with trap integrity occurred.

The cherry bark tortrix was detected in Clackamas county (2 moths), Multnomah county (52 moths), and Washington county (1 moth) in 2015. This exotic pest could endanger the nursery industry's pest-free status for export markets as well as cause direct damage to plants. It was found in Marion county a few years ago, but has not been detected again in that county.

The tufted apple bud moth was detected with the CLR lure for the first time in Malheur County in 2015, making it the 6th positive county in the state for that species.

Solanaceous crop pest survey

Barry B. Bai & Diana N. Kearns

Solanaceous crops include potatoes, which are ranked 7th among agricultural commodities in Oregon ($165 million in 2014). Oregon ranks 5th nationally for potato production. The Egyptian cotton worm (ECW, *Spodoptera littoralis*), Golden twin spot moth (GTSM, *Chrysodeixis chalices*), tomato leaf miner (TLM, *Tuta absoluta*), and Guatemalan potato tuber moth (GPTM, *Tecia solanivora*) are known pests of solanaceous crops and are of federal and international quarantine significance. A solanaceous crop pest survey was conducted for these target species in 2015: Egyptian cotton worm (45 traps), Golden twin spot moth (46 traps), tomato leaf miner (52 traps), and Guatemalan potato tuber moth (50 traps). Twenty-one fields were surveyed in Baker (4), Benton (2), Hood River (1), Jefferson (3), Klamath (1), Malheur (1), Marion (3), Morrow (1), Umatilla (2), Wasco (1), and Washington (2) counties.

This survey provides critical information on the status of these important quarantine pests and will help to maintain export markets for Oregon's solanaceous crops. Samples from this year are awaiting processing.

Corn pest survey

Barry B. Bai & Diana N. Kearns

The Silver Y moth (SYM, *Autographa gamma*), Old World bollworm (OWB, *Helicoverpa armigera*), European corn borer (ECB, *Ostrinia nubilalis*), and False codling moth (FCM, *Thaumatotibia leucotreta*) are pests of regulatory significance in corn crops. Sweet corn production ranked 19th ($45.1 million) and corn for grain ranked 22nd ($33.3 million) among commodities in Oregon in 2014. Traps for the Silver Y moth (41 traps), Old World bollworm (40 traps), European corn borer (80 traps), and False codling moth (55 traps) were placed in 20 corn fields in 2015. Survey fields were in Hood River (1), Jackson (1), Josephine (1), Malheur (3), Marion (4), Morrow (3), Multnomah (3), Polk (1), Umatilla (2), and Washington (1) counties. Corn samples are still being processed in the laboratory.

Nut commodity survey

Todd B. Adams

Oregon is the #1 producer of hazelnuts in the US, a crop valued at $130 million in 2014, with niche markets for other varieties of nuts, including chestnuts. In 2015, 12 high-risk commercial nut orchards (one walnut, two chestnut, and nine hazelnut) were selected for the nut commodity survey. Two vacuum samples were collected at each site in 2015. Pending additional funding in 2016, three more vacuum samples will be collected at each site in the spring and a survey for five moth pest species of regulatory significance will be conducted.

Exotic Wood Boring Insects Program

James R. LaBonte

Granulate ambrosia beetle and other wood boring insects in The Dalles

Surveillance for exotic wood boring insects has been ongoing at and in the vicinity of the railroad tie creosoting plant in The Dalles since 1997. The site was recognized as high risk for the introduction of such pests because it imports raw ties from other regions of the United States and sometimes Canada. Several regional exotics have been detected there. The most significant detection to date was the granulate ambrosia beetle, *Xylosandrus crassiusculus*, a threat to Oregon's orchard and nursery industries as well as to forest health and regeneration. This pest was detected in large numbers in 2004, but was ultimately eradicated by IPPM. Since then, IPPM has conducted surveillance trapping throughout the year with Lindgren funnel traps baited with four ultra-high release ethanol lures. The traps are placed on the plant premises and in the surrounding area. Currently twenty-one traps are in place and samples are taken every two weeks. A compliance agreement with the tie plant is being updated. This agreement restricts importation of ties from the riskiest sites, in the Southeast, to the coldest winter months. A total of 42,164 specimens were identified in 2015. Unfortunately, two *X. crassiusculus* were trapped on the plant premises. Additional traps were placed after this detection and additional delimitation traps will be placed in 2016.

Regional identification center for exotic ambrosia and bark beetles and other wood boring insects

The taxonomic infrastructure of the US cannot support the identification needs of many exotic insect surveys. This is particularly true of wood boring insect surveys, which are particularly challenging because of the ongoing onslaught of exotic wood borer introductions and the numerous target species. IPPM is now nationally, and to some extent, internationally recognized for expertise in the identification of wood boring insects. Consequently, one component of this multifaceted agreement, funded via the Farm Bill, is for IPPM taxonomists to provide wood borer identification services to other states and agencies in the USDA-APHIS Western Region. The table on the next page summarizes the 2015 submissions:

2015 Woodboring Insects Identification Services		
State	**No. of species**	**No. of specimens**
Alaska	2	12
California	10	50
Idaho	3	15
Nevada	3	16
Oklahoma	3	17
Oregon	35	203
South Dakota	1	3
Utah	62	295
Washington	2	6
Totals	120	612

The white pine weevil, *Pissodes strobi*, was found in infested nursery stock brought into Alaska. This pest, which can be extremely damaging, is not native to or known from Alaska. Once the identification was made, Alaska regulatory officials took prompt action.

One of the samples submitted from Nevada was a new state record for the Mediterranean pine engraver, *Orthotomicus erosus*. This is also the first record of an established population outside of California. The beetle was found at several localities and in large numbers. Although this insect very aggressively attacks stressed pines, it appears to rarely attack healthy hosts. Consequently, Nevada Department of Agriculture will not be taking regulatory action.

Live cerambycids were observed emerging from decorative wine cask willow bandings at a winery in McMinnville, OR. The beetles were *Phymatodes lividus*, a European species formerly known in North America from only a limited area in the East. This was a new western North American record. The infested casks were purchased second-hand and trace-back efforts by USDA-APHIS were unsuccessful at determining their origin. This was the second year the winery noticed the beetles and it was stated that other wineries had similar issues. Fortunately, this species is not known to attack living hosts, instead preferring dead twigs and branches. Trapping will be conducted in the vicinity in 2016 to determine whether *P. lividus* has become established.

Phymatodes lividus specimen found in wine cask willow banding.

Live beetle on willow banding of cask shows damage.

Helmuth Rogg, Clint Burfitt, and Eoin Davis (USDA APHIS) looking for beetles in casks.

The Utah identifications included new state records for four cerambycids. One, *Arhopalus syriacus*, is a European exotic formerly known only from California. The other three were all species native to other regions of North America, but these would be considered regional exotics in Utah.

One of the Washington submissions consisted of images of a cerambycid, which had emerged from Chinese wooden furniture at Bellingham, WA. There had been several tentative identifications but IPPM's senior taxonomist provided the first correct one, *Stromatium longicorne* (Newman). This beetle was intercepted in the same county several years ago in a wooden lamp from China. The species is not known to be established in North America.

Several sets of screening aids produced by other agencies or institutions were reviewed. Sadly, all were found wanting. One set was so bad that the recommendation was made to remove these screening aids from circulation.

IPPM held two bark and ambrosia beetle identification workshops in 2015, one March 2nd-6th and the other November 2nd-6th. Both were held at ODA's Hawthorne facility in Salem, OR. As at the 2014 workshop held in Bozeman, MT, Sarah Smith of Michigan State University was the co-presenter with Jim LaBonte for the March workshop and Rick Hoebeke of the University of Georgia was the co-presenter with Jim for the November workshop. Dan Clark, Tom Valente, and Josh Vlach invested a great deal of time and effort in workshop preparations and instructional support. Leslie Shaffer, our Plant Conservation and Protection Programs office manager, provided vital logistical support, including attendee lodging arrangements and workshop catering. Thomas Shahan made very well received presentations on how

Dan Clark, Jim LaBonte, and Josh Vlach (front row left) with workshop participants in March.

he acquires the amazing images used in the various identification aids produced by IPPM.

Twenty-two people attended the March workshop and twenty-three were at the November workshop. That is about the maximum the IPPM satellite lab and the conference room will hold. The March workshop was essentially full a few days after the original announcement. So many people wanted to attend that workshop that the November workshop was largely filled with overflow from the March workshop. Participants came from all parts of the country, with the most far-flung from Uruguay! Universities, state and federal land management agencies, and even private industry were represented. Evaluations from participants made it clear the workshops were held in high regard and that a great deal of useful taxonomic skills and information were acquired. This response is consistent with all similar workshops held by IPPM.

Colin Park, USDA APHIS PPQ (on the left) with other workshop participants.

Diana Kearns setting up funnel trap at an EDRR site in Medford.

Early Detection and Rapid Response (EDRR) for exotic bark and ambrosia beetles

Since its inception in 2001, IPPM has been part of the EDRR (Early Detection and Rapid Response for Exotic Bark and Ambrosia Beetles) Program. IPPM's role has included protocol development (including a very well received video on trap setting and maintenance and sample handling), Oregon surveys, and taxonomic support to other western states. Part of a national surveillance effort to detect exotic bark and ambrosia beetles new to a state, region, or the US before they become irrevocably established, this project is conducted in collaboration with the US Forest Service. Preventing such pests from becoming permanent features of Oregon's environment protects urban and rural forested areas, including fragile watersheds, as well as other agricultural and natural resources. California and Oregon were the two western states conducting EDRR trapping in 2015. IPPM taxonomists identified a total of 11,179 specimens comprising 148 species, including Buprestidae (28), Cerambycidae (53), Curculionidae: Scolytinae (61), and Siricidae (5). No species of regulatory significance were identified.

Exotic wood boring insect survey

IPPM has conducted exotic wood boring insect surveys at various times and locales since 1997. The survey for 2015 took place at nine high risk sites in the Willamette Valley, using Lindgren funnel traps and three types of lures: ultra-high release ethanol, ultra-high release alpha-pinene plus ultra-high release ethanol, and exotic *Ips* lures. A total of 8,239 specimens of wood boring insects were collected, comprising 74 species, including Buprestidae (8), Cerambycidae (30), Curculionidae: Scolytinae (30), Siricidae (5), and Xiphydriidae (1).

The rose girdler, *Agrilus cuprescens.*

Although no species of regulatory significance were found, several records were of interest. Two specimens of the rose girdler, *Agrilus cuprescens* (Buprestidae), were trapped in northwest Portland. These are the first western Oregon records. This exotic European species has been known for some time from the Columbia Gorge and eastern Oregon. It can be damaging to roses and cane berries. Large numbers of the red-headed ash borer, *Neoclytus acuminatus* (Cerambycidae), were found in the Portland metropolitan area. This species is native to eastern North America but was introduced into eastern Oregon and the Columbia Gorge years ago. In recent years, a few specimens have been found in Portland, but this is the first year large numbers have been found over a large area, so we now know it is firmly established in western Oregon. A small scarab beetle, *Ataenius abditus* (Scarabaeidae), was found in one of the traps. It is an eastern North American species and this is the first record for western North America. It is harmless, feeding on decaying plant material. These records are examples of how exotic species are continuing to be introduced into Oregon and how, once introduced, they subsequently expand their ranges.

High Priority Pest Survey Along High-risk Pathways (HPPS)

Joshua J. Vlach

A high priority pest survey was conducted in 2015 at ports, container yards, rail yards, the Oregon Zoo, fairgrounds, and shipping hubs. Sites with high volumes of national and international shipments were selected for survey. A diverse array of sampling methods was used in order to collect species that do not have a specific trap and “fall through the cracks” of most survey designs. The sampling methods used included: ant baits, a visual Asian longhorned beetle survey, vacuum collections, funnel traps, manual searches, pitfall traps, and ultraviolet light trapping. Funnel traps used ethanol, “cerambycid blend”, turpentine and ethanol, and emerald ash borer lures. Emerald ash borer lure was used on green funnel traps. Surveys were conducted at 21 sites in 9 counties (Coos, Deschutes, Jackson, Lane, Lincoln, Linn, Marion, Multnomah, and Washington). Sampling was initiated by June and continued until mid-October or through November, depending on the sampling method.

All samples have been coarsely sorted, but finer identifications are ongoing. Over 2,000 samples were generated, and over 14,000 specimens have been processed. There are still a few funnel, pitfall, vacuum, and about half of the UV light trap samples waiting for species identification. There are about a dozen specimens of a slug species awaiting identification from the national malacologist. Fourteen species of mollusk were identified representing 11 families. All of the remaining samples are processed.

Two pests of interest were identified. One is the worm slug, *Boettgerilla pallens*. A native of Europe, it has been found in North America in British Columbia and at one site in California. It appears to be moving in nursery stock. This is only the second record for the US. The other is *Neoclytus caprea*, a longhorned beetle species native to eastern North America that attacks broadleaf trees. This is the first record for western North America.

NAPIS Data Entry

Kerri A. Schwarz

The National Agricultural Pest Information System (NAPIS) database tracks the movements of exotic and invasive organisms that may impact the export of US agricultural products, as well as biocontrol agents. This database contains more than 3.4 million records.

The IPPM program enters all of the insect and mollusk Cooperative Agricultural Pest Survey (CAPS) funded survey data into the NAPIS database at the end of each calendar year. In addition, new US and state

records, county records, and some non-CAPS funded survey data are also entered. To date, 122 records have been uploaded to the NAPIS database for 2015.

Biocontrol Programs

Brown marmorated stink bug biocontrol

Barry B. Bai & Chris S. Hedstrom

The IPPM program continued testing the effectiveness of the exotic egg parasitoid, *Trissolcus japonicus*, as a biological control agent for the invasive brown marmorated stink bug (BMSB, *Halyomorpha halys*). This project is in its fourth year and is funded by a grant from USDA APHIS CPHST (Center for Plant Health Science and Technology) and works in collaboration with the Florida Department of Agriculture, Michigan State University, USDA ARS (Agricultural Research Service), and CPHST. IPPM staff have been conducting non-target testing of the biocontrol agent at Oregon State University's (OSU) quarantine facility in Corvallis. We have completed no-choice tests on ten non-target species, with the addition in 2015 of *Coleotichus blackburniae* (Hemiptera: Scutelleridae) from Hawaii (see "Koa Bug"). In these tests only non-target stink bug eggs were offered for parasitism. We also completed choice tests on four non-target species in which a female parasitoid was offered a choice between BMSB eggs and non-target stink bug eggs. The results to date indicate that the parasitoid prefers BMSB eggs over non-target stink bug eggs.

Brown marmorated stink bug caged choice test.

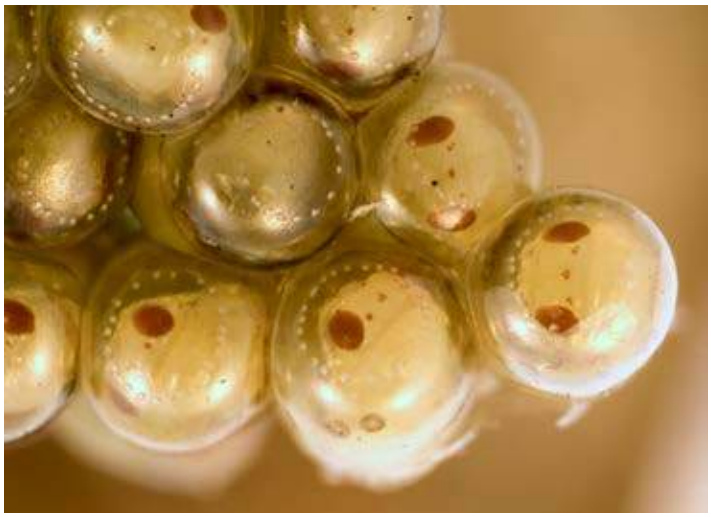
We also began to test the host-finding ability of *T. japonicus*. After some preliminary experimentation with cages, plant types, and exposure times, a protocol was developed using fine mesh cages and lima bean plants to simulate a more natural environment (compared with the no-choice and choice tests in vials). A single mated female wasp was placed in a cage with four young bean plants, two of which had been affixed with a cluster of host eggs each. The wasp was left in the cage for 48 hours to search for and parasitize host eggs. This experiment would allow for a more natural choice between target and non-target host eggs. We also began developing a protocol for testing the attractiveness of target and non-target host volatiles to *T. japonicus* in which a female wasp is observed tracking chemical footprints left by host stink bugs.

Koa bug

James R. LaBonte & Chris S. Hedstrom

In November 2014, when Helmuth Rogg, Jim LaBonte, and Josh Vlach were in Hawaii for Christmas tree importation issues, they attempted to acquire live specimens of the Koa bug (Scutelleridae: *Coleotichus blackburniae*). This lovely creature is only known from Hawaii, where it feeds on the seed pods of the Koa tree (a native acacia), an introduced species of acacia, and a native shrub. Hawaiians are concerned that the Koa bug may be threatened by a parasitoid species (*Trissolcus basalis*) that was introduced into Hawaii to control the invasive southern green stink bug, *Nezara viridula* (Pentatomidae) because *T. basalis* has been reared from Koa bug eggs. If the decision is made to release *T. japonicus* to control brown marmorated stink bugs in the continental US, it is likely that this wasp will eventually make its way to Hawaii. IPPM staff are concerned that *T. japonicus* will become a similar threat to the Koa bug. Despite hearing that Koa bugs can be somewhat challenging to find, Helmuth, Jim, and Josh were able to collect good numbers of them relatively easily from the introduced acacia on both Oahu and the island of Hawaii. They found adults, immatures, and eggs.

Tracy Johnson, with the US Forest Service in Volcano, HI, maintained a colony of Koa bugs for egg production throughout 2015. Eggs were delivered



Koa bug eggs parasitized by *T. japonicus*. Photo by Chris Hedstrom.

to Corvallis via USPS, as they became available, for testing in the presence of *T. japonicus*. No-choice parasitoid tests (only non-target host eggs presented to the parasitoid) were completed in late 2015 in the quarantine lab at OSU. *T. japonicus* successfully reproduced on Koa bug eggs in 40% of egg clusters tested. With this result, the Koa bug thus far represents the only known non-Pentatomid host on which *T. japonicus* can successfully reproduce. Choice tests will continue as eggs become available.

Linden aphid biological control

Chris S. Hedstrom & Barry B. Bai

In 2013, a pesticide spray to manage aphids on linden trees (*Tilia* sp.) in Wilsonville resulted in the death of hundreds of bumblebees near a shopping center, creating much public attention to the non-target effects of pesticides on pollinators and the importance of following proper protocol when applying chemicals to control insect pests. As linden trees are popular urban forest trees throughout western Oregon, IPPM is investigating the use of biological control to manage *Eucallipterus tiliae* (Hemiptera: Aphididae), a primary pest of lindens, as an alternative to pesticide applications. These aphids are considered a nuisance pest because they produce copious amounts of honeydew that fall on sidewalks and vehicles beneath the trees. Black sooty mildew also increases on the trees and, in some cases, the aphid feeding can damage or kill trees.

Linden aphid on linden tree in Salem.

Linden aphid parasitoid collected in Salem.

A preliminary survey was conducted during the summer 2015 to determine the pest and natural enemy complex on linden trees in Western Oregon. Surveys were conducted in Portland, Salem, Corvallis, and Medford. Colin Park, Jodie Lombardi, and Mark Hitchcox of USDA APHIS collected the samples in Portland. Thirty-two trees were sampled, representing five species. Trees were sampled every other week for aphid species, numbers of aphids, numbers of parasitized aphids, and the occurrence of other natural enemies. Parasitized aphids were collected and reared in vials in the laboratory to monitor parasitoid emergence.

The only species of aphid recovered from our samples was *Eucallipterus tiliae*. Aphid populations were highest at the beginning of the survey in late June, but steadily declined in all samples. Problematic honeydew accumulation only occurred on trees with the highest populations. Mean numbers of aphid mummies (=parasitized aphids) were much lower than the number of aphids observed, suggesting that parasitoids are not contributing to the decline in aphid populations. Aphid mummy counts were higher later in the season. Parasitoids were recovered from aphid mummies in all four cities, but species identifications are still ongoing.

Ash whitefly biological control

Chris S. Hedstrom

High populations of ash whitefly (AWF), *Siphoninus phillyreae* (Hemiptera: Aleyrodidae), were reported from the Portland metro area during late summer of 2015. Ash whitefly was first identified by IPPM staff from specimens collected in Oak Grove, Oregon in October 2014. This insect poses a threat to Oregon's nursery industry as it has an extensive host range including many ornamental plants, and would affect the export of nursery plants out of the state. It is considered a pest of citrus in many areas of the US. In 2015, ash whitefly reached nuisance levels in Portland and surrounding areas.

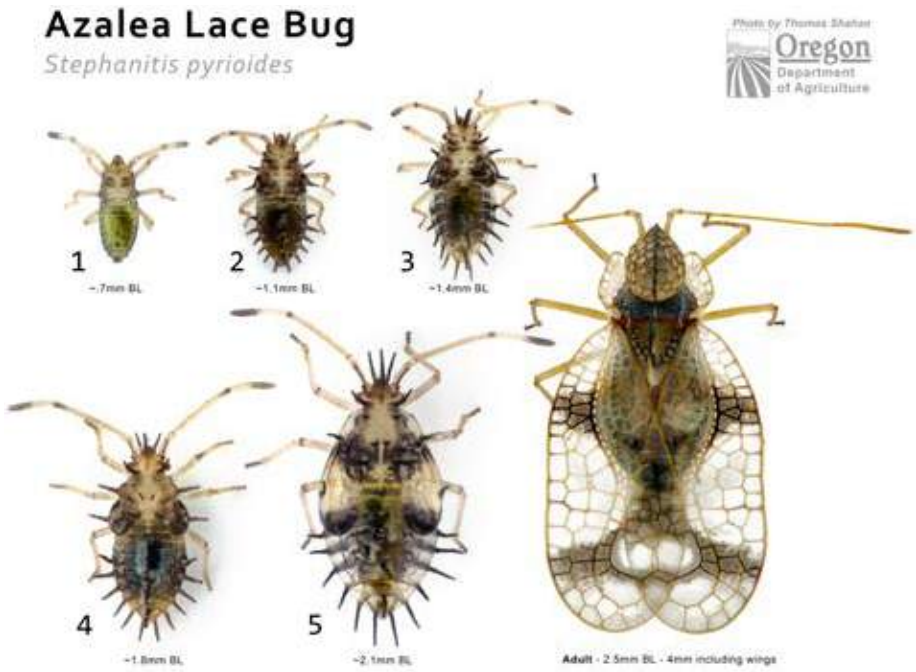
Ash whitefly biological control agent *Clitostethus arcuatus*.

Two biological control agents were released in southern California in 1990 to combat infestations of AWF: *Encarsia inaron* (Hymenoptera: Aphelinidae) and *Clitostethus arcuatus* (Coleoptera: Coccinellidae). Following releases in multiple counties, both agents became established and AWF populations were reduced to nearly undetectable levels in just a couple of years. Both *E. inaron* and *C. arcuatus* were recovered in Milwaukie, OR in September 2015. They were collected in AWF populations on ornamental *Pyrus* trees and, since then, *Encarsia* has been recovered from multiple areas

Ash whitefly and biological control agent *Encarsia inaron*.

around Portland with high levels of parasitism (>90% in some areas). However, AWF populations discovered in Grande Ronde, Scappoose, and Corvallis had very little to no parasitism. Populations of AWF in Oregon were observed overwintering on evergreen hosts in December 2015.

A colony of AWF and *Encarsia* is being maintained over the winter of 2015-2016 at the ODA Hawthorne facility for inundative releases of the parasitoid in 2016.



Stephanitis pyrioides instars.

Azalea lace bug

Thomas E. Valente

Azalea lace bugs (*Stephanitis pyrioides*) are an introduced Asian species of plant-feeding true bugs and were first found in Oregon in the Portland area in 2009. Azalea lace bugs have been established on the East Coast of the United States since 1915, where they are persistent, but minor pests of evergreen azaleas. By fall 2013 in Oregon, azalea lace bugs were causing severe damage not only to evergreen azaleas, but also to deciduous azaleas, rhododendrons, and other native Oregon azalea relatives in a number of nurseries, parks, and landscape plantings. Severe azalea lace bug damage was reported on novel host plants (not recorded from the eastern range of azalea lace bug). This damage, as well as new detections of lace bug damage in forested parks, suggested the need to assess the potential threat of this new pest to nurseries and native plants in Oregon.

IPPM greenhouse trials in 2014 showed that azalea lace bugs feed and reproduce on a variety of native and cultivated species (in the family Ericaceae) not previously identified as host plants. Host plant trials continued in 2015, focusing on evergreen shrubs of interest to the nursery industry. IPPM has identified 11 new genera of Ericaceae on which azalea lace bugs will feed and, in most cases, reproduce. Field observations have revealed 12 new genera of host plants, including five genera of plants in families other than Ericaceae.

Common garden used to assess the ability of azalea lace bug movement.

A common garden was established to assess the ability of azalea lace bugs to move from infested azaleas to other plants of concern in an outdoor setting (with natural predators and open space between plants). The garden consisted of a variety of evergreen azaleas, cultivated highbush blueberry, cranberry, and the native Oregon kalmiopsis. Azalea lace bug immatures were first observed in May 2015 in Salem and 3rd-4th instar nymphs were infesting the garden azaleas. By November, lace bug feeding damage was observed on kalmiopsis and on blueberry.

To facilitate identification and diagnostic differences between immature forms of azalea lace bug and the closely related native rhododendron lace bug (*Stephanitis rhododendri*), all instars of both species maintained at the ODA greenhouse were imaged in 2015. Field surveys were conducted to determine the present distribution of azalea lace bug beyond the heavily infested areas of Portland and Salem. Finds of note include eastern range extensions in Multnomah and Hood River counties, new northwestern records in Columbia County, and a new southern record from Douglas County.

Native Bees Program

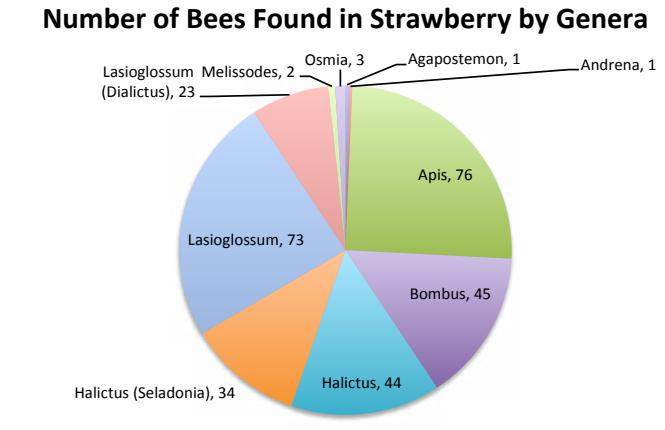
Sarah A. Kincaid

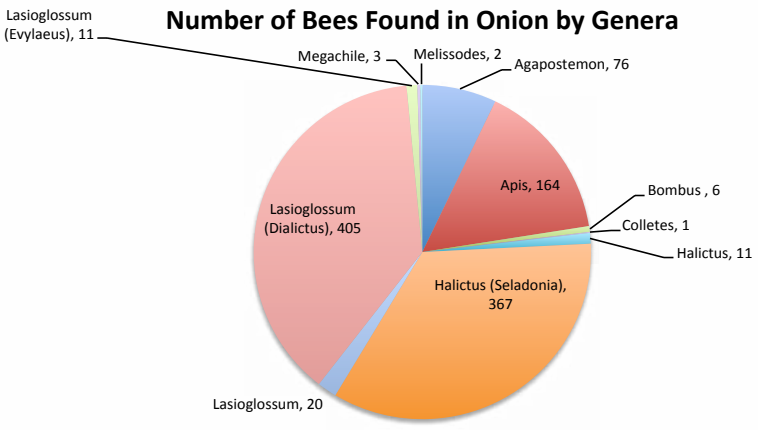
As a result of declining honey bee populations, the IPPM Program began surveying specialty crop fields in 2011 in order to identify key native pollinators. For this work, bees were collected throughout the state from 20 different specialty crops using blue vane traps and from seven crops using an insect vacuum system. In 2015, the processing and identification of specimens from all study years was finally completed.

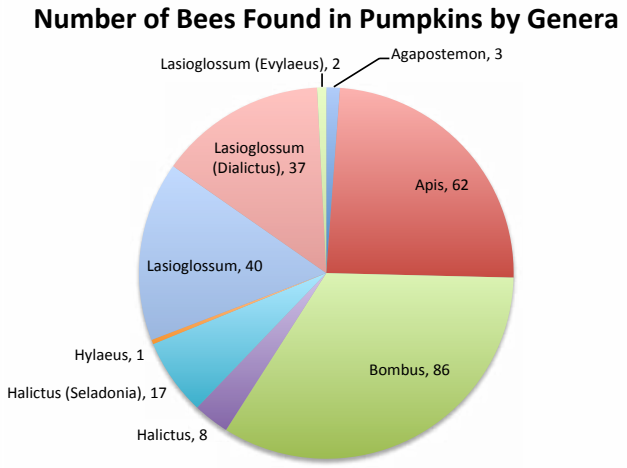
In all, a total of 40,522 individuals in 27 genera and 56 species or subgenera were collected from crop fields across all project years. Sweat bees (family Halictidae) were by far the most abundant bees found. They were found in every crop surveyed and were present in some crop fields at higher numbers than honey bees. Members of the genus *Lasioglossum* were the most frequently collected bees across all sites, with the greatest numbers associated with fields of blackberry, blueberry, carrot, meadow foam, radish, and cherry.

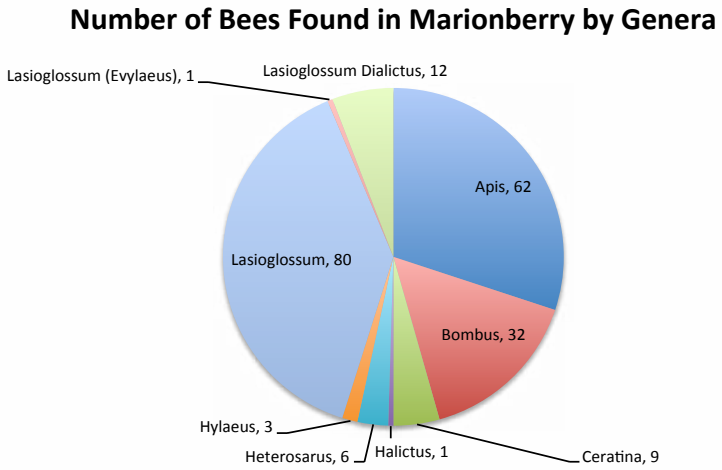
Another group of pollinators that were found in relatively high abundance during all study years were bumble bees. Twenty-one species, including a new central Oregon locality record for a threatened species, *Bombus occidentalis*, were found. Crop fields associated with the greatest number of bumble bees included blueberry, marionberry, melon, pumpkin, squash, and tomato.

The high number of native bees found within crop fields implies that they are a vital element of crop production in the state. However, more research is still needed to determine the direct economic value of the pollination services these native bees are providing. As part of the effort to help crop producers have a better understanding of which bees are active in crop fields, an image-based guide was developed in 2015 enabling the identification of common native bees. The guide covers the bumblebees of the Willamette Valley and the species or genera of other native bees found or thought to be significant pollinators of the sampled specialty crops. Images from this guide have already been used at numerous outreach events. This guide will be made available to all interested parties via the ODA website and various other outreach venues.









Christmas Trees to Hawaii and Mexico

James R. LaBonte

Since 2010, IPPM has been engaged in several projects to assist the Christmas tree industry, especially those producers exporting to Hawaii and Mexico. Activities included:

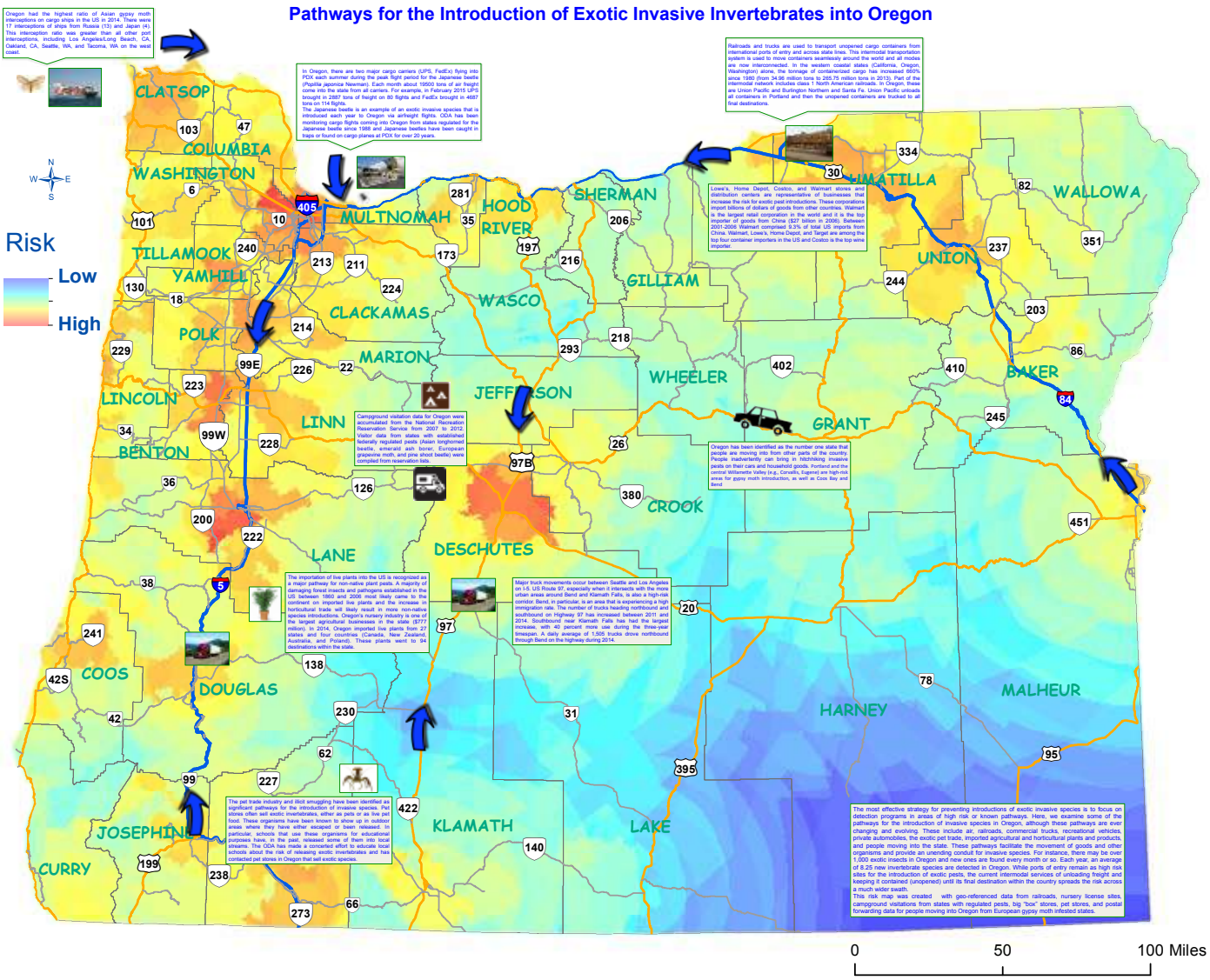
- Working closely with Hawaiian and Mexican regulatory officials to identify their concerns.
- An extensive survey of the insects and other invertebrates found in exporter fields, funded through a grant from USDA- TASC (Technical Assistance for Specialty Crops), focusing on the quarantine pests of Hawaii and Mexico.
- IPPM entomologists provided training to Mexican identifiers and border inspectors to help reduce rejection of shipments based on misidentifications.
- For several years, IPPM entomologists helped Hawaii Department of Agriculture (HDOA) with inspections of Christmas trees as they arrived in Hawaii.
- HDOA inspectors visited Oregon Christmas tree growing sites and inspected Christmas trees prior to shipment to Hawaii.

All this effort culminated in a bilingual English/ Spanish Christmas tree best management practices manual released in 2014. This manual was a collaborative effort of IPPM, OSU Extension, ODA's Christmas Tree Program, and Oregon's Christmas tree industry. It enables growers to recognize critical steps in Christmas tree production and handling and how to mitigate pests. Training was also provided to growers and shippers to reduce the incidence of hitchhikers, such as slugs and yellow jackets. Although these are not production pests, their presence in Christmas trees can lead to rejection or treatment of shipments.

Yellow jacket queen.

Example of slug.

These efforts, based in large part upon development of mutual trust and respect between IPPM and their counterparts in Hawaii and Mexico, along with the acceptance of recommended changes in protocols by the Christmas tree growers, have been effective in reducing Christmas tree shipment rejections. For instance, in 2012, about 40% of the 250 containers of Christmas trees shipped to Hawaii were held for treatment, predominantly due to the presence of slugs or yellow jackets. Since then, the rate of rejection has markedly decreased: 16% in 2013, 13% in 2014 and 3.7% in 2015. Prior to 2010, rejection rates from Mexico were highly variable. Since then, rejection rates appear to have stabilized at a very low rate. Although all the 2015 data are not yet available, it appears that only about 3.5 % of Christmas tree containers to Mexico were rejected.



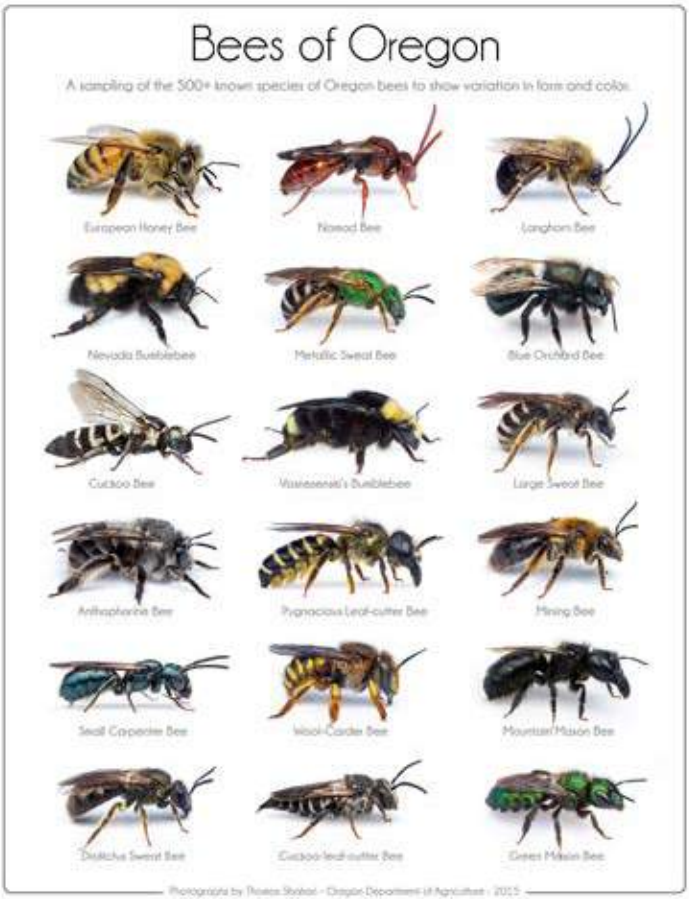
2015 Pathway Risk Analysis

Diana N. Kearns

The Oregon pathway risk analysis was completed in June 2015 and was submitted to USDA APHIS PPQ. The overall risk map for pathways was generated from data on nursery license sites, big box stores (Lowe's, Home Depot, Costco, and Walmart), postal forwarding data (move-ins from Gypsy moth infested states), campground visitations from states with regulated pests, active railroads greater than 100 miles, and pet store locations (ranked by risk, with highest risk for stores that import pets or plants or those that sell aquatic organisms). A "story map" is planned for ODA's website.

This map weights pathway risks for nurseries at .25, box stores at .2, immigration into Oregon at .2, campground visits from out-of-state at .2, railroad lines at .1, and pet stores at .05. An interactive story map can be developed from this information and a prototype is shown above.

A list of the top 100 invasive invertebrates was completed with the assistance of James LaBonte (state taxonomist), Richard Worth (Lepidoptera specialist), and Josh Vlach (taxonomist). The list included fields for the introduction pathway, establishment potential, spread potential, economic impacts, environmental impacts, and world distribution.



Native bee poster produced with IPPM's digital imaging system.

IPPM Imaging

Thomas A. Shahan

IPPM's digital imaging system continued to produce high resolution and high magnification focus-stacked images for a variety of applications in 2015. Using the latest in extended depth of field (EDF) imaging techniques, IPPM supplied photographs for identification aids, field guides, and publications. These images helped provide clear views of diagnostically significant characters to help taxonomists identify specimens, contribute to public outreach and press, and acquire funding for future imaging-related projects.

One project of note was the native bee project that took place during the summer of 2015, which required that a great deal of live bee images be aquired to illustrate a guide. This proved quite difficult and introduced several unforseen challenges. As live bees are usually too active to be focus-stacked, we shot the specimens alive in a newly acquired white-box we had previously been using to shoot terrestrial mollusks. With a bit of troubleshooting and adapted techniques, we were able to shoot approximately 4,000 images—documenting dozens of bee species present in Oregon in a consistent enough manner to illustrate the bee guide and put together outreach materials like the bee poster seen on the left.

Additional projects concerning the azalea lace bug, bark beetles, whiteflies, and the terrestrial mollusk survey all necessitated continued imaging from IPPM and produced a variety of beautiful images of Oregon's invertebrate bio-diversity.

Molecular Taxonomy via PCR

Thomas E. Valente

Contarinia needle damage.

In 2015, the IPPM laboratory continued the investigation of genetic identification of needle midges associated with Douglas fir. There are three officially described species of Douglas fir needle midge (*Contarinia* species). *Contarinia* needle midges in Douglas fir have caused phytosanitary issues for Christmas tree shipments to Mexico. Although Oregon and Mexico have the same species of Douglas fir needle midge, intercepted specimens have been identified by Mexican officials as one of the other two described species. Because of the extreme challenge distinguishing the three species of these tiny flies using morphological features (which requires slide mounting of genitalia), we are investigating DNA

Adult *Contarinia* needle midge.

sequences of a fragment of the mitochondrial gene Cytochrome c Oxidase 1 (CO1) as another method to discern the species. This sequencing can be used to determine if more than one species actually occurs in Oregon and if the current species designations are valid. Working with colleagues at the USFS Center for Bottomland Hardwoods Research (Stoneville, Mississippi) and at Oregon State University, the gene fragment has been cloned and sequenced from samples of all three species (collected from the type locality in British Columbia and from tree farms in Oregon).

Slide mount of male *Contarinia* genitalia.

New Records and Non-Survey Identifications

James R. LaBonte

IPPM staff responded to over 650 submissions of insects and other invertebrates or contacts via telephone, e-mail, and in-person visits to the IPPM lab. Most of these interactions were not associated with specific IPPM programs or surveys. Instead, these were from the general public, businesses, other ODA programs, county or state (mostly Oregon) agencies, federal agencies, academic institutions, other entomological museums, and a wide array of professional colleagues. IPPM lab staff also conducted numerous tours of the lab and museum, mostly for school classes. Staff also made many public and professional presentations and provided information or interviews for media such as newspapers or journals, radio, and television. Most of the public contacts involved spiders, and aggregative house pests such as brown marmorated stink bug and seed bugs. Several of the more interesting queries involved ambrosia beetles boring through rubber hoses of vehicles in India and through plastic gas cans in Louisiana and concerns about rust mites on cannabis.

As part of his continued volunteer contributions, IPPM's retired taxonomist, Rick Westcott, identified 1,122 specimens from various private, state, and federal sources (including IPPM surveys), predominantly flat-headed or metallic wood boring beetles in the family Buprestidae. He is also the cooperating scientist providing port interception identifications for that family to the USDA Systematic Entomology Laboratory. However, USDA submitted no specimens to him this year. Rick also identified 20 flies from the IPPM apple maggot eradication program in Umatilla County, mostly from Pendleton. Only two were apple maggots—the rest were snowberry maggots. In addition, he contributed 87 specimens representing 10 species (buprestids, of course) to the museum collection. Thank you, Rick, for your continued service!

Twenty-one exotic species new to Oregon, the Pacific Northwest, the western US, western North America, or North America were detected and identified by IPPM taxonomists in 2015. This makes a total of 91 since 2007, most of which were initially identified, confirmed, or detected by IPPM. The majority of the species identified in 2015 were species targeted by surveys. The remainder were all from samples submitted by other ODA program areas or by other agencies. Of these, three are known significant pests: the European chafer (*Amphimallon majale*), the garden slug (*Arion hortensis)*, and the oak lace bug (*Corythucha arcuata*). Two are beneficial species, the ash whitefly ladybird beetle (*Clitostethus arcuatus*) and the ash whitefly wasp (*Encarsia inaron*). Both species are biocontrols of the ash whitefly, found by IPPM in Oregon in 2015 (see ash whitefly biological control). About half of these newly detected exotic species are originally from Europe, although many of these are now established elsewhere in the US. Most of the rest are from other regions of North America. This is somewhat surprising given Asia's current domination of foreign trade with the US and the Pacific states. These detections exemplify the unceasing onslaught of exotic species.

Oregon State Fair

Diana N. Kearns

Over the past five years, the IPPM and Noxious Weed Control Programs have shared a space at the Oregon State Fair to provide outreach and education on invasive species. In 2015, IPPM provided an interactive game for children, displays of live and pinned insects and other invertebrates, including live honey bee drones, informative brochures and flyers, and a specially designed t-shirt featuring our Gypsy moth program. Staff spent five days at the fair, taking various shifts between 10 am to 6 pm each day from August 31st thorugh September 4th. Participation in the state fair is important because it reaches more people in one week than any other event of the year. More people learn about insects and invasive species at the fair than at any other venue where IPPM staff participate.

New t-shirt for the IPPM program.

Jim LaBonte engaging a fair participant.

Sarah Esch holding one of the live specimens.

Thomas Shahan overseeing the IPPM Japanese beetle tossing game.

Dan Clark and the state fair display.

Presentations 2015

Asian Gypsy Moth in the Pacific Northwest: What Happens if it Stays Here? AGM Western States Meeting. Portland, OR. Diana N. Kearns

Azalea Lace Bug (*Stephanitis pyriodes*): A Threat to Forest Shrubs? USDA Interagency Research Forum on Invasive Species. Annapolis, MD. James R. LaBonte

Case Study of ODA Partnering with Other Nation's Plant Inspection Agencies. Christmas Tree and Cut Greens Seminar. Silverton, OR. James R. LaBonte

Exotic Insect Invaders and Oregon. Oregon Envirothon Teacher Training. Oregon Gardens, OR. Diana N. Kearns

Out of Control? Azalea Lace Bug in Oregon and What We Need to Know Now. American Rhododendron Society, Portland Chapter. Thomas E. Valente

Techniques for Collecting and Mounting Microlepidoptera. 37th PNW Lepidopterists' Workshop. OSU, Corvallis. Richard A. Worth

Tracking an Invasive Species: Hydrogen Isotopes of Japanese Beetles (*Popillia japonica* Newman) in Oregon. Japanese Beetle Eradication Planning Session. Ontario, OR. Diana N. Kearns and Bruce A. Hungate

Tracking Repeated Introductions of an Invasive Species: Stable Isotope Equilibration in Japanese Beetles (*Popillia japonica* Newman) in Oregon. USDA Interagency Research Forum. Annapolis, MD. Diana N. Kearns, Bruce A. Hungate, Helmuth W. Rogg

Traveling in Peru: The Amazon Rainforest and Machu Picchu. Kiwanis. Gresham, OR. James R. LaBonte

Unwelcome to Oregon! Oregon's New Terrestrial Invertebrates Since 2007. Columbia Gorge Invasive Species & Exotic Pest Workshop. Stevenson, WA. James R. LaBonte

Publications 2015

Basham, Joshua P., Robyn J. Waayers, and Richard L. Westcott. 2015. Discovery of *Chrysobothris costifrons costifrons* Waterhouse, 1887 (Coleoptera: Buprestidae) in southern California, U.S.A. The Pan-Pacific Entomologist 91(2): 200–202.

Hungate BA, D.N. Kearns, M. Caron, J.C. Marks, and H.W. Rogg. 2016. Hydrogen isotopes as a sentinel of biological invasion by the Japanese Beetle (*Popillia japonica* Newman). PLoS ONE in press / journal.pone

Kimoto, Troy, Josie Roberts, Richard L. Westcott, Eduard Jendek, Matthias Buck, David Holden and Phlip D. Careless. 2015. Colony distribution and prey diversity of *Cerceris fumipennis* (Hymenoptera: Crabronidae) in British Columbia. Journal of Hymenoptera Research 46: 45–59.

Westcott, Richard L., and William H. Clark. 2015. *Chrysobothris lixa* Horn, 1886 (Coleoptera: Buprestidae) confirmed in Baja California, Mexico and newly recorded for New Mexico, U.S.A., with other notes on the species and the historical locality Catalina Springs, Arizona. The Pan-Pacific Entomologist 91(4): 1–4.

Westcott, Richard L., Chris Looney, and Megan Asche. 2015. *Agrilus cuprescens* (Ménétries) (Coleoptera: Buprestidae), the rose stem girdler, discovered in the state of Washington, with comments on host plant associations. The Coleopterists Bulletin, 69(2): 275–279.

Westcott, Richard L. and Michael C. Thomas. 2015. A new species of *Chrysobothris* Eschscholtz (Coleoptera: Buprestidae) from nests of *Cerceris fumipennis* Say (Hymenoptera: Crabronidae) in northeastern Florida, USA, with new state records for species of *Chrysobothris* and a list of buprestid prey species taken by the wasp in Florida. Insecta Mundi 0417: 1–10.

Noxious Weed Control Program

Introduction

Our mission is to protect Oregon's natural resources from the invasion and proliferation of exotic and invasive noxious weeds by:

- Providing leadership and coordinating noxious weed management.
- Serving as a technical resource for noxious weed issues.
- Providing public outreach, education, and awareness.
- Conducting weed risk assessments.
- Implementing early detection and rapid response projects for new invaders.
- Coordinating and implementing biological control of weeds.
- Administering the State Weed Board Grant Program.

The program has nine technical staff located in Salem, Pleasant Hill, Grants Pass, Burns, Enterprise, and Terrabone. The program also employs a grant coordinator, 0.5 clerical staff, and seasonal staff during the field season to help implement projects statewide.

The Noxious Weed Control staff works with private landowners, state and federal land managers, and other cooperators to implement integrated weed management projects throughout Oregon. The program focus is on early detection and rapid response (EDRR) for new invading noxious weeds, implementation of biological control, completion of statewide weed inventory and surveys, technology transfer, noxious weed education, noxious weed data maintenance, weed risk assessment, and maintenance of the state noxious weed list. A study published in 2014, "Economic Impacts From Select Noxious Weeds in Oregon", estimates an annual loss of almost $83.5 million to the state's economy from 25 selected noxious weed species. If left unchecked, there is a potential loss of $1.8 billion per year.

Noxious Weed Control staff work closely with the Oregon State Weed Board (OSWB) to host meetings, provide updates and technical support, and to administer the OSWB grants. The OSWB is a seven-member board appointed by the ODA director. The primary mission of the OSWB is to provide oversight for the listing of noxious weeds, guide statewide noxious weed control priorities, and award noxious weed control grants.

Noxious Weed Control Program staff (left to right):
Back: Jo Davis, Carri Pirosko, Tristen Berg, Bonnie Rasmussen, Glenn Miller.
Front: Eric Coombs, Tim Butler, Tom Forney, Mark Porter, Mike Crumrine.

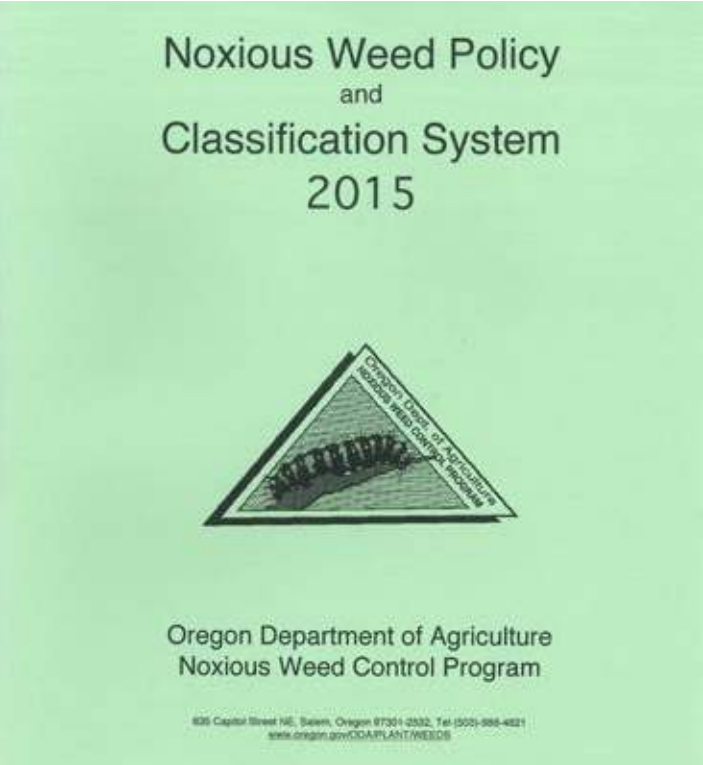
To implement an effective weed program, staff must foster relationships and work with private, local, county, state, and federal interests. Developing and maintaining partnerships is critical to accomplishing the mission. The program works closely with federal partners to develop memorandums of understanding (MOUs), cooperative agreements, or contracts to facilitate control projects and financially assist the program. About 50% of the program budget is from federal sources.

2015 Weed Program highlights

- Program staff implemented 90 noxious weed projects, made 505 treatments, completed 73 pre- and post-treatment monitoring activities and gave 42 presentations.
- Fourteen species of biological agents (over 105,080) were released against 11 species of targeted weeds at more than 81 sites. Over 50 biocontrol sites were monitored to determine establishment and impact. Numerous releases of agents were provided to cooperators in neighboring states. The weed biocontrol database contains more than 13,010 records of biocontrol agent releases; nearly 90% of all releases were made in Oregon.
- OSWB receives $2.5 million in grant funding per biennium. Of the 73 grant proposals submitted, 49 grants were awarded totaling $1,259,694.00, which is about half of the total grant funds available for the 2013-2015 biennium.
- Ravennagrass, *Saccharum ravennae*, was listed as an A-rated weed by OSWB this year after the completion of a risk assessment. At the time of

listing, the only known site was at McNary Dam in a wildlife area managed by the Army Corps of Engineers. Weed staff worked with Army Corps staff to treat the site.

- Hoary alyssum, *Berteroa incana*, was listed as an A-rated weed by OSWB after the completion of a risk assessment by the Weed Program. Three populations are known, one in Wallowa County and two in Deschutes County.
- In August of 2014, three small populations of flowering rush, *Butomus umbellatus*, were found on the Columbia River in Umatilla County above McNary Dam. These are the first known occurrences in Oregon of this A-listed noxious aquatic weed. Populations of flowering rush were already known from Washington and Idaho (the Spokane River, the Yakima River and Pend Oreille River, the Snake River and the Flathead River). Previous to these Oregon infestations, the furthest downstream population of flowering rush in the Columbia River basin was from the Two Rivers Park in the Tri-Cities area in Washington. Weed staff worked with the Army Corps of Engineers to facilitate treatment of the Oregon site during the summer of 2015. Additional survey was completed below McNary Dam and five additional populations were found.
- Water primrose, *Ludwigia peploides*, *L. hexapetala*, control in the Willamette River branched out from the Delta Ponds and Golden Gardens projects to treatment on the Long Tom River. Control efforts in Lane County are being coordinated to reduce or eliminate *Ludwigia* from water bodies that flow into the Upper Willamette system. The Weed Program's collaborative partnership with several groups allowed for intensive survey and further treatment plans for 2016.



- Matgrass, *Nardus stricta*, was detected at three new locations in 2015. In July, an infestation was confirmed at Cape Blanco airport in Curry County. Shortly after it was found to infest a small area at Devil's Kitchen State Park in Bandon, Coos County. A third site located in Clatsop County on North Coast Land Conservancy property was reported and verified in November. Previously, matgrass was only known to occur in Klamath County.
- Yellow floating heart, *Nymphoides peltata*, was found east of the Cascades 2013. Eight new sites were detected and treated in Deschutes County. Follow up survey and treatment took place in 2015 to control the site. No additional sites were found. The western Oregon sites in Washington and Lane counties were monitored and treated. The Deschutes sites bring the total to 13 locations.
- Smooth cordgrass, *Spartina alterniflora*, a problematic and difficult to control cordgrass species, was located and removed from a site in near Sand Lake. The discovery was made by Oregon State Parks and is the first site known from the area.
- The second phase of the Deschutes Metolius ribbongrass project, *Phalaris arundinaceae*, was conducted downstream of Camp Sherman. This is part of the new Deschutes National Forest EIS to control invasive weeds on the forest.
- Oblong spurge, *Euphorbia oblongata*, experienced a resurgence at Oregon's largest site, located in Salem, after several years of no plants. Weed staff treated all known locations.
- Goatsrue, *Galega officinalis*, was treated by Weed staff this year at a sand and gravel operation site in Tualatin that has been under monitoring and treatment for about five years. Three plants were found this year after observing no plants in 2014. The City of Portland reported treating three existing locations of goatsrue. The Weed Program is planning to continue working with City of Portland, USDA, and BPA to coordinate treatment and monitoring of sites.

2015 Noxious Weed List Update

The Noxious Weed Control Program develops risk assessments and gathers information to help OSWB maintain and update the State Noxious Weed List. A risk assessment process is used to help identify which species are high risk and should be listed. For 2015, Cape ivy, *Delairea odorata*, common frogbit, *Hyirocharis morass-ranae*, garden yellow loosestrife, *Lysimacjia*

vulgaris, hoary alyssum, *Bertoroa incase*, ravennagrass, *Saccharum ravine*, water soldier, *Stratiotes aloides*, and West Indian spongeplant, *Limnobium laevigatum* were added to the "A" list. No plants were added to the "B" list. Cape ivy, hoary alyssum and ravennagrass were also designated under the "T" list category as they are currently present in Oregon and are targets for control by the Weed Program.

Noxious Weed Control Grants

The Oregon State Weed Board (OSWB) Grant Program funds reside within the Oregon Watershed Enhancement Board (OWEB) budget. The grant program receives $2.5 million per biennium to award. The single-year cycle grant requires an interim report within six months and the completion report within 15 months after the start of the project. The Weed Program continued to administer and provide technical expertise to OSWB, while OWEB was responsible for issuance of payments.

In 2015, 73 grant proposals were received and 49 grants were awarded totaling $1,259,694. OSWB grants must meet specific criteria to be funded. Grant dollars were used in project implementation to protect and enhance watersheds and wildland habitats from the impacts of invasive noxious weeds. The Weed Program works with a great group of grantees that work around the state to implement their projects. Success of the OSWB Grant Program is due to the outstanding work that is being done on the ground by grantees.

In 2015, staff monitored 16 grant projects. Monitoring is an important process to maintain communication with grantees, provide technical advice, and to monitor progress on the ground. The following are a few of the projects that were monitored:

In June, staff made a site visit with Alexis Brickner of the Coos Watershed Association to monitor the Coos Noxious Weed Control Partnership grant. Coos Watershed is very successful with the biocontrol efforts on purple loosestrife in some areas. Other areas were visited to show the complex treatment areas for policeman's helmet (the majority of area is owned by private landowners). Alexis did a good job involving students at a local middle school to volunteer with native plant restoration. Alexis is also very involved in a variety of education and outreach activities in her county, which is important for gaining much needed support and permission from private landowners for treatment.

Alexis Brickner of Coos Watershed Association shows ODA staff Carri Pirosko, Tim Butler and Tristen Berg (not pictured) purple loosestrife biocontrol success.

The next stop on the June monitoring trip was with Dustin Williams from the Curry SWCD, on their "Oh My Gorse" and "Curry Most Wanted" grants. Curry SWCD is doing a great job with private landowner education outreach on projects and as a result is gaining more participants to remove invasive weeds and allow treatments. Curry SWCD is making great progress on treatment of gorse, Cape ivy, and other invasive weeds and as a result, native plants are returning in many areas.

Tristen Berg, Carri Pirosko, and Chrissy Morgan stand in front of a Portuguese broom plant in Douglas County.

Douglas SCWD was also monitored in June regarding their Portuguese Broom and Gorse Control grant project. Chrissy Morgan showed sites where plant numbers continue to decrease in those areas. Chrissy said a big part of the success is due to continued monitoring and treatment by returning contractors that know the area and are familiar with the steep mountain terrain.

The Weed Program continued working in partnership with OWEB on the OSWB Grant Program. At the April OWEB Board meeting, Tristen Berg and Tim Butler presented the history of the OSWB Grant Program. Work also continued with OWEB on the electronic submission process of grant project completion reporting. Work also started on improving the Oregon Watershed Restoration Inventory (OWRI) online weed data reporting structure, streamlining guidelines so weed site data can meet requirements for Weedmapper for new weed sites. These changes make final reporting quicker and easier for grantees for weed-specific reporting questions and weed site data.

Education and Outreach Activities in 2015

The Governor declared the week of May 17th–23rd, 2015 to be Oregon Invasive Weed Awareness Week (WAW). The proclamation by the Governor, combined with education and outreach activities during the designated week, furthers the goal to increase public awareness of the economic and environmental impacts of invasive weeds, which is a key component in protecting Oregon's natural resources and agricultural economy. The Weed Program's theme for 2015 WAW was "Weeds Attack Threatened Environmental Resources" (WATER) to spotlight how invasive plants affect Oregon's water quality and quantity. In appreciation to all the weed warriors in the state, the Weed Program sent out T-shirts to weed cooperators with the hope to carry the message to the public. The Weed Program also created a flyer for WAW to raise awareness of aquatic weed spread through recreation, which was given to cooperators to post at boat launches and other water recreation sites.

In 2015, the Weed Program signed on as a partner to the national PlayCleanGo (PCG) campaign. This campaign provides a call-to-action to recreationalists assisting in the prevention of spreading noxious weeds and other invasives through hiking, biking, ATV riding, boating, and a myriad of other outdoor activities. These high-quality marketing materials were used during WAW, on social media pages, and provided the primary theme at the state fair booth this year.

August 31st-September 4th, 2015, the Noxious Weed Control Program and Insect Pest Prevention and Management Program set up a booth at the natural resources area at the Oregon State Fair and answered public questions on invasive weeds and insects, and handed out alerts, brochures, and small items for outreach.

Many kids (and kids at heart) tried their hand at the "native plant survival game" in which they send their plant "seeds" (small rubber balls) down a game board riddled with ecological traps (e.g. lack of water, soil erosion) that are often exacerbated by invasive plants.

Play Clean Go campaign booth at the Oregon State Fair.

There was a dual focus at the State Fair this year on preventing the spread of invasive plants through recreation and on providing tips for identifying and managing common noxious weeds. The Weed Program set up a display showing how weed seeds can stick to gear and clothing and there was also a display of plant specimens so the public could see and touch plants for identification. Hundreds of people went through the booth, resulting in several plant reports and connections to further outreach opportunities.

In December, staff assisted Marion SWCD and the Oregon Forest Resources Institute in providing

invasive species training to over 40 high school teachers from across the state who will be advising groups of students in the coming year's Envirothon competition, which highlights invasive species as a current issue.

Purple loosestrife beetle mania in Sellwood

Galerucella calmariensis beetles on roses.

Biological control of purple loosestrife has been successful at a number of sites in Oregon, especially where tides and heavy stream flow do not impede the progress of the biological control agents. In August of 2015, an unusual event occurred in the Sellwood neighborhood of the greater Portland area. Perhaps due to the exceptional warm year and low water levels, the leaf beetle *Galerucella calmariensis* developed in unprecedented numbers at the Oaks Bottom Wildlife Refuge. The beetle population quickly overran their resource of purple loosestrife and began their search for more food. On August 7th, millions of beetles took to the air; the Sellwood neighborhood was inundated with hungry beetles searching for additional host material. Residents became alarmed as the hungry hordes experimentally fed on some of their ornamental plants, particularly crape myrtle, which is in the loosestrife family. News stations were quickly alerted and the nuisance invasion was documented. The Weed Program, IPPM Program, and cooperators from USDA APHIS and Portland Parks met with residents and informed them that the outbreak would be short-lived. By August 14th, beetles were dying en masse and the crisis abated. This was an unusual occurrence when biological control is practiced in the urban interface. The control of purple loosestrife was spectacular, despite the temporary incursion in the surrounding neighborhood.

Sellwood community meeting attended by ODA Noxious Weed and IPPM staff.

Early Detection and Treatment Activities

Early detection and rapid response (EDRR) is a primary focus of the Noxious Weed Program. Weeds are listed and targeted for EDRR activities. The goal is to prevent introduction or find new weeds through early detection efforts and implement control measures to limit their widespread occurrence in Oregon.

The Weed Program accomplishes this objective through its noxious weed quarantine and by implementing EDRR projects. A principal activity is using the weed risk assessment process to guide the Oregon State Weed Board (OSWB) on which species to list on the state noxious weed list. Priority listed species, the "A" and "T" weeds, are of limited distribution in the state and are the primary EDRR targets. Priority species are incorporated into presentation and outreach activities to increase public awareness. Pest alerts and educational materials are distributed in an effort to help locate and report new infestations.

Survey for target weeds is conducted and when they are found, rapid response projects are implemented for eradication or containment. Weed staff work with state and federal cooperators, county weed programs, Cooperative Weed Management Areas (CWMAs), and private landowners to implement EDRR projects and provide assistance through OSWB grants.

An economic analysis by the Weed Program revealed a 34:1 benefit to cost ratio for EDRR projects. Annual treatments for the control of "A" and "T" listed weeds have reduced the net acreage of many large infestations of these weeds. For example, annual intensive control efforts for distaff thistle, *Carthamus lanatus*, and purple starthistle, *Centaurea calcitrapa*, have achieved 99% control. The program implemented 63 control projects for 21 A- and T-listed species during the 2015 field season.

Flowering rush

Several small populations of flowering rush, *Butomus umbellatus*, were found in Lake Wallula on the Columbia River in Umatilla County, Oregon in early August 2014. These were the first known occurrences in Oregon of this A-listed noxious aquatic weed. Populations of flowering rush were already known along the Spokane River, Yakima River, Pend Oreille River, Snake River, and Flathead River as well as in isolated patches of still-water settings. Previous to these Oregon infestations, the furthest downstream population of flowering rush in the Columbia River basin was from the Two Rivers Park in the Tri-Cities area in Washington State.

Flowering rush is an escaped aquatic ornamental that invades and dominates shallow slow moving mud- bottomed waters. It invades and hampers irrigation systems, endangers salmon migration, alters water quality, and precludes recreation. Flowering rush is very resistant to known herbicides, which complicates the already challenging issue of aquatic herbicide treatments. Biocontrol research is underway for flowering rush with at least one potential agent showing promise. However, it will be years before the regulatory process will be completed and biocontrol agencies could be released in Oregon. The strategy at this time is to detect and control populations early and reduce the impact with a long-term strategy of finding improved treatment options and biological control. The preferred treatment option is a diver-assisted vacuum system and should be a feasible option to control what has been found thus far.

The Oregon State Weed Board funded early detection surveys on the Oregon side of the McNary Pool by Portland State University's Center for Lakes and Reservoirs (PSU) in 2014. Surveys for flowering rush and other aquatic weeds were conducted between Willow Lake and Juniper Canyon in 2014; six small patches of flowering rush were found. Washington State Department of Ecology (WSDOE) also surveyed the northern shore in 2014; 12 sites (all less than three meters in diameter) were found. The Walla Walla District of the Army Corps of Engineers is responsible for the management of these waters and must follow federal regulations and have NEPA environmental impact documentation and consultation in place to actively manage these sites (endangered species, cultural and heritage interests, and power production issues all need to be addressed). The process involved a number of state and federal agencies and brought about the Flowering Rush Working Group (with more than 50 participants) to help address the issue.

The Weed Program and Washington State weed managers called together and co-facilitated the Columbia River Flowering Rush Work Group to clarify the known research about the ecology of the plant, share control methods, evaluate the plant's potential impact to Columbia River water and fisheries resources, help to shorten the consultation process, and work to identify funding and policy needs for managers. The Walla Walla District of the Army Corps of Engineers, Portland State University, Portland Office of the US Forest Service, Oregon Department of State Lands, Oregon Department of Fish and Wildlife, Department of Environmental Quality, and the US Fish and Wildlife Service are all key participants.

Diver assisted in vacuuming the flowering rush bublets and plant materials in the Columbia River.

The Army Corps successfully completed the required NEPA documentation to receive regulatory approval for manual treatment of the plant. Manual treatment techniques include covering and removal of plant material by pulling and using a vacuum system to remove and recover plants and reproductive fragments. The Army Corps provided the dive team and support crew for the plant removal and covering work. The Weed Program and the Army Corps crew covered about half of the known sites in January of 2015 to test the methodology. During the summer of 2015, crews manually treated with the vacuum assisted method and covered the location with mats to prevent regrowth.

Flowering rush roots.

Additional survey was completed in 2015 by PSU below the McNary Dam. They found five additional sites, bringing the total to seven sites below the dam. These sites are small and cover less than one tenth of an acre. The sites are under the jurisdiction of the Portland District of the Army Corps of Engineers. Similar to the Walla Walla District, the Portland District has no NEPA or consultation in place for any treatment of aquatic weeds. Treatment is dependent on the Portland District to complete site specific analysis for this reach of the Columbia. It is hoped crews will be able to remove all of the flowering rush plants at those sites and cover them to prevent re-sprouting in August 2016.

Matgrass

Matgrass, *Nardus stricta*, is a small perennial bunchgrass native to Eastern Europe. Matgrass is unpalatable to grazing animals and therefore can quickly render infested pasturelands unusable. One of the challenges in controlling matgrass is identifying it amongst other native or desirable forage species. Seedlings are small, ranging in size from a dime to a quarter making them hard to find. Seedlings can grow to form circular colonies up to three feet in diameter in a single year. Matgrass was first noticed about 36 years ago in a peat pasture near Fort Klamath. The Klamath site was the only infestation known from Oregon until this year. Three new sites where detected in Curry, Coos, and Clatsop counties. Impacts to coastal habitats are less well known, but early surveys reveal an aggressive invader that pushes out native flora.

Matgrass found at Cape Blanco Airport in Curry County.

Previous farming practices at the Fort Klamath site of dragging the pastures to break up clumps of cattle manure and flood irrigation has spread mat grass over 180 acres of pasture. Control efforts have had mixed success over the past 30 years. Eradication is unlikely, unless the entire pasture is sprayed out and taken out of production for several years to eliminate and destroy the seed bank. At this time, the landowner is reluctant to allow such control measures. The Weed Program has been treating the infestation as the matgrass first started greening up, before the rest of the pasture grasses started to turn green, making the matgrass easier to find. The same strategy was applied to 2015 treatments and 2.43 net acres of matgrass were treated over the 180-acre project area.

In July, an infestation of matgrass was confirmed at Cape Blanco airport in Curry County. Shortly after confirmation of the matgrass infestation in Curry County, matgrass was found to infest a small area at Devil's Kitchen State Park in Bandon, Coos County. This new coastal infestation occurs across lands managed by Oregon State Parks. The area, referred to as "Black Lock Point" by locals, is comprised of trails that lead out to a rugged headland just north of Cape Blanco. Botanically the area is noted for a unique pygmy forest and is one of the few remaining habitats for the federally endangered western bog lily.

In November 2015, a new matgrass site, located in a coastal prairie, was reported by the North Coast Land Conservancy (NCLC) via the iMapInvasives database. An alert was sent to the database administrator as this was a new record in Clatsop County for the A-listed weed. The administrator advised NCLC staff to notify the Weed Program and a specimen was subsequently sent to the OSU herbarium for positive identification. Weed staff visited the site containing approximately 100 plants spread over 1,000 square feet. Staff will ensure that NCLC has the resources to treat it next season, either through a grant to Clatsop SWCD or direct staff assistance. Further surveys of coastal prairie habitats are planned so that populations can be identified and the impacts to this particular ecosystem can be evaluated.

Water primrose, *Ludwigia* spp.

The Willamette River *Ludwigia* project branched out from the Delta Ponds and Golden Gardens projects to treatment on the Long Tom River. Control efforts in Lane County are now being coordinated to reduce or eliminate *Ludwigia* from water bodies that flow into the Upper Willamette system. Partners include the Oregon Department of Transportation, City of Eugene Parks, Long Tom Watershed Council, State Parks, and Willamette Riverkeeper. The Weed Program

Panoramic shot of *Ludwigia* infested waterway in the Willamette River system.

also assisted in an ongoing canoe survey covering 18 miles of the mainstem Willamette from Albany to Rogue Farms, north of the Buena Vista ferry. *Ludwigia* infestations were identified and recorded to a central database managed by the non-profit group Willamette Riverkeeper. Many infestations were recorded and survey results will guide future treatment efforts. Further treatments involving the Weed Program are scheduled for 2016.

Alyssum

Yellowtuft, or *Alyssum murale* and *A. corsicum*, are perennial plants native to Eastern Europe. *Alyssum* species are unique in that they can hyper-accumulate metals extracted from the soil in leaf and shoot material. USDA promoted the use of hyper-accumulating plants in cleaning up contaminated mining soils through a process called phytoremediation. In the 1990s, Viridian LLC proposed the use of *Alyssum* species for phyto-mining, the process of using plants to accumulate and then harvest marketable metal from naturally high mineral (serpentine) soils. *Alyssum* species were planted by Viridian LLC on nine serpentine-rich sites in the Illinois Valley of southwest Oregon. Originally planted fields included those on private lands and lands owned by Josephine County and managed by the Illinois Valley Airport. The project failed and *Alyssum* spread from the planted areas and became invasive in the surrounding areas.

The originally planted airport fields are located immediately adjacent to the floristically diverse Rough and Ready Botanical Area. The Illinois Valley contains the largest concentration of serpentine soils in Oregon and supports a diverse and unique flora. Fifteen plant taxa with conservation status listed as rare, threatened, or endangered by the Native Plant Conservation Program with ODA, US Fish and Wildlife Service, or Oregon Natural Heritage Information Center occur in this area, including two species federally listed as endangered. Areas such as Eight Dollar Mountain and Rough and Ready Creek are federally protected as areas of critical environmental concern (ACEC). There are more state and federally listed “threatened” and “endangered” plants on serpentine soils in Oregon than any other soil class. Many of the planted *Alyssum* fields are directly adjacent to these highly valued botanically rich treasures.

In 2005, local citizens and federal land managers reported observing *Alyssum* flowering far from cultivated fields and were becoming skeptical of early assertions regarding the inability of these species to invade the Illinois Valley’s botanically rich serpentine areas. Evaluation and documentation by an interagency task force began in 2005 and continued through 2008. The Weed Program completed a plant risk assessment that resulted in both species being A-listed weeds by the Oregon State Weed Board in 2009.

The Yellowtuft-*Alyssum* working group continues to meet semi-annually to help guide this important project. Local volunteerism continues to be key to success in this project. It is estimated that volunteers throughout the Illinois Valley have contributed over 500 hours toward the project in 2015 alone. This season was an especially challenging year on the *Alyssum*-front. Nearly every private property either underwent a change of ownership and/or dramatically changed crop production practices. In addition, a brand new site was discovered in a previously unsuspected part of the county. In June, a retired BLM employee reported a suspicious yellow flowering stand of plants in the Chapman Creek area. *Alyssum* was confirmed at the site and surveys found that the infestation had spread across lands managed by the BLM, two private landowners, and a private timber company. After careful consideration, it is suspected that Viridian LLC planted a test plot on BLM land (thinking it was private ground due to a fence) and deer trailed the *Alyssum* from the test plot to adjacent landownerships. Days after the new site was discovered, a large collaborative team gathered to hand-pull all flowering material. Remaining vegetative plant material was treated with herbicide by the BLM and the Weed Program.

Glenn Miller surveys for *Spartina*.

Spartina survey and treatment

The Weed Program has maintained an excellent track record of finding and treating new infestations of cordgrass, *Spartina* spp. Portland State University, Center for Lakes and Reservoirs (PSU) and the Weed Program have developed a comprehensive effort to implement regular surveys of thirteen Oregon estuaries at high risk of infestation. Three species of *Spartina* have been documented in Oregon. Prior to 2013, only two species, *S. alterniflora* and *S. patens*, were known to occur. The third species of cordgrass, *Spartina densiflora*, was detected in Coos Bay during a 2013 fall survey. The Coos Bay site was monitored in 2015, no additional plants were found.

Spartina alterniflora was located and removed from a site near Sand Lake in the fall of 2014. The discovery was made by Oregon State Parks and is the first site known from the area. The site was monitored in 2015. Further surveys are planned for the winter of 2016.

The Young's Bay *S. alterniflora* infestation was chemically treated in September 2008, and again in 2009, with glyphosate and imazapyr. The original patch was 800 square feet in size. Site monitoring in 2009 found only six stems. No plants have been found for the last four years.

Saltmeadow cordgrass, *Spartina patens*, established on Cox Island in the Siuslaw estuary of the Siuslaw watershed decades ago. In recent years, it has been targeted for eradication by The Nature Conservancy, which owns the property. Some seed production and off-site movement has occurred with several patches forming on two additional islands. PSU located these additional patches by air and ground survey in 2009. In 2010 and 2011, five patches were located and treated. Working in this environment is difficult due to tidal fluctuations, heavy marsh vegetation, and hidden steep-sided gullies. Hidden plants that set seed among the taller saltmarsh plants may continue, prolonging eradication efforts. Continued surveys and early treatment will be necessary for several more years. The Weed Program monitored 200 gross acres surrounding the island and treated less than 1/100 of an acre in 2011. No regrowth has been found in these off-island infestations since 2012.

Using boat and foot surveys, Weed Program staff searched the Nestucca, Sand Lake, the western side of Tillamook, and Netarts bays. Following up on a confirmed citing in the Sand Lake Estuary, staff managed to enter and survey this and other shallow water bays at high tide without getting trapped by outgoing tides. No additional *Spartina* was found. Estuaries to be surveyed this winter include the Alsea, Siletz, Nehalem, Necanicum, and eastern parts of Tillamook Bays.

Purple and Iberian starthistle

Purple and Iberian starthistle, *Centaurea calcitrapa* and *C. iberica*, are two species of limited distribution in Oregon. These species have the potential to invade 1.5 million acres in Oregon, with an estimated economic impact of $12 million per year. Five historic sites and two active sites have been documented. Prior to the 2009 field season, only a single active purple starthistle site was known from Oregon, in Clackamas County. The Clackamas County infestation was two net acres over 80 gross acres. Since treatment started, there has been a significant drop in plant numbers, indicating that the dormant seed bank is nearing depletion. No plants were found in 2015.

In 2009, a new infestation of purple starthistle was discovered in a nine-acre pasture just south of Spray, in Wheeler County. Several plants were also discovered in the flood plain of the John Day River. The area was treated within a day of being found. Additional survey was completed involving 4,500 acres. The site was monitored and no plants were found for the last four seasons.

Woolly distaff thistle

Woolly distaff thistle, *Carthamus lanatus*, was discovered in Oregon in 1987. This non-native is known to infest vast acreages in California and Australia. Elimination of seed production and seeds banked in the soil is key when battling an annual thistle. The project involves the control, survey, and monitoring of all known infestations of woolly distaff thistle. At a minimum, each site is treated three times each year. Crews apply herbicide with backpack sprayers early and manual methods later in the season. The Weed Program continues to provide supervision and coordination for this project. Since the inception of this project, woolly distaff thistle has been reduced by 99% from historic levels.

Crew spot-spraying woolly distaff thistle.

This season produced the fewest infested acres of woolly distaff thistle since the project began. The treated area totaled a mere 1.23 net acres. Only three sites increased in size due to new thistle patches found near historically infested areas. A helicopter survey resulted in a significant find of a new location of distaff thistle just east of Glide on the Lone Rock Ranch 2014. This site continued to receive extra attention for treatment and monitoring.

Paterson's curse

Paterson's curse, *Echium plantagineum*, is an A-rated weed species that threatens Oregon's native habitats with the potential to invade oak woodlands, native prairies, and dry upland slopes. Despite a beautiful appearance, this invasive weed truly is a curse in that it is extremely toxic to livestock and infests thousands of acres across Australia.

Paterson's curse flower.

An infestation of Paterson's curse was identified on private lands southeast of Dillard in Douglas County in 2004. Initially 80 net acres of the project area were treated aerially, while the remaining twenty acres (not accessible by helicopter) were treated with ground equipment. A private contract crew managed under an agreement with Douglas SWCD has worked the 300 acre gross area using backpack sprayers since 2008. This season, the project area was treated on five occasions between April and August. In 2014 as well as 2015, plant numbers have declined after showing a spike in number in 2013. An impressive 65% decrease in Paterson's curse plants was accomplished between 2014 and 2015.

In Linn County, the Lebanon infestations of Paterson's curse were a fraction of the 2013-14 population levels due to cropping changes in the infested areas. Switching to grass seed from flax allowed for greater suppression of broadleaves including Paterson's curse. The few emerged plants were manually controlled in 2015.

Orange, yellow, and meadow hawkweeds

Orange, yellow, and meadow hawkweeds, *Hieracium aurantiacum*, *H. pratense* and *Pilosella caespitosum*, are very invasive members of the Aster family. Once established, hawkweed can quickly develop patches that expand until they cover an area and form a solid mat of rosettes. Hawkweeds displace natives, posing a serious threat to native plant communities. They can also dominate pastures, lawns, and roadsides, crowding out desirable species.

Hawkweeds are invading native meadows on the Mt. Hood National Forest (NF). Additional populations occur in Wallowa, Union, Deschutes, Klamath, and Harney counties. Overall, orange and yellow hawkweeds continue to be found at new locations in central and eastern Oregon. Most of the new finds are small and manageable. The concern is the increasing number of new orange hawkweed sites. It is an attractive plant and is used as an ornamental; awareness and outreach activities have helped to increase the reporting of new sites.

The Mt. Hood NF infestation covers over 1,000 gross acres of Lolo Pass on the Zig Zag and Hood River Ranger Districts. The majority of the infestation is found on Bonneville Power Administration (BPA) managed rights-of-way and additional outlier sites are found in the Mt. Hood Wilderness. Treatments have achieved 90 percent reduction since 2003. In 2010, the population rebounded following several years of low plant numbers. The following field season has shown good results and recent treatments are keeping

Meadow hawkweed in Wallowa County.

the infestation in check. For the last two years, the Weed Program has partnered with Clackamas SWCD crews to more effectively cover the site.

In 2005, the first populations of orange hawkweed were found in central Oregon in the landscaping of the City of Sisters. As a result of that find and press coverage, 16 confirmed locations were found in Deschutes County. Plants were determined to be from a nursery that was selling orange hawkweed as "orange aster." Since the original finds in 2005, new populations continue to be found and treated throughout central Oregon on private and national forest lands. The Weed Program is working in cooperation with Deschutes County Weed Control to manage the infestations. They work with homeowners to monitor and treat infestations each year. The USFS helps to support this project with State and private funding. The Deschutes NF completed an EIS to address the infestation on national forest lands. The Deschutes NF continues to find new sites and works with the Weed Program under contract to help control the sites. Treatment strategies shifted for 2014 with Deschutes County. Funded by grant dollars, the county offered a cost share to residential private landowners. Treatments were also conducted on public and private lands by Weed staff at several sites throughout Deschutes County. The same program continued with Deschutes County providing herbicide and equipment for those landowners affected by orange hawkweed during the 2015 season.

A single population of orange hawkweed exists in Crook County. This single property in Prineville is the only known orange hawkweed site within Crook County. Both the Weed Program and Crook County staff made multiple treatments.

In 2009, the first two small sites of orange hawkweed were found in Klamath County. One site with 30 plants was found in northern Klamath County on USFS land, and the other site was in a residential yard in Klamath Falls. The USFS site was pulled and bagged by USFS crews. Weed staff chemically treated the residential yard. In 2010, the Klamath County Weed Department found several additional sites in the towns of Chemult and Crescent. In 2012, a new large site was found in the landscape of a retirement home in Chiloquin. The Weed Program and Klamath County worked with the maintenance manager to develop a treatment plan for the facility. The sites were monitored and treated in 2015.

Orange hawkweed was found in 2006 in the City of Hines, Harney County. Weed staff started treatments at three residences in 2007. Sites are monitored and treated as needed by the Weed Program or the county weed crews annually.

Several residential sites of orange hawkweed in the City of Portland in Multnomah County are being tracked and treated by City staff, who are reporting the activities to the Weed Program.

Meadow hawkweed control in Wallowa and Union counties is a cooperative effort by county, state, and federal agencies. Acres treated have remained relatively constant for the last several years. Outlying sites from years past were treated except when prevented from doing so by lawsuits against the Wallowa-Whitman NF. Highest priority was given to treating small hawkweed populations in the north end of Wallowa County near the Asotin County line close to Troy and on the Grande Ronde River and Imnaha River. An active survey and monitoring protocol is in place and has been effective over time at containing and eliminating the infestation. New sites continue to be found and treatments are implemented in a timely manner. Wallowa County declared a new containment area for meadow hawkweed in the Salt Creek Summit area. This is the second containment area in the County. The first was created years ago in Bear Creek near the town of Wallowa. Both containment areas are aggressively managed to curtail seed and plant material flow out of the area.

Barbed goatgrass.

Barbed goatgrass

Barbed goatgrass, *Aegilops triuncialis*, an A-listed weed was detected in 2003 along Hwy 199 near Rough and Ready Creek, south of Cave Junction in Josephine County. While infested acres of barbed goatgrass are increasing in California, this is the only known population in Oregon. In recent years, training field tours have focused on identification characteristics of barbed goatgrass. Results of these trainings were again realized, with two additional sites near the infested zone detected. One new site was reported through the online Invasive Species Hotline by a citizen botanist, while a seasonal USFS botany crew detected a second new site. The infestation zone extends across private, state, and federal boundaries. Three volunteer sweeps were made across the area to manually remove and bag plants. Nearly four bags were taken off-site and destroyed.

Yellow floating heart

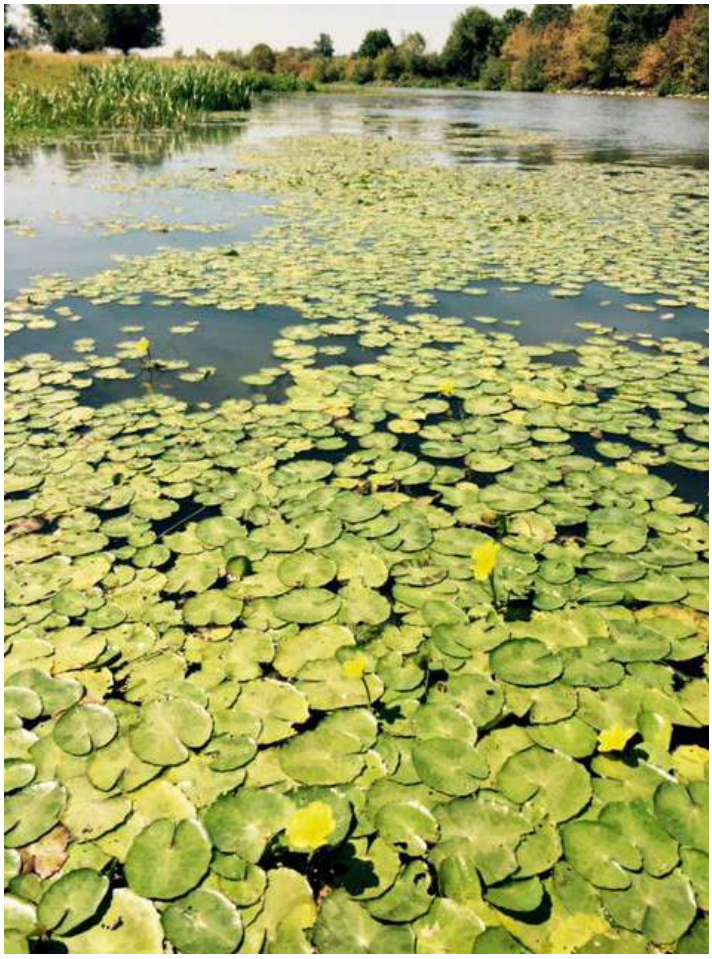
Yellow floating heart, *Nymphoides peltata*, an escaped ornamental aquatic plant, was first reported in 2004 in Washington County, Oregon. As of this field season, 13 sites have been documented and are undergoing treatment. Sites are found throughout western Oregon and as of 2014, east of the Cascades at eight sites in Deschutes County. The Deschutes infestations more than doubled the number of known sites in Oregon.

Yellow floating heart survey in Umpqua National Forest.

Five yellow floating heart infested water bodies are known to occur in southwestern Oregon. No new infested ponds were detected in 2015. Over the past five years, the Rogue-River Siskiyou National Forest has nearly eradicated an infestation at Little Squaw Lake in Jackson County. In 2015, only a few small plant fragments were detected. Bottom barriers and divers have proven instrumental in this effort. In Douglas County, two private ponds near Kellogg and two ponds at a golf course in Roseburg were treated in the spring and fall. A significant reduction in plant density was accomplished at all four ponds. Imazamox was used this season compared to glyphosate and imazapyr in 2014. An infested fire pond on the Umpqua National Forest was brought to the Weed Program's attention in 2013. A letter from the State Weed Board was sent to the Umpqua Forest Supervisor to encourage prioritization of this A-listed weed NEPA site analysis. The completion of an EIS in 2015 finally allowed treatment of the pond. Weed staff conducted two fall treatments and monitoring photo-points were established.

In September 2013, a report came in that a stock pond near Redmond contained yellow floating heart. Investigation, image analysis, and reports from the general public (after radio and newspaper articles) have turned up a total of eight infested ponds and water features within Deschutes County. All of the newly discovered sites were treated by the Weed Program. The 2013 treatments had varying success, believed to be largely a factor of their discovery and treatment late in the fall. For 2014, treatments continued at the 8 original sites. Three additional sites were found and treated in July with different herbicides.

As with the treatments of 2013 made in the fall season, the treatments of July 2014 proved to be



Yellow floating heart.

a mixed result. Re-treatments were made through the summer of 2015. Some sites showed noticeable improvement, while some appeared to have no effect from prior year chemical treatments.

Portland State University Center for Lakes and Reservoirs provided locations of potential yellow floating heart infestations based on their own image analysis and study of central Oregon imagery. Of the 12 possible new infestations, fortunately none were found to be yellow floating heart. However, one new infestation was confirmed in the Redmond area. The new site was reported by neighbors and confirmed by the Weed Program. The owners of the property requested to carry out herbicide treatment on their own.

An active site at Horseshoe Lake in Benton County continues to be treated by contract crews as part of a Benton Cooperative Weed Management Area, Oregon State Weed Board grant project. A new site for 2015, located in a Willamette River side channel, has been located by cooperators. Weed staff will treat this site in 2016.

Giant hogweed

In 2015, Weed staff worked with City of Portland, Clackamas SWCD, Columbia SWCD, Clatsop SWCD, Tualatin SWCD, Tillamook SWCD and Hood River SWCD to monitor and/or treat all known locations of giant hogweed in Oregon. Through outreach and survey efforts, a small number of new sites in Portland were located and work is underway to secure permission from property owners to ensure they get treated. Most sites are in current or former residential landscape settings.

Fanno Creek and Vermont Creek, both in the Portland Metro area, are the two known riparian infestations of giant hogweed in the state. No plants were found along Vermont Creek this year and over 40% of the 125 previously recorded patches along Fanno Creek had no observable plants.

Work is currently underway to update and analyze the giant hogweed database. Fifty-two of the initial 193 sites have been considered eradicated, 12 of them were given that status this year alone. Twenty additional locations have had no plants recorded for 4 years. These will be added to the eradicated list pending monitoring for no occurrences next year. As database analysis continues, sites that are considered eradicated will likely increase. Overall, active giant hogweed sites and plant numbers have dropped significantly since it was first discovered in Oregon in 2001.

Oblong spurge in Salem.

Oblong spurge

There was a resurgence of oblong spurge at Oregon's largest site, located in Salem. It is believed to have been introduced as a contaminant in flax seed that was grown and processed at the location in the mid 1900's. The core infestation is at the current location of the Oregon Office of Emergency Management where it lines the south shore of a pond and it has also moved off-site along a drainage ditch to adjacent Oregon State Penitentiary property along Mill Creek. The Weed Program staff treated all known locations with imazapyr herbicide.

There are also scattered locations in the Portland Metro area that City of Portland and Clackamas SWCD staff are monitoring, treating, and reporting to the Weed Program. It is not entirely clear how many of these urban locations originated, but some of them may have been planted as ornamentals.

Kudzu

In July 2000, kudzu, *Pueraria lobata*, was detected on a road bank in Clackamas County. This was the first infestation detected west of Texas. Kudzu is an aggressive climbing vine that trails over and smothers surrounding trees and plants. It is native to China and Japan and is a major problem in the southeastern US, where an estimated 7 million acres are infested. A second Oregon site was detected in Multnomah County in 2000, and another in 2001. These sites were treated with a selective herbicide and have required periodic follow-up treatments for control of re-growth. Survey and detection efforts have been conducted throughout western Oregon and no additional sites have been detected. The three known sites were monitored and two required treatment in 2010. No plants have been found since 2011. These sites will continue to be monitored for several years to confirm eradication.

Plumeless thistle flowers.

Plumeless thistle

Plumeless thistle, *Carduus acanthoides*, is known from three counties in Oregon: Klamath, Grant and Wallowa. The Klamath County weed supervisor first discovered plumeless thistle near Klamath Falls in 2007 at the Miller Island Waterfowl Refuge. In 2008, the Klamath County weed supervisor found another small site in a new subdivision being built just west of Klamath Falls. The Miller Island site was about one acre scattered over five acres and the subdivision site contained 24 plants. In 2012, Klamath County Weed Department treated all the sites. The County and the Weed Program surveyed the surrounding 500 acres, finding no additional plants. These sites will be monitored and treated for several years.

The Grant County plumeless thistle site was the original site discovered 20 years ago. It is managed very aggressively each year to reduce plant density and for containment. Recent increases in landowner cooperation have allowed for the discovery and treatment of several new sites. Aerial surveys were planned for this year but were initially delayed due to drought conditions that resulted in small plants that were hard to detect. Then the survey was eventually cancelled due to large-scale wildfires near the infested area. A total of 20.5 net acres were treated in Grant County this year.

In Wallowa County, several sites were discovered four years ago and staff are treating all of those sites. In Wallowa County, most sites were down to less than five plants. Some of these sites are in immediate proximity to Spalding's Silene, *Silene spaldingii*, an endangered plant. Treatment of this weed is important to general rangeland health and agricultural production, but also to prevent any threat it may pose to this endangered plant and the area's native grasslands.

Taurian thistle

Taurian thistle, *Onopordum tauricum*, is a sister plant species to Scotch thistle, *Onopordum acanthium*, and has the same potential to be invasive. In Europe, it is more aggressive than Scotch thistle. Taurian thistle is lime green with large baseball-sized terminal flower heads that resemble an artichoke.

The first Oregon infestation was discovered in Klamath County in 2007. The Weed Program and the Klamath County Weed Program have treated and monitored the site for the last five years. Two new sites were found in 2012, located west of Klamath Falls on Hwy 140. Both sites together totaled 200 plants and covered one net acre. Sites continue to be monitored and treated in 2015.

Squarrose knapweed

Squarrose knapweed, *Centaurea virgata*, is an A-listed weed in Oregon. Presently, one site is under treatment in Grant County and a second in Jefferson County. A historic site in Malheur County continues to be monitored and no plants have been found there since 2003. The Grant County site has been under treatment since its discovery in the early 1980s. Grant County weed supervisor, Mike Martin, supervised the summer survey and treatment, under the Weed Program's direction and with an OSWB grant. The Weed Program continues to monitor the efficacy of the treatments to ensure effective control.

In 2003, Jefferson County Weed Control recognized that the plants being treated were not diffuse knapweed as believed, but squarrose knapweed. OSU herbarium staff confirmed the identification. This population of squarrose knapweed has not produced seed since 2003. Plants are occasionally found, but since Jefferson County and the Weed Program have been watching this site, these plants have not seeded. The Weed Program plans to periodically monitor the site; no plants were found in 2015.

Poisonous Pheasant's eye flowers.

Pheasant's eye

Pheasant's eye, *Adonis aestivalis*, appears to be on the move in southeastern Oregon. All plant parts of pheasant's eye are poisonous if ingested and are especially dangerous to horses and other grazing animals. Weed staff coordinated with Grant County, Silvies Ranch, and Harney County for monitoring and control work on known sites. There has been a significant increase in plant numbers and locations in the Silvies Valley. Grant County is coordinating control efforts.

African rue

The first report of African rue, *Peganum harmala*, in Oregon was a mystery. An OSU herbarium specimen was recorded in the mid 1960s from Crook County, but did not mention a specific location. A member of the Native Plant Society located the site in 1991. African rue has been treated as an A-listed weed by the Weed Program and Crook County since the re-discovery.

The Crook County infestation is along Highway 27 and occurs on both public and private land. The main portion of the infestation is on BLM land, which provides most of the funding for control. Crook County and the Weed Program are working together to treat the site. The roadways leading into and out of the control area and the surrounding rangeland are surveyed yearly. No new plants were found outside of the historic treatment area. Crook County completed all the control work in 2015. Plants continue to be found, although the population has remained static since 2013.

In early September 2008, a contractor for the Bureau of Indian Affairs noted a possible infestation of African rue on tribal allotments located in the Harney Basin southeast of Burns. The Weed Program verified the plant as African rue. The initial response plan was to treat outlier sites, roadsides, barnyards, and pivots for containment and to prevent further spread. In 2008, the Weed Program spent several weeks doing the initial site delimitation, which revealed a project area of 2,700 gross acres and 19 landowners including Department of State Lands, private, and tribal lands. An African Rue Cooperative Weed Management Plan was completed in 2009. This project is now largely funded by an Oregon State Weed Board Grant to Harney County and is monitored by Weed Program staff.

The Harney County Weed Board once again performed the comprehensive survey and treatment for the African rue known to be infesting Harney County south of Burns, Oregon. This year, the site was treated with the entire inter-agency ATV crew run by the county. The crew treated a total of 52.5 acres including right-of-way acres on county road. The treatments were performed in a 4 day window with a follow-up day to survey. Attempts to establish competitive vegetation by re-seeding treatments sites has had little success so far. The plan at this point is to continue aggressive treatments of the African rue in a continuing effort to stop any escapes of this highly invasive noxious weed. Once an area is under control and sufficient time has passed for the re-seeding to take place, another seeding attempt is planned.

African rue is getting tougher to find as the large monocultures are reduced to scattered small plants. Crews have to look much harder to locate the much smaller plants. Although the plants are often smaller, the plant numbers in most cases are still rather high. Because of this, using more people and more eyes is needed to ensure a higher success rate. There was a total of 48.5 net acres treated this year.

Significant Accomplishments and Special Projects

5-year strategic plan

The Noxious Weed Control Program has taken on the challenge to develop a 5-year strategic plan. The vision is to provide a stronger statewide presence that fully utilizes our staff's exceptional skills and experience, focuses on state invasive weed priorities and emerging needs (e.g. water quality, EDRR, and sensitive species protection), and serves local, county, state, federal, and private land managers. This will require shifting away from dependence on inflexible funding sources to those that allow for priority-driven adaptive management, which will best protect Oregon's natural resources from the impacts of invasive noxious weeds.

To better understand the program, three basic questions were asked: where are we, where should we be, and how do we get there? A baseline assessment and economic assessment were completed with input from Weed Program staff and cooperators. This identified the Program's current core priorities and services, constraints of the current structure, and improvements to better serve statewide priorities.

- **Internal ODA review:** Staff meeting and outcomes, SWOT Analysis (Strengths, Weaknesses, Opportunities, Threats)
- **External review:** Noxious Weed Strategic Plan, Listening Session Report that provided County Weed Association and stakeholder input for program needs.
- **County survey and assessment**
- **GAP analysis:** Identified how current resources are being used and how they can be better directed to address current and future needs.
- **Economic assessment findings:** *2014 Economic Impact from Selected Noxious Weeds in Oregon*. Study looked at 25 of 128 state listed noxious weeds and estimates an $83.5 million per year impact.

2015 Highlights in Biological Control

Classical biological control is the intentional introduction of selected natural enemies for the purpose of reducing the population of targeted noxious weeds. Since 1947, 77 species of classical biological control agents have been introduced against 27 species of noxious weeds in Oregon. Several of these biocontrol agents have become re-associated with five additional species of weeds for which they were not originally introduced (for a total of 32 weeds). The Weed Program manages over 120 biocontrol projects (weed/agent combinations). The biocontrol database contains more than 13,010 records of biocontrol agent releases, nearly 90% of releases made in Oregon.

Several biocontrol projects in Oregon have been successful in controlling targeted weeds, including: tansy ragwort, St. Johnswort, musk thistle, Mediterranean sage, purple loosestrife, yellow starthistle, Dalmatian toadflax, and diffuse knapweed, especially at sites that are managed to improve competitive vegetation. The Weed Program strives to adhere to the international code of best practices for classical biological control of weeds in order to implement a safer and more effective biocontrol program. Our goal is to protect our natural resources by managing approved biocontrol agents, redistributing them to major infestations, and monitoring their impacts on the target weeds. There are 1,512 weed/agent/county combinations. This means that for each infested county, the total number of weeds targeted for biological control plus the number of biocontrol agents. Keeping track of all this information is a daunting task. Our goal is to get every approved biocontrol agent as widely distributed in as short of a time as possible. At the end of 2015, the percentage of established biocontrol agents that are widespread on their target weeds by county is 41%.

Significant accomplishments

In 2015, 14 species of biocontrol agents (over 105,080 biocontrol agents) were released against 11 species of targeted weeds at more than 81 sites, a treatment of more than 405 acres. Over 50 biocontrol sites were monitored to determine establishment and impact of biocontrol agents. Numerous releases of biocontrol agents were provided to cooperators in neighboring states. Entomologist Eric Coombs gave 12 invited talks at various symposia and training sessions and peer-reviewed four scientific papers.

The United States Department of Agriculture Animal Plant Health Inspection Service Plant Protection and Quarantine branch (USDA-APHIS-PPQ) biocontrol program remains a very important partner in implementing biocontrol in Oregon. The Weed Program and APHIS provide surplus biocontrol agents to many local agencies and other states. In 2015, the Weed Program, APHIS staff, and other cooperators provided over 105,000 biocontrol agents (81 releases) to county weed programs, other agencies, and other states. The Weed Program continues cooperative research projects with Drs. Peter McEvoy, Fritzi Grevstad, Ed Peachy and their staff at Oregon State University (OSU). The Weed Program is also a partner with Dr. Fritzi Grevstad at the OSU Forestry Sciences Quarantine Laboratory, where work on cooperative projects on the biological control of knotweeds and gorse is being conducted.

Field bindweed moth.

Field bindweed, *Convolvulus arvensis*

A cooperative research project is being conducted in conjunction with Dr. Ed Peachy and Jessica Green (OSU) to determine the distribution of the gall mite and the field bindweed moth, *Tyta luctuosa*, in western Oregon. The flight season of the moth was studied at the Baskett Slough National Wildlife Refuge in Polk County. The flight season begins in May and extends into September, with two peak periods. Additional monitoring did not reveal establishment at any of the release sites in Eastern Oregon.

Gorse, *Ulex europaeus*

In 2008, testing of the gorse shoot moth *Agonopterix ulicitella* and the gorse thrips *Sericothrips staphylinus* began at the OSU Quarantine. Insects were collected near Hilo, HI and brought to Oregon. The project is being coordinated by Dr. Fritzi Grevstad, OSU, and primarily funded by USDA Forest Service (USFS). A petition for field release of the gorse thrips was submitted in 2012 and pre-release studies were conducted along the SW Coast. Field releases are anticipated for the 2016 field season, as the Technical Advisory Group (TAG) approved its release to APHIS and release of the final Environmental Assessment is pending.

Gorse shoot moth larvae.

Japanese Knotweed, *Fallopia japonica*

Host specificity tests at the OSU Quarantine Lab by Dr. Fritzi Grevstad were finalized and a petition for field release of the plant sucking psyllid, *Aphalara itadori*, was submitted to TAG. More testing is required on the southern strain, however the northern strain was approved by TAG. Pending approval by USDA APHIS, release could be made in 2016.

Plant sucking psyllid, a biocontrol agent that attacks Japanese knotweed (Photo by CABI).

Russian knapweed, *Acroptilon repens*

The gall midge, *Jaapiella ivannikovi*, was extensively collected and redistributed throughout Oregon from the McNabb Road site in the Willow Creek area in Morrow County in cooperation with USDA APHIS. An extensive redistribution program was conducted in 2015, which provided 45 releases throughout infested areas in Oregon. The gall wasp, *Aulacida acroptilonica*, was released at three sites, two in the Willow Creek area of Morrow County and at Rimrock Reservoir on the USFS Crooked River National Grasslands in Jefferson County in 2014. Five additional releases were made in 2015, including Wasco County. Over 700 wasp galls were collected at the Rim Rock site for redistribution to other sites in Oregon. Monitoring in 2015 revealed that the wasp established at the Rhea Road site in Gilliam County and the Rimrock Reservoir site in Jefferson County. Additional releases were released in Morrow and Malheur counties. This is the first wasp used as a biocontrol agent in the USA.

Gall midge on Russian Knapweed.

Yellow starthistle, *Centaurea solstitialis*

In 2014, the rust fungus, *Puccinia jacea* var. *solstitialis*, was recovered for the first time in Oregon in the Myrtle Creek area in Douglas County. A cooperative study on its impact and distribution was conducted in 2015 with Bill Bruckart, USDA Agricultural Research Service. The rust was confirmed to be established and had spread nearly three miles from the original release site. Results were published in the Plant Disease Journal.

Rust fungus on yellow starthistle.

Economic benefits

Classical biological control of weeds has a good safety record, but a somewhat scanty track record of documented economic benefits. Most of the funding for biocontrol projects is used during the foreign exploration, host specificity testing, and introduction phases, with little appropriated for long-term efficacy studies. Because biological control is a public good, it is best coordinated by public agencies, as it would be impossible for private enterprises to recuperate the development costs of each project. The average upfront cost per release for the Weed Program is about $500. Reported benefit-cost ratios from around the world vary from 112:1 to 2:1. Biocontrol of tansy ragwort in Oregon yielded an 85% internal rate of return and a 15:1 benefit-cost ratio. On successful long-term projects, benefits can occur as steady stream returns, for example $5 million per year for the ragwort project in Oregon, where annual agency expenditures on this weed is now less than $20,000 per year. Where feasible, it is economically advantageous to implement biocontrol in order to reduce annual losses. By actively redistributing ragwort biocontrol agents, the Weed Program accomplished a successful regional project 5-10 years sooner than by the natural spread of the insects, thus averting $25-$50 million in losses to agriculture.

WA partially successful biocontrol project (i.e. one that reduces weed infestations by variable percentages over large areas) can provide a positive benefit-cost ratio, even though the degree of weed control may be less than desired. If biocontrol in Oregon reduced the top 12 weeds by 30%, annual losses could decrease by $20 million. A 10% reduction of Scotch broom alone would yield $1.5 million in annual benefits. An estimate of the net economic benefit of biocontrol agents in Oregon was valued at $12 million per year.

Native Plant Conservation Program

Introduction

In an effort to preserve Oregon's impressive natural heritage and unique biodiversity, the Native Plant Conservation Program (NPCP) was established by the Legislature in 1987 in response to citizen concerns about the loss of native plant species and habitats in our state. The program's focus is to assist public agencies and private citizens with management issues involving native plants on non-federal public lands. Both ODA and federal native plant regulations only affect public lands and are not applicable or enforceable on private property. The program meets this responsibility by:

- Providing guidance and support to state and local government agencies managing lands that contain target plant species or their habitat.
- Setting priorities for the establishment of conservation programs and plans for protected native species, and subsequently developing those programs/plans.
- Assisting the general public with native plant management and protection issues.
- Overseeing and regulating research and restoration activities involving target species and habitat on state lands.
- Creating a system of permits to regulate activities associated with protected plant collection and related actions on public lands.
- Establishing and revising Oregon's list of protected native plants, as well as providing state review of the federal government's process for listing Oregon plant species under the federal Endangered Species Act.
- Conducting independent research to develop protocols for protected species recovery efforts, designed to aid in their eventual delisting.

Native Plant Conservation Program (left to right):
Cameron Metzler, Kelly Amsberry, Laura Kentnesse, Jordan Brown, Lauren Pittis, Bob Meinke, and Maelagh Baker.

Cooperative Conservation Planning and Recovery Efforts

Program staff have worked with federal, state, and local government agencies, as well as tribal groups and private organizations and citizens, on over 275 plant conservation initiatives, projects, partnership agreements, and management plans since the program's inception. This work has continued in 2015, with projects occurring in every corner of the state and involving a diversity of species and partners from both the public and private arena.

2015 cooperative projects involved:

- Staff monitoring, surveying for, or conducting research projects on listed and candidate plant species in 16 of Oregon's counties.
- Work initiated or continued on roughly 25% of Oregon's 59 listed plant species, as well as research involving several candidate or other rare species.
- Numerous private, local, state, and federal partners, including: the Federal Aviation Administration, the US Fish and Wildlife Service (USFWS), multiple field offices of the Bureau of Land Management (BLM), US Forest Service (USFS), US Army Corps of Engineers, Natural Resources Conservation Service, the Burns-Paiute Tribe, Oregon Department of Transportation (ODOT), Oregon Parks and Recreation Department (OPRD), Department of State Lands,

the Oregon Biodiversity Information Center, the Washington Natural Heritage Program, California Fish and Game Department, Eastern Oregon University, Oregon State University, Jackson County, Josephine County, Benton County, Lane County, Yamhill County, the City of Jacksonville, the City of Medford, the City of Corvallis, the City of Salem, Humble Roots Nursery, the Jacksonville Woodlands Association, Rare Care, the Cultural and Ecological Enhancement Network, The Nature Conservancy, the Southern Oregon Land Conservancy, the Humane Society Wildlife Land Trust, Friends of the Tumalo Wildlife Corridor, and the Native Plant Society of Oregon.

- Projects in recent years have largely been supported through external grants or specific consultations, providing important opportunities to improve state plant conservation efforts in many areas and allowing the Native Plant Conservation Program to provide management input for endangered species management on both federal and state lands.

Projects of note that were initiated or continued in 2015:

Gentner's fritillary

Continuing recovery work on the federally-endangered Gentner's fritillary (*Fritillaria gentneri*) with support from USFWS and Medford BLM. The Native Plant Program has led the recovery-based propagation and outplanting efforts that began in 2002, collaborating with Medford District BLM, USFS Rogue River–Siskiyou National Forest, the City of Jacksonville, Jacksonville Woodlands Association, Southern Oregon Land Conservancy, OPRD, and ODOT. Wild collected Gentner's fritillary bulblets are cultivated at the Oregon State University greenhouse facilities for several years to generate more substantial transplant stock to increase their chances of survival in the wild. This past fall, we planted over 4,500 cultivated bulbs in the wild, which helped bolster natural populations and reduces the risk of extinction. The survival and growth of previous outplantings were monitored in the spring and the successes that were observed will help guide future efforts. Approximately 10,000 Gentner's fritillary plants are established and surviving in the wild thanks to the efforts of the Native Plant Program. This contribution not only reduces the risk of extinction, but also brings us closer to reaching administrative recovery goals for downlisting and delisting in the future.

Two new projects focused on the recovery of Gentner's fritillary were initiated in 2015, including: a focused study on the reproductive biology of the species and a protocol development and evaluation of focal conservation areas for Gentner's fritillary. We conducted controlled cross pollinations of carefully selected flowering plants in the wild in an attempt to encourage this mostly asexually reproducing plant to set viable seed; this study will continue next year. The establishment of Fritillaria Management Areas (FMAs) (an administrative designation reserved for top priority Gentner's fritillary conservation areas) is required for downlisting or delisting. All FMAs need to be appropriately managed for the conservation of Gentner's fritillary and to assist with the goal that created a streamlined protocol for assessing habitat quality and threats within FMAs. This allows management to be well informed and tailor response to site-specific needs. Using the standard protocol we developed, four proposed FMAs were evaluated and baseline conditions were documented.

In partnership with BLM and USFWS, ongoing recovery-based propagation and outplanting of Gentner's fritillary (inset) reinvigorates natural populations and has been a major contribution to the recovery of the species.

Rough popcornflower

Evaluating the status of the federally-endangered rough popcornflower (*Plagiobothrys hirtus*), to determine where focused efforts are needed and in preparation for a future downlisting recommendation, entailed a range-wide inventory of all created and natural populations in collaboration with Roseburg BLM, the City of Sutherlin, The Nature Conservancy, and ODOT. After years of progress towards recovery, the end is near, in a large part thanks to the recovery-based propagation and outplanting completed by the Native Plant Program. In conjunction with determining the abundance and distribution of the species in protected sites, identifying threats and management recommendations were a focus of this season's work.

Over the years we have been granted access to the largest known population of rough popcornflower, which occurs on private land and contains more plants than all other known populations combined. This private ranch is grazed and, since rough popcornflower is relatively unpalatable to livestock, it does not appear

Monitoring of rough popcornflower (inset) in Douglas County shows that recovery-based propagation and outplanting, led by the Native Plant Program, have brought us closer to meeting recovery goals.

Burns Paiute Tribe Natural Resources Department staff assisted the Native Plant Program in monitoring the created and now established population of Oregon semaphore grass, which is one of Oregon's rarest plants, naturally occurring in only two sites worldwide.

to be drastically impacted by the levels of grazing and may actually benefit. We plan to work with ranch management to gain a better understanding of their grazing regime so that a similar treatment may be tested at other sites. Also, coordination has begun on a potential arrangement to conserve and possibly expand this population, which would contribute significantly to the recovery of this species.

Oregon semaphoregrass

Ongoing efforts to establish new populations of Oregon semaphoregrass (*Pleuropogon oregonus*), one of the rarest plants in the state, are helping to preclude the listing of this species as endangered. Funding from the USFWS has allowed for collaboration with the Burns Paiute Tribe, The Nature Conservancy, the Humane Society Wildlife Land Trust, the Southern Oregon Land Conservancy, Blue Mountain Conservancy, ODOT, and the USFS Fremont–Winema National Forest to transplant cultivated stock back into the wild. Monitoring was conducted this past year to determine which plantings are successfully establishing. Additional seeds and vegetation were collected for the cultivation of more transplanting stock for the future.

While transplants continue to persist at varying rates in all of the recently planted sites, the most successful of the created populations continues to thrive on Burns Paiute tribal land in Grant County. This Logan Valley population, as it is named for its location, is now considered to be self-sustaining after over ten years of persistence and is one of only three populations known worldwide. The Logan Valley population is critical because it flourishes on tribal land that is managed for wildlife habitat protection, while only a portion of one of the two natural populations is administratively protected on ODOT land, leaving the remainder completely unprotected. The population on ODOT property, now rebounding after recently being fenced from adjacent livestock, served as a collection site for seeds and plant material that will be used for cultivation.

Serpentine fen

Developing protocols for assessing and evaluating threats to rare serpentine fen habitats in southern Oregon was supported by the Medford District BLM and USFS Rogue River–Siskiyou National Forest. Following those protocols, the Native Plant Program monitored priority sites that support populations of the five rare plant species that occupy this unique habitat: Oregon willow-herb (*Epilobium oreganum*), large-flowered rush-lily (*Hastingsia bracteosa*), purple-

Native Plant Program monitoring of rare serpentine fen habitat will inform management to protect the iconic cobra lilies and other rare species associated with this habitat type, including Oregon willow-herb (bottom left inset) and Mendocino gentian (upper right inset).

flowered rush-lily (*Hastingsia atropurpurea*), Mendocino gentian (*Gentiana setigera*), and western bog violet (*Viola primulifolia* ssp. *occidentalis*). These efforts provided information on target species abundance, distribution, and threats by which current and future management can be based on. All five species are on the BLM and USFS sensitive species list and contributing to their conservation will help avoid the need for state or federal listing in the future.

Siskiyou mariposa lily

Expanding on the Native Plant Program's previous conservation planning work with Siskiyou mariposa lily (*Calochortus persistens*), a greenhouse study was undertaken to investigate the effect of Dyer's woad (*Isatis tinctoria*), a B-listed weed, on this extremely rare species. The Siskiyou mariposa lily was recently removed from the list of candidates for federal listing based on the reduction of threats from dyer's woad and other invasive weeds. The ongoing study will investigate both the effects of competition and inhibition of germination, providing better information on exactly how dyer's woad impacts Siskiyou mariposa lily.

Assisting State and Local Governments

Consultations and permits

In 2015, Native Plant Program staff consulted with federal, state, and local government agencies (including the Bonneville Power Administration, US Fish and Wildlife Service, Oregon Department of Energy, Oregon Parks and Recreation Department, Oregon Department of Forestry, Oregon Department of State Lands, Yamhill County, Lane County, City of Medford, City of Sweet Home, City of Brookings, City of Klamath Falls, Tumelo Water an Irrigation District, and many other counties and cities throughout Oregon) regarding publicly-funded land actions throughout the state. Through these efforts, the Native Plant Program helped these entities proceed with their proposed projects while meeting their statutory responsibilities to conserve native plant resources. Consultations of note that were initiated or continued in 2015 include:

- An OPRD consultation, in which the Native Plant Program completed a greenhouse study to determine whether herbicide treatment of European beach grass (primarily implemented to restore the endangered snow plovers' habitat) would negatively impact the endangered pink sandverbena (*Abronia umbellate* var. *breviflora*) seed bank. The herbicide treatment of the non-native grass led to an increase in the germination of the endangered native plant, which affirms the use of herbicide by OPRD to restore the critical habitat.

A greenhouse study conducted by the Native Plant Program determined that a specific herbicide application on invasive European beachgrass, as shown here, can eliminate the target without impacting the seed bank of a co-occurring endangered dune plant, pink sandverbena (inset).

- Consultation on the proposed addition of a new taxiway at the Crater Lake-Klamath Regional Airport (owned and managed by the City of Klamath Falls) needed to facilitate aircraft movement and promote airfield safety. A federally endangered species (Applegate's milkvetch) occurs widely on the airport, but essentially nowhere else in the world on public land. The Native Plant Program staff developed a management plan that will protect the species while allowing the airport project to move forward. As part of that plan, seeds of Applegate's milkvetch were collected and conserved to mitigate upcoming impacts to the population occurring on the airport.

Development of site management plans

Over the years, the Native Plant Program has provided many state and local government entities with technical expertise, as well as assisting them with the development of site management plans aimed at guiding the protection and management of state-listed plant species on their lands.

Botanical surveys

When time and resources are available, Native Plant Program botanists provide plant identification and survey expertise to state and local governments in order to help them meet their obligation to protect

Ongoing collaborative work with the Oregon Military Department included monitoring of federally-endangered Kincaid's lupine (*Lupinus oreganus*) on the Camp Adair National Guard Training Facility in Benton County.

listed plants on publicly-managed lands. In 2015, the Native Plant Program continued working with the Oregon Military Department (OMD) to finish surveying a portion of the Umatilla Army Depot (Umatilla County), providing updated information on plant communities and rare species populations. The Native Plant Program also assisted OMD in monitoring the threatened Kincaid's lupine (*Lupinus oreganus*; primary larval host plant of the federally endangered Fender's blue butterfly [*Icaricia icarioides fender*]) population that occurs on their Camp Adair National Guard Training Facility. Findings provided the basis for future management recommendations.

Miscellaneous

Employee Training

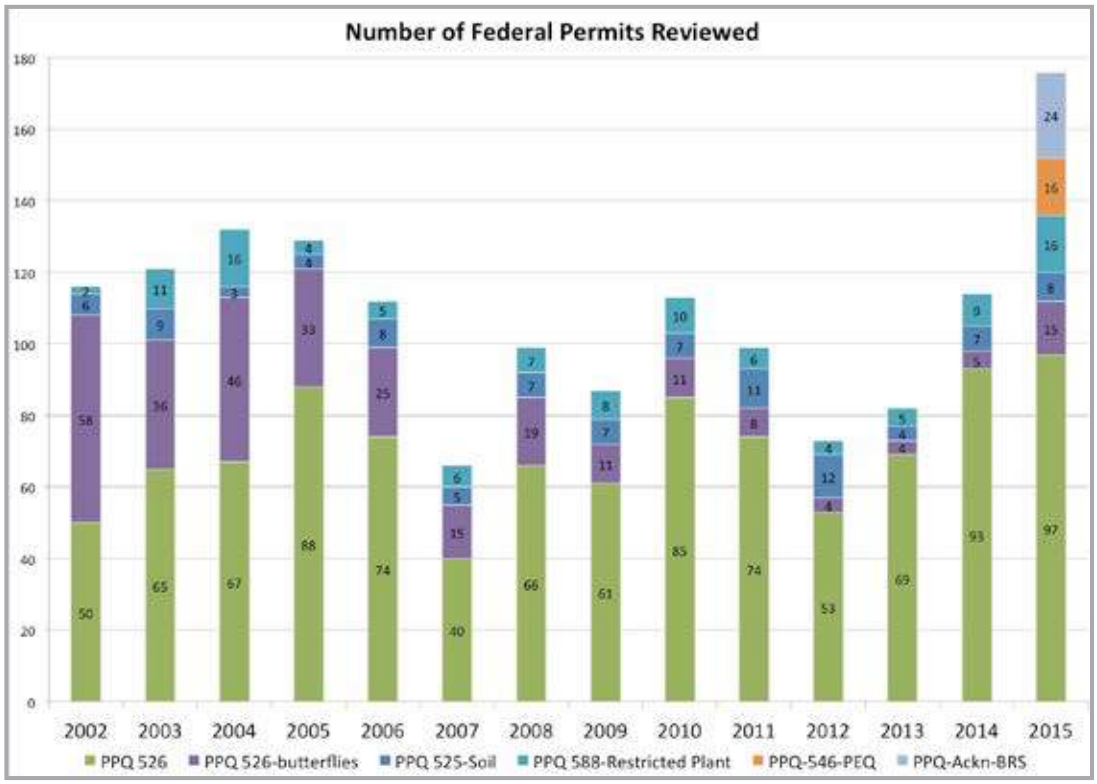
This year, staff participated in a variety of training opportunities such as: emotional intelligence, defensive driving, first aid, CPR, Microsoft SharePoint, export certification, pesticide applicator licensing, and consultant licensing recertification. In addition, staff attended a wide variety of conferences and meetings, including the Oregon Vegetation Management Association, Cooperative Agriculture Pest Survey (CAPS), Entomological Society of America, Western Horticultural Inspectors Society, SANC (Systems Approach to Nursery Certification), USDA APHIS–Understanding Audits, Western Plant Board, and National Plant Board. Employee training, continuing education, and career development remain high priorities of the Plant Protection and Conservation Programs Area.

Plant Protection and Conservation Programs Online

Plant Protection and Conservation webpages are maintained and updated by a team of staff members: Tristen Berg, Jordan Brown, Bonnie Rasmussen, Lisa Rehms, Kerri Schwarz, and Leslie Shaffer. The new Oregon Department of Agriculture website has been up since August 2014 at: www.oregon.gov/ODA

Federal Permits and Compliance Agreements

In 2015, Plant Protection and Conservation Programs staff reviewed 160 federal permit applications through the e-permit system. Ninety-six of those permits were Plant Pest Quarantine (PPQ) 526 applications to import live plant pests or noxious weeds, including fifteen PPQ 526 permits to import butterflies and moths; sixteen were for P546 Post Entry Quarantine. There were also eight PPQ 525 permits to import soil and 16 PPQ 588 permits (permits to import restricted plants or plant products for experimental purposes) and 24 BRS (Biotechnology Regulatory Services) permits for genetically modified crops.



Oregon Revised Statute and Administrative Rule Changes

In 2015, Plant Protection and Conservation Programs adopted or amended the following rules and statutes:

Amend: 603-052-1300

Added several approved species to the approved terrestrial invertebrates list.

- Giant African millipede *Archispirostreptus gigas*
  Education, pet
- Common desert centipede *Scolopendra polymorpha*
  Education, pet
- Millipede *Spiropoeus fischeri*
  Education, pet
- Brazilian white-knee tarantula *Acanthoscurria geniculata*
  Education, pet
- Costa Rican Zebra tarantula *Aphonopelma seemanni*
  Education, pet
- Pink-toe tarantula *Avicularia avicularia*
  Education, pet
- Metallic pink-toe tarantula *Avicularia metallica*
  Education, pet
- Antilles pink-toe tarantula *Avicularia versicolor*
  Education, pet
- Mexican golden red rump tarantula *Brachypelma albiceps*
  Education, pet
- Curly hair tarantula *Brachypelma albopilosum*
  Education, pet
- Mexican red-legged tarantula *Brachypelma emilia*
  Education, pet
- Mexican red-knee tarantula *Brachypelma smithi*
  Education, pet
- African rear-horned baboon *Ceratogyrus darlingi*
  Education, pet
- Greenbottle blue tarantula *Chromatopelma cyaneopubescens*
  Education, pet
- Costa Rican tiger rump *Cyclosternum fasciatum*
  Education, pet
- Brazilian salmon pink bird-eating tarantula *Lasiodora parahybana*
  Education, pet
- Tailless whip-scorpion *Phrynus marginemaculatus*
  Education, pet
- Lesser wax moth *Achroia grisella*
  Pet food
- American painted lady *Vanessa virginiensis*
  Education, release

Amend: 603-052-1230

Amended the quarantine boundary for *Phytophthora ramorum* in Curry County; updates the quarantine's statutory authority.

The most recent survey and detection data from the Oregon Department of Forestry and epidemiology research from Oregon State University indicate that *Phytophthora ramorum* has increased its rate of spread within Curry County from 1 to 2 mi per year pre-2011, to a current rate of 3 to 4 mi per year. In addition, new infestations have been found near the border of and outside of the existing quarantine boundary. In response, ODA proposed to expand the quarantine boundary in the county to encompass the new infestations and to address the increased rate of spread. ODA also updated the statutory authority used to promulgate this rule.

Oregon Invasive Species Council

Plant Protection and Conservation Programs Area Director, Helmuth Rogg serves as the ex-officio member for the Oregon Department of Agriculture on the Oregon Invasive Species Council (OISC). The OISC was created by the Oregon Legislature in 2001 defined by ORS 570.750 – 570.810. The council consists of seven permanent or non-officio, and 10 appointed members, representing important natural resource agencies and a cross-section of Oregon's agricultural and natural resources and business interest. Dr. Wyatt Williams, Oregon Department of Forestry, was the OISC Chair in 2015. In early 2015, the vacant Invasive Species Council Coordinator position was filled with the Samara Group LLC. The principle OISC coordinator is Jalene Littlejohn. Other members of the Samara Group are Leslie Bliss-Ketchum, Christian Parker, Brian Turner, and Jessica Riehl. Here is a short description of our new coordinators:

- **R. Jalene Littlejohn, Lead Coordinator**
  Jalene will manage the project including management of tasks, deliverables, executive support to the council and chair, facilitation of meetings, and development of all reports. Jalene is a skilled project manager and partnership facilitator with a background in Pacific Northwest ecology and environmental management.
- **Leslie L. Bliss-Ketchum, Assistant Coordinator**
  Leslie will closely support project coordination, specifically leading legislative projects and event management. Leslie is a skilled project manager with experience coordinating large public events, liaising with state and regional government regarding wildlife and habitat issues, and supporting research of invasive species.

- **Christian A. Parker, Web & Data Coordinator**
  Christian will manage the content management system, website, and social media integration. Christian is a talented data programmer and analyst specializing in effective and efficient data management and ecological systems.
- **Brian Turner (sub-contract), Communications and Outreach Specialist**
  Brian will be sub-contracted to research and produce informative reports for OISC social media, educational materials, and blog posts. Brian is an experienced research scientist at Portland State University specializing in invasive species ecology and behavior.
- **Jessica Riehl (sub-contract), Communications and Outreach Specialist**
  Jessica will be sub-contracted to research and produce informative reports for OISC social media, educational materials, and blog posts.

The OISC Coordinator Group Samara assisted in the Asian Gypsy Moth (AGM) outreach efforts coordinating communication and facts for affected stakeholders. They created a new website where all information, communication, and facts about the AGM project are compiled and easily accessible to the interested public.

More information is available at:
www.oregoninvasivespeciescouncil.org

Reporting Invasive Species

The Oregon Invasive Species Council manages www.oregoninvasiveshotline.org, where people can report suspected invasive species. In addition, the Oregon Department of Agriculture maintains a toll-free 1-866-INVADER phone line for the public to report suspected invasives.

Presentations

Asian Gypsy Moth in the Pacific Northwest: What Happens if it Stays Here? AGM Western States Meeting. Portland, OR. Diana N. Kearns

Azalea Lace Bug (*Stephanitis pyriodes*): A Threat to Forest Shrubs? USDA Interagency Research Forum on Invasive Species. Annapolis, MD. James R. LaBonte

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