2012 Plant Health Program Annual Report

Market Access & Certification Program Area

The Plant Health Program provides official field inspections and laboratory testing for Oregon's specialty seed, grass seed, and nursery industries. For other commodities, such as potatoes and wheat, we conduct surveys to establish pest-free status for specific counties or the state. These inspections, surveys, and testing are required for shipment to interstate and international markets. The Program's pathologists also provide commodity groups and trade negotiation officials with official statements to facilitate the opening of new markets for Oregon's agricultural commodities.

The Plant Health Program is responsible for several state quarantines, control area orders, and other regulations for plant pathogens. These administrative rules are designed to prevent exotic pathogens from being introduced or becoming established in the state and to provide quarantine pest-free production areas for Oregon growers. Other regulations also facilitate market access by ensuring products are free of pests of concern to interstate and international customers.

In cooperation with USDA Animal and Plant Health Inspection Service - Plant Protection and Quarantine (APHIS/PPQ), the Plant Health Program conducts statewide surveys for exotic pathogens. These surveys are federally funded and help provide crucial data to keep interstate and international markets open to Oregon's agricultural products.

We are also active in helping to shape national policy on important and emerging issues such as the National Clean Plant Network and boxwood blight. Staff scientists are regularly consulted by APHIS/PPQ, and provide crucial input to national plant disease control efforts. Staff expertise is maintained and enhanced with a research program that develops and publishes new diagnostic protocols for regulated and emerging plant pathogens.

- The seed field inspection program continues to grow, with a 4% increase in the number of fields inspected over last year. Inspectors surveyed 36 different host crops in 19 counties for more than 100 different pathogens and other pests of regulatory concern.
- The Plant Health Program received a Specialty Crops Block Grant to implement a nursery cleanliness program for the recently introduced disease boxwood blight (*Cylindrocladium pseudonaviculatum*). This voluntary, audit-

based program is designed to mitigate the risk of spreading boxwood blight through the movement of nursery stock.

- For the first time, Oregon blueberry growers shipped fresh blueberries into the Republic of Korea. The Plant Health and Shipping Point Inspection programs worked together to provide the official inspections and audits to meet Korea's phytosanitary requirements for import.
- The *Phytophthora ramorum* eradication effort in Curry County underwent significant changes in 2012. The effort is now a slow-the-spread campaign, focused on preventing further disease spread into un-infested areas. The *P. ramorum* quarantine was amended to reflect those changes.

With this consistently high workload, the staff managed to sustain the high level of competence expected of our Program, maintaining a low laboratory test error rate of 0.03%. It is a privilege to serve with such an exceptional and dedicated group.

Thank you for all your hard work.

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Cooperative Agricultural Pest Surveys

Potato pest survey

Surveys for *Globodera rostochiensis* (golden potato cyst nematode), *G. pallida* (pale potato cyst nematode), *Synchytrium endobioticum* (potato wart), and *Candidatus* Liberobacter solanacearum (zebra chip) were initiated in 2011 and completed in the spring of 2012 (Table 1). A total of 2,195 soil samples were collected from seven counties to test for the presence of the two *Globodera* species. Samples were collected and processed using a USDA Soil Cyst Washer as described in the 2009 Pale Potato Cyst Nematode National Diagnostic Survey and Diagnostic Cyst Sample

Forwarding Protocols (Revised 4/29/09, USDA APHIS PPQ EDP NIS CPHST). No samples tested positive for *Globodera* species.

A total of 51 samples from the same seven counties were tested for potato wart (Table 1). Soil samples were collected from the same fields as those tested for the two nematodes. Samples were processed using sieve extraction and density centrifugation. No potato wart was found.

A total of 1,441 tubers from seven counties were tested for zebra chip (Table 1). Tubers were examined for symptoms suggestive of disease and then tested with PCR as described in Sector et al, 2009, Plant Disease 93:574-483. In all, eight tubers from Umatilla and Morrow counties were confirmed as infected with zebra chip.

Table 1. Potato pest survey results from 2011/2012 survey.

COUNTY	POTATO CYST NEMATODES		POTATO WART		ZEBRA CHIP	
	#SAMPLES	#POSITIVE	#SAMPLES	#POSITIVE	#SAMPLES	#POSITIVE
Baker	425	0	5	0	247	0
Benton	4	0	4	0	N/A	N/A
Klamath	384	0	9	0	266	0
Malheur	138	0	5	0	142	0
Morrow	N/A	N/A	N/A	N/A	110	4
Umatilla	29	0	9	0	429	4
Union	1,155	0	17	0	100	0
Wallowa	N/A	N/A	N/A	N/A	147	0
Washington	60	0	2	0	N/A	N/A

Cyst nematode survey

Fields planted in specialty seeds were surveyed for *Heterodera cajani*, *H. ciceri, H. filipjevi,* and *H. latipons*. Composite soil and root samples were collected within each field as described in the Mini Risk Assessment: Mediterranean Cereal Cyst Nematode *Heterodera latipons* Franklin (E.E. Davis and R.C. Venette, Dept. of Entomology, University of Minnesota, written Sept. 29, 2004 for the USDA/APHIS CAPS program). Nematode cysts were isolated from soil using a soil cyst washer and nematodes isolated from roots using a standard mist chamber method. Suspect nematodes were identified to genus and species morphologically and using PCR, as needed.

As of December 31, 2012, soil and root samples from 35 fields (625 acres) in five counties have been collected and processed in the laboratory. No *Heterodera* species were detected in this survey (Table 2).

Table 2. Nematodes detected in root and soil samples from specialty seed fields in 2012.

CROP	# FIELDS	# ACRES	COUNTY	NEMATODES DETECTED FROM	
				SOIL	ROOTS
Radish	1	20	Lane	*Pratylenchus*	-
Sunflower	2	14	Marion	*Pratylenchus*	*Pratylenchus*

Pumpkin	1	6	Marion	*Pratylenchus*	*Pratylenchus*
Cucumber	11	89	Marion	*Pratylenchus, Paratylenchus, Tylenchus, Meloidogyne naasi*	*Pratylenchus*
Carrot	13	391	Jefferson	*Pratylenchus, Mesocriconema*	*Pratylenchus, Tylenchorhynchus*
Arugula	1	7	Linn	*Pratylenchus, Xiphinema, Longidorus*	*Pratylenchus*
Chinese cabbage	1	9	Linn	*Pratylenchus*	-
Wild rocket	1	7	Linn	*Pratylenchus*	*Pratylenchus*
Edible chrystanthmum	1	2	Linn	*Pratylenchus*	
Squash	1	3	Linn	*Pratylenchus*	-
Cucumber	1	5	Linn	*Pratylenchus*	*Pratylenchus*
Sunflower	1	72	Union	-	-

As part of this cooperative agreement, we also agreed to survey potato breeding research farms for *Globodera pallida* and *G. rostochiensis*. Unfortunately, funding was received too late to conduct a biologically accurate survey for those pests. We will be requesting an extension to complete this work. Composite soil samples will be collected within each research farm as described in 2009 Pale Potato Cyst Nematode National Survey and Diagnostic Cyst Sample Forwarding Protocols. Nematode cysts will be isolated from the soil using a USDA soil cyst washer and suspect cysts identified to genus. Molecular identification via PCR and/or DNA sequencing will be used to identify cysts to species as needed.

Oak/pine survey

This survey targeted several pathogens of national concern that affect oak and pine: *Raffaela quercivora*, *Gymnopus fusipes*, *Phytophthora quercina*, *Cronartium flaccidum*, and *Mycosphaerella gibsonii*. The goal was to survey nursery stock at five nurseries at three different times during the year, collecting samples for identification in the lab if needed.

Funding for this program was received too late to conduct a biologically accurate survey for all target pests within the time frame given. As of December 31, 2013, the target nurseries had been inspected once. Samples were collected from two different pine species and six different oak cultivars from one nursery location. None of the target pathogens were detected. At least two additional surveys will be needed to fulfill the survey objectives. Currently, there is no foliage present on the oaks in the cooperating nurseries. Oaks break bud much later in the season than most hardwood species. To improve our chances of detecting foliar pathogens on the oaks, we will be requesting an extension to this cooperative agreement.

Karnal bunt survey

Karnal bunt (*Tilletia indica*) is a fungal disease of wheat originally reported from India. After its discovery in Arizona wheat fields in 1996, a federal quarantine was adopted and a national survey strategy implemented to ensure US wheat export markets remained open. Oregon has participated in the national survey since its inception in 1996.

In 2012, we collected a total of 20 samples from nine counties (Baker, Klamath, Malheur, Polk, Sherman, Wallowa, Wasco, Washington, and Yamhill). All samples were shipped to the national Karnal bunt-testing laboratory in Phoeniz, AZ and were found to be free of Karnal bunt. This is the seventeenth consecutive year Oregon has tested free of Karnal bunt. Survey results were entered into the IPHIS database.

Farm Bill Projects

Stone fruit orchard survey

This survey focused on two pathogens of national concern that affect pome and stone fruit trees, plum pox virus (PPV) and European stone fruit yellows phytoplasma (ESFY). The primary commercial stone fruit growing areas in the state were to be surveyed by following a standardized protocol to determine the presence or absence of the pathogens within the orchards. The goal was to survey about 25 orchards for the target pests. Both PPV and ESFY are temperature sensitive; foliar samples must be collected in the spring to ensure pathogen detection.

We have identified the orchards to be surveyed. Funding did not arrive in time for this survey to be biologically accurate (i.e., funding was received in late summer, when high temperatures would inhibit pathogen detection). Because of this, all fieldwork and lab testing will take place in the spring of 2013, after new leaf emergence. We will be requesting an extension to the cooperative agreement to complete this work.

Efficacy of using systems approaches in nurseries pilot study

In 2007, the Plant Health Program and Nursery and Christmas Tree Inspection Program (Plant Division) implemented the grower assisted inspection program (GAIP) in Oregon's nurseries. The GAIP is an audit-based program that requires nurseries to adopt best management practices to address mandatory critical control points (water, soil, potting media, used containers, and incoming plant material) where *Phytophthora ramorum* and other foliar *Phytophthora* species can be introduced into their nursery. A similar program, the US Nursery Certification Program (US NCP), was developed by the USDA APHIS to meet phytosanitary requirements to ship nursery stock into Canada. The US NCP also requires participants to adopt on a systems approach to mitigate the risk of spreading pests and diseases through the movement of nursery stock. This program relies heavily upon documentation of business and plant production practices within the nursery.

In the fall of 2010, the Plant Health and Nursery and Christmas tree Inspection programs initiated a study involving GAIP and US NCP nurseries. This study compared the efficacy of the GAIP, the US NCP, and the conventional shipping point inspection (SPI) program at mitigating the risk of moving five pests through the trade of nursery stock. The five pests were Phytophthora root rot and foliar blight, root weevils, snails and slugs, and bittercress. This study continued in 2012 and is scheduled to conclude in 2013.

Two GAIP, two US NCP, and two SPI nurseries had been surveyed four times for the five pests since the onset of this study. In addition, samples were collected from CCP in each nursery to test for the presence of *Phytophthora*. The CCP targeted were soil substrate, potting media, used containers, and irrigation water.

The average pest incidence since the onset of the study and through December 31, 2012, indicate the most common pest problem detected was snails and slugs followed by Phytophthora root rot (Figure 1). Snails and slugs were most commonly detected in USNCP nurseries, while Phytophthora root rot was most common in SPI nurseries. Bittercress incidence was highest in GAIP nurseries. The incidence of root weevils and Phytophthora foliar blight was similar between the three types of nurseries.

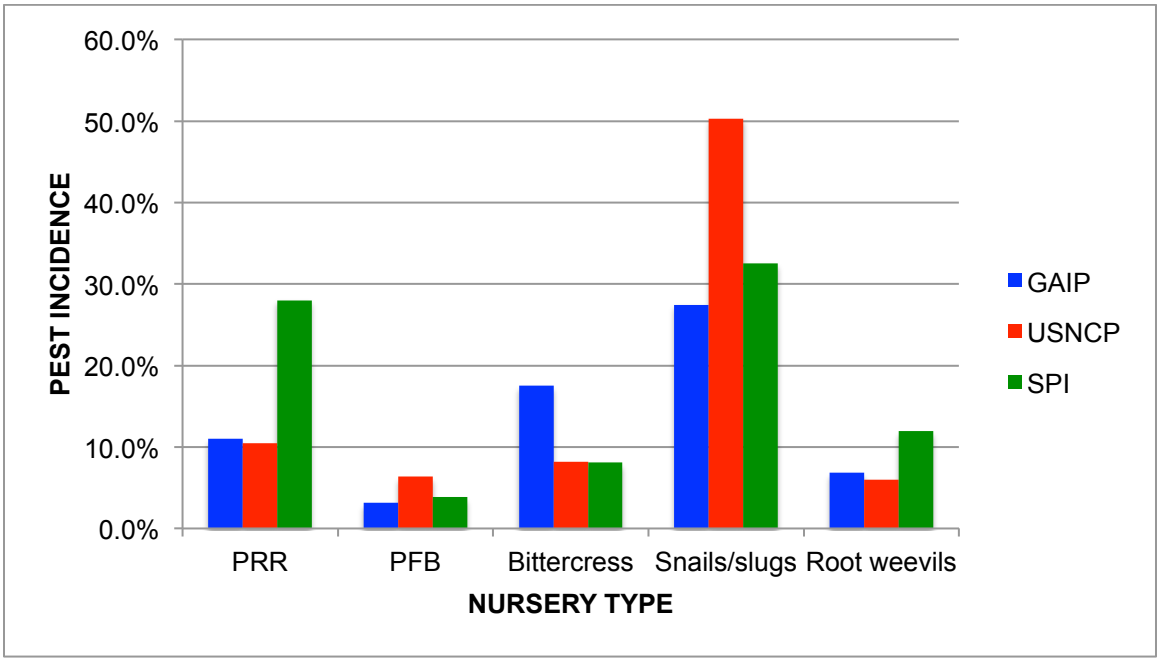

Figure 1. Average pest incidence for five target pests (PRR = Phytophthora root rot, PFB = Phytophthora foliar blight) since the study began in 2010.

For the CCP, the average *Phytophthora* incidence since the onset of the study and through December 31, 2012, is higher in potting media and used pots at SPI nurseries (Figure 2). However, *Phytophthora* incidence in irrigation water appears

to be higher in GAIP nurseries, while the incidence in soil substrate appears to be relatively similar between the three types of nurseries.

As part of this study, the Plant Health and Nursery and Christmas tree Inspection programs also worked with Oregon State University Extension to provide educational workshops on using the systems approach within nurseries to mitigate pest risk. In 2012, the workshops were held on-site at nurseries, with nursery field workers representing the target audience. Topics included identifying hazardous conditions within nurseries, best management practices for pest prevention, and water management. The workshop series was presented in English and in Spanish.

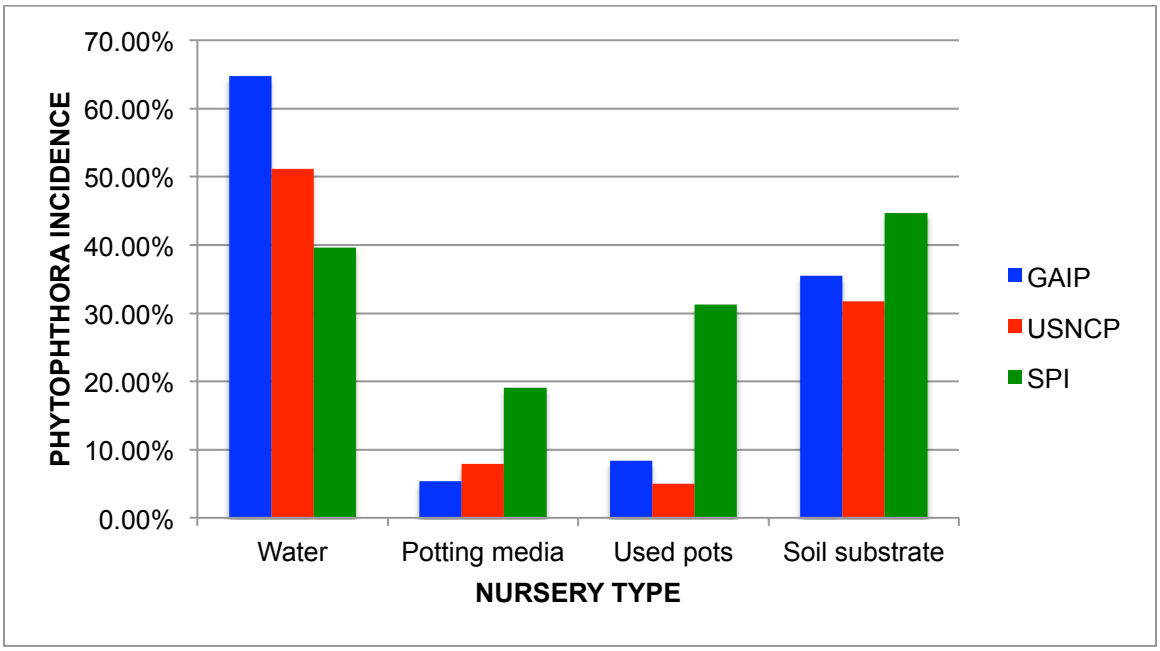

Figure 2. *Phytophthora* incidence at four critical control points in nursery production systems.

Boxwood blight nursery cleanliness program

Boxwood blight disease (*Cylindrocladium pseudonaviculatum*) was first reported on the East Coast of the United States in late 2010. It has since been reported in Connecticut, Maryland, Massachusetts, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island and Virginia, as well as British Columbia and Ontario, Canada. This disease spreads very quickly and can complete its life cycle within a week if environmental conditions are favorable. It can also kill highly susceptible cultivars of *Buxus*, *Sarcococca*, and *Pachysandra terminalis*. Rather than adopt federal or state quarantines for the disease, the National Plant Board (NPB) worked with the American Nursery and Landscape Association (ANLA) to develop a voluntary nursery cleanliness program designed to mitigate the risk of spreading boxwood blight between and within nurseries.

In the fall of 2012, the Plant Health Program, in cooperation with the Nursery & Christmas tree Inspection Program, was awarded funds through the Specialty Crop

Block Grant program to develop an audit-based nursery cleanliness program based on the NPB/ANLA model to help prevent the spread of boxwood blight. There are several goals associated with this project, including developing a compliance agreement for nurseries, an audit form for the compliance agreement, a website listing participating nurseries, and an education and outreach program for nurseries. Oregon State University was awarded a sub-contract to develop the education and outreach program.

We are in the beginning stages of this project and anticipate completing all objectives by September 30, 2013. The effectiveness of the nursery cleanliness program will be quantified at the end of the funding period.

Field Inspection and Certification Programs - 2012

Allium white rot inspection

In 2012, ODA staff inspected a total of 64 garlic (*Allium sativum*) fields (1,665.27 acres) in six counties for the presence of white rot caused by *Sclerotium cepivorum*. The program offers a 100% visual inspection designed to find single strikes or plants infected with white rot in the field. Allium white rot was found in 14 fields in 2012, with most infected fields found in central Oregon (Crook and Jefferson counties) (Table 4).

Table 4. Allium white rot inspection results for 2012.

NUMBER OF	COUNTIES					
	CROOK	JEFFERSON	KLAMATH	MARION	MORROW	SHERMAN
Fields inspected	7	25	10	7	12	3
Acres inspected	322.90	737.05	101.38	268.49	180.45	55.00
Fields infected	6	5	3	0	0	0

Mint Verticillium wilt inspection

The ODA offers a mint (*Mentha* spp.) rootstock field inspection service to detect Verticillium wilt (*Verticillium dahliae*) in established control areas. Under the provisions of the control area order, any fields confirmed as infected with *V. dahliae* cannot be used as a rootstock source. In 2012, the ODA staff inspected two fields (64 acres) in Klamath County with no Verticillium wilt found.

Potato late blight inspection

In 2012, the ODA staff conducted field surveys for late blight (*Phytophthora infestans*) on potato (*Solanum tuberosum*). These surveys are done to support the export of fresh potatoes to Taiwan. A total of 146 fields (9,709.5 acres) from six counties including two in California were inspected for *P. infestans* (Table 5). No potato late blight was found. The ODA has a Memorandum of Understanding with

the State and County California Agricultural Officials to conduct late blight inspections in Modoc and Siskiyou counties.

Table 5. Potato late blight (PLB) inspection results for 2012.

COUNTY/STATE	NO. FIELDS INSPECTED	NO. ACRES INSPECTED	RESULTS
Klamath, OR	36	1897.6	No PLB found
Morrow, OR	8	605.0	No PLB found
Umatilla, OR	37	3,532.9	No PLB found
Washington, OR	3	120.0	No PLB found
Modoc, CA	27	1,660.0	No PLB found
Siskiyou, CA	35	1,894.0	No PLB found

Seed crop field inspections

In 2012, the ODA staff inspected 902 seed crop fields (17,283.48 acres) for the presence of seed-borne or seed-associated pests of concern. This continues the trend of increased requests for this service by specialty seed growers (Figure 3). Inspectors surveyed for the presence of more than 100 different pathogens and other pests associated with 36 different host crops grown in 19 counties. Around 29% of the inspected fields (262) were found to have at least one pest of concern. The five most commonly observed diseases were bacterial leaf blight of carrot (*Xanthomonas campestris* pv. *carotae*), black rot of carrot (*Alternaria radicina*), downy mildew of pea (*Peronospora viciae*), common smut of corn (*Ustilago maydis*), and Botrytis blight of onion (*Botrytis* sp.) Their disease incidences were 69.2%, 43.4%, 39%, 27%, and 26.8%, respectively, within their corresponding host species (Table 6).

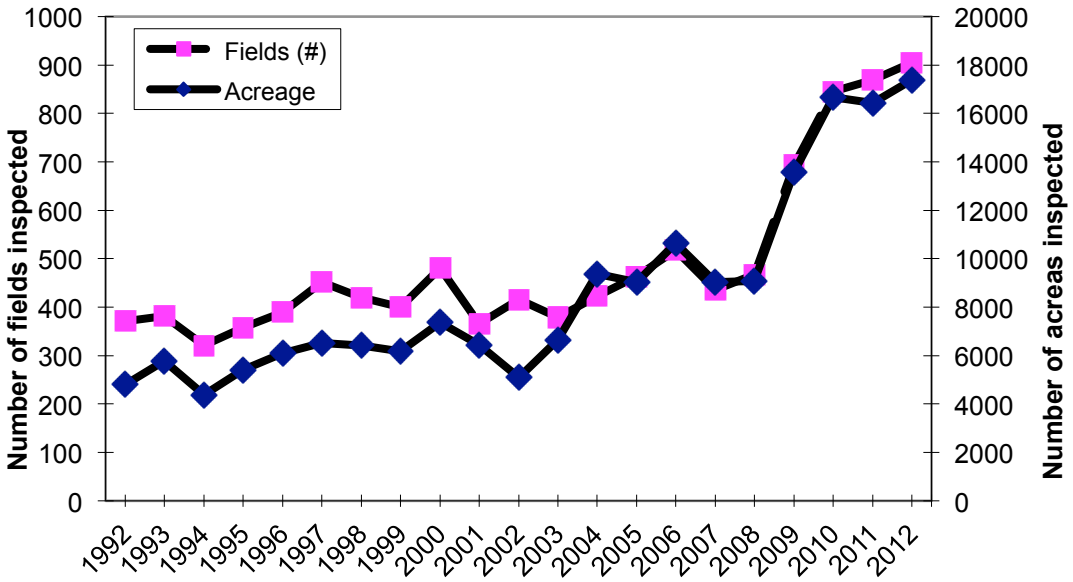

Figure 3. Historical record of seed field inspections from 1992 to 2012.

Table 6. Seed crop field inspection results by crop and county for 2012.

CROP	COUNTY	# FIELDS INSPECTED	ACREAGE INSPECTED	PESTS OF CONCERN DETECTED (NO. OF FIELDS)
Alfalfa (*Medicago sativa*)	Gilliam	4	325	*Cirsium arvense* (2)
	Josephine	18	36.05	
	Linn	1	75	
	Malheur	30	55.17	*Cirsium arvense* (1), *Ditylenchus dipsaci* (7)
	Umatilla	1	0.06	
	Union	6	156	*Cirsium arvense* (2),
Allium – Garlic (*Allium sativum*)	Crook	1	58	
	Jefferson	15	496.3	
	Marion	5	79	*Ditylenchus dipsaci* (1)
Allium – Onion (Allium cepa)	Clackamas	2	16	*Botrytis* sp. (1), *Peronospora destructor* (1)
	Jefferson	3	55.55	
	Lane	1	10	*Botrytis* sp. (1)
	Linn	5	55.5	*Botrytis* sp. (3), *Peronospora destructor* (1), *Puccinia* sp. (1)
	Malheur	9	74.27	
	Marion	19	147	*Botrytis* sp. (6)
	Sherman	1	14	
	Yamhill	1	20	
Barley (*Hordeum vulgare)*	Polk	1	14	
Bean (*Phaseolus vulgaris*)	Malheur	13	272.8	
	Umatilla	4	233	
Beta-Beet (*Beta vulgaris*)	Washington	1	10	
Beta - Swiss chard (*Beta vulgaris*)	Marion	8	127	*Cercospora beticola* (1), *Peronospora farinose* f. sp. *betae* (*P. schachtii*) (1)
	Polk	2	10	
	Yamhill	2	27.5	
Bluegrass (*Poa trivialis*)	Jefferson	1	33	
Carrot (*Daucus carota*)	Crook	8	229	*Alternaria radicina* (1), *Xanthomonas campestris* pv. *carotae* (1)
	Deschutes	9	115	*Xanthomonas campestris* pv. *carotae* (3)
	Jefferson	119	3,349.1	*Alternaria radicina* (59), *Kochia scoparia* (8), *Xanthomonas campestris* pv. *carotae* (95), *Sclerotinia sclerotiorum* (1)

	Malheur	6	14.3	*Alternaria radicina* (2)
	Marion	1	3	
Chrysanthemum (*Chrysanthemum coronarium*)	Linn	1	2	
Clover (*Trifolium* sp.)	Benton	2	81	
	Lane	1	70	
	Linn	3	293	*Cirsium arvense* (1)
	Marion	3	205	
	Washington	2	165	
	Yamhill	1	70	
Coriander (*Coriandrum sativum*)	Linn	1	35	*Pseudomonas* sp. (bacterial leaf blight)
	Marion	1	15	
Corn (*Zea mays*)	Malheur	41	553.94	*Ustilago maydis* (21),
	Morrow	4	163.31	*Ustilago maydis* (1)
	Umatilla	214	2,646.89	*Ustilago maydis* (48), High Plain Virus (1)
Brassica – Arugula (*Brassica eruca*)	Lane	1	10	
	Linn	1	7	
	Marion	1	0.5	
	Polk	1	0.5	
Brassica – Cabbage (*Brassica oleracea*)	Clackamas	6	29.5	*Peronospora parasitica* (1)
	Jackson	1	10	
	Josephine	1	10	
	Lane	14	72.5	
	Linn	12	87.21	*Alternaria brassicicola* (*A. circinans*) (1), *Leptosphaeria maculans* (*Phoma lingam*) (1), *Mycosphaerella brassicicola* (2)
	Malheur	1	6	
	Marion	28	207.85	*Alternaria brassicae* (*A. herculea*) (1), *Leptosphaeria maculans* (*Phoma lingam*) (1), *Mycosphaerella brassicicola* (3), *Peronospora parasitica* (1), *Sclerotinia sclerotiorum* (3)
	Washington	4	35	
	Yamhill	5	60	*Mycosphaerella brassicicola* (1)
Brassica – Kale (*Brassica oleracea*)	Marion	3	68	*Mycosphaerella brassicicola* (2), *Sclerotinia sclerotiorum* (1)
Brassica – Kohlrabi (*Brassica oleracea*)	Yamhill	1	2.4	
Brassica – Mustard	Crook	1	5	

(*Brassica* sp.)	Linn	2	30	
Brassica – Turnip (*Brassica rapa)*	Lane	1	40	
	Linn	2	60	
	Malheur	2	57	
Cucurbit - Cucumber (*Cucumis sativus*)	Linn	2	30.5	*Pseudomonas syringae* pv. *lachrymans* (1)
	Marion	13	91.85	*Pseudomonas syringae* pv. *lachrymans* (1)
Curcurbit – Pumpkin (*Curcurbita* sp.)	Linn	2	9.5	
Curcurbit – Squash (*Curcurbit sp.*)	Linn	2	8.48	
Dill (*Anethum graveolens*)	Linn	1	4	
	Malheur	1	20	
	Marion	4	32	
	Washington	1	13	
	Yamhill	1	30	
Lettuce (*Lactuca sativa*)	Malheur	2	23	
Oat (*Avena sativa*)	Washington	1	30	
Parsley (*Petroselinum crispum*)	Jefferson	4	35	
	Lane	3	20	*Septoria petroselini* (2)
	Linn	2	8.5	*Septoria petroselini* (2)
	Marion	2	11	
Parsnip (*Pastinaca sativa*)	Marion	3	35	
Pea (*Pisum sativum*)	Benton	1	18	
	Clackmas	2	21	*Peronospora viciae* (1)
	Lane	5	72	*Peronospora viciae* (3)
	Linn	6	130.1	*Peronospora viciae* (3)
	Malheur	2	52	
	Marion	17	262	*Peronospora viciae* (5), Pea Enation Mosaic Virus (1)
	Polk	2	50	
	Yamhill	6	96	*Peronospora viciae* (3), Virus symptoms observed (1)
Radish (*Raphanus sativus*)	Benton	3	64	
	Clackmas	1	40	
	Crook	1	15	
	Deschutes	2	30	
	Lane	11	297	
	Linn	8	198.5	

	Malheur	14	287	
	Marion	26	453.5	
	Polk	1	15	
	Washington	4	85	
	Yamhill	4	125	
Rocket (*Eruca sativa*)	Marion	1	10	
Wild Rocket (*Diplotaxis tenuifolia*)	Linn	2	9.7	
Rye (*Spinacia oleracea*)	Polk	1	10	
Safflower (*Carthamus tinctorius*)	Umatilla	4	173	*Puccinia carthami* (4)
Spinach (*Spinacia oleracea*)	Lane	4	65	
	Linn	2	43	
	Marion	24	469.15	
	Washington	2	58	
	Yamhill	3	62.5	
Sunflower (*Helianthus annuus*)	Lane	1	10	*Alternaria helianthi* (1)
	Marion	2	13.5	
	Morrow	3	386	*Sclerotinia sclerotiorum* (3)
	Union	29	1,907	
	Washington	1	8.5	
Tomato (*Lycopersicon esculentum*)	Jackson	1	1	
Total: 36 crops	19 counties	902 fields	17,283.48 acres	29% (262) of the inspected fields infected with at least one pest of concern

Laboratory Seed Testing

Export seed

In 2012, Plant Health staff conducted tests to detect specific seed-borne fungi, bacteria, nematodes, viruses, pests, weeds, and other miscellaneous problems. Seed were tested according to standard, officially accepted protocols for the target organism(s). A total of 10,804 tests were conducted on 7,235 seed lots from more than 15 different crops, mainly grasses and vegetables, were tested this year. This represents a 12% decrease in the number of seed lots tested from 2011. About 3% of the lots tested positive for one or more organisms of regulatory concern (Table 7). The seed lots were tested at the request of Oregon seed exporters to meet the phytosanitary requirements of their international and interstate customers.

Table 7. Laboratory tests conducted on grass, vegetable, and other seed lots in 2012.

PATHOGEN/PEST TESTS	# TESTS CONDUCTED	# TESTS PASSED	# TESTS FAILED
GENERAL PEST & DISEASE ANALYSIS	6415	6315	100
FUNGI			
Israeli wash	51	42	9
Korea wash	423	363	60
Tilletia sp.	1351	1309	42
Urocystis sp.	147	116	31
Ustilago sp.	2	2	0
Gloeotinia sp.	188	181	7
Phoma/Kabatiella grow out	61	61	0
Other fungi	127	122	5
Total:	2350	2196	154
NEMATODES			
Anguina sp.	592	584	8
Ditylenchus sp.	168	168	0
Other nematode	887	859	28
Total:	1647	1611	36
BACTERIA			
Corynebacterium rathayi	204	203	1
Clavibacter sp.	18	18	0
Pseudomonas sp.	31	24	7
Xanthomonas sp.	14	14	0
Total:	267	259	8
WEEDS & PARASITIC PLANTS			
Orobanche minor	81	81	0
Glyceria declinata	28	28	0
Total:	109	109	0
VIRUS	16	13	3
GRAND TOTAL	10,804	10,503	301

Endophyte testing

In 2012, the Plant Health Laboratory received 100 seed lots of forage grass seed varieties to be tested for the presence of the Endophyte fungus, *Epichloe* sp. The endophyte fungus produces alkaloids that can be toxic to livestock. To qualify for an endophyte tag, no more than 5% of the seeds in a lot can be infected with the

fungus. Fifteen seed lots tested positive for *Epichloe* sp. and were ineligible to receive the endophyte tag.

Official certification and testing programs

Virus certification of nursery stock

Twenty-eight nurseries participated in Oregon's virus ornamental and fruit tree certification program in 2012. *Malus* (apples and crabapples), *Prunus* (fruiting and ornamental cherries, fruiting and ornamental plums, peaches, apricots, etc.), *Pyrus* (domestic pears, Asian pears, and flowering pears) and *Cydonia* (quince) are included in the testing program.

Individual *Prunus* mother trees (scions) and rootstock are tested each year for prune dwarf virus (PDV) and Prunus necrotic ringspot virus (PNRSV). *Malus*, *Pyrus*, and *Cydonia* scions and rootstocks are tested for tomato ringspot virus (ToRSV). Foliar samples were collected in the spring and tested for the target viruses using commercially available ELISA test kits. A total of 7,732 samples were tested. About 0.51% of the field samples were PDV-positive, 1.41% were PNRSV-positive and 0.00% were ToRSV-positive for this season. Field inspections were also conducted to ensure compliance with the regulations. Growers were notified of any areas of non-compliance. Follow-up visits by ODA staff are underway to document the corrective actions taken.

A summary of the virus-free varieties grown by each participating nursery is sent yearly to state, federal, and Canadian officials to facilitate the movement of the nurseries' products.

Blueberry virus testing

We continued the official testing program of blueberry nursery stock for blueberry scorch virus and blueberry shock virus in 2012. This program was implemented in 2004 at the request of nurseries to comply with the regulatory requirements of other states and countries. Nursery inspectors collect official samples from participating nurseries and submit the samples to the laboratory for testing. All testing is done with commercially available ELISA test kits. The sampling protocol was updated to streamline testing and provide for more uniform sample collection this year.

In 2012, 34,910 leaf samples were tested. About 3.4% of the samples tested were infected with Blueberry Shock Virus. The infected samples came from ten nurseries. The nursery owners were informed of the positive samples. No samples were positive for Blueberry Scorch Virus.

Fresh blueberries to Korea program

Fresh Oregon blueberries were shipped to the Republic of Korea for the first time in 2012. Orchards and packing houses exporting blueberries had to meet specific phytosanitary requirements before they were allowed to ship. These requirements

target seven pests and diseases (*Phytophthora ramorum*, tobacco ringspot virus, tomato ringspot virus, *Monilinia vaccinii-corymbosi*, *Argyrotaenia citrana*, *Choristoneura rosaceana*, and *Grapholita packardi*) of concern to Korea.

For *P. ramorum*, tobacco ringspot virus, and tomato ringspot virus, Korea requires a specific percentage of blueberry orchards be visually inspected and, if necessary, samples tested for the pathogens. In 2012, 36 orchards in 10 counties (Benton, Clackamas, Hood River, Lane, Linn, Marion, Multnomah, Polk, Washington, and Yamhill) were surveyed for the three pathogens. Samples were collected from three orchards for testing in the lab, with none of the target pathogens detected. The survey data were entered into NAPIS.

For the remaining four organisms of concern, Korea requires the orchards and packing houses to adopt and implement specific mitigation measures that decrease the risk of these pests infesting fresh fruit. The ODA conducted official audits at all orchards and packing houses exporting fruit to Korea to ensure these mitigation measures had been implemented correctly. One orchard failed to implement the mitigation measures as required and was suspended from the program.

In 2012, 49 orchards and eight packing houses met the requirements to ship fresh blueberries to Korea. We anticipate similar numbers of orchards and packing houses will participate in the program in 2013.

Survey and Disease Containment Programs

Phytophthora ramorum - Curry County

The *Phytophthora ramorum* program in Curry County underwent significant changes in 2012, in response to expansion and intensification of the disease within the quarantine area. The disease expansion was largely attributed to work stoppages due to inadequate funding to complete eradicative treatments in 2009 and later. The quarantine area expanded to 202-mi^2 in 2012, and other significant changes were made to the State quarantine. These changes included: 1) establishing a generally infested area (GIA) within the quarantine area where *P. ramorum* is considered established and is no longer required to be treated; 2) allowing increased utilization of tanoak within the quarantine area; and, 3) concentrating treatments efforts on the leading edge of the infestation to slow further spread. Aerial, ground, and stream-bait surveys detected 111 new infested sites within the quarantine area; this number may be underestimated because survey efforts were decreased within the GIA. In total, 685 infested sites have been found in Curry County since the initial detection of *P. ramorum* in 2001. Several of the new detections to the north and east will result in an expansion of the quarantine area to approximately 264-mi^2 in 2013 (Figure 4).

The goal of the *P. ramorum* program is to slow further spread of the disease by early detection and rapid eradication of epidemiologically important sites, reducing inoculum levels through cost-share programs, and improving education and

outreach to educate landowners about best management practices that can help limit disease spread. Early detection remains the greatest challenge for the program, although increased emphasis on ground surveys in 2012 resulted in very early detections on some sites.

Much of this data was provided by the Oregon Department of Forestry. We continue to be unable to enter the Curry County survey and monitoring data into NAPIS. USDA is aware of the issue.

P. ramorum – nurseries

As of 12/31/12, 21,353 samples from 542 grower sites were collected and tested in the laboratory using federally approved protocols to meet the federal requirements for interstate movement of nursery stock (7 CFR 301.92). *Phytophthora* species were detected at 265 of the sites surveyed. *Phytophthora ramorum* was detected at 11 sites on *Camellia japonica* (two blocks), *C. japonica 'Grand Prix'* (two blocks), *C. japonica 'Mrs. Tingley', Hamamelis virginiana, Kalmia latifolia* (four blocks), *Pieris* sp., *P. japonica* (four blocks), *Rhododendron 'Baden Baden', Rhododendron 'Bessie Howell'* (two blocks), *Rhododendron 'Black Sport', Rhododendron 'Holden'* (three blocks), *Rhododendron 'Maximum Roseum', Rhododendron* sp. (five blocks), *Viburnum* sp., *V. davidii,* and *V. tinus* (three blocks). Delimitation surveys within the *P. ramorum*-positive nurseries detected additional positives on *C. sasanqua* (10 blocks), *Cornus kousa, H. intermedia, Magnolia grandiflora* (five blocks), *Pieris* sp., *Prunus laurocerasus, Rhododendron* sp. (six blocks), *Rhododendron* cultivars *Betty Bob, Electra, Grandma's Hat, OSU, Seta,* and *Trewithen Orange, Viburnum* sp. (two blocks), *V. bodnantense, V. cinnamomifolium,* in potting media (six times), in soil (three times), and in a cull pile. All of the nurseries have undergone the USDA Confirmed Nursery Protocol (CNP). Prior to release from quarantine, additional detections were made in *Rhododendron* sp. (six blocks) in one nursery. The USDA CNP was reinstated at this nursery.

In addition to the annual inspections and testing, the nurseries were assessed for common hazards that can contribute to *P. ramorum* introduction and establishment. Poor water management, which includes using untreated water to irrigate plants and allowing standing water within plant production areas, was the most common hazard encountered. Re-using pots without cleaning or sanitizing them was the next most common hazard. Other relatively common hazards included poor sanitation within plant production areas and potting areas, and placing potted plants directly on native soil or compacted gravel. The nurseries were also assessed for commonly used best management practices that help mitigate the risk from *P. ramorum*. The majority of nurseries kept their loading docks clean, isolated their cull piles from their plant production areas, stored their potting media in manner that prevented potential *P. ramorum* contamination, and had at least one pest-free source of water (i.e., well or municipal water) available for irrigation.

The ODA also conducted trace out investigations at 30 sites with 66 samples collected for testing. *Phytophthora ramorum* was detected at a residential site on *Gaultheria shallon* and *G. procumbens* plants imported from a *P. ramorum*-positive nursery in Washington. *Gaultheria procumbens* is a new host for the pathogen. The USDA Confirmed Residential Protocol was enacted and completed at the site. Finally, the ODA inspected one incoming shipment of host and associated host species for *P. ramorum*. No *P. ramorum* was detected.

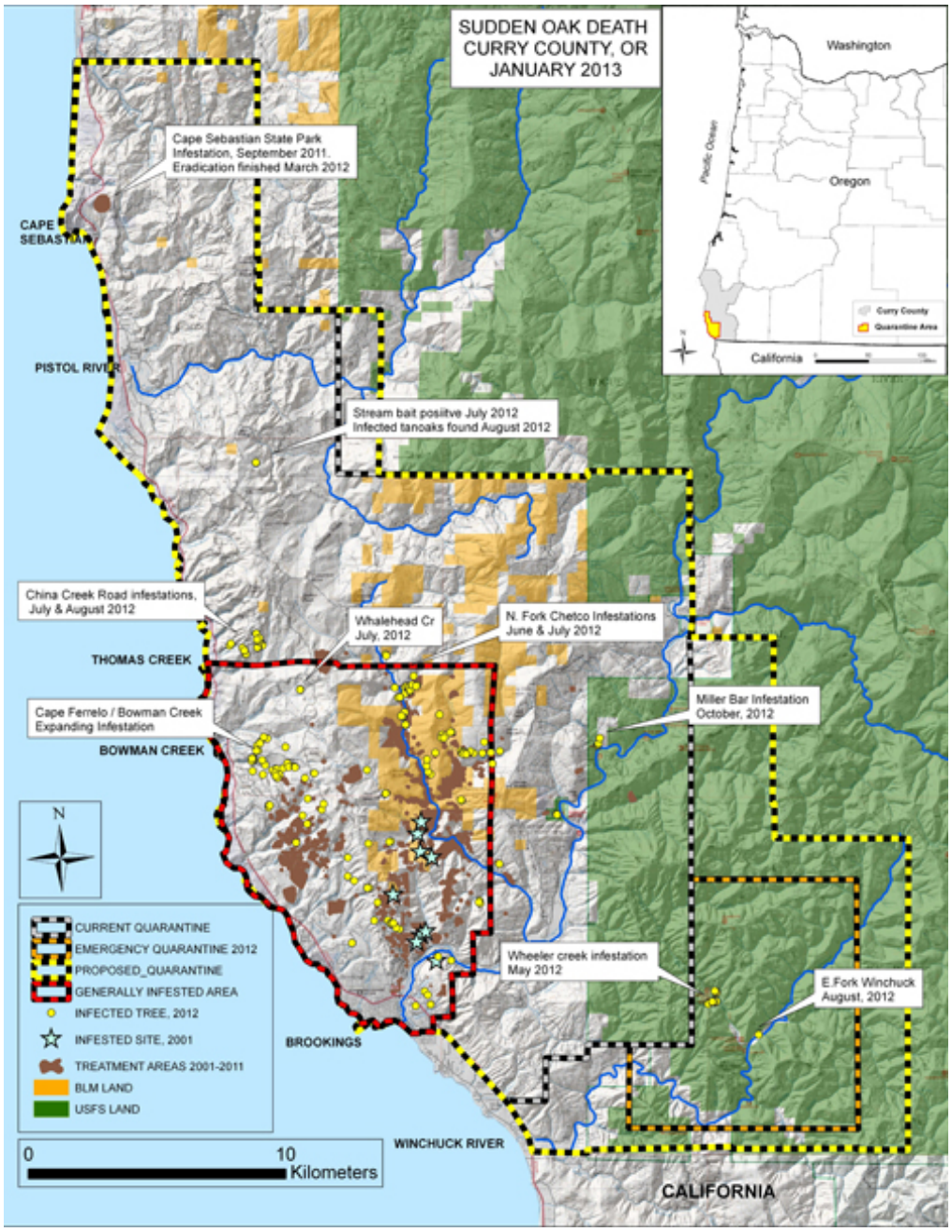

Figure 4. Proposed boundary for the *P. ramorum* quarantine area based on 2012 survey results.

The data from the nursery certification survey was entered in NAPIS.

Other Programs

Columbia root knot nematode

Nursery inspectors collected 65 soil samples for nematode testing from Oregon production nurseries in 2012. This annual survey is conducted at the request of Canadian agricultural officials to demonstrate that Oregon production nurseries are free of Columbia root knot nematode (CRKN, *Meloidogyne chitwoodii*). Plant-parasitic nematodes were detected in 63% of the samples with *Pratylenchus* spp. being the most abundant (present in 49% of the samples). *Meloidogyne hapla* was detected in three samples. *Meloidogyne naasi* was detected in one sample. No CRKN were detected in Oregon nurseries based on morphometric analysis of juveniles. Other nematodes detected included *Paratylenchus*, *Xiphinema*, *Mesocriconema*, *Tylenchorhynchus*, *Heterodera*, and *Hemicyclophora* in order of most to least abundant.

National Clean Plant Network

The Plant Health Program has taken a leading role in the development and governance of the National Clean Plant Network (NCPN). The goals of the NCPN are to: 1) Protect US specialty crops, such as grapes, berries, and apples, from the spread of economically harmful plant pests and diseases, and, 2) Ensure the global competitiveness of US specialty crop producers by creating high standards for our clean plant programs. Currently, there are five commodity groups that are a part of the NCPN, the Fruit Tree Clean Plant Network (NCPN-FT), the Hops Clean Plant Network, the Citrus Clean Plant Network, the Berries Clean Plant Network, and the Grapevine Clean Plant Network (NCPN-Grapes). The ODA has representatives on the Tier 2 Governing Boards for both the NCPN-FT and NCPN-Grapes.

The NCPN-FT developed a harmonized national standard for the virus certification of *Malus, Prunus, Pyrus, Chaenomeles,* and *Cydonia* nursery stock. After receiving numerous public comments, including comments from the ODA and Oregon nurseries, the final version of the standard was adopted by the NCPN-FT Tier 2 Committee October of 2012. The ODA is working with nurseries participating in the Virus Ornamental and Fruit Tree Certification Program to adjust our state regulations to match the language of the national standard.

The NCPN-Berries Commodity Group is continuing to develop a harmonized national standard for virus certification of blueberries. A member of the Plant Health Program is participating on the subcommittee charged with developing the national standard.

The NCPN also held a workshop in Davis, California, in conjunction with the 17th Meeting of the International Council for the Study of Virus and Virus-Like Diseases of Grapevine. The goal of the workshop was to develop a template and other guidance documents to aid commodity groups in the development of their own

national standards for virus certification. A member of the Plant Health Program participated in this workshop.

The Plant Health Program expects to continue to play a prominent role in the development and governance of the NCPN as this network continues to develop.

NPDN and WPDN

The National Plant Diagnostic Network (NPDN) was established in 2002 by legislative mandate in response to the need to enhance agricultural security through protection of the health and productivity of plants in agricultural and natural ecosystems in the U.S. The specific purpose of the NPDN is to provide a nationwide network of public agricultural institutions with a cohesive, distributed system to quickly detect high consequence pests and pathogens that have been introduced into agricultural and natural ecosystems, identify them, and immediately report them to appropriate responders and decision makers. The NPDN is also working with the USDA APHIS Center for Plant Health Sciences and Technology to develop the System for True, Accurate, and Reliable Diagnostics (STAR-D), an accreditation system for diagnostic laboratories that will be federally recognized.

The Western Plant Diagnostic Network (WPDN) is one of five NPDN centers. WPDN is a consortium of land grant institutions and state departments of agriculture throughout the western United States and the U.S. territories in the Pacific that provide services for plant disease diagnosis, plant identification, and insect/pest identification. WPDN uses a common software interface to process diagnostic requests and share information among diagnostic laboratories.

ODA is a sub-contractor to the WPDN. ODA staff participated in WPDN monthly conference calls and communicated with other states regarding new disease outbreaks, first detector training, and disease diagnostic protocols. The Plant Health Program is also in the early stages of implementing the STAR-D accreditation system in our lab.

Plant Health laboratory diagnostics

Plant samples are submitted to the Plant Health laboratory for disease assessment to meet export requirements or for general diagnostics. In 2012, 145 samples were submitted to meet export requirements, certification program requirements, Oregon importation requirements, federal traceback surveys, and/or general diagnostics. Of the 66 samples submitted for general diagnostics, 26% had problems caused by fungi and 13% by abiotic/environmental problems. No pests were detected in the remainder of those samples. The laboratory also tested 32 samples for the presence of the Liberty Link® *PAT/bar* gene to support the export of non-genetically engineered rice from California to India. All samples tested free of the gene.

Quarantines and control area orders

Several regulations were reviewed and updated in 2012. The list of areas under quarantine was updated in the peach yellows phytoplasma quarantine (OAR 603-052-0116). The boundaries of the quarantine area and regulations for tanoak within the quarantine area were updated in the *Phytophthora ramorum* quarantine (OAR 603-052-1230). The powdery mildew of hop quarantine was updated to clarify the areas exempt from the regulatory requirements (OAR 603-052-1020). The covered commodities for the small broomrape (OAR 603-052-1025) and peach rosette phytoplasma (OAR 603-052-0118) quarantines were updated. A new quarantine was adopted to protect Oregon from the importation of invasive species on firewood produced outside the Pacific Northwest (OAR 603-052-1080).

Permit reviews

The Section continues to provide reviews of federal permits to import plants, pathogens and parasites, and genetically modified (bioengineered) organisms to our state. The permits are reviewed for compliance with existing Oregon quarantines and regulations. In all, 125 permits were reviewed; 78 for live pests and noxious weeds, one for plants for post-entry quarantine, six for prohibited plants imported for experimental purposes, seven for soil, and 33 for genetically engineered organisms. Staff members also participated in federal inspections of facilities and fields where permitted organisms, such as genetically engineered organisms or a regulated pathogen, were to be received and/or grown.

Exported timber inspections

In 2012, staff from the Plant Health and Nursery & Christmas tree Inspection programs inspected thirty-seven shipments of conifer logs bound for China. China requires that all conifer log shipments also be tested for the presence of pine wilt nematode (PWN, *Bursaphelenchus xylophilus*) prior to importation. Inspectors are required to collect a composite sample of wood shavings from the shipment for laboratory testing. The number of logs sampled depends upon the size of the shipment, with a maximum of 29 logs sampled per shipment. Thus, 37 composite samples were officially tested for PWN using a modified pie pan method. No PWN was found.

Publications

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Osterbauer, N., M. Lujan, and G. McAninch. 2012. Incidence of five common pests in nurseries participating in three different certification schemes for pest risk mitigation. Phytopathology 102:S4.89.

Osterbauer, N.K, M. Lujan, G. McAninch, A. Trippe, and S. Lane. 2012. Verifying critical control points for *Phytophthora* introduction into nurseries. Fifth Sudden Oak Death Science Symposium Meeting Abstracts, June 19-22, 2012, Petaluma, CA, p. 77.