2011 Plant Health Section Annual Report

Commodity Inspection Division

The Plant Health Section 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 section'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 Section has responsibility 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.

In cooperation with USDA Animal and Plant Health Inspection Service - Plant Protection and Quarantine (APHIS/PPQ), the Plant Health Section 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 issues such as boxwood blight and the National Clean Plant Network. 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 number of seed lots sent in for testing increased over 17% from last year to 8,216 seed lots. This suggests the market for Oregon seed crops continues to improve.
- A new disease, boxwood blight (*Cylindrocladium pseudonaviculatum*), was discovered in an Oregon nursery infecting several *Buxus* cultivars. The Section is working closely with the Nursery & Christmas tree Program

to eradicate this disease and develop a quality management program for nurseries.

- In 2011, the Plant Health Section and Shipping Point Inspection Program worked with the Oregon Blueberry Commission and USDA-APHIS-AMS to gain entry to the Republic of Korea for fresh blueberries. This new program depends upon official inspections and audits to meet Korea's phytosanitary requirements for import. We anticipate shipping our first blueberries in 2012.
- With the addition of Dr. Brooke Edmunds, Clare Taylor, and Ryan Woolverton, the Section is at full staffing levels for the first time in about 3-years. Kate Allen transferred to another section of CID towards the end of the year.

With this consistently high workload, the staff managed to sustain the high level of competence expected of our Section, maintaining a low laboratory test error rate of 0.02%. It is a privilege to serve with such an exceptional and dedicated group.

Thank you for all your hard work.

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Plant Health Program Supervisor

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Cooperative Agricultural Pest Surveys

Potato Cyst Nematode Survey

This survey targets golden potato cyst nematode (GN, *Globodera rostochiensis*), pale potato cyst nematode (PCN, *G. pallida*), potato wart (*Synchytrium endobioticum*), and zebra chip disease (*Candidatus* Liberobacter solanacearum).

The goal is to survey 25% of all seed potato acreage, 1% of all commercial potato acreage, and all university research/breeding program acreage in the state. Soil samples have been collected from seed potato and commercial potato fields as described in the 2009 Pale Potato Cyst Nematode National Survey and Diagnostic Cyst Sample Forwarding protocols (USDA-APHIS-PPQ, April 29, 2009). A percentage of the soil samples will also be examined for potato wart disease. About 1,000 tubers collected from all major potato growing areas in the State will be examined for zebra chip disease using standard testing methods and peer-reviewed protocols.

There was a miscommunication with USDA APHIS regarding the availability of funds for this program (i.e., we did not receive the executed articles for the cooperative agreement until 12/5/2011) that delayed this survey work. As of 12/31/2011, 1,632 soil samples have been collected primarily from seed potato fields located throughout the state. Additional soil samples will be collected this spring from research farms and commercial fields in two major growing areas. About 125 soil samples were processed in the USDA soil cyst washers by the end of the year, with no cysts recovered. Tubers will be collected for zebra chip testing in early 2012.

Because of the delay caused by the miscommunication, USDA-APHIS-PPQ granted us a 4-month extension to complete the survey work. The new project end date is 8/31/2012.

Oak/Hardwoods Survey

This survey targets several pathogens of national concern: laurel wilt (*Raffaela lauricola*), Japanese oak wilt (*R. quercivora*), bluestain (*Ophiostoma quercus*), root rot (*Gymnopus fusipes*), oak decline (*Phytophthora quercina*), alder root rot (*P. alni*), and ash dieback (*Chalara fraxinea*). The goal was to survey 25 incoming shipments of oak, alder, ash, sassafras, and other hardwood species of plants for planting for symptoms indicative of the seven pathogens of concern. Recently, the new disease boxwood blight (*Cylindrocladium pseudonaviculatum*, = *C. buxicola*) was detected in three eastern states. APHIS granted us a “Change to Scope of Work” to include this pathogen in the Oak/Hardwoods Survey.

Due to the poor economy, fewer nurseries have imported nursery stock than in previous years. Thus, the plants inspected upon import varied somewhat from the initially targeted species. We have examined 20 shipments/nurseries as of the end of the year (Table 1), with one of the pathogens of concern confirmed at a nursery in Washington County. This identification was officially confirmed by USDA’s National Mycologist on 12/20/2011 and reported in NAPIS as required. Funding for this survey concludes on 2/28/2012.

Table 1. Oak/Hardwoods Survey results as of 12/28/2011.

Plant Species	No. of nurseries	Issue detected
Cordyline baurei	1	Low temperature injury
Quercus spp.	3	None detected
Magnolia	1	Pythium root rot
Osteospermum	1	Abiotic injury
Acer palmatum	1	Nectria canker
Rhododendron	1	Abiotic injury
Buxus spp.	12	*Cylindrocladium pseudonaviculatum* confirmed on two *Buxus* 'True Dwarf' plants at one nursery. Samples from three nurseries are still in process.

Corn Diseases Survey

This survey targeted five parasites of national concern: *Harpophora maydis, Peronosclerospora maydis, P. philippinensis, Sclerophthora rayssiae* var. *zeae*, and *Punctodera chalcoensis.* Surveys were conducted in corn seed fields in Malheur, Morrow, and Umatilla counties, with 23 fields surveyed for the five parasites. For the fungal pathogens, 5-20% of the plants in each field were visually inspected. Samples were collected from symptomatic plants and brought to the ODA Plant Health Laboratory for microscopic examination. For *P. chalcoensis*, a single composite soil sample was collected from each field and tested for nematodes using a standard protocol. None of the target pests were found during the survey (Table 2), indicating Oregon remains free of these pests. Data from this survey have been entered into NAPIS.

Table 2. Survey results for *H. maydis, P. maydis, P. philippinensis, S. rayssiae* var. *zeae*, and *P. chalcoensis* in Oregon corn seed fields.	County		
	Malheur	Morrow	Umatilla
No. of fields surveyed	3	2	18
No. of acres surveyed	61n	29	222
H. maydis detected?	No	No	No
P. maydis detected?	No	No	No
P. philippinensis detected?	No	No	No
S. rayssiae var. *zeae* detected?	No	No	No
Pu. chalcoensis detected?	No	No	No

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 2011, we collected a total of 32 samples from 11 counties (Benton, Crook, Deschutes, Gilliam, Jefferson, Lane, Linn, Marion, Morrow, Umatilla, and Union). All samples were shipped to the national Karnal bunt-testing laboratory in Olney, TX, and were found to be free of Karnal bunt. This is the sixteenth consecutive year Oregon has tested free of Karnal bunt. Survey results were entered into the NAPIS database.

Grass Seed Survey

In 2010, the ODA detected *Anguina funesta*, the nematode vector of the Select Agent *Rathayibacter toxicus*, in Oregon grass seed. Two suspicious galls were recovered from a single annual ryegrass seed lot. PCR was performed on the galls to test for the presence of *R. toxicus* as described by Kowalski et al. (2007, Australian Journal of Experimental Agriculture, 47, 177-183), which resulted in the amplification of a 200-bp DNA fragment. This fragment was sequenced and compared to already published sequences using BLAST. The resulting sequence did not match *R. toxicus*. Instead, we determined that Kowalski et al's PCR primers cross-amplified several other bacteria including *R. rathayii,* which is common in Oregon (data not shown).

To verify the presence of *A. funesta* and absence of *R. toxicus* in Oregon, we examined annual ryegrass seed lots for *Anguina* spp. and suspicious galls. We examined 219 ryegrass seed lots for *Anguina* spp. (Table 3). Ten were positive for *A. funesta* using PCR-RFLP (Powers et al, 2001, Journal of Nematology, 33, 191-194); those seed lots came from four growers in Linn County. No galls indicative of *R. toxicus* were found in the ten positive seed lots. We are awaiting official confirmation from USDA APHIS before entering data into NAPIS.

Table 3. Results of the survey of annual ryegrass seed lots for *A. funesta* and *R. toxicus*.

County	# Seed Lots tested	# Seed Lots *A. funesta*-positive	*R. toxicus* galls found
Benton	21	0	0
Linn	157	10	0
Lane	15	0	0
Marion	3	0	0
Polk	16	0	0
Washington	4	0	0
Yamhill	3	0	0

Farm Bill Projects

Plum Pox Virus, European Stone Fruit Yellows, Cherry Leaf Spot 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), and one pathogen of state concern, cherry leaf spot (CLS, *Blumeriella jaapii*). The survey was conducted in nurseries identified as being at high risk for potential introduction of these pathogens and in the four major production areas for pome and stone fruit orchards (Willamette Valley, Hood River area, Columbia Basin, and the Klamath Basin).

Samples for PPV and ESFY testing were collected according to the USDA APHIS National Survey Protocol for PPV. For PPV, samples were tested using the USDA-approved ELISA test kit (AgDia Inc., Elkhart, IN). For ESFY, samples were tested using a general PCR protocol using primers P1 and P7 to test for the presence of any phytoplasma (Smart et al,1996, Applied Environmental Microbiology, 62, 2988‐ 2993). DNA was extracted from samples using CTAB buffer in conjunction with Qiagen DNeasy kits. Samples were compared with phytoplasma-positive control DNA obtained from Dr. Ken Eastwell, Washington State University. For CLS, identification was based on visual survey in the field with suspicious samples examined and fungal identity confirmed with microscopy in the lab. Commercial orchards in Oregon's four main production areas (1,080 samples) and two nurseries (456 samples) were surveyed.

The PPV samples collected all tested negative for PPV with ELISA. ESFY testing is in progress with an anticipated completion date of 1/15/12. All samples tested for ESFY as of 12/31/11 yielded negative results using PCR. No CLS was found during visual surveys. Data has been entered into NAPIS as results are available.

Efficacy of Using Systems Approaches in Nurseries Pilot Study

In 2007, the Plant Health Section and Nursery and Christmas Tree Inspection Program (Plant Division) implemented the novel grower assisted inspection program (GAIP) in Oregon's nurseries. The GAIP targets *Phytophthora ramorum* and other foliar *Phytophthora* species that can contaminate plants, water, and soil in nurseries and can be transported between nurseries or into the natural environment via infected plant material. Nurseries participating in the program are required to adopt best management practices (BMP) to address four mandatory critical control points (water, soil and potting media, used containers, and incoming plant material) where *Phytophthora* 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 is also based on using a systems

approach to mitigate the risk of spreading pests and diseases through the movement of nursery stock. This program concentrates primarily upon documenting business and plant production practices within the nursery.

In 2010, the Plant Health Section and Nursery and Christmas tree Inspection Program 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 2011.

As of 12/31/2011, two GAIP, two US NCP, and two SPI nurseries had been surveyed twice for the five pests since the start of this study. In addition, samples were collected from critical control points (CCP) in each nursery to test for the presence of Phytophthora. The CCP targeted were soil substrate, potting media, used containers, and irrigation water. Data from these first two sampling periods show the most common pest problem detected was snails and slugs followed by Phytophthora root rot (Table 4). For the CCP, the data collected so far indicate the *Phytophthora* incidence in potting media is about the same for all three types of nurseries. However, *Phytophthora* incidence in irrigation water appears to be higher in GAIP and SPI nurseries, while the incidence in used containers and soil substrate appears to be higher in SPI nurseries.

Table 4. Incidence of five target pests in GAIP, US NCP, and SPI nurseries averaged over two survey seasons.

Certification type	Phytophthora root rot	Phytophthora foliar blight	Bittercress	Snails/slugs	Root weevils
GAIP	24.1	2.6	16.9	29.0	6.9
US NCP	32.0	7.3	8.0	51.6	6.7
SPI	34.2	5.8	6.5	34.0	10.4

As part of this new study, the Plant Health and Nursery and Christmas tree Inspection programs worked with Oregon State University Extension to provide training workshops for GAIP and other nurseries interested in BMP for CCP. The workshop series was presented in English and in Spanish. Topics covered included: 1) biology and seasonal activity of *Phytophthora*; 2) cultural control for pest prevention; 3) water management; 4) media, substrate, containers; and, 5) BMP summary.

Specialty Crops Block Grant Critical Control Point Study

In the fall of 2010, the Oregon Department of Agriculture received a Specialty Crops Block Grant to conduct a study within nurseries participating in the Grower

Assisted Inspection Program (GAIP). Nurseries participating in the GAIP are required to adopt best management practices (BMP) for critical control points (CCP) where the pathogen *Phytophthora* can be introduced into the nursery. This study concentrated on used containers, irrigation water, soil substrate, and potting media. The goal of the study was to determine the presence or absence of *Phytophthora* at these four CCP and to provide feedback to the nurseries on the efficacy of their BMP.

A total of 13 nursery locations, each with unique BMP, were surveyed from January through March of 2011. Samples were collected from their irrigation water sources, used containers, and potting media and components, and then tested using USDA-approved water- and soil-baiting methods. Soil substrate samples were collected by walking random transects within each nursery and collecting three subsamples at equidistant points along each transect. The three subsamples were combined into one composite soil sample per transect for testing as described previously.

A total of 354 samples were collected from all CCP for this study, with 30.2% testing positive for *Phytophthora*. For the four CCP, *Phytophthora* was detected significantly more often in irrigation water (45.5%, $p < 0.05$) than in soil substrate (36.4%), used container (30.4%), and potting media (10.3%) samples. When looking at the number of nurseries with *Phytophthora* detected at each CCP, soil substrate and irrigation water were significantly more likely sources of potential contamination (Figure 1). When looking at irrigation water samples only, *Phytophthora* was not detected in any well water samples, although it was detected in both river water samples and water samples from recycling ponds. Two hundred-sixty samples were collected from soil substrate, with 30.4% positive for *Phytophthora*. Statistical analyses showed there was a significant difference ($p < 0.05$) between nursery locations, with smaller nurseries tending to have fewer positive soil substrate samples. For used containers, the greatest concern was the detection of *Phytophthora* in one sample after the pots had reportedly been sterilized. For potting media samples, those taken from media stored on a concrete pad were less contaminated with *Phytophthora* than those taken from media stored on other barriers.

The results of this study underscore the importance of all four CCP as sources of *Phytophthora* contamination in nurseries. However, the results also suggest that directing efforts at irrigation water and soil substrate may provide nurseries with limited resources the greatest opportunity for risk mitigation. As a result of this and other studies, greater emphasis will be placed on these two CCP for nurseries participating in the GAIP.

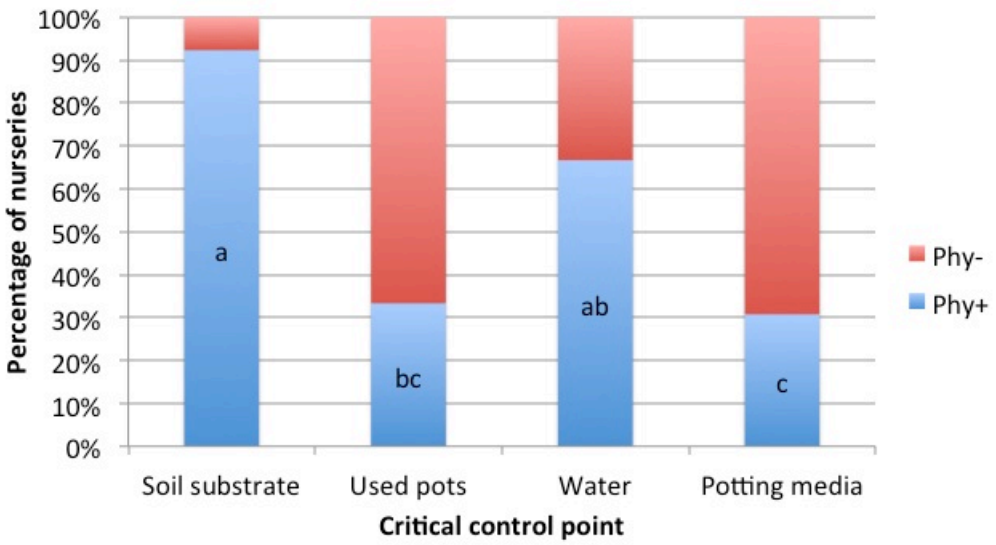

Figure 1. The percentage of nurseries with *Phytophthora* detected at each of the four critical control points (CCP); statistical significance between CCP ($p < 0.05$) is indicated by different letters.

Field Inspection and Certification Programs

Allium White Rot Inspection

In 2011, ODA staff inspected a total of 56 garlic (*Allium sativum*) fields (1,304 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 nine fields in 2011, with most infected fields found in central Oregon (Table 5).

Table 5. Allium white rot inspection results for 2011.

Number of	County					
	Crook	Jefferson	Klamath	Marion	Morrow	Sherman
Fields inspected	9	23	7	7	7	3
Acres inspected	319	593	79	129	123	61
Fields infected	3	5	1	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 2011, the ODA staff inspected two fields (72 acres) in Klamath County with no Verticillium wilt found.

Potato Late Blight Inspection

In 2011, the ODA staff conducted field surveys for late blight of potato (*Solanum tuberosum*) for the export of fresh potatoes to Taiwan. A total of 135 fields (9,136 acres) from four counties were inspected for *Phytophthora infestans*, the causal agent of late blight (Table 6). No potato late blight was found.

Table 6. Potato late blight inspection results for 2011.

County	No. fields inspected	No. acres inspected	Results
Klamath	81	5,037	No potato late blight found
Morrow	10	635	No potato late blight found
Umatilla	38	3,324	No potato late blight found
Washington	6	140	No potato late blight found

Seed Crop Field Inspections

In 2011, the ODA staff inspected 867 seed crop fields (16,501.47 acres) for the presence of seed-borne or seed-associated pests of concern (Figure 1). Inspectors surveyed for the presence of more than 100 different pathogens and other pests associated with 35 different host crops in 18 counties. Around 28% (242 fields) of the inspected fields were found with at least one pest of concern. The five most commonly observed diseases were downy mildew of pea (*Peronospora viciae*), bacterial leaf blight of carrot (*Xanthomonas campestris* pv. *carotae*), black rot of carrot (*Alternaria radicina*), Sclerotinia stem rot of cabbage (*Sclerotinia sclerotiorum*), and common smut of corn (*Ustilago maydis*). Their disease incidences were 58.8%, 51.3%, 47.3%, 22.4%, and 18.9%, respectively (Table 7).

Table 7. Seed crop field inspection results by crop and county for 2011.

Crop	County	# fields inspected	Acreage inspected	Pests of concern detected (No. of fields)
Alfalfa (*Medicago sativa*)	Josephine	8	17.63	
	Malheur	19	57.95	*Ditylenchus dipsaci* (7)
	Umatilla	1	0.06	
	Union	1	35	
Allium - Garlic (*Allium sativum*)	Crook	6	173.7	
	Jefferson	19	451	
	Marion	5	86	
Allium - Onion	Jefferson	8	68.36	*Botrytis* sp. (4)

(*Allium cepa*)				
	Lane	2	17.5	*Botrytis* sp. (1) *Peronospora destructor* (2)
	Linn	2	32	*Peronospora destructor* (1)
	Malheur	10	82.8	*Botrytis* sp. (1)
	Marion	22	184.65	*Botrytis* sp. (6) *Peronospora destructor* (3)
	Yamhill	1	8.2	*Peronospora destructor* (1)
Bean (*Phaseolus vulgaris*)	Malheur	23	516.8	
Beta - Swiss chard (*Beta vulgaris*)	Linn	1	15	
	Marion	2	11	
Bluegrass (*Poa trivialis*)	Jefferson	1	30	
Carrot	Crook	7	203	*Xanthomonas campestris* pv. *carotae* (1)
(*Daucus carota*)	Deschutes	6	104	*Alternaria radicina* (1) *Xanthomonas campestris* pv. *carotae* (2)
	Jefferson	121	3,417.1	*Alternaria radicina* (69) *Xanthomonas campestris* pv. *carotae* (73) *Kochia scoparia* (19)
	Malheur	12	44.2	
	Marion	1	3	
	Washington	3	48	*Alternaria radicina* (1) *Xanthomonas campestris* pv. *carotae* (1)
Clover	Benton	3	151	*Virus symptoms observed* (1)
(*Trifolium* sp.)	Clackamas	2	127	
	Linn	4	285	
	Marion	2	79	
	Washington	5	251	
	Yamhill	19	1,228	*Cirsium arvense* (4) *Orobanche minor* (1)
Coriander *(Coriandrum sativum)*	Jefferson	2	54.6	
	Linn	2	96	
	Malheur	2	53	
	Marion	2	75	
Corn (*Zea mays*)	Malheur	34	446.05	*Ustilago maydis* (23)
	Morrow	28	482.04	*Ustilago maydis* (3)
	Umatilla	203	2,512.79	*Ustilago maydis* (24) High Plain Virus (2)

				Maize Dwarf mosaic Virus (1)
Corn salad	Linn	2	4	
(*Valerianella locusta*)				
Brassica – Arugula (*Brassica eruca*)	Linn	2	14	
Brassica –Brussel Sprout (*Brassica oleracea*)	Marion	1	10	
Brassica - Cabbage	Benton	1	1	
(*Brassica oleracea*)	Clackamas	3	11.5	*Leptosphaeria maculans* (2)
	Lane	5	40	*Sclerotinia sclerotiorum* (1)
	Linn	6	64.54	*Leptosphaeria maculans* (1) *Mycosphaerella brassicicola* (1) *Peronospora parasitica* (2)
	Malheur	1	11	
	Marion	35	337.8	*Leptosphaeria maculans* (5) *Peronospora parasitica* (3) *Sclerotinia sclerotiorum* (12)
	Washington	1	15.6	*Peronospora parasitica* (1)
	Yamhill	6	73.56	*Alternaria brassicae* (1) *Mycosphaerella brassicola* (1) *Peronospora parasitica* (3)
Brassica – Kale	Marion	2	27	
(*Brassica oleracea*)	Washington	1	10	
Brassica – Kohlrabi	Linn	1	2.8	
(*Brassica oleracea*)	Marion	2	15.2	*Leptosphaeria maculans* (1)
Brassica – Mustard	Lane	1	10	
(*Brassica* sp.)	Linn	1	11	
Brassica - Turnip	Lane	1	18.5	
(*Brassica rapa)*	Linn	1	40	
	Malheur	2	65	*Alternaria brassicae* (2)
Cucurbit – Cucumber	Linn	1	8	
(*Cucumis sativus*)	Marion	9	26.2	
Curcurbit – Pumpkin (*Curcurbita* sp.)	Linn	2	15	
Dill	Lane	1	5	
(*Anethum*	Linn	2	18	

graveolens)				
	Malheur	1	25	
	Marion	5	53.5	
	Yamhill	1	25	
Edmame (*Glycine* sp.)	Marion	1	5	
Oat (*Avena sativa*)	Lane	1	25	
	Washington	1	25	
Parsley	Jefferson	8	60	
(*Petroselinum crispum*)	Lane	3	22	*Septoria petroselini* (2)
	Linn	5	35	*Septoria petroselini* (1)
	Marion	3	25	*Septoria petroselini* (1)
Parsnip (*Pastinaca sativa*)	Marion	2	30	
Pea (*Pisum sativum*)	Benton	1	46	*Peronospora viciae* (1)
	Lane	7	86	*Peronospora viciae* (5) Pea Enation Mosaic Virus (1)
	Malheur	5	102	
	Marion	13	144	*Peronospora viciae* (10) Pea Enation Mosaic Virus (1)
	Umatilla	1	3	
	Wallowa	4	240	*Peronospora viciae* (2)
	Yamhill	3	76	*Peronospora viciae* (2) Pea Enation Mosaic Virus (1)
Radish (*Raphanus sativus*)	Benton	2	62	
	Lane	6	139	
	Linn	6	173	
	Malheur	18	395	
	Marion	15	280.5	*Sclerotinia sclerotiorum* (1)
	Polk	2	50	
	Washington	5	76	
	Yamhill	7	215	
Rocket (*Eruca sativa*)	Lane	1	10	
	Marion	1	5	
Spinach (*Spinacia oleracea*)	Clackamas	1	25	
	Lane	5	81	*Cladosporium* sp.
	Linn	1	29	
	Marion	16	376	
	Washington	4	38	
	Yamhill	3	62	

Sunflower (*Helianthus annuus*)	Lane	1	10	
	Marion	1	7	
	Morrow	3	145	
	Polk	1	5	
	Union	10	537	
Tomato	Jackson	1	1	
(*Lycopersicon esculentum*)	Linn	1	0.25	
Vetch (*Vicia* sp.)	Polk	1	165	
Hairy Vetch (*Vicia villosa*)	Washington	9	278	
Wheat (*Triticum sp.*)	Linn	1	3	
Wild rocket perennial (*Diplotaxis tenuifolia*)	Marion	1	4	

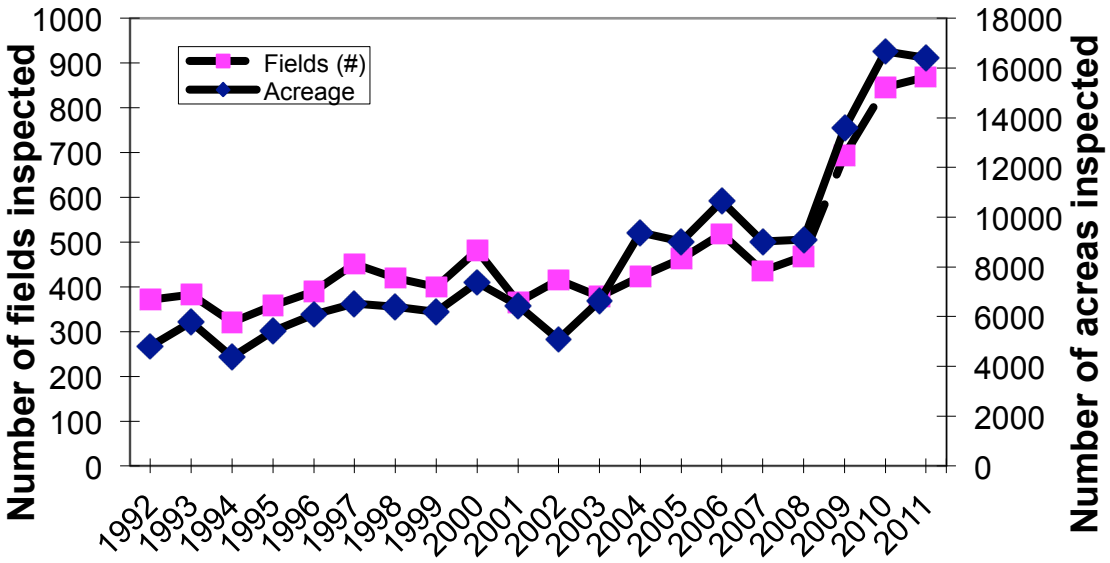

Figure 1. Historical record of seed field inspections from 1992 to 2011.

Laboratory Seed Testing

Export seed

In 2011, Plant Health staff conducted tests to detect specific seed-borne fungi, bacteria, nematodes, viruses, pests, diseases, and other miscellaneous problems. Seed were tested according to standard, officially accepted protocols for the target organism(s). A total of 12,962 tests on 8,216 seed lots from more than 15 different crops, mainly grasses and vegetables, were conducted this year. This represents a 17% increase from 2010 (Figure 2). We are now receiving requests for export seed testing consistently throughout the year rather than primarily during the winter months (Figure 3).

About 4.8% of the lots tested positive for one or more organisms of regulatory concern (Table 8). The seed lots were tested at the request of Oregon seed exporters to meet the phytosanitary requirements of their international and interstate customers.

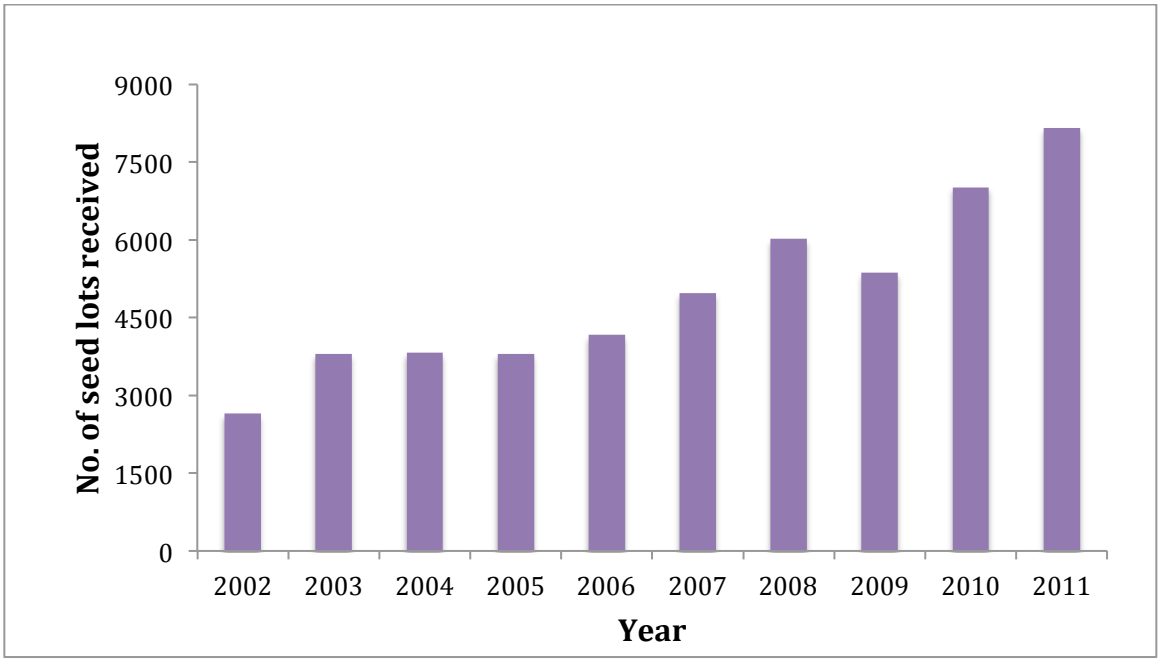

Figure 2. Total number of seed lots tested each year from 2002-2011.

Table 8. Laboratory tests conducted on grass, vegetable, and other seed lots in 2011.

Pathogen/pest tests	# tests conducted	# tests passed	# tests failed
General Pest and Disease Analysis	**7,777**	**7,621**	**156**
Fungi:			
Israel wash	34	34	0
Korea wash	556	472	84
Tilletia sp.	1,831	1,762	69
Urocystis sp.	157	135	22
Ustilago sp.	18	9	9
Gloeotinia sp.	248	240	8
Grow-out (*Phoma, Kabatiella*)	79	78	1

Other fungi	74	72	2
Fungi total:	**2,997**	**2,802**	**195**
Nematodes:			
Anguina sp.	549	540	9
Subanguina sp.	0	0	0
Ditylenchus sp.	228	227	1
Other nematode	811	780	31
Nematode total:	**1,588**	**1,547**	**41**
Bacteria:			
Corynebacterium rathayi	272	270	2
Clavibacter sp.	33	33	0
Pseudomonas sp.	30	26	4
Xanthomonas sp.	59	59	0
Bacteria total:	**394**	**388**	**6**
Weeds and parasitic seed plants:			
Orobanche minor	87	87	0
Glyceria declinata	97	97	0
Weeds and parasitic seed plants total:	**184**	**184**	**0**
Virus total:	**22**	**17**	**5**
GRAND TOTAL	**12,962**	**12,559**	**403**

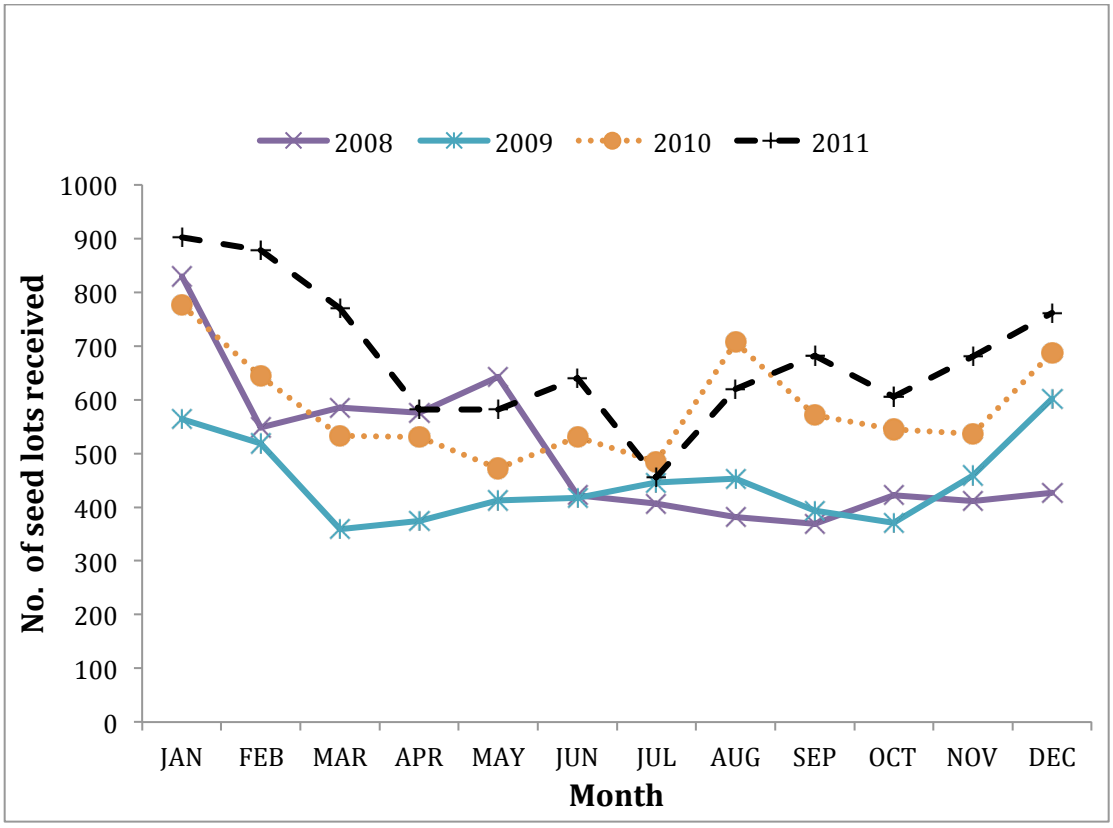

Figure 3. Number of seed lots tested per month from 2008-2011.

Endophyte testing

In 2011, the Plant Health Laboratory received 116 seed lots of forage grass seed varieties to be tested for the presence of the Endophyte fungus, *Epichloe* sp. (= *Neotyphodium* spp.). 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. Eleven 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-four nurseries participated in Oregon's virus ornamental and fruit tree certification program in 2011. *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 (TomRSV). Foliar samples were collected in the spring and tested for the target viruses using commercially available ELISA test kits. A total of 12,686 samples were tested. About 0.37% of the field samples were PDV-positive, 0.53% were PNRSV-positive and 0.00% were TmRSV-positive for this season. Field and paperwork audits 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 2011. 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 2011, 30,770 leaf samples were tested. About 4.8% of the samples tested were infected with Blueberry Shock Virus. The infected samples came from five nurseries. The nursery owners were informed of the positive samples. No samples were positive for Blueberry Scorch Virus.

Fresh Blueberries to Korea

In late 2011, the Republic of Korea adopted regulations that allow for the importation of fresh Oregon blueberries. The Plant Health Section, working with the Shipping Point Inspection Program, Inspect Pest Prevention and Management Program (Plant Division) and USDA/APHIS/Agricultural Marketing Service developed an inspection and mitigation program for the pests and diseases of concern to Korea. The seven pests and diseases include *Phytophthora ramorum*, tobacco ringspot virus, tomato ringspot virus, *Monilinia vaccinii-corymbosi*, *Argyrotaenia citrana*, *Choristoneura rosaceana*, and *Grapholita packardi*. Official inspections and testing are required for *P. ramorum* and the two viruses, while the other pests must be actively monitored for during the growing season and appropriate control measures applied if detected at injurious levels. All packing houses and orchards participating in the program are also subject to official audit by the ODA for compliance with the Korean regulations.

The Korean regulations were not adopted in time for Oregon blueberry growers to ship to this new market in 2011. However, we anticipate great interest in this new export program for 2012.

Survey and Disease Containment Programs

Phytophthora ramorum - Curry County

The ODA *Phytophthora ramorum* quarantine area in Curry County remained at 162-mi^2 in 2011. However, surveys during the course of the year detected 336 infected trees on 172 new sites, for a total of 91 newly infected acres. One site is located in Cape Sebastian State Park about 3.5-miles south of Gold Beach and outside of the quarantine boundary. Based on this latter find, the quarantine boundary will have to be expanded in 2012. The ODA and its cooperators, the Oregon Department of Forestry (ODF), USDA Forest Service, and Oregon State University, continued to work with affected landowners to eradicate *P. ramorum* from infested areas, with the standard treatment consisting of cutting, piling, and

burning all infected plants and all asymptomatic susceptible plants within 300-feet of each infection center. Tan oak stumps are treated with herbicide to prevent re-sprouting. The Oregon State Parks & Recreation Department has been an active ally in treating the *P. ramorum* infestation on their land.

Analysis of the data from the post-treatment monitoring done on 145 plots in 2008-2009 and 143 plots in 2010 is partially complete (Courtesy of Ellen Goheen, USDA Forest Service). Of the 2008-2009 plots, 51% tested free of *P. ramorum*, while 12.5% had the pathogen present in vegetation and soil, 32% in soil only, and 4.5% in vegetation only. Of the 2010 plots, 63% tested free of *P. ramorum*, while 7% had the pathogen present in vegetation and soil, 25% in soil only, and 5% in vegetation only. Forty-two plots were visited during both the 2008-2009 sampling period and 2010 sampling period. Of those 42 plots, 39% remained free of *P. ramorum* for both years, while 22% were *P. ramorum*-positive in soil in both years and 6% had *P. ramorum*-positive vegetation in both years. Analysis of the data continues. This information will be used to inform future post-treatment monitoring of treated plots.

The last 3-years have been difficult ones for the eradication and containment effort in Curry County. Although the USDA Forest Service continues to support the effort, an inability to find sufficient matching funds for the federal dollars led to repeated work slowdowns and stoppages. As a result, disease continued to spread in the county and, in 2011, the cumulative acres projected for eradicative treatment exceeded the amount of funds available. Thus, in the fall of 2011, the *P. ramorum* Interagency Task Force recommended transitioning to a disease containment effort in Curry County. Stakeholder input was sought at a December meeting held in Gold Beach. Recommendations from that meeting were given to the ODA to assist in revising the State quarantine in 2012 to reflect the transition to a disease containment program.

P. ramorum – Nurseries

As of 12/31/11, 23,432 samples from 588 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 236 of the sites surveyed. *P. ramorum* was detected at six sites on *Camellia* 'April Tryst', *Camellia japonica* 'Blood of China', *Camellia* sp., *Rhododendron* 'Balalaika', *Rhododendron* 'Chinoides', *Rhododendron* 'Helliki', *Rhododendron* spp. (seven blocks), *Viburnum* sp. (two blocks), *V. tinus* (four blocks), and *V. tinus* 'Spring Bouquet'. Delimitation surveys within the *P. ramorum*-positive nurseries detected additional positives on *Camellia* 'April Remembered', *Rhododendron* cultivars Dorothy Amateis and PJM, *Rhododendron* spp. (26 blocks), *Pieris* spp., *Viburnum* sp., *V. plicatum*, in the soil substrate (twice), and in the potting media associated with an infected plant (four times). All of the nurseries have undergone the USDA Confirmed

Nursery Protocol (CNP). In addition to the six positive nurseries, one nursery remains under an Administrative Directive that strictly regulates how plants are grown at and moved from the site. This is because of multiple positive detections at the nursery in previous years. This nursery has also adopted mandatory best management practices to reduce their level of *Phytophthora* disease present.

In addition to the federally required nursery certification survey, the ODA surveyed Christmas tree plantations for *P. ramorum*. Although the pathogen has never previously been reported in Oregon Christmas tree plantations, periodic surveys are required to maintain pest-free status for this industry. The survey took place in the spring, when conditions are most optimal for *P. ramorum* detection in conifers. A total of 5,562 samples from 121 plantations were collected for laboratory testing as described above. *Phytophthora* species were detected at 43 plantations. However, no *P. ramorum* was detected. This indicates Oregon Christmas tree plantations remain free of this quarantine disease.

The ODA also conducted trace out investigations at seven sites with 13 samples collected for testing. No *Phytophthora* species were detected. Finally, the ODA inspected three incoming shipments of host and associated host species for *P. ramorum*. No *P. ramorum* was detected, although another *Phytophthora* was detected in one shipment.

The data from the nursery certification and Christmas tree plantation surveys have been entered in NAPIS. We continue to be unable to enter the Curry County survey and monitoring data into NAPIS. USDA is aware of the issue.

Other Programs

Columbia root knot nematode

Nursery inspectors collected 70 soil samples for nematode testing from Oregon production nurseries in 2011. 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 66% of the samples with *Pratylenchus* spp. being the most abundant (present in 57% of the samples). *Meloidogyne hapla* was detected in five 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.

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 2011, 50 samples were submitted to meet export requirements and 25 for general diagnostics. All export samples were free from pathogens of concern. Samples for general diagnostics had problems caused by fungi (33%), insects (4%) or abiotic/environmental problems (20%). No pests were detected in the remainder of the samples. Additionally, four samples were submitted for nematode testing for certification programs, five samples were tested to meet Oregon importation requirements, and fifty-one samples were submitted as part of a federal traceback surveys.

Quarantines and Control Area Orders

Four regulations were reviewed and updated in 2011. The scientific names of the bean diseases named in the control area order for Malheur County (OAR 603-052-0385) were updated to the current nomenclature. The list of affected commodities was updated in the small broomrape (OAR 603-052-1025) and in the peach rosette phytoplasma (OAR 603-052-0118) quarantines. The areas under quarantine and the list of affected commodities was updated in the peach yellows phytoplasma quarantine (OAR 603-052-0116).

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, 175 permits were reviewed; 90 for live pests and noxious weeds, seven for plants for post-entry quarantine, seven for prohibited plants imported for experimental purposes, 11 for soil, and 60 for genetically modified 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.

National Clean Plant Network

The Plant Health Section 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 has developed a draft of a harmonized national standard for the virus certification of *Malus, Prunus, Pyrus, Chaenomeles,* and *Cydonia* nursery stock. The draft was released for public comment in 2011, with the ODA and Oregon nurseries providing comments. Members of the Plant Health Section continue to participate on the NCPN-FT subcommittee that will refine the draft of the proposed national standard based on the comments received. The ODA also continued to participate in a pilot study to examine the efficacy of using a systems approach for virus certification of ornamental and fruit tree nursery stock. This pilot study has helped identify several areas of confusion in the draft national standard.

The Berries Clean Plant Network also began work on a draft of a harmonized national standard for the virus certification of blueberry nursery stock. The Plant Health Section participated in the initial development of the standard and provided critical review of the first draft. This effort will continue in 2012.

The Plant Health Section 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. With support from the USDA-NIFA and through the collective efforts of many individuals representing Land Grant Universities, federal agencies, state departments of agriculture, and other stakeholders, the NPDN has grown into an internationally respected consortium of plant diagnostic laboratories. 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 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. The WPDN was selected to host the Third National Meeting of the NPDN in Berkeley, CA, from November 6-9, 2011. An ODA staff member participated on the Posters & Exhibits Subcommittee responsible for organizing those parts of the meeting. Another ODA staff member attended the meeting, presenting a first report of *Sclerotinia sclerotiorum* on a new host found in Oregon. ODA staff also participated in WPDN monthly conference calls and communicated with other states regarding new disease outbreaks, first detector training, and disease diagnostic protocols.

Publications

Meng, Shawn X., Wu,Bo-Ming; Ludy, Robin L.; Fraley, Cindy L.; and Osterbauer, Nancy K. 2011. Detection of *Sclerotinia sclerotiorum* on whitloof chicory (*Cichorium intybus* L.) in Oregon. In: National Plant Diagnostic Network Third National Meeting Program Book, Berkeley, CA, p. 17, www.npdn.org.

Osterbauer, N., A. Trippe, S. Lane, and S. Lewis. 2011. First report of *Phytophthora ramorum* infecting *Trachelospermum jasminoides* in Oregon. Phytopathology 101:S134.