Oregon
Department
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# 2009 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, 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 *Phytophthora ramorum* and the National Clean Plant Network. Staff scientists are regularly consulted by 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.

- In 2009, *P. ramorum* was detected in six nurseries. Quick responses by the Plant Health Section and Nursery & Christmas Tree Inspection Program (Plant Division) allowed for the eradication of *P. ramorum* from five sites. One site remains under an Administrative Directive because of recurring problems at the nursery.
- The number of seed lots sent in for testing decreased 12% from last year from 6,038 to 5,386 seed lots. This trend is believed to be indicative of the recent economic downturn.
- The number of fields inspected by the seed field inspection program increased 48% during that same time period. This is consistent with reports that the vegetable and specialty seed industries perform well during periods of economic uncertainty.
- The Section cooperated with the Nursery & Christmas Tree Inspection Program to survey certified grapevine nursery stock for viruses of regulatory concern. For the first time, grapevine leafroll-associated virus 3 (GLRaV-3) was detected in

Oregon. We are working with the affected growers to eliminate the infected plants.
- The Plant Health Section and Nursery & Christmas Tree Inspection Program completed the first 3-years of the Grower Assisted Inspection Program pilot study. This program has garnered national attention as a potential model for implementing a systems approach to manage pests and diseases in nursery crops.

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.

**Nancy K. Osterbauer, Ph.D.**
Plant Health Program Supervisor

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## Cooperative Agricultural Pest Surveys

### Potato Pest Survey

The Plant Health Section surveyed seed potato fields for golden potato cyst nematode (*Globodera rostochiensis*) and pale potato cyst nematode (*G. pallida*). This year, those growers that were sending seed to Canada or Idaho had their fields surveyed. Soil was sampled at 5-lbs of soil per acre, with 100% of each field surveyed. The soil was dried and then processed using the modified USDA soil cyst washer. No potato cyst nematodes have been detected to date (Table 1). The results of these surveys are being entered into ISIS and NAPIS as samples are received and processing is being completed.

**Table 1.** Results through 12/31/2009, of the potato cyst nematode survey of Oregon seed potato fields.

| County | Fields | Acres | PCN Detected |
|---|---|---|---|
| Klamath | 10 | 543 | NO |

| | | | |
|---|---|---|---|
| Malheur | 4 | 142 | NO |
| Union | 1 | 65 | Still In Process |
| Total | 15 | 750 | |

**Small Grains Survey**

Wheat is the 6th most important agricultural commodity grown in Oregon accounting for more than $198.4 million in gross annual sales. In early 2008, Oregon State University reported the discovery of *Heterodera filipjevi* in Union County, the first detection of this nematode in the US. *H. filipjevi* is on APHIS' list of National Pests of Concern. This survey will determine the presence or absence of *H. filipjevi* in Oregon. As well, the wheat-growing areas were surveyed for *Meloidogyne artiella* and *M. fallax*, two other cyst-forming nematodes of national concern.

The survey was conducted when the wheat was 2- to 3-months old. A composite sample of ten sub-samples of soil and roots were collected in each field. Sampling targeted areas of poor growth in the field. Poor growth can be indicative of nematode infestation. The roots were misted and then examined for *Meloidogyne* spp., while the soil was processed in a USDA soil cyst washer and then examined for *Heterodera* spp. As of 12/31/2009, none of the target nematodes were found, although samples remain to be processed from four counties (Table 2).

**Table 2.** Results through 12/31/2009, of the small grains survey for three nematode pests of national concern.

| County | Field | *H. filipjevi* | *M. artiella* | *M. fallax* |
|---|---|---|---|---|
| Washington | 1 | No | No | No |
| Baker | 4 | No | No | No |
| Klamath | 2 | No | No | No |
| Malheur | 11 | | | |
| Wallowa | 3 | | | |
| Umatilla | 1 | No | No | No |
| Union | 5 | | | |
| Marion | 3 | | | |

**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 2009, we collected a total of 37 samples from 8 counties, up by 30 % from the previous year. All samples were shipped to the national Karnal bunt-testing laboratory in Olney, TX, and were found to be negative. This is the fourteenth consecutive year Oregon has tested free of Karnal bunt. Survey results were entered into the NAPIS database.

**Grass Seed Weed and Nematode**

In 2008, for the first time, Oregon conducted an official survey in response to the needs of the grass seed industry. The survey was conducted for the pests *Ditylenchus dipsaci*, a

nematode, and *Glyceria declinata*, a weed. Both pests are considered to be of regulatory significance to international recipients of Oregon grass seed. In the case of *D. dipsaci*, all grass seed lots must be free of this pest or the lots will be rejected. In the case of *G. declinata*, it is the only *Glyceria* species allowed as a contaminant in grass seed lots shipped to Australia. We sought to establish a baseline for the presence of *D. dipsaci* and *G. declinata* in counties producing grass seed.

Due to unforeseen circumstances, the survey for *G. declinata* could not be completed in 2008, although the survey for *D. dipsaci* was completed. Results from the *D. dipsaci* survey were presented in the 2008 Plant Health Section Annual Report. USDA APHIS PPQ granted us an extension to complete the *G. declinata* survey in the spring of 2009. Thus, in May, we conducted a survey for flowering *Glyceria* plants in Oregon grass seed fields. A total of 58 fields in seven counties (Benton, Clackamas, Lane, Linn, Marion, Polk, and Yamhill) were surveyed. *Glyceria* plants were collected from fields in which such plants were found and kept in the greenhouse until seeds formed. Then, seeds and leaves from each plant were tested with a newly developed real time PCR technique (see Publications) to identify each plant to the species level. All *Glyceria* plants collected during the month of May were identified as *G. declinata*. Survey results were entered in the NAPIS database.

**Grapevine Virus Survey**

This survey was a joint effort between IPPM and Plant Health. The Plant Health portion of the survey focused on diseases of state regulatory concern, namely grapevine virus A (GVA), grapevine leafroll-associated viruses (GLRaV), grapevine fanleaf virus (GFLV), and tomato ringspot virus (TomRSV) in certified grapevine nursery stock. Testing for arabis mosaic virus (AMV) was included as one of the ELISA kits used tested for both GVA and AMV. This report focuses on the Plant Health portion of the survey.

Survey and testing of the grapevines for the viruses of concern was split into two seasons: spring (May to June) testing for TomRSV, GFLV, and AMV, and fall (September to October) testing for GLRaV strains 1 and 3, and GVA. Certified blocks of grapevine nursery stock were surveyed in 14 nurseries (Table 2). One to three composite samples were collected per certified grapevine cultivar. Each composite sample consisted of leaf tissue collected from five different plants. Leaf tissue was collected from symptomatic plants whenever possible.

Results from the spring testing showed no target viruses were detected (Table 3). However, in the fall testing, GLRaV was detected in one nursery in Polk County and in one nursery in Douglas County (Table 4). In the Douglas County nursery, a single cultivar, Riparia Gloire, was found infected. In the Polk County nursery, one cultivar (Ruby) was confirmed infected while another cultivar (Interlaken) produced ambiguous test results. 'Interlaken will be re-tested in the fall of 2010. Dr. Bob Martin (USDA Agricultural Research Service, Corvallis, OR) has identified one of the cultivars as being infected with GLRaV-3. This is the first report of this insect-vectored GLRaV strain in Oregon. We are working with the nurseries to delimit these infections and destroy the infected plants. Survey data was entered into NAPIS.

**Table 3.** Grapevine virus survey 2009: spring testing results.

| County | No. of nurseries surveyed | No. tested | | Test results | | |
|---|---|---|---|---|---|---|
| | | Cultivars | Composite samples | TomRSV | AMV | GFLV |
| Benton | 1 | 3 | 7 | - | - | - |
| Clackamas | 1 | 8 | 8 | - | - | - |
| Douglas | 2 | 7 | 19 | - | - | - |
| Josephine | 1 | 20 | 22 | - | - | - |
| Lane | 3 | 36 | 57 | - | - | - |
| Marion | 2 | 37 | 50 | - | - | - |
| Polk | 1 | 53 | 97 | - | - | - |
| Yamhill | 3 | 30 | 39 | - | - | - |

**Table 4.** Grapevine virus survey 2009: fall testing results.

| County | No. of nurseries surveyed | No. tested | | Test results | |
|---|---|---|---|---|---|
| | | Cultivars | Composite samples | GLRaV 1,3 | GVA |
| Benton | 1 | 3 | 3 | - | - |
| Clackamas | 1 | 8 | 8 | - | - |
| Douglas | 2 | 6 | 6 | +^ | - |
| Josephine | 1 | 11 | 11 | - | - |
| Lane | 3 | 36 | 38 | - | - |
| Marion | 2 | 34 | 37 | - | - |
| Polk | 1 | 50 | 97 | +^ | - |
| Yamhill | 3 | 23 | 23 | - | - |

**^GLRaV was confirmed in one cultivar at a single nursery.**

# Field Inspection and Certification Programs

## Allium White Rot Inspection

In 2009, ODA staff inspected a total of 46 garlic (*Allium sativum*) fields in five 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. White rot was found in seven fields in 2009, with most infected fields found in central Oregon (Table 5).

**Table 5.** Allium white rot inspection results for 2008.

| Number of | County | | | | |
|---|---|---|---|---|---|
| | Crook | Jefferson | Klamath | Morrow | Sherman |
| Fields inspected | 8 | 23 | 1 | 12 | 2 |
| Acres inspected | 348 | 598.35 | 28 | 539.4 | 53.2 |
| Fields infected | 3 | 3 | 1 | 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 2009, the ODA staff inspected two fields (71 acres) in Klamath County with no Verticillium wilt found.

## Potato Late Blight Inspection

In 2009, the ODA staff conducted field surveys for late blight of potato (*Solanum tuberosum*) for the export of fresh potatoes to Taiwan. A total of 100 fields 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 2009.

| County | No. fields inspected | No. acres inspected | Results |
|---|---|---|---|
| Klamath | 56 | 3,023 | No potato late blight found |
| Morrow | 5 | 406 | No potato late blight found |
| Multnomah | 1 | 60 | No potato late blight found |
| Umatilla | 38 | 3,563.4 | No potato late blight found |

## Seed Crop Field Inspections

In 2009, the ODA staff inspected 694 seed crop fields (13,581.63 acres) for the presence of seed-borne or seed-associated pests of concern. The number of fields inspected increased 48% over last year and 34% over our previous high of 518 fields inspected in 2006 (Figure 1). Inspectors surveyed for the presence of more than 100 different pathogens and other pests associated with 31 different host crops. Around 25% of the inspected fields were found to have at least one pest of concern. The top three diseases observed were common smut of corn (*Ustilago maydis*), bacterial leaf blight of carrot (*Xanthomonas campestris* pv. *carotae*), and scape blight of onion (*Botrytis* sp.)(Table 7).

**Figure 1.** Number of fields and acres inspected from 1992 to 2009.

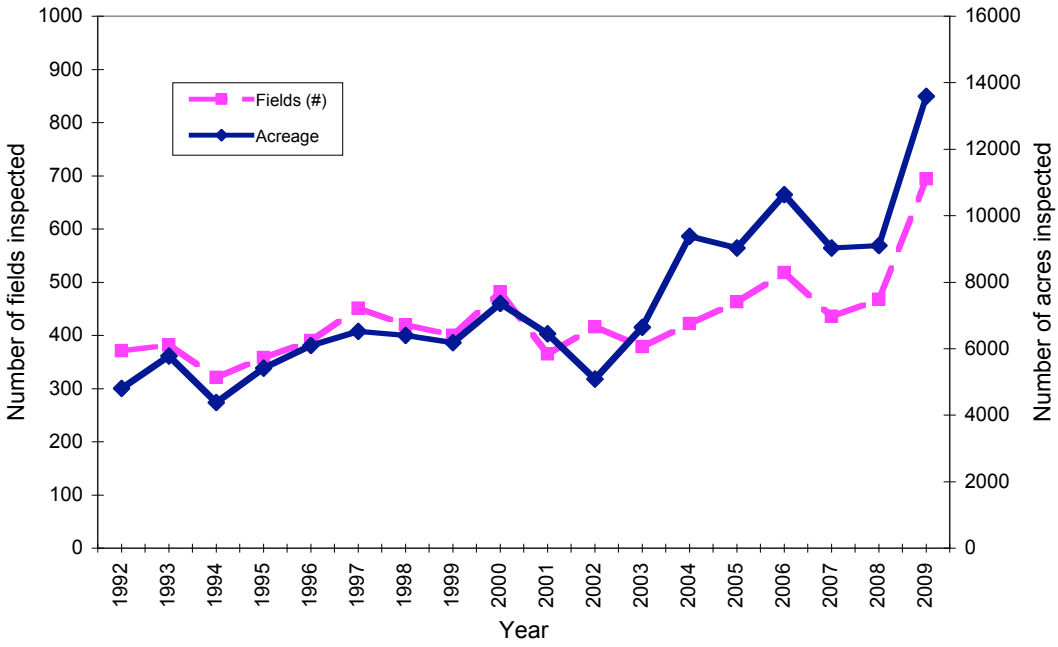

**Table 7.** Seed crop field inspection results by crop and county for 2009**.**

| Crop | County | # fields inspected | Acreage inspected | Pests of concern detected (No. of fields) |
|---|---|---|---|---|
| Alfalfa (*Medicago sativa*) | Morrow | 3 | 159 | |
| | Umatilla | 1 | 44 | |
| Allium - Garlic (*Allium sativum*) | Crook | 5 | 184.5 | *Botrytis* sp. (1) |
| | Jefferson | 18 | 457.75 | *Botrytis* sp. (2) |
| | Marion | 4 | 73 | |
| | Morrow | 5 | 256.4 | |
| Allium - Leek (*Allium porrum*) | Linn | 2 | 10.7 | *Sclerotium cepivorum* (1) |
| | Marion | 2 | 8 | |
| Allium - Onion (*Allium cepa*) | Jefferson | 2 | 24.1 | *Botrytis* sp. (1), *Sclerotium cepivorum* (1) |
| | Linn | 2 | 12 | *Sclerotium cepivorum* (1) |
| | Malheur | 9 | 64.2 | |
| | Marion | 21 | 117.9 | *Botrytis* sp. (9) |
| | Sherman | 1 | 16 | *Botrytis* sp. (1) |
| Bean (*Phaseolus vulgaris* | Benton | 1 | 5 | |
| | Lane | 2 | 11 | |
| | Malheur | 46 | 1,009.8 | |
| | Umatilla | 1 | 2 | |
| Beta – Table beet (*Beta vulgaris*) | Yamhill | 1 | 2 | |
| Beta - Swiss chard (*Beta vulgaris*) | Marion | 1 | 10 | |
| Carrot (*Daucus carota*) | Clackamas | 1 | 40 | |
| | Crook | 8 | 207 | *Xanthomonas campestris* pv. *carotae* (2) |
| | Deschutes | 7 | 166 | |
| | Jefferson | 113 | 2,799 | *Xanthomonas campestris* pv. *carotae* (41), *Alternaria radicina*(10*)* |
| | Malheur | 18 | 25.01 | *Xanthomonas campestris pv. carotae (8), Alternaria radicina (2)* |
| | Marion | 1 | 2 | |
| | Union | 1 | 30 | |
| Chicory (*Cichorium* sp.) | Jefferson | 2 | 8.5 | |
| | Marion | 8 | 18.72 | |
| Clover (*Trifolium* sp.) | Benton | 2 | 102 | |
| | Linn | 2 | 125 | *Cirsium arvense* (1) |
| | Malheur | 1 | 20 | |
| | Marion | 3 | 100 | |
| | Polk | 2 | 90 | *Cirsium arvense* (2) |
| | Washington | 3 | 169 | |
| | Yamhill | 11 | 796 | *Cirsium arvense* (4*), Cuscuta* spp. (1) |
| Coriander (*Coriandrum sativum*) | Benton | 1 | 10 | |
| | Jefferson | 2 | 55 | |
| | Lane | 5 | 174 | |
| | Linn | 1 | 40 | |
| | Marion | 1 | 6.2 | |
| Corn (*Zea mays*) | Josephine | 1 | 1 | |
| | Malheur | 34 | 539.3 | *Ustilago maydis* (17), High plains virus (3) |
| | Morrow | 18 | 278.6 | *Ustilago maydis* (7), |

| | | | | |
|---|---|---|---|---|
| | Umatilla | 93 | 512.77 | *Ustilago maydis* (38), High plains virus (1) |
| Brassica - Cabbage (*Brassica oleracea*) | Benton | 3 | 32.5 | |
| | Clackamas | 5 | 41 | |
| | Douglas | 2 | 15 | |
| | Lane | 12 | 102 | |
| | Linn | 3 | 30.5 | |
| | Malheur | 1 | 8 | |
| | Marion | 21 | 224.6 | *Sclerotinia sclerotiorum* (1) |
| | Polk | 1 | 7 | |
| | Yamhill | 1 | 8 | |
| Brassica – Collard (*Brassica oleracea*) | Malheur | 1 | 12 | |
| Brassica – Kale (*Brassica oleracea*) | Marion | 2 | 11.7 | |
| | Yamhill | 1 | 23.1 | |
| Brassica - Kohlrabi (*Brassica oleracea*) | Marion | 2 | 3.15 | |
| Brassica – Mustard (*Brassica sp*.) | Crook | 1 | 12 | |
| | Deschutes | 1 | 15 | |
| | Jefferson | 1 | 15 | |
| | Malheur | 1 | 12 | |
| Brassica - Turnip (*Brassica rapa)* | Malheur | 6 | 194 | |
| Cucurbit – Cucumber (*Cucumis sativus*) | Marion | 1 | 1 | |
| Dill (*Anethum graveolens*) | Linn | 1 | 7.1 | |
| | Malheur | 2 | 13 | |
| Lettuce (*Lactuca sativa*) | Douglas | 4 | 4.3 | Lettuce mosaic virus (1) |
| Oat (*Avena sativa*) | Polk | 1 | 120 | |
| Orach (*Atriplex hortensis*) | Marion | 1 | 3 | |
| Parsley (*Petroselinum crispum*) | Jefferson | 3 | 37 | |
| | Linn | 2 | 10 | *Septoria apiicola* (2) |
| | Marion | 1 | 10 | *Septoria apiicola* (1) |
| Parsnip (*Pastinaca sativa*) | Marion | 1 | 23.1 | |
| Pea (*Pisum sativum*) | Clackamas | 2 | 15 | *Peronospora viciae* (1) |
| | Lane | 10 | 88.9 | *Peronospora viciae* (4). Pea enation mosaic virus (5), Pea seedborne mosaic virus (1) |
| | Linn | 4 | 106 | *Peronospora viciae* (1). Pea enation mosaic virus (1) |
| | Malheur | 3 | 118.7 | |
| | Marion | 5 | 90 | *Peronospora viciae* (3) |
| | Polk | 3 | 19 | *Peronospora viciae* (2), Pea enation mosaic virus (2) |
| | Umatilla | 12 | 81 | |
| | Union | 2 | 216 | |
| | Wallowa | 3 | 218 | |
| | Yamhill | 1 | 5 | |
| Paspalum | Marion | 2 | 20 | |
| Radish (*Raphanus sativus*) | Benton | 1 | 19 | |
| | Jefferson | 3 | 29 | |
| | Lane | 6 | 145.9 | |
| | Linn | 3 | 75 | |
| | Malheur | 18 | 385 | |

| | | | | |
|---|---|---|---|---|
| | Marion | 9 | 176.9 | |
| | Polk | 1 | 34.4 | |
| | Yamhill | 3 | 83 | |
| Spinach (*Spinacia oleracea*) | Benton | 1 | 40 | |
| | Lane | 7 | 75.8 | |
| | Marion | 10 | 220.5 | |
| | Polk | 1 | 30 | |
| | Union | 1 | 20 | |
| | Yamhill | 1 | 30 | |
| Sunflower (*Helianthus annuus*) | Marion | 4 | 23 | *Cirsium arvense* (1) |
| | Morrow | 2 | 221 | |
| | Umatilla | 3 | 10.78 | |
| | Union | 21 | 1204 | |
| Tomato (*Lycopersicon esculentum*) | Jackson | 1 | 1 | |
| | Josephine | 3 | 2.25 | |
| Total: 31 crops | 20 counties | 694 fields | 13,582 acres | 25% of the inspected fields with at least one pest of concern |

## Laboratory Seed Testing

### Export seed

In 2009, Plant Health staff conducted tests to detect specific seed-borne fungi, bacteria, nematodes, viruses, pests, and other miscellaneous problems. Seed were tested according to standard, officially accepted protocols for the target organism(s). A total of 9,080 different tests were conducted on 5,386 seed lots from more than 15 different crops, mainly grass and vegetable seed. This represents a 12% decrease from 2008. About 5.1% of the lots tested positive for one or more organisms of regulatory concern (Table 8). The lots were tested at the request of Oregon seed exporters to meet the phytosanitary requirements of their international and interstate customers.

### Endophyte testing

In 2009, the Plant Health Laboratory received 134 seed lots of forage grass seed varieties to be tested for the presence of the endophyte fungus, *Epichloe* sp. The number of testing requests was virtually the same as in 2008. 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. Twenty-six seed lots tested positive for *Epichloe* sp. and were ineligible to receive the endophyte tag.

**Table 8.** Laboratory tests conducted on grass, vegetable, and other seed lots in 2009.

| Pathogen/pest tests | # Seed lots tested | # Seed lots passed | # Seed lots failed |
|---|---|---|---|
| **Pests and Diseases** | **5,030** | **4,948** | **82** |
| **Fungi:** | | | |
| Israel wash | 71 | 65 | 6 |
| Korea wash | 598 | 574 | 24 |
| *Tilletia* sp. | 1186 | 1164 | 22 |
| *Urocystis* sp. | 88 | 87 | 1 |
| *Ustilago* sp. | 14 | 14 | 0 |
| *Gloeotinia* sp. | 191 | 172 | 19 |
| Grow-out (*Phoma, Kabatiella*) | 51 | 51 | 0 |
| Other | 44 | 42 | 2 |
| **Fungi total:** | **2,243** | **2,169** | **74** |

| | | | |
|---|---|---|---|
| **Nematodes:** | | | |
| *Anguina* sp. | 724 | 716 | 8 |
| *Subanguina* sp. | 0 | 0 | 0 |
| *Ditylenchus* sp. | 110 | 110 | 0 |
| Other | 566 | 543 | 23 |
| **Nematode total:** | **1,400** | **1,369** | **31** |
| **Bacteria:** | | | |
| *Corynebacterium rathayi* | 202 | 198 | 4 |
| *Clavibacter* sp. | 23 | 10 | 13 |
| *Pseudomonas* sp. | 35 | 25 | 10 |
| *Xanthomonas* sp. | 31 | 31 | 0 |
| **Bacteria total:** | **291** | **264** | **27** |
| **Weeds and parasitic seed plants:** | | | |
| *Orobanche minor* | 82 | 82 | 0 |
| *Glyceria declinata* | 27 | 27 | 0 |
| **Weeds and parasitic seed plants total:** | **109** | **109** | **0** |
| **Viruses** | **7** | **6** | **1** |
| **Grand Total** | **9,080** | **8,865** | **215** |

## Official certification and testing programs

### Dutch Elm Disease

Dutch elm disease (DED), a deadly tree disease caused by the fungus *Ophiostoma novo-ulmi*, has been found in Oregon's Willamette Valley. It was first detected in 1978 in Portland. Its normally rapid spread has been slowed by a diligent survey and eradication program that is supported by a state quarantine. Because of budgetary constraints, the Plant Health Section referred all testing for DED to the Oregon State University Plant Clinic. Thus, we did not receive or test any elm samples for DED.

### Virus Certification of Nursery Stock

Twenty-three nurseries participated in Oregon's virus ornamental and fruit tree certification program in 2009. *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. All of the participating nurseries, except for one, grow their materials in the Willamette Valley.

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 7,949 samples were tested, down 4% from 2008. About 0.3% of the field samples were PDV-positive, 0.4% PNRSV-positive and 0.0% TmRSV-positive for this season.

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.

In 2009, the Plant Health Section also entered into a pilot study with USDA APHIS to examine the possibility of using a systems approach for virus certification of ornamental and fruit tree nursery stock. The Pennsylvania and Michigan Departments of Agriculture are also participating in the study. The three states are working together to develop a common regulatory infrastructure, to identify volunteer nurseries for the study, and to develop research questions that can be asked by the study. The pilot study began in September 2009 and is funded through August 2010, with the possibility of renewal.

**Blueberry Virus Testing**

We continued the official testing program of blueberry nursery stock for blueberry scorch virus (BlScV) and blueberry shock virus (BlShV) in 2009. 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. This year, 27,025 leaf samples were tested, up 8% from 2008. About 3% of the samples tested were infected with BlShV. The infected samples came from three nurseries. The nursery owners were informed of the positive samples. No samples were positive for BlScV.

## Survey and Eradication Programs

***Phytophthora ramorum* - Curry County**

The ODA *Phytophthora ramorum* quarantine area in Curry County remained at 162-mi$^2$ in 2009. Surveys during the course of the year detected 102 new infected trees on 59 sites, all within the existing quarantine boundary. Most new sites included only one or a few infected trees. Thus, a total of 20 newly infested acres were found, a decrease from the previous two years. The ODA and its cooperators, the Oregon Department of Forestry (ODF), USDA Forest Service, and Oregon State University, continue to work with affected landowners to eradicate *P. ramorum* from infested areas. Treatment consists of cutting, piling, and burning all infected plants and all asymptomatic susceptible plants within 300- or more feet of each infection center. Tan oak stumps are treated with herbicide to prevent re-sprouting. The sites are monitored periodically after treatment to determine if the pathogen has been eradicated.

In 2009, we continued to monitor the efficacy of the treatments as was done in 2008. Survey plots were placed within each treated site with each plot centered upon stumps from known infected trees. Within each plot, at least five plant samples were collected; symptomatic plants were collected when possible. Soil samples were also collected, with samples collected at regular intervals according to a pre-established grid. All samples were processed according to USDA-approved testing methods. Surveyors also recorded information on re-vegetation within the treated sites.

Monitoring has been completed at 25 sites treated between 2001 and 2008. Sixty-eight percent of the sites are *P. ramorum*-free. On 32% of the sites *P. ramorum* can only be recovered from soil, while on 16% it can be recovered from vegetation. Sites with *P. ramorum*-positive vegetation also always had *P. ramorum*-positive soil samples. Positive

samples were recovered from sites that had been treated within the past 2-years, and most were from sites that were treated 1-year prior to sampling. Since 2007, we have experienced several treatment delays on infected sites due to funding issues for the eradication and containment effort. This monitoring effort is ongoing and is being supported with State funds.

In Curry County, we continue to work with landowners and other stakeholders to develop innovative ways to limit the spread of *P. ramorum* and help eventually eradicate the disease. We are currently working with a group that is interested in developing new commercial uses for tanoak. The eventual goal is to provide landowners with incentives to remove tanoak, particularly within areas at high risk for disease spread.

***P. ramorum* – Nurseries**

As of 12/31/09, 25,593 samples from 621 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 270 of the sites surveyed or 43.5%. *P. ramorum* was detected at six sites (1.0% of all sites surveyed) on *Pieris japonica* (three blocks), *Pieris* (one block), *Pieris* 'Flaming Silver' (one block), *Rhododendron* 'Baden Baden' (one block), *Viburnum tinus* (one block), *Camellia sasanqua* (one block), and *Camellia* (two blocks). Delimitation surveys within the nurseries detected additional positives on *Rhododendron* cultivars PJM Compacta and Cinnkey, *Rhododendron* spp., *P. japonica* 'Purity', *Camellia* 'Miss Tingley', in the soil, and in the potting media associated with an infected plant. All of the nurseries have undergone the USDA Confirmed Nursery Protocol (CNP). One nursery for which this was the fourth consecutive year *P. ramorum* had been detected was placed under emergency quarantine by the ODA. This nursery remains under an Administrative Directive that strictly regulates how plants are grown at and moved from the site. This has included the adoption of mandatory best management practices by the nursery to reduce their level of *Phytophthora* disease present.

In addition to the federally required nursery certification survey, the ODA performed additional inspections at nurseries that grow and/or ship *Rhododendron* and *Camellia* out of state. When suspicious symptoms were found, samples were collected for laboratory testing as described above. As of 12/31/09, 5,168 additional samples were collected from 246 high-risk nurseries. *Phytophthora* species were detected at 89 of these sites (36.2%). No *P. ramorum* was found.

The ODA also conducted trace out investigations at 52 sites with 356 samples collected for testing. *Phytophthora* species were detected at 20 of those sites with no *P. ramorum* detected. Finally, the ODA has inspected seven incoming shipments of host and associated host species for *P. ramorum*. No *Phytophthora* species were detected in the shipments.

The data from the nursery certification and high-risk surveys has 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.

**Grower Assisted Inspection Program**

In 2007, the Plant Health Section and Nursery and Christmas Tree Inspection Program (Plant Division) received a grant from the USDA Natural Resources Conservation Service to implement a novel grower assisted inspection program (GAIP) in Oregon's nurseries. The GAIP targets *Phytophthora ramorum* and other related *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.

Twenty nursery farms initially volunteered to participate in the GAIP, with 16 farms remaining with the program through 2009. These first three years were considered the pilot study for the GAIP program. To measure the efficacy of the GAIP at the nurseries, we used the results from the federally required certification surveys for *P. ramorum*. This provided for a qualitative analysis of the efficacy of the program at managing *Phytophthora* diseases within nurseries.

Based on our results, the longer a BMP is in place the more efficacious it is against *Phytophthora* diseases. Thus, it may take several seasons for BMP to substantially reduce *Phytophthora* diseases at a nursery with a substantial endemic pathogen population. Also, nursery plant production processes factor significantly into how prevalent *Phytophthora* is within the nursery (Figure 2). Nurseries that grow containerized stock appear to be at greater risk for *Phytophthora* disease problems. Finally, nurseries that grow *Rhododendron* are at higher risk for *Phytophthora* diseases as well. Although most samples were collected from *Rhododendron*, the total number of *Phytophthora*-infected samples was disproportionately high compared to other species (Table 9).

Researchers from Oregon State University and USDA-ARS are presently conducting a quantitative analysis of the impact of the GAIP within participating nurseries at three of the mandatory CCP identified in their previous research, water, soil and potting media, and used containers. For subsequent years of the GAIP, we plan to modify the monitoring of plants to remove the bias of the previous sampling scheme. Also, we will collect samples systematically from the mandatory CCP to better determine the efficacy of the BMP adopted by the nurseries.

Funding for this GAIP pilot study ends February 28, 2010. The ODA is working with industry and USDA APHIS to ensure continuity of the program.

**Figure 2.** The percentage of all samples testing ELISA-positive for *Phytophthora* by the predominant nursery stock production system used at the GAIP nurseries.

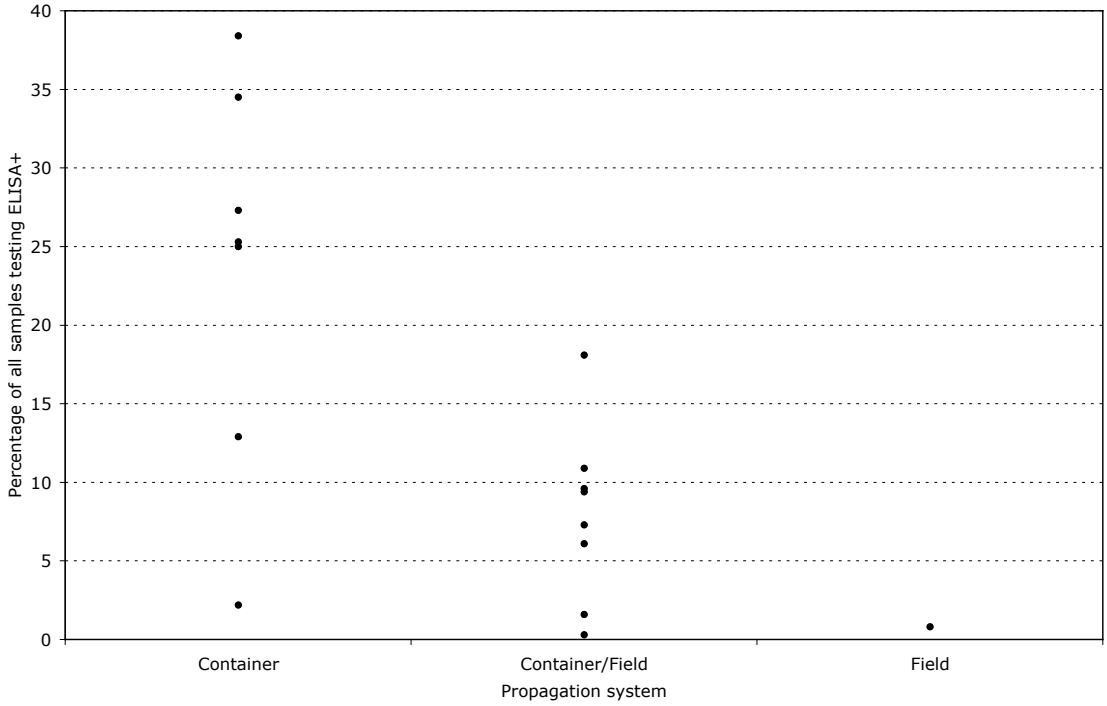


**Table 9.** Number of samples collected each year from *Rhododendron, Camellia, Pieris, Viburnum*, *Kalmia*, and other genera that tested ELISA-positive for *Phytophthora* over the course of the GAIP pilot study.

| Genus | 2007 | | 2008 | | 2009 | |
|---|---|---|---|---|---|---|
| | ELISA+ | ELISA- | ELISA+ | ELISA- | ELISA+ | ELISA- |
| ***Camellia*** | 12 | 14 | 3 | 17 | 0 | 24 |
| *Kalmia* | 12 | 27 | 16 | 31 | 4 | 17 |
| *Pieris* | 21 | 207 | 24 | 243 | 23 | 192 |
| *Rhododendron* | 205 | 670 | 244 | 671 | 191 | 573 |
| *Viburnum* | 8 | 188 | 2 | 189 | 3 | 145 |
| Other genera | 33 | 751 | 17 | 522 | 28 | 420 |
| TOTAL | 291 | 1857 | 306 | 1673 | 249 | 1371 |

# Other Programs

## Columbia root knot nematode

Nursery inspectors collected 83 soil samples for nematode testing from Oregon production nurseries in 2009. This annual survey is conducted at the request of Canadian agricultural officials to demonstrate that Oregon production nurseries are free of CRKN. Plant-parasitic nematodes were detected in 61% of the samples with *Pratylenchus* spp. being the most abundant (present in 53% of the samples). *Meloidogyne hapla* was detected in four samples. No Columbia root knot nematodes (CRKN, *M. chitwoodii*) were detected in Oregon nurseries based on morphometric analysis of juveniles. Other nematodes detected included *Paratylenchus*, *Xiphinema*, *Mesocriconema*,

*Tylenchorhynchus*, *Trichodorus*, *Heterodera*, *Rotylenchus*, *Scutellonema*, and *Helicotylenchus,* in order of most to least abundant.

**Plant Health Laboratory Diagnostics**
Plant samples are submitted to Plant Health for disease assessment to meet export requirements or for general diagnosis. In 2009, 55 samples were submitted to meet export requirements and 34 for general diagnostics. All export samples were free from pathogens of concern. Samples for general diagnostics had pest problems caused by fungi (24%), bacteria (6%) and virus (6%). Twenty-four percent of the samples had symptoms from abiotic or environmental problems. No pests were detected in 38% of the samples. Finally, two samples were submitted for nematode testing for certification programs and 20 samples were tested to meet Oregon importation requirements.

**Quarantines and Control Area Orders**
Two regulations were reviewed and updated in 2009. The control area order for white rot in Malheur County (OAR 603-052-0347) was amended to update the list of Idaho counties and add an Arizona county from which vegetative propagative material may be imported. Disposal requirements for cull onions imported from outside of the control area were added. Finally, control and eradication methods for Allium white rot detections in a Malheur County were updated to reflect the newest disease management methods. The grape quarantine (OAR 603-052-0051) was amended to list specific harmful organisms recognized as a threat to the State's wine-grape and nursery industries, update the list of commodities covered by the quarantine, and specify measures that must be taken if a harmful organism is found in Oregon. It also specifies precautions that must be taken with table grapes and wine grapes for pressing, to mitigate the risk of introducing vine mealybug.

**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, 106 permits were reviewed; 62 for live pests and noxious weeds, five for plants for post-entry quarantine, eight for prohibited plants imported for experimental purposes, six for soil, and 25 for genetically modified organisms. Staff members also participated in federal inspections of facilities where permitted organisms, such as genetically engineered organisms or a regulated pathogen, were to be received.

**National Clean Plant Network**
The Plant Health Section is taking 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 two commodity groups that are a part of the NCPN, the Fruit Tree Clean Plant Network (FTCPN) and the Grapevine Clean Plant Network (GCPN). The ODA has representatives on the Tier 2 Governing Boards for both the FTCPN and

GCPN. Additional commodity groups including berries/small fruits, hops, and citrus, have expressed interest in joining the NCPN.

One goal of the FTCPN is to develop a harmonized, national standard for the virus certification of *Malus, Prunus, Pyrus, Chaenomeles,* and *Cydonia* nursery stock. Members of the Plant Health Section participated in the FTCPN subcommittee that developed a draft of the proposed national standard. The ODA will also be a participant in a pilot study to examine the efficacy of using a systems approach for virus certification of ornamental and fruit tree nursery stock. 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.

**Publications**

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