



Plant Diseases in Kentucky

**Plant Disease Diagnostic Laboratory
Summary**

2009

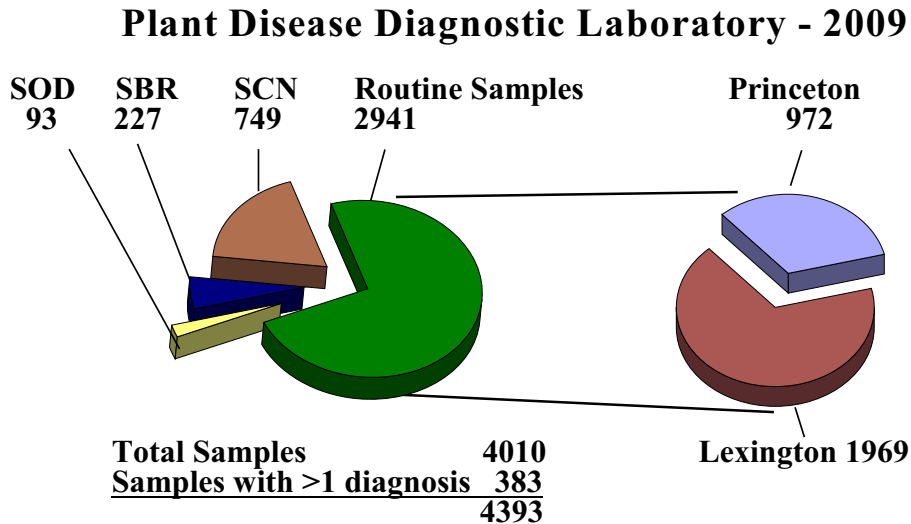
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INTRODUCTION

The Plant Disease Diagnostic Laboratory (Lexington and Princeton) handled 3261 plant samples and 749 nematode soil samples during 2009. Plant samples with more than one problem numbered 383 bringing the total number of actual diagnoses to 4393. The Lexington Laboratory diagnosed 2062 specimens. Of that number there were 1969 routine plant samples and 93 samples from commercial nurseries from the survey work for the Sudden Oak Death (SOD) pathogen. The SOD samples are included in the total number of samples in Figure 1 below, within the totals for the various woody plant samples, and in a summary report on page 24. The Princeton Laboratory's specimens totaled 1948: of that number 972 were plant samples, 227 were Soybean Rust (SBR) sentinel plot samples and 749 were soil samples submitted exclusively for soybean cyst nematode analysis. The SBR samples are included in the total number of samples in Figure 1 below and in the summaries for soybean and kudzu. In addition to the specimens processed in the laboratory, 202 cases were also submitted in 2009 through the web-based UK Digital Consulting System for consultation with the Diagnosticians and Extension Specialists (see Table 10, page 22). Plant samples plus SCN samples are summarized in Figure 1 below:



NATURE OF WORK

Plant disease diagnosis is an ongoing educational and research activity of the U.K. Department of Plant Pathology. We maintain two branches of the Plant Disease Diagnostic Laboratory, one on the U.K. campus in Lexington, and one at the U.K. Research and Education Center in Princeton.

Making a diagnosis involves a great deal of research into the possible causes of the plant problem. Most visual diagnoses involve microscopy to determine what plant parts are affected and to identify the microbe(s) involved. In addition, many specimens require special tests such as moist chamber incubation, culturing, enzyme-linked immunosorbent assay (ELISA), electron microscopy, nematode extraction, or soil pH and soluble salts tests. The laboratory also uses the polymerase-chain-reaction (PCR) technique for identification of certain pathogens. Computer-based laboratory records are maintained to provide information used for conducting plant disease surveys, identifying new disease outbreaks, and formulating educational programs. In addition, information from the laboratory forms the basis for timely news of plant disease problems through the Kentucky Pest News newsletter, radio and television tapes, and plant health care workshops. Our laboratories currently meet homeland security rules that require reporting of all diagnoses of plant diseases to USDA-APHIS on a real-time basis. To assist County Extension Agents and Specialists in dealing with plant disease issues, we also

operate a web-based UK Digital Consulting System utilizing photographic images. The images can be used to help determine how and where best to collect samples for submission to the laboratory, as well as general or specific advice on a wide range of topics.

WEATHER SUMMARY

January: Above normal rainfall and below normal temperatures.

The month ended with a winter storm that inundated the Bluegrass State with ice and caused over 600,000 residents to lose power. Some areas received a combination of over an inch of ice plus 6 inches of snow and sleet from this one storm. The arctic air masses that invaded the region throughout most of the period caused the winter to remain colder than average as January was the 4th straight month to report below normal temperatures.

Temperatures for the period averaged 30 degrees across the state which was 3 degrees below normal. High temperatures averaged from 39 in the West to 38 in the East. Departure from normal high temperatures ranged from 5 degrees below normal in the West to 1 degree below normal in the East. Low temperatures averaged from 23 degrees in the West to 23 degrees in the East. Departure from normal low temperature ranged from 2 degrees below normal in the West to 1 degree above normal in the East.

Rainfall for the period totaled 5.09 inches statewide, which was 1.37 inches above normal. Rainfall totals by climate division: West 4.26 inches, Central 5.67 inches, Bluegrass 4.64 inches and East 5.61 inches, which was 0.55, 1.65, 1.20 and 1.91 inches, respectively, above normal.

February: Below normal rainfall and near normal temperatures

Temperatures for the period averaged 38 degrees across the state which was near normal. High temperatures averaged from 48 in the West to 48 in the East. Departure from normal high temperatures ranged from 3 degrees below normal in the West to 3 degrees above normal in the East. Low temperatures averaged from 31 degrees in the West to 30 degrees in the East. Departure from normal low temperature ranged from 3 degrees above normal in the West to 4 degrees above normal in the East.

Rainfall for the period totaled 2.67 inches statewide, which was 1.08 inches below normal. Rainfall totals by climate division: West 3.08 inches, Central 2.92 inches, Bluegrass 2.61 inches and East 2.23 inches, which was 0.96, 1.21, 0.83 and 1.24 inches, respectively, below normal.

March: Above normal temperatures and below normal rainfall

Temperatures for the period averaged 48 degrees across the state which was 2 degrees above normal. High temperatures averaged from 62 in the West to 59 in the East. Departure from normal high temperatures ranged from 1 degree above normal in the West to 5 degrees above normal in the East. Low temperatures averaged from 42 degrees in the West to 39 degrees in the East. Departure from normal low temperature ranged from 6 degrees above normal in the West to 5 degrees above normal in the East.

Rainfall for the period totaled 3.43 inches statewide, which was 1.14 inches below normal. Rainfall totals by climate division: West 3.35 inches, Central 3.35 inches, Bluegrass 2.53 inches and East 3.14 inches, which was 1.33, 1.53, 1.82 and 0.26 inches, respectively, below normal.

April: Slightly above normal temperatures and rainfall

Temperatures for the period averaged 55.5 degrees across the state which was 0.3 degrees above normal. High temperatures averaged from 68 in the West to 67 in the East. Departure from normal high temperatures ranged from 2 degrees below normal in the West to near normal in the East. Low temperatures averaged from 48 degrees in the West to 48 degrees in the East. Departure from normal low temperature ranged from 1 degree above normal in the West to 2 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 4.51 inches statewide, which was 0.32 inches above normal. Precipitation totals by climate division: West 5.07 inches, Central 4.81 inches, Bluegrass 4.97 inches and East 3.89 inches, which was 0.54, 0.61, 1.08 and 0.06 inches, respectively, above normal.

May: Slightly above normal temperatures and above normal rainfall

Temperatures for May 2009 averaged 64.9 degrees across the state which was 0.5 degrees above

normal. High temperatures averaged from 76 in the West to 74 in the East. Departure from normal high temperatures ranged from 5 degrees below normal in the West to 1 degree below normal in the East. Low temperatures averaged from 57 degrees in the West to 56 degrees in the East. Departure from normal low temperature ranged from 1 degree above normal in the West to 1 degree above normal in the East.

Precipitation (liq. equ.) for the period totaled 6.33 inches statewide, which was 1.28 inches above normal. Precipitation totals by climate division: West 6.53 inches, Central 6.78 inches, Bluegrass 5.20 inches and East 6.60 inches, which was 1.54, 1.52, 0.29 and 1.75 inches, respectively, above normal.

June: Above normal temperatures and rainfall

Temperatures for the period averaged 74 degrees across the state which was 1.5 degrees above normal. High temperatures averaged from 87 in the West to 82 in the East. Departure from normal high temperatures ranged from 0 degrees from normal in the West to 1 degree below normal in the East. Low temperatures averaged from 66 degrees in the West to 62 degrees in the East. Departure from normal low temperature ranged from 3 degrees above normal in the West to 0 degrees from normal in the East.

Rainfall for the period totaled 5.77 inches statewide, which was 1.51 inches above normal. Rainfall totals by climate division: West 3.22 inches, Central 7.56 inches, Bluegrass 5.69 inches and East 6.49 inches, which was, respectively, 0.77 inches below normal, 3.20 inches above normal 1.34 inches above normal and 2.14 inches above normal.

July: Below normal temperatures and above normal rainfall

July 2009 will go into the record books as the 2nd coolest and 8th wettest July in the past 115 years for the Bluegrass State.

Temperatures for the period averaged 72 degrees across the state which was 4 degrees below normal. High temperatures averaged from 83 in the West to 80 in the East. Departure from normal high temperatures ranged from 7 degrees below normal in the West to 6 degrees below normal in the East. Low temperatures averaged from 65 degrees in the West to 63 degrees in the East. Departure from normal low temperature ranged from 1 degree below normal in the West to 2 degrees below normal in the East.

Precipitation (liq. equ.) for the period totaled 6.57 inches statewide, which was 2.17 inches above normal. Precipitation totals by climate division: West 7.54 inches, Central 6.78 inches, Bluegrass 5.92 inches and East 6.09 inches, which was 3.43, 2.26, 1.40 and 1.64 inches, respectively, above normal.

August: Below normal temperatures and below normal rainfall

Temperatures for the period averaged 74 degrees across the state which was 1 degree below normal. High temperatures averaged from 85 in the West to 82 in the East. Departure from normal high temperatures ranged from 3 degrees below normal in the West to 2 degrees below normal in the East. Low temperatures averaged from 65 degrees in the West to 64 degrees in the East. Departure from normal low temperature ranged from near normal in the West to 1 degree above normal in the East.

Rainfall for the period totaled 3.31 inches statewide, which was 0.27 inches below normal. Rainfall totals by climate division: West 3.29 inches, Central 1.78 inches, Bluegrass 3.76 inches and East 4.19 inches, which was +0.11, -1.74, +0.04 and +0.29 inches, respectively, from normal.

September: Above normal temperatures and much above normal rainfall

September 2009 was the 10th wettest September in the past 115 years.

Temperatures for the period averaged 69 degrees across the state which was 1 degree above normal. High temperatures averaged from 80 in the West to 77 in the East. Departure from normal high temperatures ranged from 1 degree below normal in the West to 1 degree below normal in the East. Low temperatures averaged from 62 degrees in the West to 60 degrees in the East. Departure from normal low temperature ranged from 4 degrees above normal in the West to 4 degrees above normal in the East.

Rainfall for the period totaled 5.55 inches statewide, which was 2.07 inches above normal. Rainfall totals by climate division: West 5.11 inches, Central 5.58 inches, Bluegrass 6.15 inches and East 5.45 inches, which was 1.77, 1.64, 2.90 and 1.99 inches, respectively, above normal.

October: Below normal temperatures and much above normal rainfall

October 2009 was the 3rd wettest October in the past 115 years.

Temperatures for the period averaged 53.8 degrees across the state which was 2.8 degrees below normal. High temperatures averaged from 62 in the West to 63 in the East. Departure from normal high temperatures ranged from 8 degrees below normal in the West to 5 degrees below normal in the East. Low temperatures averaged from 46 degrees in the West to 45 degrees in the East. Departure from normal low temperature ranged from 1 degree below normal in the West to near normal in the East.

Rainfall for the period totaled 6.38 inches statewide, which was 3.25 inches above normal. Rainfall totals by climate division: West 9.08 inches, Central 7.86 inches, Bluegrass 5.70 inches and East 3.70 inches, which was 5.91, 4.66, 2.77 and 0.77 inches, respectively, above normal.

November: Above normal temperatures and much below normal rainfall

Temperatures for the period averaged 48.9 degrees across the state which was 2.5 degrees above normal. High temperatures averaged from 62 in the West to 60 in the East. Departure from normal high temperatures ranged from 2 degrees above normal in the West to 4 degrees above normal in the East. Low temperatures averaged from 41 degrees in the West to 38 degrees in the East. Departure from normal low temperature ranged from 3 degrees above normal in the West to 4 degrees above normal in the East.

Rainfall for the period totaled 1.11 inches statewide, which was 2.98 inches below normal. Rainfall totals by climate division: West 1.28 inches, Central 0.90 inches, Bluegrass 1.02 inches and East 1.20 inches, which was 3.24, 3.37, 2.58 and 2.69 inches, respectively, below normal.

December: Slightly below normal temperature and below normal precipitation

Temperatures for the period averaged 36 degrees across the state which was 1 degree below normal. High temperatures averaged from 40 in the West to 41 in the East. Departure from normal high temperatures ranged from 5 degrees below normal in the West to 3 degrees below normal in the East. Low temperatures averaged from 28 degrees in the West to 27 degrees in the East. Departure from normal low temperature ranged from 1 degree below normal in the West to 4 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 4.01 inches statewide, which was 0.37 inches below normal. Precipitation totals by climate division: West 3.48 inches, Central 3.63 inches, Bluegrass 3.70 inches and East 4.89 inches, which was -0.33, -0.32, +0.1, and +0.6 inches, respectively, from normal.

CROP SUMMARIES

Tobacco: The number of tobacco samples for 2009 (364) was slightly higher than last year's total (326), which was the lowest total since accurate records were first recorded in 1976, but below the 2007 total (374). There have been fewer tobacco samples in the last three years than in 2006 (536) and 2005 (528), 2005 being the first year of the Tobacco Quota Buyout Program. For the second year in a row Kentucky was not the first state with a confirmed case of Blue mold (*Peronospora tabacina*). For 2009 Pennsylvania had the first confirmed case on June 5 and Kentucky's first confirmed case was in Clark Co. on July 16. With the cool, wet weather came a significant increase in Blue mold and Black Shank (*Phytophthora parasitica* var. *nicotianae*) samples.

The number of cases of Tomato Spotted Wilt virus were down significantly from last year. Target Spot (*Thanatephorus cucumeris*) continued to be a significant problem in the field.

Other agronomic crops:

Corn: Due to the much above normal precipitation in September and October, harvest was delayed and several samples with ear/kernel rot (especially Diplodia ear rot (*Diplodia maydis*)) were seen. A couple of samples with Southern rust (*Puccinia polysora*) and a few with Northern corn leaf blight (*Setosphaeria turcica*) were also seen.

Soybean: Australasian Soybean Rust (SBR; *Phakopsora pachyrhizi*) was detected in Kentucky on September 11, 2009, more than a month earlier than the first find of 2008 (October 16), and 9 days ahead of the 2007 date (September 20). The fungus was found on soybean leaves within the sentinel plot located in Henderson Co. In all, SBR was found on 17 soybean samples; no SBR was found on kudzu. Leaf blight (*Cercospora kikuchii*) was also common due to the cool, wet weather.

Small Grains: Wheat Streak Mosaic Virus and Take-all (*Gaeumannomyces graminus* var. *tritici*) were the most common diseases of wheat for 2009.

Forages: Leptosphaerulina leaf spot (*Leptosphaerulina briosiana*) and Spring black stem (*Phoma medicaginis* var. *medicaginis*) were the most common diseases on alfalfa samples while Gray leaf spot of millet (*Pyricularia grisea*) was the only other forage disease of note.

Fruit and Vegetable Plant Disease Observations:

Of the more than 3,000 plant specimens examined in 2009, approximately 25% were fruits and vegetables, and 40% of those were from commercial growers. Although the growers are not charged for plant disease diagnoses at U.K., the estimated direct annual expenditure to support diagnosis of fruit and vegetable specimens by the laboratory is \$25,000, excluding U.K. physical plant overhead costs. During recent years we have acquired funds from Kentucky Integrated Pest Management and the Southern Plant Diagnostic Network to help defray some of the laboratory operating costs. In addition, approximately 39% of digital cases in 2009 involved fruit and vegetable diseases and disorders.

The 2009 growing season in Kentucky was an excellent one for most fruit crops, with the exception of apples and grapes, but was difficult for most vegetable crops due to intense disease pressure during the summer.

New, Emerging, and Problematic Fruit and Vegetable Diseases in Kentucky:

Pierce's disease of grape caused by *Xylella fastidiosa* was detected in vineyards in several Kentucky counties using a combination of ELISA and PCR testing methods. This disease was first detected in Kentucky in 2001 and has only rarely been seen until this year. Growers and Extension Agents should continue careful scouting for symptoms and submit samples from any suspect vines to the UK PDDL. Early detection and prompt removal of diseased vines is critical in preventing spread of Pierce's disease.

Plum pockets disease (*Taphrina communis*) was an unusual find for the second consecutive year. Although the related disease, peach leaf curl, is a common occurrence, plum pockets is seen less often in Kentucky. Leaves and developing shoots become thickened, curled and deformed; infected fruits are much larger than normal and hollow.

Thread blight (*Corticium stevensii*) is not a new disease, but is only seen in years with abundant moisture and cooler temperatures. It was diagnosed on apple in several eastern Kentucky counties; in one location, it was also seen on filbert. This disease blights the leaves, matting them together with fungal mycelium; the fungus produces thickened mycelial threads (rhizomorphs) and over-wintering sclerotia on infected twigs.

Diseases caused by Oomycete pathogens—Phytophthora and Pythium diseases of root/crown, foliar Phytophthora blights and downy mildews---can be problematic in most years in locations with wet soils, heavy irrigation, or susceptible crops grown in shade. The persistent cool, wet weather throughout much of the 2009 growing season, however, favored epidemic levels of certain Oomycete diseases:

Late blight (*Phytophthora infestans*) was officially diagnosed (in the PDDL) on tomato samples from 25 Kentucky counties, and was locally devastating in both commercial and home plantings in some areas. This disease is only rarely seen in Kentucky—the widespread occurrence was truly extraordinary for the state.

Downy mildew was seen commonly on grape and at damaging levels in certain cucurbit plantings. Sentinel (monitoring) plots were useful in early detection of cucurbit downy mildew, enabling UK Plant Pathologists quickly to alert growers of disease potential in their area. Other unusual diagnoses of Phytophthora diseases included Phytophthora root rot of turnip and Phytophthora fruit rot of fig.

Tree Fruit Diseases:

Pome Fruits: Wet weather favored common foliar diseases of apple. Particularly abundant were apple scab (*Venturia inaequalis*), cedar-apple rust (*Gymnosporangium juniperi-virginianae*) and frog-eye leaf spot (*Botryosphaeria obtusa*). Most primary fire blight (*Erwinia amylovora*) infections of apple occurred late in April (April 18-20 and after) with symptoms appearing about one month later. Thread blight (*Corticium stevensii*) was diagnosed on apple in several eastern Kentucky locations (see above).

Stone Fruits: Leaf spot diseases of cherry caused by fungal pathogens *Coccomyces hiemalis* and *Cercospora circumscissa* were seen much more frequently than in the past several years; powdery mildew (*Podosphaera clandestina*) was also common on cherry, causing leaf distortion. Scab (*Cladosporium carpophilum*) and brown rot (*Monilinia fructicola*) were diagnosed on apricot and peach. Spring rains favored the development of peach leaf curl (*Taphrina deformans*), and the related disease plum pockets (*Taphrina communis*) was also diagnosed (see above).

Small Fruit Diseases:

Grapes: Pierce's disease of grape caused by the bacterium *Xylella fastidiosa* was diagnosed in multiple locations (see above). Foliar diseases were common due to wet weather and high humidity throughout the season. Black rot (*Guignardia bidwellii*) was quite common; anthracnose (*Elsinoe ampelina*), downy mildew (*Plasmopara viticola*), powdery mildew (*Uncinula necator*) and a few isolated cases of zonate leaf spot (*Cristulariella moricola*), a disease favored by extremely wet conditions, were diagnosed.

Brambles: Cane blight (*Leptosphaeria coniothyrium*) and spur blight (*Didymella applanata*) were both diagnosed on blackberry canes, while anthracnose (*Elsinoe veneta*) was seen on leaves and canes of blackberry and raspberry. Leaf spots were common on blackberry (*Septoria rubi*, *Cercospora rubi*) and raspberry (*Sphaerulina rubi*). Double blossom disease, also known as rosette (*Cercospora rubi*), was diagnosed in a number of blackberry samples. Root and collar rot caused by *Phytophthora* spp. affected raspberry in wet locations.

Blueberries: Phomopsis dieback (*Phomopsis vaccinii*), leaf spot (*Phyllosticta* spp.), powdery mildew (*Microsphaera vaccinii*) and root and collar rot caused by *Phytophthora* spp. were diagnosed.

Strawberries: Diseases were common, including leaf spot (*Mycosphaerella fragariae*) leaf blight (*Phomopsis obscurans*), anthracnose (*Colletotrichum acutatum*) black root rot (various fungi), red stele (*Phytophthora fragariae*) and crown rot (*Phytophthora cactorum*).

Vegetable diseases:

Beans: Foliar diseases including angular leaf spot (*Phaeoisariopsis griseola*), web blight (*Rhizoctonia solani*) and common bacterial blight (*Xanthomonas phaseoli*) and foliar and pod infections of anthracnose (*Glomerella lindemuthianum*) were favored by wet weather throughout the growing season. Root rot (*Rhizoctonia* sp.) and southern blight (*Sclerotium rolfsii*) were also observed on bean. Southern blight was also seen on peanut from a home garden.

Cucurbits: Cucurbit diseases were plentiful in 2009 and included numerous cases of bacterial wilt (*Erwinia tracheiphila*), which is vectored primarily by the striped cucumber beetle (*Acalymma vittatum*) in cucumber and melon fields. A wide variety of other fungal and bacterial foliar/vine diseases were common in all cucurbit crops: anthracnose (*Colletotrichum orbiculare*), Alternaria leaf blight (*Alternaria cucumerina*), angular leaf spot (*Pseudomonas syringae* pv. *lachrymans*), *Cercospora* leaf spot (*Cercospora citrullina*), powdery mildew (*Podosphaera xanthii* and *Erysiphe cichoracearum*), gummy stem blight (*Didymella bryoniae*) and Plectosporium blight (*Plectosporium tabacinum*). Cucurbit downy mildew (*Pseudoperonospora cubensis*) developed in late summer and became widespread; sentinel (monitoring) plots were useful in early detection of cucurbit downy mildew, enabling UK Plant Pathologists quickly to alert growers of disease potential in their area.

Tomatoes: Although the epidemic of late blight in tomato (see above) eclipsed other tomato problems in many locations, foliar diseases such as early blight (*Alternaria solani*), Septoria leaf spot (*Septoria lycopersici*), leaf mold (*Fulvia fulva*), bacterial spot (*Xanthomonas campestris* pv. *vesicatoria*) and bacterial speck (*Pseudomonas syringae* pv. *tomato*) were also common. Buckeye rot (*Phytophthora nicotianae*) was also seen occasionally on tomato fruits. Timber rot (*Sclerotinia sclerotiorum*) was diagnosed from several locations and was active for a much longer period than usual—another consequence of prolonged cool, wet weather. Southern blight (*Sclerotium rolfsii*) was diagnosed in some areas, and bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*) was found in a number of commercial plantings. Tobacco mosaic virus and tomato spotted wilt virus were also diagnosed.

Peppers: Bacterial spot (*Xanthomonas campestris* pv. *vesicatoria*), southern blight (*Sclerotium rolfsii*), and root rot (*Rhizoctonia* spp., *Pythium* spp.) were seen frequently. Bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*), common on tomato but only occasionally seen on pepper, was found in one location. Pepper mild mottle virus, a potyvirus which produces only mild

foliar symptoms but can cause more severe mottling, mosaic and distortion in fruits, was confirmed via ELISA.

Other vegetables: Bacterial soft rot (*Erwinia chrysanthemi* var. *zoeae*), Stewart's wilt (*Erwinia stewartii*) and northern leaf blight (*Setosphaeria turcica*) were diagnosed on sweet corn. Rhizoctonia root rot (*Rhizoctonia solani*), Cercospora leaf spot (*Cercospora beticola*), bacterial leaf spot (*Pseudomonas syringae*) and southern blight (*Sclerotium rolfsii*) were diagnosed on beet. Common scab (*Streptomyces scabies*) of potato and scurf (*Monilochaetes fuscans*) of sweet potato were diagnosed.

Landscape Plant Disease Observations:

Plant diseases play a significant role in production and maintenance of landscape plants in Kentucky. The first step in appropriate pest management in the landscape and nursery is an accurate diagnosis of the problem. The U.K. Plant Disease Diagnostic Laboratory assists the landscape industry of Kentucky in this effort. To serve their clients effectively, landscape industry professionals, such as arborists, nursery operators, and landscape installation and maintenance organizations need to be aware of recent plant disease history and the implications for landscape maintenance. As previously mentioned, making a diagnosis involves a great deal of research into the possible causes of the plant problem, and many types of testing may be necessary. Like fruit and vegetable samples, the variety of ornamental plant samples received makes diagnosis more difficult.

The digital consulting system is especially useful in providing advice about landscape tree and shrub diseases and disorders because whole plants are difficult to send to the laboratory. In 2009, approximately 30% of digital consulting cases dealt with landscape and nursery plants.

Landscape plant diseases were common this year and included those favored by wet weather (e.g., leaf spot diseases, root rots). The following important or unusual diseases were observed:

Deciduous trees:

- Ash, dogwood, hornbeam, linden, maple, oak, sycamore, walnut and yellowwood anthracnose (*Discula*, *Gloeosporium*, *Gnomonia*, *Kabatella*, *Apiognomonina*) and dogwood spot anthracnose (*Elsinoe*) and blackgum spot anthracnose (*Sphaceloma*)
- Ash, dogwood, cherry, crapemyrtle and tuliptree powdery mildew (*Erysiphe*, *Microsphaera*, *Phyllactinia*, *Podosphaera*)
- Oak leaf blister (*Taphrina*) and Actinopelte leaf spot (*Tubakia*)
- Flowering pear, hawthorn, and flowering crabapple fire blight (*Erwinia*)
- Flowering cherry leaf spot diseases (*Coccomyces*, *Cercospora*, *Xanthomonas*)
- Maple, oak and willow cankers (*Botryosphaeria*, *Cryptodiaporthe*)
- Maple, oak and sycamore bacterial leaf scorch (*Xylella*)
- Maple and smoketree wilt (*Verticillium*)
- Maple leaf spots (*Phyllosticta*, *Cristulariella*) and tar spot (*Rhytisma*)
- Mulberry leaf spot (*Phloeospora*)
- Dutch elm disease (*Ophiostoma*)
- Elm root rot (*Phytophthora*)

Needle Evergreens:

- Juniper galls from cedar-apple rust (*Gymnosporangium*)
- Pine tip blight (*Diplodia*)
- Spruce needle cast (*Rhizosphaeria*) and canker (*Cytospora*)
- Arborvitae, hemlock, juniper, chamaecyparis, pine, spruce and taxus root rot (*Phytophthora*)
- White pine root decline (*Verticicladiella*)
- White pine decline (physiological)

Shrubs:

- Azalea leaf/flower gall (*Exobasidium*)
- Boxwood canker (*Pseudonectria*)
- Buddleia downy mildew (*Peronospora*)
- Cherrylaurel, cotoneaster, rhododendron and viburnum root rot (*Phytophthora*)
- Holly black root rot (*Thielaviopsis*)
- Hydrangea bacterial leaf spot (*Xanthomonas*), fungal leaf spot (*Cercospora*) and rust

(*Pucciniastrum*)

- Hazelnut [filbert] blight (*Anisogramma*) and thread blight (*Corticium*)
- Lilac powdery mildew (*Microsphaera*)
- Photinia leaf spot (*Entomosporium*)
- Rose black spot (*Diplocarpon*), blight (*Botrytis*), leaf spot (*Cercospora*), powdery mildew (*Sphaerotheca*), downy mildew (*Peronospora*) and rosette (possible phytoplasma, leaf curl mite-transmitted)

Herbaceous Annuals and Perennials:

- Chrysanthemum bacterial leaf spot (*Pseudomonas*)
- Petunia root/crown rots (*Rhizoctonia*)
- Daylily leaf streak (*Aureobasidium*)
- Geranium bacterial leaf spot (*Pseudomonas*)
- Hosta crown rot (*Sclerotium*)
- Asiatic lily blight (*Botrytis*)
- Liriope anthracnose (*Colletotrichum*) and crown rot (*Phytophthora*)
- Sunflower downy mildew (*Plasmopara*) and foliar nematodes (*Aphelenchoides*)
- Echinacea aster yellows (*Aster yellows phytoplasma*)
- Peony blotch (*Cladosporium*) and powdery mildew (*Erysiphe*)

A Shift in Sample Types:

Continuing the trend of recent years, the number of tobacco samples for 2009 (364) was very low. Overall tobacco samples have been much lower than historical levels prior to 2000. This drop in the number of tobacco samples has been mostly offset by increases in the number of woody and herbaceous ornamental samples, both commercial and homeowner, as well as commercial fruit and vegetable samples. An increasing number of these samples are of plant types which are less common and therefore require more effort, testing, and time to provide an accurate diagnosis. Along with the diversification of crops, we are seeing a diversification of diseases.

Disease Monitoring:

In addition to the diagnosis of routine plant samples, the following organisms and the diseases they cause are monitored more carefully in the diagnostic laboratory during the year:

Pierce's disease of grapes caused by *Xylella fastidiosa*

Grape crown gall caused by *Agrobacterium tumefaciens*

Cucurbit yellow vine disease caused by *Serratia marsescens*

Root, stem and fruit diseases of solanaceous and cucurbit vegetables caused by *Phytophthora* spp.

Bacterial canker of peppers caused by *Clavibacter michiganensis* subsp. *michiganensis*

Copper-resistant bacterial speck of tomatoes caused by *Pseudomonas syringae* pv. *tomato*

Furthermore, surveys for Asian soybean rust and Sudden oak death, and the tests to detect soybean cyst nematodes in new areas of the state and in soil on commercial ornamental stock for export (e.g., to Canada and California) are also conducted.

Educational Resource:

A major activity of the laboratory is to serve as an educational resource to County Extension Agents and Extension Specialists for assistance in the diagnosis of plant diseases--common, complex, and new.

ACKNOWLEDGMENTS

Sara Long works in the Lexington laboratory as a full-time Diagnostic Assistant. Her main responsibility is to fulfill the laboratory's data transmission requirements for the National Plant Diagnostic Network as part of our duties under the Department of Homeland Security. In addition, Sara provided much-needed assistance to the Lexington laboratory in sample triage, diagnostic and technical support.

Technicians within the department of Plant Pathology continued to make significant contributions. Ed Dixon, research technician in Lexington, worked with Drs. John Hartman, Paul Vincelli, and Kenny Seebold in conducting research in turf, ornamentals, corn, tobacco, forages, and fruits as well as with the Soybean rust sentinel plot in Lexington. Bernadette Amsden, also in Lexington, conducted laboratory research on vegetables, fruits, tobacco, and ornamentals, including conducting diagnostic tests (PCR, ELISA, etc.) on many plant samples. Brenda Kennedy, research technician in Princeton, worked with Dr. Don Hershman in conducting research in soybean and wheat as well as oversaw the Soybean Cyst Nematode and Asian Soybean Rust work. Terry Yielding worked in Princeton and looked at the vast majority of the Asian Soybean Rust samples as well as worked with Soybean Cyst Nematode analysis. Mary Rachel Ray provided very capable, part-time assistance in the Princeton Laboratory.

Thanks also go to Mindy Thompson in Lexington and Mary Ann Kelley and Stephanie Farmer in Princeton, for their work in mailing thousands of diagnostic forms. Tom Priddy, Biosystems and Ag. Engineering - Meteorology, and his staff provided information for the summary of weather conditions for 2009.

Support from the Kentucky Integrated Pest Management Program and from the Southern Plant Diagnostic Network for supplemental funding of additional diagnostic testing, supplies and part-time laboratory assistance and support from the Pesticide Safety Education Program for reference books is gratefully acknowledged.

We also wish to thank the College of Agriculture's extension specialists and researchers who served as consultants to the diagnostic laboratory in 2009. Their services ranged from making diagnoses to assisting the diagnosticians with plant, insect, weed or pesticide questions. These individuals are too numerous to mention here (see Table 9) but we are grateful nonetheless to each for their valuable assistance.

EXPLANATORY REMARKS

As you examine the main body of this report, you will notice three columns of numbers following the diagnosis and causal agent sections. The first column indicates the number of primary diagnoses, the second column contains the number of secondary diagnoses and the third column is the total of the previous two. The primary diagnosis is the main, or frequently, the only problem observed on a plant sample. If a second problem of equal or lesser importance was observed, it was entered as the secondary diagnosis. Occasionally, a problem may have only been diagnosed as a secondary problem, and not as a primary problem for this year thus a zero (0) will appear in the primary diagnosis column. Referrals and consultations: Insect problems were generally identified or verified by a specialist in the Entomology Department. Chemical injuries on all commercially grown crops were diagnosed by a weed control specialist or by the crop specialist in the Agronomy or Horticulture Departments. On a number of occasions we also consulted with crop specialists in other departments to diagnose or verify abiotic problems.

Table 1.**SUMMARY OF DIAGNOSES¹ BY CROP CATEGORY AND CAUSAL AGENT TYPE**

Crop Category	Abiotic Problems	Biotic² Problems	Chemical Injury	Inadequate Specimen	Insect Injury	Other³	Total Diagnoses
<u>Agronomic</u>							
Corn	19	42	5	1	2	14	83
Forages	9	36	0	2	3	7	57
Small grains	9	16	1	1	2	11	40
Soybeans	23	802*	15	0	12	234*	1086
Tobacco	138	197	41	1	3	43	423
<u>Fruit</u>							
Small fruit	33	106	16	1	11	40	207
Tree fruit	12	109	1	3	26	18	169
<u>Herbs</u>							
	1	8	0	2	3	1	15
<u>Identifications</u>							
	0	81	0	6	0	0	87
<u>Ornamentals</u>							
<u>Herbaceous and</u>							
Houseplants	48	105	1	6	19	40	219
Turfgrass	13	110	0	1	0	25	149
Woody	253	465**	38	10	198	267**	1231
<u>Vegetables</u>							
	103	337	54	20	29	49	592
<u>Miscellaneous</u>							
	1	0	0	1	0	33***	35
Total	662	2414	172	55	308	782	4393

¹ All counts and totals include primary diagnoses plus secondary diagnoses.

² Refer to Table 2 for a further breakdown of this category.

³ "Other" includes the causal agent categories: No disease and Unknown.

*Numbers include 17 soybean samples with and 183 soybean samples without Asian Soybean Rust from the SBR sentinel plot system; and 713 soil samples with and 36 soil samples without Soybean Cyst Nematodes.

**Numbers include 93 SOD samples with 24 problems caused by fungi and 69 with no diseases.

***Number includes 27 Kudzu samples without Asian Soybean Rust from the SBR sentinel plot system.

Table 2. SUMMARY OF BIOTIC PROBLEMS¹ BY CROP CATEGORY

Crop Category	Bacterial	Fungal	Nematode	Virus	Other²
<u>Agronomic</u>					
Corn	1	41	0	0	0
Forages	1	35	0	0	0
Small grains	3	7	0	6	0
Soybeans	1	84*	716**	1	0
Tobacco	13	164	0	19	1
<u>Fruit</u>					
Small fruit	14	90	0	1	1
Tree fruit	8	99	0	1	1
<u>Herbs</u>					
	2	6	0	0	0
<u>Identifications</u>					
	0	43	0	0	38
<u>Ornamentals</u>					
<u>Herbaceous and</u>					
Houseplants	7	94	0	2	2
Turfgrass	0	110	0	0	0
Woody	53	395***	0	5	12
<u>Vegetables</u>					
	57	265	1	14	0
<u>Miscellaneous</u>					
	0	0	0	0	0
Total	160	1433	717	49	55

¹ All counts and totals include primary diagnoses plus secondary diagnoses.

² Other includes these categories: Animal (rodent and bird damage), Plant (plant identifications or parasitic plant) and Algæ, Lichen and Phytoplasma.

* Number includes 17 soybean samples with Asian Soybean Rust from the SBR sentinel plot system.

**Number includes 713 soil samples with Soybean Cyst Nematodes.

***Number includes 24 SOD samples with problems caused by fungi.

Table 3. NUMBER OF PLANT SAMPLES BY CROP CATEGORY

Crop Category	Number of Plant Specimens	Percentage of Total Plant Specimens
Agronomic (-Tobacco + 200 Soybean SBRs)	458	14.0
Tobacco	364	11.2
Fruit	323	9.9
Herbs	14	0.4
Identifications	87	2.7
Ornamentals (+93 SODs)	1454	44.6
Vegetables	526	16.1
Miscellaneous (includes 27 Kudzu SBRs)	35	1.1
Total Plant Samples (includes SBRs and SODs)	3261	100.0

Table 4.

SUMMARY OF DIAGNOSES BY CROP CATEGORY AND CROP

Crop Category and Crop	Number of Primary Diagnoses¹	Number of Secondary Diagnoses²	Total Diagnoses³
<u>Agronomic</u>			
Corn	65	18	83
Forages	49	8	57
Small grains	35	5	40
Soybeans	1058*	28	1086
Tobacco	364	59	423
<u>Fruit</u>			
Small fruit	182	25	207
Tree fruit	141	28	169
<u>Herbs</u>	14	1	15
<u>Identifications</u>	87	0	87
<u>Ornamentals</u>			
Herbaceous and Houseplants	196	23	219
Turfgrass	130	19	149
Woody**	1128	103	1231
<u>Vegetables</u>	526	66	592
<u>Miscellaneous***</u>	35	0	35
<u>Total</u>	4010	383	4393

¹ The number of primary diagnoses corresponds to the number of different specimens examined.

² If a second problem was evident on the plant specimen it was considered the secondary diagnosis. See "Explanatory Remarks."

³ Total diagnoses equals the number of primary plus the number of secondary diagnoses.

* Soybean plant samples + 749 SCN soil samples + 200 SBR samples

**Numbers include 93 SOD samples

***Numbers include 27 Kudzu samples from the SBR sentinel plot system.

Table 5.**SUMMARY OF ROUTINE SAMPLES RECEIVED BY GROWER TYPE AND CROP GROUP**

Crop Group	Grower Type							
	Commercial		Homeowner		Research		Institution	
	Ext ¹	Non-Ext ²	Ext ¹	Non-Ext ²	Ext ¹	Non-Ext ²	Ext ¹	Non-Ext ²
<u>Agronomic</u>								
Corn	53	9	0	0	0	3	0	0
Forages	46	0	0	0	0	3	0	0
Small grains	28	3	0	0	0	4	0	0
Soybeans	97	10	0	0	0	2	0	0
Tobacco	345	13	0	0	0	6	0	0
<u>Fruit</u>								
Small Fruit	95	8	70	3	0	6	0	0
Tree Fruit	19	1	116	5	0	0	0	0
<u>Herbs</u>								
	5	0	8	0	1	0	0	0
<u>Identifications</u>								
	2	1	79	3	0	1	0	1
<u>Ornamental</u>								
Herbaceous and								
Houseplants	61	16	87	6	0	15	6	5
Turfgrass	15	36	47	1	0	2	7	22
Woody	134	118	730	35	4	0	12	2
<u>Vegetable</u>								
	208	6	285	10	7	9	1	0
<u>Miscellaneous</u>								
	1	0	7	0	0	0	0	0
<u>Total</u>	1109	221	1429	63	12	51	26	32
<u>Total/Grower Type</u>	1330		1492		63		56	

Total number of routine samples received = 2941¹ Ext = Extension samples submitted via County Extension Agents or Extension Specialists.² Non-Ext = Non-extension samples submitted directly by the grower or other non-extension clients.

Table 6.

**NUMBER OF ROUTINE SAMPLES REFERRED TO OTHER DEPARTMENTS,
UK LABORATORY FACILITIES OR OUTSIDE AGENCIES FOR DIAGNOSIS***

Department, Facility or outside agency	Crop Category					Total
	Agronomic	Fruit	Ornamental	Vegetable	Other	
Agdia, Inc.	13	1	2	3	0	19
Entomology Department	4	1	19	1	0	25
Horticulture Department	0	1	1	0	0	2
Plant & Soil Sciences Department	15	0	0	0	0	15
USDA	0	1	1	0	0	2
					Total	63
					Total number of routine plant specimens	3161
					Percent of specimens referred outside Diagnostic Lab for diagnosis	2.0

* Numbers do not reflect the total number of diagnoses and/or consultations conducted by other departments (See Table 9).

Table 7.

**SPECIAL LABORATORY TESTS PERFORMED
BY PLANT DISEASE DIAGNOSTIC LABORATORY***

Test	Number of Tests
Polymerase Chain Reaction (PCR)	5
Culturing	12
Enzyme-linked Immunosorbent Assay (ELISA) (191 routine plant samples + 93 SOD)	284
Inclusion Body	3
Inoculation	1
Microscope (1360 routine plant samples + 227 SBR)	1587
Nematode extraction Soybean cyst nematode (SCN)	749
Soil tests	62
Visual	1307
Total	4010

*** Based on 2941 routine plant samples, 227 SBR, 749 SCN, and 93 SOD samples = 4010.**

Note: Some samples may have required more than one test but only the definitive test was recorded.

Table 8.**NUMBER OF ROUTINE PLANT SAMPLES RECEIVED BY COUNTY AND CROP CATEGORY
(KY AND OUT-OF-STATE SOURCES) ¹**

COUNTY	Total	Agronomic²	Tobacco	Fruit	Ornamental	Vegetable	Other
ADAIR	22	8	8	0	3	3	0
ALLEN	14	0	3	0	0	11	0
ANDERSON	23	8	1	1	5	8	0
BALLARD	8	1	1	2	2	1	1
BARREN	35	4	1	7	23	16	0
BATH	8	2	2	0	3	1	0
BELL	9	0	0	0	7	2	0
BOONE	34	0	0	2	24	6	2
BOURBON	38	7	2	3	20	6	0
BOYD	12	2	0	0	6	4	0
BOYLE	24	2	3	0	15	4	0
BRACKEN	8	2	2	0	3	1	0
BREATHITT	1	0	0	0	0	1	0
BRECKINRIDGE	95	14	43	5	15	18	0
BULLITT	20	0	0	1	18	1	0
BUTLER	2	0	0	0	1	1	0
CALDWELL	40	6	4	8	12	6	4
CALLOWAY	90	10	21	11	33	14	1
CAMPBELL	24	0	0	3	15	5	1
CARLISLE	9	4	1	3	0	1	0
CARROLL	12	1	0	0	5	6	0
CARTER	7	0	1	1	4	0	1
CASEY	19	2	1	2	7	6	1
CHRISTIAN	86	12	6	8	31	28	1
CLARK	15	0	2	0	11	2	0
CLAY	4	0	2	0	1	1	0
CLINTON	7	1	0	0	4	2	0
CRITTENDEN	13	2	0	2	3	6	0
CUMBERLAND	21	0	1	4	12	1	3
DAVISS	87	7	12	13	44	11	0
EDMONSON	5	0	0	2	3	0	0
ELLIOTT	13	1	1	4	5	2	0
ESTILL	11	1	0	1	7	1	1
FAYETTE	345	10	14	23	261	26	11
FLEMING	53	10	10	8	9	16	0
FLOYD	3	0	0	1	0	2	0
FRANKLIN	106	0	3	10	80	10	3
FULTON	2	2	0	0	0	0	0
GALLATIN	17	1	3	1	9	3	0
GARRARD	16	2	4	1	7	2	0
GRANT	15	0	0	6	5	2	2
GRAVES	10	0	4	1	2	3	0
GRAYSON	24	0	2	2	16	4	0
GREEN	8	0	1	1	2	4	0
GREENUP	7	0	0	1	4	2	0
HANCOCK	9	1	4	1	2	0	1
HARDIN	21	2	3	1	13	2	0
HARLAN	12	0	0	5	4	2	1
HARRISON	16	1	2	0	4	9	0
HART	16	1	0	9	1	5	0
HENDERSON	45	11	3	4	15	12	0
HENRY	24	2	9	2	6	5	0
HICKMAN	11	4	0	3	3	1	0
HOPKINS	20	4	0	1	8	0	7
JACKSON	22	0	1	10	4	6	1
JEFFERSON	32	0	0	0	27	5	0
JESSAMINE	17	1	0	0	14	2	0
JOHNSON	1	0	0	0	0	1	0
KENTON	16	0	4	1	4	5	2
KNOTT	0	0	0	0	0	0	0
KNOX	1	0	0	0	1	0	0

COUNTY	Total	Agronomic ²	Tobacco	Fruit	Ornamental	Vegetable	Other
LARUE	21	2	7	2	5	4	1
LAUREL	33	1	1	6	13	6	6
LAWRENCE	11	0	0	5	4	2	0
LEE	4	1	0	1	1	1	0
LESLIE	1	0	0	0	0	1	0
LETCHER	6	0	0	2	3	0	1
LEWIS	25	2	3	2	6	12	0
LINCOLN	35	4	5	0	10	16	0
LIVINGSTON	5	1	0	2	2	0	0
LOGAN	13	5	3	0	2	3	0
LYON	23	2	2	3	11	5	0
McCRACKEN	75	1	0	9	33	23	9
McCREARY	1	0	0	0	1	0	0
McLEAN	14	2	6	0	0	5	1
MADISON	30	1	3	2	16	5	3
MAGOFFIN	3	0	0	0	3	0	0
MARION	20	6	3	0	6	4	1
MARSHALL	31	1	1	1	27	1	0
MARTIN	0	0	0	0	0	0	0
MASON	23	1	10	7	4	1	0
MEADE	24	8	4	2	3	7	0
MENIFEE	6	0	0	2	0	3	1
MERCER	33	3	1	2	22	5	0
METCALFE	16	1	3	9	2	0	1
MONROE	11	1	3	5	1	1	0
MONTGOMERY	53	1	9	12	14	16	1
MORGAN	22	0	7	3	6	6	0
MUHLENBERG	18	1	4	1	4	8	0
NELSON	26	3	1	4	10	4	4
NICHOLAS	7	1	5	0	0	1	0
OHIO	2	1	1	0	0	0	0
OLDHAM	20	0	0	2	16	2	0
OWEN	4	2	1	1	0	0	0
OWSLEY	2	0	1	1	0	0	0
PENDELTON	1	0	1	0	0	0	0
PERRY	7	0	0	0	7	0	0
PIKE	3	0	0	0	2	1	0
POWELL	4	0	1	0	1	2	0
PULASKI	47	4	6	8	14	9	6
ROBERTSON	8	0	6	0	1	0	1
ROCKCASTLE	7	0	1	2	2	2	0
ROWAN	10	0	4	0	5	1	0
RUSSELL	39	4	0	7	12	7	9
SCOTT	42	4	5	0	30	3	0
SHELBY	18	2	1	0	11	1	3
SIMPSON	33	4	4	1	17	6	1
SPENCER	28	0	2	2	22	1	1
TAYLOR	29	5	4	3	12	4	1
TODD	38	9	17	0	7	5	0
TRIGG	52	3	5	7	28	3	6
TRIMBLE	15	2	8	1	1	2	1
UNION	5	4	0	1	0	0	0
WARREN	105	3	8	9	71	12	2
WASHINGTON	13	1	0	3	8	1	0
WAYNE	15	3	2	4	1	5	0
WEBSTER	19	3	4	5	3	2	2
WHITLEY	9	0	0	2	4	2	1
WOLFE	8	0	3	1	0	4	0
WOODFORD	58	5	9	5	31	6	2
Out-of-State	8	0	4	1	3	0	0
TOTALS	2941	258	364	323	1361	526	109

¹ Does not include SBR, SCN, or SOD samples

² Agronomic crops include corn, soybeans, forages, and small grains but in this particular case, it excludes tobacco.

Table 9.

THE NUMBER OF CASES IN WHICH UK EXTENSION SPECIALISTS, DIAGNOSTICIANS OR RESEARCHERS WERE INVOLVED IN MAKING A PRIMARY DIAGNOSIS AND THE NUMBER OF CASES IN WHICH THEY SERVED AS CONSULTANTS.

Specialists, Researchers, Diagnosticians	Department	Number of cases	
		Primary Diagnosis ¹	Consultations ²
LEXINGTON			
Beale, JW (Diagnostician)	Plant Pathology	1625	10
Bessin, RT	Entomology	5	3
Coolong, TW	Horticulture	0	2
Dutton, SR	Horticulture	1	1
Fountain, WM	Horticulture	0	1
Geneve, RL	Horticulture	0	1
Green, JD	Plant & Soil Sciences	14	5
Hartman, JR	Plant Pathology	54	3
Lee, CD	Plant & Soil Sciences	0	3
Long, SJ	Plant Pathology	313	1
Palmer, GK	Plant & Soil Sciences	2	1
Pearce, BC	Plant & Soil Sciences	6	8
Schwab, GJ	Plant & Soil Sciences	0	1
Seebold, KW	Plant Pathology	17	18
Strang, JG	Horticulture	0	1
Townsend, LH	Entomology	20	3
Vincelli, P	Plant Pathology	12	10
PRINCETON			
Bachi, PR (Diagnostician)	Plant Pathology	905	34
Bailey, WA	Plant & Soil Sciences	17	10
Dunwell, WC	Horticulture	4	11
Herbek, JH	Plant & Soil Sciences	6	2
Hershman, DE	Plant Pathology	2	7
Johnson, DW	Entomology	2	5
Kennedy, BS	Plant Pathology	0	1
Lacefield, GD	Plant & Soil Sciences	1	3
Martin, JR	Plant & Soil Sciences	21	4
Murdock, LW	Plant & Soil Sciences	9	2
Yielding, TL	Plant Pathology	226	0

¹ The specialist or diagnostician making the primary diagnosis.

² In some cases, more than one person was consulted, however, only one name can be entered into the computer database. Therefore, these numbers may indicate fewer consultations than were actually performed.

Table 10.**DIGITAL CONSULTING SYSTEM**

To assist County Extension Agents and Specialists in dealing with plant disease, insect, and weed issues, we also operate a web-based Digital Consulting System utilizing photographic images. The images can be used to help determine how and where best to collect samples for submission to the laboratory, as well as general or specific advice on a wide range of topics.

The system is also useful for Homeland Security purposes because the topic possibilities are not limited to plants and because specialists in other states can be brought into the system as a consultant on a case-by-case basis with limited access to only the case in question.

**202 cases were submitted in 2009 by a total of 44 submitters.
Cases came from a total of 41 counties.**

DCS cases 2009	
Crop	Count Of Crop
Corn	4
Forage crop	2
Forest tree	3
Herb	2
Herbaceous ornamental	7
Landscape shrub	23
Landscape tree	48
other (Fungal ID)	2
other (Insect ID)	2
other (Weed ID)	1
Small fruit	14
Small grain	4
Soybean	10
Tobacco	12
Tree fruit	27
Turf grass	4
Vegetable	37

National Nursery Survey for *Phytophthora ramorum* in Kentucky, 2009

Julie Beale and Sara Long, Department of Plant Pathology;
Janet Lensing, Katie Kittrell, and John Obrycki, Department of Entomology

Note: A more complete report of this work can be found in the UK Agricultural Experiment Station publication, PR-602, <http://www.ca.uky.edu/agc/pubs/pr/pr602/pr602.pdf>

Acknowledgments: Thanks to John Obrycki (Dept. of Entomology) for providing funding for part of this work, and to all the nursery owners for their collaboration.

Nature of Work

Phytophthora ramorum, the cause of Ramorum blight and sudden oak death, continues to be a problem on the west coast in California and Oregon. This disease, first observed in California in the mid 1990s, causes the widespread death of many oak and tanoak species. Other hosts for this pathogen include: camellia, rhododendron, viburnum, lilac and mountain laurel. Regulations and quarantines have been established to limit the spread of this pathogen, but concerns still remain about potential movement in contaminated nursery stock. Methods of long distance spread of the pathogen include moving plants, plant parts, soil and water. *P. ramorum* infection and symptom expression takes place when the leaves, shoots and stems are wet for 12 hours a day for 10 days or more, at temperatures between 37 -82°F. The Appalachian region is considered to be a high risk area for the establishment of *P. ramorum* because appropriate weather conditions often occur and because several of native plant species in the region are identified as hosts.

The National Nursery Survey for *P. ramorum* in Kentucky was continued through the 2009 growing season. This survey, a collaborative effort between the Department of Plant Pathology and the Office of the State Entomologist (Department of Entomology) at the University of Kentucky, and the USDA-APHIS, has been ongoing each year since 2004. Procedures for collecting and testing followed protocols established by the USDA-APHIS-PPQ. Samples were collected from nurseries, parks, and home gardens from across the state of Kentucky. Ninety-three samples with foliar symptoms suggestive of general *Phytophthora* infection were collected from sixteen counties: Breathitt, Boone, Clark, Daviess, Fayette, Franklin, Hardin, Jefferson, Jessamine, Kenton, McCreary, Meade, Nelson, Pike, Pulaski and Russell. These samples were double bagged and sent to the Plant Disease Diagnostic Lab (PDDL) in Lexington for testing. An immunological assay (ELISA) was used to detect the presence of proteins typical of several species of *Phytophthora*, as an initial screen of these samples at the Lexington PDDL. DNA was then extracted from samples testing positive for general *Phytophthora* infection. Extracted DNA samples were sent to USDA-APHIS approved testing laboratories for further identification via polymerase chain reaction (PCR).

Results and Discussion

Of the 93 total samples collected throughout the state, 24 tested positive for infection by *Phytophthora* species. Extracted DNA from these samples was sent to the USDA-APHIS laboratory in Maryland for further testing via polymerase chain reaction (PCR). The *P. ramorum* PCR test for each of these samples was negative. *Phytophthora ramorum* was NOT found in the state of Kentucky this growing season.

Literature Cited

- 1 De Sa, P.B., J. Hartman, J. Lensing, J. 1. Collins, C. Harper, J. Obrycki. 2007. National Nursery Survey for *Phytophthora ramorum* in Kentucky. Research Report of the Nursery and Landscape Program. Agricultural Experiment Station. University of Kentucky. PR-554. P26-27.

<i>CROP</i>	<i>DIAGNOSIS</i>	<i>CAUSAL AGENT</i>	<i>#1° DIAGs</i>	<i>#2° DIAGs</i>	<i>TOTAL</i>
AGRONOMIC CROPS					
<u>CORN</u>					
CORN (Zea) (includes Popcorn)					
	Chemical injury	- herbicide	5	0	5
	Cultural	- compaction	1	0	1
	Ear/Kernel rot	- Diplodia	8	2	10
		- Fusarium	2	1	3
		- Gibberella	2	1	3
		- Trichoderma	2	1	3
	Environmental stresses		2	2	4
	Inadequate specimen, no disease		15		15
	Insect injury		0	2	2
	Leaf blight	- Helminthosporium	0	1	1
	Northern corn leaf blight	- Setosphaeria	5	1	6
	Nutritional	- acid soil	1	0	1
		- fertilizer burn	1	0	1
		- low pH	1	0	1
		- magnesium deficiency	2	0	2
		- phosphorus deficiency	2	0	2
		- potassium deficiency	3	0	3
		- zinc deficiency	1	1	2
	Physical injury	- unknown	1	0	1
	Pollination problem	- unknown	1	0	1
	Root rot	- Fusarium	1	0	1
	Rust, common	- Puccinia	0	1	1
	Rust, southern	- Puccinia	2	1	3
<u>FORAGES</u>					
ALFALFA (Medicago)					
	Anthraxnose	- Colletotrichum	2	0	2
	Bacterial leaf spot	- Xanthomonas	1	0	1
	Crown/Root rot	- complex	1	0	1
		- Fusarium	1	0	1
		- Phoma	1	0	1
		- Phytophthora	1	0	1
		- Pythium	1	0	1
	Crown/Stem rot	- Sclerotinia	2	0	2
	Environmental stresses		3	0	3
	Inadequate specimen, no disease		6		6
	Insect injury		2	0	2
	Leaf spot	- Leptosphaerulina	2	2	4
		- Stemphylium	1	1	2
	Nutritional	- boron deficiency	2	0	2
		- general	0	1	1
		- nitrogen deficiency	0	1	1
		- poor nodulation	2	0	2
	Root rot	- Phytophthora	0	1	1
	Spring black stem	- Phoma	4	0	4
	Summer black stem	- Cercospora	1	1	2
BERMUDAGRASS (Cynodon)					
	Leaf spot	- Bipolaris	1	0	1

<i>CROP</i>	<i>DIAGNOSIS</i>	<i>CAUSAL AGENT</i>	<i>#1° DIAGs</i>	<i>#2° DIAGs</i>	<i>TOTAL</i>
CLOVER (Trifolium)					
	Inadequate specimen		1		1
	Leaf spot	- Stemphylium	1	0	1
MILLET (Panicum)					
	Gray leaf spot	- Pyricularia	3	0	3
ORCHARDGRASS (Dactylis)					
	Anthrachnose	- Collectotrichum	1	0	1
	Brown stripe	- Cercosporidium	1	0	1
	Insect injury		1	0	1
	No disease		1		1
REED CANARYGRASS (Phalaris)					
	Zonate leaf spot	- Drechslera	1	0	1
SWITCHGRASS (Panicum)					
	Leaf spot	- Exserohilum	0	1	1
		- unknown	1	0	1
	No disease		1		1
	Rust	- Puccinia	1	0	1
<u>SOYBEAN</u>					
SOYBEAN (Glycine)					
	Anthrachnose	- Collectotrichum	1	0	1
	Asian soybean rust	- Phakopsora	17	0	17
	Bacterial blight	- Pseudomonas	0	1	1
	Brown spot	- Septoria	1	0	1
	Charcoal rot	- Macrophomina	1	0	1
	Chemical injury	- growth regulator	8	0	8
		- herbicide	3	1	4
		- unknown	2	1	3
	Downy mildew	- Peronospora	10	8	18
	Environmental stresses		2	0	2
	Frogeye	- Cercospora	6	2	8
	Insect injury		5	7	12
	Leaf blight	- Cercospora	9	1	10
	No disease		198		198
	Nutritional	- acid soil	1	0	1
		- manganese deficiency	0	1	1
		- potassium deficiency	18	1	19
	Pod/Stem blight	- Diaporthe	0	1	1
	Purple seed stain	- Cercospora	2	0	2
	Root/stem rot	- Rhizoctonia	4	0	4
	Seed decay	- Phomopsis	0	1	1
	Soybean cyst nematode	- Heterodera			
		on plant samples	2	1	3
		* in soil samples	713		713
		* absent in soil samples	36		36
		(*soil submitted to Nematode Analysis Laboratory)			
	Stem rot	- Rhizoctonia	1	0	1
		- Sclerotinia	1	0	1
	Sudden death	- Fusarium	16	0	16
	Virus	- Tobacco ringspot	1	0	1

<i>CROP</i>	<i>DIAGNOSIS</i>	<i>CAUSAL AGENT</i>	<i>#1° DIAGs</i>	<i>#2° DIAGs</i>	<i>TOTAL</i>
<u>SMALL GRAINS</u>					
BARLEY (Hordeum)					
	Chemical injury	- herbicide	1	0	1
OAT (Avena)					
	Virus	- Barley yellow dwarf	1	0	1
TEFF (Eragrostis)					
	Insect injury		1		1
WHEAT (Triticum)					
	Bacterial mosaic	- Clavibacter	0	2	2
	Bacterial streak	- Xanthomonas	1	0	1
	Cultural	- shallow planting	1	0	1
	Environmental stresses		5	1	6
	Glume blotch	- Stagonospora	2	0	2
	Inadequate specimen, no disease		12		12
	Insect injury		0	1	1
	Nutritional	- nitrogen deficiency	1	1	2
	Smut, loose	- Ustilago	1	0	1
	Take-all	- Gaeumannomyces	4	0	4
	Virus	- unknown	1	0	1
		- Wheat streak mosaic	3	0	3
		- Wheat spindle streak mosaic	1	0	1

<i>CROP</i>	<i>DIAGNOSIS</i>	<i>CAUSAL AGENT</i>	<i>#1° DIAGs</i>	<i>#2° DIAGs</i>	<i>TOTAL</i>
<u>TOBACCO</u>					
TOBACCO (Nicotiana)					
	Angular leaf spot	- Pseudomonas	3	0	3
	Bacterial soft rot	- Erwinia	2	0	2
	Black leg	- Erwinia	3	1	4
	Black root rot	- Thielaviopsis	1	0	1
	Black shank	- Phytophthora	46	1	47
	Blue mold	- Peronospora	23	0	23
	Brown spot	- Alternaria	2	1	3
	Chemical injury	- creosote	1	0	1
		- fungicide	4	1	5
		- growth regulator	9	0	9
		- herbicide	16	0	16
		- unknown	9	1	10
	Collar rot	- Sclerotinia	4	0	4
	Cultural	- compaction	1	0	1
		- improper light	1	0	1
		- transplant shock	19	0	19
	Damping-off	- Rhizoctonia	3	2	5
	Environmental	- weather scald	7	1	8
		- wet feet	5	2	12
		- others	2	1	3
	Frenching	- metabolites	5	0	5
	Frogeye	- Cercospora	6	4	10
	Hollow stalk	- Erwinia	3	0	3
	House burn	- fungal	1	0	1
		- bacterial	0	1	1
	Improper curing	- greening	1	0	1
	Inadequate specimen, no disease		44		44
	Insect injury		3	0	3
	Leaf breakdown	- physiological	2	0	2
	Nutritional	- acid soil	3	3	6
		- general	10	1	11
		- manganese toxicity	10	1	11
		- nitrogen deficiency	3	1	4
		- pH high	1	0	1
		- potassium deficiency	12	3	15
		- soluble salts	2	1	3
		- temp. phosphorus def.	12	1	13
	Physical injury	- animal	1	0	1
		- clipping	1	0	1
	Root rot	- Pythium	15	1	16
	Root/stem rot	- Rhizoctonia	2	4	6
	Sore shin	- Rhizoctonia	1	2	3
	Stem rot	- Pythium	1	1	2
	Target spot	- Rhizoctonia	26	7	33
	Variegation	- genetic	1	0	1
	Virus	- potyvirus	1	1	2
		- Potato virus Y	1	0	1
		- Tobacco etch	1	0	1
		- Tobacco ringspot	0	1	1
		- Tobacco streak	3	1	4
		- Tomato spotted wilt	5	3	8
	Weather fleck	- ozone	19	1	20
	Wilt	- Fusarium	3	0	3

<i>CROP</i>	<i>DIAGNOSIS</i>	<i>CAUSAL AGENT</i>	<i>#1° DIAGs</i>	<i>#2° DIAGs</i>	<i>TOTAL</i>
FRUIT CROPS					
<u>SMALL FRUITS</u>					
BLUEBERRY (Vaccinium)					
	Canker	- Phomopsis	1	0	1
	Chemical injury	- growth regulator	1	0	1
	Cultural	- oedema	1	0	1
		- transplant shock	1	0	1
	Dieback	- unknown	2	0	2
	Environmental	- cold injury	1	0	1
	Inadequate specimen, no disease		12		12
	Leaf scorch	- unknown	2	0	2
	Leaf spot	- Phyllosticta	3	0	3
	Mosaic	- unknown	1	0	1
	Nutritional	- acid soil	2	0	2
		- iron deficiency	2	3	5
		- soluble salts	0	1	1
	Root rot	- Phytophthora	1	0	1
		- Rhizoctonia	1	0	1
	Root/Crown rot	- Phytophthora	5	0	5
	Virus	- Red ringspot	1	0	1
BRAMBLES - BLACKBERRY, RASPBERRY and LOGANBERRY (Rubus)					
	Anthraxnose	- Elsinoe	4	0	4
	Cane blight	- Leptosphaeria	1	0	1
	Cultural	- transplant shock	1	0	1
	Double blossom	- Cercospora	1	0	1
	Insect injury		2	1	2
	Leaf spot	- Cercospora	1	0	1
		- Septoria	1	1	2
		- Sphaerulina	2	0	2
	No disease		4		4
	Nutritional	- iron deficiency	1	0	1
	Pollination problem	- unknown	2	0	2
	Root/Crown rot	- Phytophthora	7	0	7
	Spur blight	- Didymella	3	0	3
GOOSEBERRY and CURRANT (Ribes)					
	Lichen	- species	1	0	1
	No disease		1		1
GRAPE (Vitis)					
	Anthraxnose	- Elsinoe	8	4	12
	Black rot	- Guignardia	23	1	24
	Chemical injury	- growth regulator	11	3	14
	Crown gall	- Agrobacterium	1	1	2
	Downy mildew	- Plasmopora	4	2	6
	Environmental stresses		1	1	2
	Insect injury		2	5	7
	Leaf spot	- Cristulariella	2	0	2
		- physiological	1	0	1
		- Pseudocercospora	1	0	1
	No disease		17		17
	Nutritional	- potassium deficiency	1	0	1
	Pierce's disease	- Xylella	13	0	13

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STRAWBERRY (Fragaria)					
	Anthracnose	- Colletotrichum	1	0	1
	Black root	- complex	1	0	1
	Chemical injury	- herbicide	1	0	1
	Crown rot	- Phytophthora	1	0	1
	Environmental stresses		2	0	2
	Insect injury		1	0	1
	Leaf blight	- Phomopsis	3	0	3
	Leaf spot	- Mycosphaerella	2	1	3
	No disease		6		6
	Nutritional	- potassium deficiency	2	0	2
	Red stele	- Phytophthora	3	0	3
	Root rot	- Phytophthora	0	1	1
<u>TREE FRUITS</u>					
APPLE (Malus)					
	Bitter rot	- Glomerella	1	1	2
	Black rot	- Botryosphaeria	1	0	1
	Canker	- Botryosphaeria	1	0	1
	Cedar apple rust	- Gymnosporangium	19	3	22
	Chemical injury	- fungicide	1	0	1
	Cultural	- transplant shock	2	0	2
	Fire blight	- Erwinia	6	0	6
	Frogeye	- Botryosphaeria	9	5	14
	Insect injury		6	1	7
	Lichen	- species	1	0	1
	No disease		7		7
	Powdery mildew	- Podosphaera	1	0	1
	Scab	- Venturia	9	3	12
	Sooty blotch	- Gloeodes	0	2	2
	Thread blight	- Corticium	2	0	2
	White rot	- Botryosphaeria	0	1	1
CHERRY (Prunus)					
	Environmental	- freeze injury	1	0	1
	Inadequate specimen, no disease		5		5
	Insect injury		0	1	1
	Leaf spot	- Cercospora	2	0	2
		- Coccomyces	4	0	4
		- unknown	1	0	1
	Powdery mildew	- Podosphaera	1	0	1
	Root rot	- Armillaria	1	0	1
FIG (Ficus)					
	Fruit rot	- Phytophthora	1	0	1
PAWPAW (Asimina)					
	Leaf spot	- Phoma	1	0	1

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PEACH, APRICOT and NECTARINE (Prunus)					
	Bacterial spot	- Xanthomonas	1	0	1
	Brown rot	- Monilinia	7	1	8
	Environmental stresses		2	0	2
	Insect injury		7	5	12
	Leaf curl	- Taphrina	7	0	7
	No disease		2		2
	Nutritional	- nitrogen deficiency	1	0	1
	Scab	- Cladosporium	5	3	8
	Virus	- unknown	1	0	1
PEAR (Pyrus)					
	Dieback	- unknown	1	0	1
	Environmental	- decline	1	0	1
	Fire blight	- Erwinia	1	0	1
	Fruit crack	- environmental	1	0	1
	Inadequate specimen, no disease		4		4
	Insect injury		2	1	3
	Leaf spot	- Entomosporium	1	0	1
	Russet	- environmental	1	0	1
	Scab	- Venturia	0	1	1
PECAN (Carya)					
	Environmental	- stress	1	0	1
	Insect injury		2	0	2
	No disease		1		1
	Scab	- Cladosporium	1	0	1
PERSIMMON (Diospyros)					
	No disease		1		1
PLUM (Prunus)					
	Black knot	- Apiosporina	3	0	3
	Insect injury		1	0	1
	No disease		1		1
	Plum pockets	- Taphrina	2	0	2
<u>HERBS</u>					
BASIL (Ocimum)					
	Insect injury		1	0	1
GARLIC (Allium)					
	Bacterial soft rot	- Erwinia	0	1	1
	Insect injury		1	0	1
GINGER (Zingiber)					
	Stem rot	- Sclerotinia	1	0	1
GINSENG (Panax)					
	Leaf blight	- Alternaria	1	0	1
HOPS (Humulus)					
	Insect injury		1	0	1

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<u>HERBS (continued)</u>					
MINT (Mentha)					
Root/Stem rot	-	Rhizoctonia	1	0	1
ROSEMARY (Rosmarinus)					
Blight	-	Botrytis	2	0	2
Inadequate specimen			1		1
Nutritional	-	soluble salts	1	0	1
Powdery mildew	-	Oidium	1	0	1
SWEET WOODRUFF (Galium)					
Bacterial scorch	-	Xylella	1	0	1
TARRAGON (Artemesia)					
Inadequate specimen			1		1
THYME (Thymus)					
No disease			1		1
<u>MISCELLANEOUS</u>					
ANIMAL DROPPING					
No disease			1		1
FIBER					
Synthetic fiber	-	unknown	1	0	1
KUDZU (Pueraria) (part of survey work for Asian Soybean Rust)					
No disease			27		27
LINT HAIR					
No disease			1		1
POTTING MIX					
No disease			1		1
SOIL					
Inadequate specimen, no disease			4		4
<u>IDENTIFICATIONS</u>					
FUNGAL IDENTIFICATIONS					
Agaricus	-	species	1		1
Amanita	-	flavoconia	1		1
	-	species	1		1
Basidiomycete	-	species	2		2
Cantharellus	-	cibarium	1		1
	-	species	1		1
Cortinarius	-	species	1		1
Cyathus	-	species	2		2
Ganoderma	-	species	3		3
Geastrum	-	species	1		1
Gyrodon	-	meruliodes	1		1

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IDENTIFICATIONS (continued)					
	Hydnellum	- species	1		1
	Hygrophorus	- species	1		1
	Inadequate specimen		2		2
	Laccaria	- species	1		1
	Lycoperdon	- species	1		1
	Morchella	- semilibera	2		2
		- species	1		1
	Mutinus	- caninus	1		1
	Nidula	- candida	1		1
	Panaeolus	- foenisecii	1		1
	Polyporus	- versicolor	1		1
	Pseudocolus	- fusiformis	1		1
	Russula	- cremoricola	1		1
		- species	1		1
	Slime mold	- Physarum	1		1
		- species	6		6
	Sphaerobolus	- species	2		2
	Steccherinum	- species	2		2
	Suillus	- species	2		2
	Xylaria	- species	1		1
LICHEN IDENTIFICATIONS					
	Lichen	- species	3		3
PLANT IDENTIFICATIONS					
	Algae	- species	1		1
	Baptisia	- leucophaea	1		1
	Chamaecybe	- nutans	1		1
	Chrysanthemum	- species	1		1
	Cotinus	- coggygria	1		1
	Cydonia	- oblonga	1		1
	Diospyros	- virginiana	1		1
	Festuca	- rubra			
	Inadequate specimen		3		3
	Liverwort	- species	2		2
	Lobelia	- erinus	1		1
	Melothra	- pendula	1		1
	Morus	- rubra	1		1
		- species	1		1
	Nostoc	- species	10		10
	Philodendron	- species	1		1
	Pinus	- taeda	1		1
	Prunus	- persica 'atropurpurea'	1		1
	Pyrus	- calleryana	1		1
		- species	1		1
	Quercus	- acutissima	1		1
	Syringa	- species	1		1
	Taxus	- species	1		1
	Unknown	- unknown	1		1
	Veronica	- species	1		1
	Zinnia	- elegans	1		1

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ORNAMENTALS					
<u>HERBACEOUS ORNAMENTS and INDOOR PLANTS</u>					
ABUTILON (Abutilon)	Insect injury		1	1	2
ANGELONIA (Angelonia)	Damping-off	- Rhizoctonia	1	0	1
ANTHURIUM (Anthurium)	No disease		1		1
ARABIDOPSIS (Arabidopsis)	Nutritional	- soluble salts	1	0	1
ASTER (Aster)	Rust	- Coleosporium	1	0	1
	Stem rot	- Sclerotinia	1	0	1
BACOPA (Bacopa)	No disease		1		1
BAMBOO (Dracaena)	Anthracoze	- Collectotrichum	0	1	1
	Root rot	- Pythium	1	0	1
BEGONIA (Begonia)	No disease		1		1
	Powdery mildew	- Oidium	1	0	1
BRASSIA (Brassia)	No disease		1		1
CACTUS (Schlumbergera)	Cultural	- wet feet	1	0	1
	Sooty mold	- species	1	0	1
CAMPION (Lynchnis)	Rust	- Uromyces	1	0	1
CANNA (Canna)	No disease		1		1
CATTLEYA (Cattleya)	No disease		1		1
CENTRADENIA (Centradenia)	No disease		1		1
CHRYSANTHEMUM (Chrysanthemum)	Bacterial leaf spot	- Pseudomonas	2	0	2
	Environmental stresses		1	1	2
	Nutritional	- nitrogen deficiency	0	1	1
	Root rot	- Pythium	3	0	3
		- Rhizoctonia	2	0	2

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COLEUS (Coleus)					
	Damping-off	- Rhizoctonia	1	0	1
COLUMBINE (Aquilegia)					
	Environmental stresses		2	0	2
CONE FLOWER (Echinacea)					
	Aster yellows	- Phytoplasma	2	0	2
	No disease		1		1
	Root rot	- Fusarium	1	0	1
CRASSULA (Crassula)					
	Powdery mildew	- species	1	0	1
CREEPING JENNY (Lysimachia)					
	Insect injury		1	0	1
	No disease		1		1
DAHLIA (Dahlia)					
	Environmental	- cold injury	1	0	1
	No disease		1		1
DAISY (Dimorphotheca)					
	Rust	- Puccinia	1	0	1
DAYLILY (Hemerocallis)					
	Anthrachnose	- Collectotrichum	1	0	1
	Environmental	- drought	0	1	1
	Insect injury		1	3	4
	Leaf streak	- Aureobasidium	3	0	3
	Nutritional	- general	1	0	1
DESERT ROSE (Adenium)					
	Cultural	- overwatering	1	0	1
DIANTHUS (Dianthus)					
	No disease		1		1
	Nutritional	- nitrogen deficiency	1	0	1
	Root rot	- Pythium	0	1	1
	Stem rot	- Fusarium	1	0	1
DRACAENA (Dracaena)					
	Environmental	- cold injury	1	0	1
ECHEVERIA (Echeveria)					
	No disease		1		1
ELEPHANT EAR (Alocasia)					
	No disease		1		1
ERYNGIUM (Eryngium)					
	No disease		1		1
	Root rot	- Pythium	1	0	1

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FERN (Nephrolepis)					
	Insect injury		1	0	1
	No disease		1		1
FICUS (Fig)					
	Insect injury		1	1	2
GERANIUM (Pelargonium)					
	Bacterial leaf spot	- Pseudomonas	1	0	1
	Cultural	- oedema	1	1	2
	Environmental	- high temperature	1	0	1
	Gray mold	- Botrytis	1	0	1
	No disease		1		1
	Nutritional	- iron deficiency	1	1	2
		- general	1	0	1
		- soluble salts	1	0	1
	Root rot	- Pythium	1	1	2
	Stem split	- unknown	1	0	1
GEUM (Geum)					
	Root rot	- Rhizoctonia	1	0	1
GLADIOLUS (Gladiolus)					
	Insect injury		1	0	1
GOOD-LUCK PLANT (Cordyline)					
	No disease		1		1
HENS AND CHICKENS (Sempervivum)					
	Stem rot	- Phytophthora	1	0	1
HOLLYHOCK (Althaea)					
	Rust	- Puccinia	4	0	4
HOSTA (Hosta)					
	Anthrachnose	- Collectotrichum	0	1	1
	Cultural	- transplant shock	1	0	1
	Environmental	- drought	1	0	1
	Leaf blight	- Alternaria	1	0	1
	Southern blight	- Sclerotium	1	0	1
IMPATIENS (Impatiens)					
	Insect injury		1	0	1
	Leaf spot	- Alternaria	1	0	1
	No disease		1		1
	Virus	- Impatiens necrotic spot	1	0	1
IRESINE (Iresine)					
	Root rot	- Pythium	1	0	1
IRIS (Iris)					
	Leaf spot	- Heterosporium	2	0	2

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IVY (Hedera)					
	Anthracnose	- Collectotrichum	0	1	1
	Bacterial spot	- Xanthomonas	1	0	1
	Environmental	- winter injury	2	0	2
	No disease		1		1
LEMON (Citrus)					
	No disease		2		2
	Nutritional	- general	1	0	1
LIATRIS (Liatris)					
	Bacterial spot	- bacterial	2	0	2
LILY (Lilium)					
	Blight	- Botrytis	4	0	4
	No disease		1		1
LIRIOPE (Liriope)					
	Anthracnose	- Colletotrichum	3	0	3
	Crown rot	- Phytophthora	2	0	2
LOBELIA (Lobelia)					
	No disease		1		1
MARIGOLD (Tagetes)					
	Insect injury		2	0	2
	No disease		1		1
	Nutritional	- soluble salts	1	0	1
MELAMPODIUM (Melampodium)					
	Environmental	- cold injury	1	0	1
MISCANTHUS (Miscanthus)					
	No disease		1		1
OSTEOSPERMUM (Osteospermum)					
	No disease		1		1
	Nutritional	- soluble salts	1	0	1
PACHIRA (Pachira)					
	Environmental	- stress	1	0	1
PAMPAS GRASS (Cortaderia)					
	Environmental	- cold injury	1	0	1
PANSY (Viola)					
	Nutritional	- phosphorus deficiency	0	1	1
	Powdery mildew	- Oidium	1	0	1
	Root rot	- Pythium	1	0	1
PENSTEMON (Penstemon)					
	Stem rot	- Fusarium	1	0	1

<i>CROP</i>	<i>DIAGNOSIS</i>	<i>CAUSAL AGENT</i>	<i>#1° DIAGs</i>	<i>#2° DIAGs</i>	<i>TOTAL</i>
PEONY (Paeonia)					
	Leaf blotch	- Cladosporium	4	0	4
	Leaf spot	- Cercospora	1	0	1
	No disease		1		1
	Powdery mildew	- Erysiphe	1	0	1
		- Oidium	2	0	2
PERENNIAL (unknown)					
	Cultural	- oedema	1	0	1
PERIWINKLE (Vinca)					
	Insect injury		1	0	1
PETUNIA (Petunia)					
	Chemical injury	- herbicide	1	0	1
	Crown rot	- Rhizoctonia	3	0	3
	Environmental	- cold injury	3	0	3
	Gray mold	- Botrytis	2	0	2
	Inadequate specimen, no disease		3		3
	Nutritional	- nitrogen deficiency	2	0	2
		- soluble salts	1	0	1
	Root rot	- Pythium	1	0	1
	Stem rot	- Fusarium	1	1	2
		- Rhizoctonia	2	0	2
PHILODENDRON (Philodendron)					
	No disease		1		1
PHLOX (Phlox)					
	No disease		1		1
POINSETTIA (Euphorbia)					
	Environmental	- unknown	1	0	1
	Nutritional	- fertilizer burn	1	0	1
		- molybdenum deficiency	0	1	1
	Root rot	- Pythium	3	0	3
	Stem rot	- Botrytis	1	1	2
		- Rhizoctonia	1	0	1
	Virus	- Poinsettia mosaic	1	0	1
POTHOS (Pothos)					
	Bacterial spot	- bacterial	1	0	1
	No disease		1		1
PRUNELLA (Prunella)					
	Insect injury		1	0	1
RUDBECKIA (Rudbeckia)					
	Inadequate specimen		1		1
	Nutritional	- phosphorus deficiency	1	0	1
RUSSIAN SAGE (Petrovskia)					
	Insect injury		1		1

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SALVIA (Salvia)					
	Inadequate specimen, no disease		2		2
	Nutritional	- nitrogen deficiency	1	0	1
SCABIOSA (Scabiosa)	No disease		1		1
SEDUM (Sedum)	Inadequate specimen, no disease		1		1
SILENE (Silene)	Rust	- Uromyces	1	0	1
SILVER LACE VINE (Polygonum)	Inadequate specimen		1		1
SOLIDAGO (Solidago)	Rust	- Puccinia	1	0	1
SPATHIPHYLLUM (Spathiphyllum)	No disease		1		1
SPIDER PLANT (Chlorophytum)	Insect injury		1	0	1
	No disease		1		1
SUNFLOWER (Helianthus)	Downy mildew	- Plasmopora	1	0	1
	Leaf spot	- Septoria	1	0	1
SWEETPEA (Lathyrus)	No disease		1		1
SWEETPOTATO VINE (Ipomoea)	Environmental	- cold injury	1	0	1
TULIP (Tulipa)	Blight	- Botrytis	1	0	1
VERBENA (Verbena)	No disease		2		2
	Nutritional	- soluble salts	1	0	1
VERONICA (Veronica)	Stem rot	- Rhizoctonia	1	0	1
VINCA (Vinca)	Blight	- Phytophthora	1	0	1
	Canker/Dieback	- Phoma	2	0	2
	Root rot	- Pythium	1	0	1
	Root/Stem rot	- Phytophthora	1	0	1
		- Rhizoctonia	1	1	2
ZINNIA (Zinnia)	Gray mold	- Botrytis	1	1	2
	Leaf spot	- Cercospora	1	0	1
	Root rot	- Pythium	1	0	1

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<u>TURFGRASS</u>					
BENTGRASS (Agrostis)					
	Anthracnose	- Colletotrichum	16	0	16
	Blight	- Pythium	2	0	2
	Brown patch	- Rhizoctonia	1	0	1
	Dollar spot	- Sclerotinia	0	1	1
	Environmental	- stress	5	0	5
	Large patch	- Rhizoctonia	1	0	1
	No disease		9		9
	Red leaf spot	- Drechslera	1	0	1
	Root rot	- Pythium	3	4	7
		- unknown	1	0	1
	Summer patch	- Magnaporthe	1	0	1
	Take-all patch	- Gaeumannomyces	7	1	8
	Yellow patch	- Rhizoctonia	2	1	3
BERMUDAGRASS (Cynodon)					
	Brown patch	- Rhizoctonia	0	1	1
	Dollar spot	- Sclerotinia	1	0	1
	Environmental	- winter injury	1	0	1
	No disease		1		1
BLUEGRASS (Poa)					
	Anthracnose	- Collectotrichum	0	2	2
	Brown patch	- Rhizoctonia	0	1	1
	Environmental	- wet feet	1	0	1
	No disease		7		7
	Necrotic ringspot	- Leptosphaeria	1	0	1
	Red thread	- Laetisaria	1	0	1
	Rust	- Puccinia	4	0	4
	Summer patch	- Magnaporthe	1	0	1
	Yellow patch	- Rhizoctonia	2	0	2
FESCUE (Festuca)					
	Anthracnose	- Collectotrichum	2	2	4
	Brown patch	- Rhizoctonia	12	0	12
	Cultural	- heavy thatch	1	0	1
		- sand amendment	0	1	1
	Dollar spot	- Sclerotinia	2	0	2
	Environmental stresses		1	1	2
	Fairy ring	- Basidiomycete	1	0	1
	Gray leaf spot	- Pyricularia	1	1	2
	No disease		4		4
	Nutritional	- soluble salts	1	0	1
	Powdery mildew	- Erysiphe	1	0	1
	Rust	- Puccinia	2	1	3
	Slime mold	- species	1	0	1

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RYEGRASS (Lolium)					
	Anthracnose	- Collectotrichum	2	0	2
	Brown patch	- Rhizoctonia	2	0	2
	Gray leaf spot	- Pyricularia	1	0	1
	Leaf decay	- Leptosphaerulina	1	0	1
	Leaf spot	- Bipolaris	1	0	1
		- Drechslera	1	0	1
	Pink snow mold	- Microdochium	2	0	2
	Root rot	- Pythium	1	0	1
	Rust	- Puccinia	0	1	1
	Summer patch	- Magnaporthe	1	0	1
	Yellow patch	- Rhizoctonia	1	1	2
TURF (unspecified)					
	Anthracnose	- Collectotrichum	2	0	2
	Cultural	- heavy thatch	1	0	1
	Fairy ring	- Basidiomycete	2	0	2
	Inadequate specimen, no disease		3		3
	Red thread	- Laetisaria	1	0	1
	Rust	- Puccinia	1	0	1
	Slime mold	- species	1	0	1
	Smut	- Ustilago	1	0	1
ZOYSIA (Zoysia)					
	Large patch	- Rhizoctonia	3	0	3
	No disease		1	0	1
	Root decline	- Gaeumannomyces	1	0	1

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<u>WOODY ORNAMENTALS</u>					
ARBORVITAE (Thuja)					
	Black branch disease	- unknown	1	0	1
	Blight	- Botrytis	1	0	1
	Cultural	- transplant shock	5	0	5
	Environmental stresses		6	0	6
	Insect injury		5	1	6
	No disease		3		3
	Nutritional	- acid soil	1	0	1
	Physical injury	- rodent	1	0	1
	Root rot	- Phytophthora	2	0	2
	Tip blight	- Pestalotiopsis	2	1	3
ASH (Fraxinus)					
	Anthracnose	- Apiognomonia	6	0	6
	Bacterial scorch	- Xylella	1	0	1
	Chemical injury	- growth regulator	2	0	2
	Environmental	- stress	1	0	1
	Insect injury		3	0	3
	Leaf scorch	- unknown	1	0	1
	Leaf spot	- Tubakia	3	0	3
		- unknown	1	0	1
	No disease		5		5
	Powdery mildew	- species	2	0	2
AZALEA - See listing under RHODODENDRON					
BALDCYPRESS (Taxodium)					
	Insect injury		1	0	1
BARBERRY (Berberis)					
	Cultural	- transplant shock	1	0	1
	Dieback	- unknown	1	0	1
	Insect injury		1	0	1
	No disease		1		1
BAY LAUREL (Laurus)					
	No disease		1		1
BEECH (Fagus)					
	Anthracnose	- Apiognomonia	1	0	1
	Leaf spot	- Gloeosporium	1	0	1
BIRCH (Betula)					
	Collar rot	- Phytophthora	1	0	1
	Environmental	- stress	1	0	1
	Insect injury		3	0	3
	Leaf spot	- Gloeosporium	1	0	1
	No disease		2		2
	Nutritional	- iron deficiency	1	0	1
	Root rot	- Rhizoctonia	1	0	1
BLACK GUM (Tupelo)					
	Nutritional	- iron deficiency	1	0	1
	Spot anthracnose	- Sphaceloma	1	0	1

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BOXWOOD (Buxus)					
	Canker	- Pseudonectria	8	4	12
	Cultural	- oedema	1	0	1
		- transplant shock	2	0	2
	Environmental stresses		6	2	8
	Inadequate specimen, no disease		8		8
	Insect injury		9	2	11
	Nutritional	- general	1	0	1
		- potassium deficiency	1	0	1
BUCKEYE (Aesculus)					
	Anthracnose	- Glomerella	1	0	1
	No disease		1		1
BUTTERFLY BUSH (Buddleia)					
	Downy mildew	- species	1	0	1
	Insect injury		2	0	2
	Leaf spot	- Alternaria	1	0	1
CAMELLIA (Camellia)					
	Dieback	- unknown	1	0	1
	No disease		1		1
CATALPA (Catalpa)					
	Bacterial scorch	- Xylella	1	0	1
	No disease		1		1
CEDAR (Cedrus)					
	Cedar/Apple rust	- Gymnosporangium	1	0	1
	No disease		2		2
CHAMAECYPARIS (Chamaecyparis)					
	Cultural	- transplant shock	1	0	1
	Root rot	- Phytophthora	1	0	1
CHERRY (Prunus)					
	Bacterial spot	- Xanthomonas	2	0	2
	Cultural	- transplant shock	1	0	1
	Fire blight	- Erwinia	1	0	1
	Inadequate specimen, no disease		5		5
	Insect injury		3	0	3
	Leaf spot	- Blumeriella	1	2	3
		- Cercospora	2	0	2
		- Collectotrichum	1	0	1
		- Mycosphaerella	1	0	1
		- Phyllosticta	1	0	1
		- unknown	1	0	1
	Powdery mildew	- Podosphaera	2	0	2
	Thread blight	- Corticium	1	0	1

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CHERRYLAUREL (Prunus)					
	Bacterial spot	- bacterial	1	0	1
	Canker	- Cytospora	1	0	1
	Cultural	- transplant shock	1	0	1
	Environmental stresses		1	2	3
	Insect injury		2	0	2
	Leaf spot	- Phyllosticta	1	0	1
		- unknown	1	0	1
	No disease		2		2
	Root rot	- Phytophthora	1	0	1
CHESTNUT (Castanea)					
	Root/Crown rot	- Phytophthora	1	0	1
CLEMATIS (Clematis)					
	Bacterial scorch	- Xylella	1	0	1
	Inadequate specimen, no disease		2		2
	Mutation	- genetic	1	0	1
CLETHRA (Clethra)					
	No disease		1		1
COTONEASTER (Cotoneaster)					
	Root rot	- Phytophthora	1	0	1
CRABAPPLE (Malus)					
	Black rot	- Botryosphaeria	1	0	1
	Chemical injury	- growth regulator	1	0	1
	Environmental	- stress	0	1	1
	Frogeye	- Botryosphaeria	1	0	1
	Inadequate specimen, no disease		3		3
	Insect injury		1	1	2
	Physical injury	- mechanical	1	0	1
	Root rot	- Phytophthora	1	0	1
	Scab	- Venturia	19	1	20
	Sooty mold	- species	0	1	1
CRAPE MYRTLE (Lagerstroemia)					
	Chemical injury	- herbicide	1	0	1
	Environmental	- cold injury	1	0	1
	Leaf spot	- Cercospora	1	0	1
	Powdery mildew	- species	1	0	1
	Sooty mold	- species	3	0	3
CRYPTOMERIA (Cryptomeria)					
	Cultural	- improper light	1	0	1
CYPRESS (Cupressocyparis)					
	No disease		1		1

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DOGWOOD (Cornus)					
	Anthracnose	- Discula	2	0	2
	Canker	- Botryosphaeria	1	0	1
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	1	0	1
	Dieback	- unknown	1	2	3
	Environmental stresses		2	0	2
	Insect injury		2	0	2
	Leaf scorch	- unknown	2	1	3
	Leaf spot	- Pestalotia	1	0	1
		- Septoria	1	2	3
	Lichen	- species	1	0	1
	No disease		6		6
	Powdery mildew	- Erysiphe	16	0	16
	Spot anthracnose	- Elsinoe	2	3	5
	Wetwood	- bacterial	1	0	1
ELM (Ulmus)					
	Black spot	- Stegophora	2	0	2
	Canker	- Botryosphaeria	1	0	1
	Dutch elm disease	- Ophiostoma	3	0	3
	Leaf spot	- unknown	1	0	1
	No disease		8		8
	Root rot	- Phytophthora	2	0	2
	Sooty mold	- species	1	0	1
EUONYMUS (Euonymus)					
	Cultural	- oedema	1	0	1
		- transplant shock	1	0	1
	Environmental stresses		3	0	3
	Insect injury		5	0	5
	Leaf spot	- Cercospora	1	0	1
	No disease		2	0	2
	Nutritional	- soluble salts	1	0	1
FILBERT (Corylus)					
	Blight	- Anisogramma	1	0	1
	Thread blight	- Corticium	1	0	1
FIR (Abies)					
	Environmental	- stress	1	0	1
	Root rot	- Phytophthora	1	0	1
FORSYTHIA (Forsythia)					
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	1	0	1
	Leaf scorch	- unknown	1	0	1
	Leaf spot	- Phyllosticta	1	0	1
	No disease		3		3
FOTHERGILLA (Fothergilla)					
	Nutritional	- acid soil	1	0	1

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GINKGO (Ginkgo)					
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	1	0	1
	Insect injury		1	0	1
	No disease		1		1
GOLDENCHAIN TREE (Laburnum)					
	No disease		1		1
GOLDENRAINTREE (Koelreuteria)					
	Leaf scorch	- unknown	1	0	1
HAWTHORN (Crataegus)					
	Cedar/Quince rust	- Gymnosporangium	4	0	4
	Fire blight	- Erwinia	1	0	1
	Insect injury		1	1	2
HEMLOCK (Tsuga)					
	Environmental	- drought	1	0	1
	Insect injury		2	0	2
	No disease		3		3
	Root rot	- Phytophthora	1	0	1
HIBISCUS (Hibiscus)					
	Cultural	- transplant shock	1	0	1
	Environmental	- cold injury	2	0	2
	Graft problems	- incompatible	1	0	1
	Insect injury		1	0	1
	Leaf spot	- unknown	1	0	1
	No disease		1	0	1
	Root/Crown rot	- Phytophthora	1	0	1
HICKORY (Carya)					
	Chemical injury	- growth regulator	1	0	1
	Gall	- Phomopsis	1	0	1
	Insect injury		2	1	3
	Leaf spot	- Diplodia	0	1	1
	Lichen	- species	1	0	1
HOLLY (Ilex)					
	Black root rot	- Thielaviopsis	10	1	11
	Chemical injury	- herbicide	1	0	1
	Cultural	- transplant shock	4	0	4
	Decline	- unknown	3	0	3
	Environmental stresses		16	2	18
	Insect injury		7	1	8
	Leaf spot	- fungal	3	0	3
		- Pestalotia	1	0	1
		- Phyllosticta	1	0	1
	No disease		13		13
	Nutritional	- acid soil	1	0	1
		- pH high	0	1	1
	Root rot	- Rhizoctonia	1	0	1

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HONEYLOCUST (Gleditsia)					
	Bark crack	- unknown	1	0	1
	Canker	- Cytospora	0	1	1
		- Thyronectria	1	0	1
	Insect injury		1	0	1
HONEYSUCKLE (Lonicera)					
	No disease		2		2
	Powdery mildew	- Erysiphe	1	0	1
HORNBEAM (Carpinus)					
	Anthracnose	- Gloeosporium	1	0	1
	Environmental	- winter injury	0	1	1
HYDRANGEA (Hydrangea)					
	Bacterial spot	- Xanthomonas	2	0	2
	Chemical injury	- growth regulator	1	0	1
	Environmental stresses		2	0	2
	Insect injury		2	1	3
	Leaf spot	- Cercospora	4	0	4
		- Phyllosticta	1	0	1
	No disease		2		2
	Physiological	- oedema	0	1	1
	Rust	- Pucciniastrum	1	0	1
ITEA (Itea)					
	Leaf spot	- Phyllosticta	1	0	1
	Root rot	- Rhizoctonia	1	0	1
JUNIPER and RED CEDAR (Juniperus)					
	Cedar/Quince rust	- Gymnosporangium	2	0	2
	Canker	- fungal	1	0	1
	Cultural	- transplant shock	2	0	2
	Environmental stresses		2	0	2
	Insect injury		1	0	1
	No disease		5		5
	Physical injury	- rodent	1	0	1
	Root/Crown rot	- Phytophthora	1	0	1
KERRIA (Kerria)					
	Bacterial scorch	- Xylella	1	0	1
	No disease		1		1
	Nutritional	- soluble salts	1	0	1
KY COFFEETREE (Gymnocladus)					
	No disease		1		1
LEYLAND CYPRESS (X Cupressocyparis)					
	Canker	- Seiridium	1	0	1
	Cultural	- transplant shock	1	0	1
	Environmental	- cold injury	2	0	2
	Physical injury	- Bagworm silk	1	0	1

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LILAC (Syringa)					
	Bacterial blight	- Pseudomonas	1	0	1
	Bacterial scorch	- Xylella	1	0	1
	Bacterial leaf spot	- bacterial	1	0	1
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	1	0	1
	Leaf scorch	- unknown	3	1	4
	Leaf spot	- Phyllosticta	2	0	2
	No disease		5		5
	Powdery mildew	- Erysiphe	4	0	4
LINDEN (Tilia)					
	Anthracnose	- Apiognomonia	1	0	1
	No disease		1		1
MAGNOLIA (Magnolia)					
	Artillery fungus	- Sphaerobolus	0	1	1
	Chemical injury	- growth regulator	3	0	3
	Cultural	- transplant shock	2	0	2
	Environmental stresses		12	0	12
	Insect injury		7	1	8
	Leaf spot	- fungal	1	0	1
		- Phyllosticta	0	1	1
	No disease		11		11
	Nutritional	- iron deficiency	1	0	1
	Pollination problem	- unknown	2	0	2
	Powdery mildew	- Oidium	1	0	1
MAPLE (Acer)					
	Anthracnose	- Aureobasidium	2	0	2
		- Discula	4	0	4
		- Kabatiella	6	0	6
	Artillery fungus	- Sphaerobolus	1	0	1
	Bacterial scorch	- Xylella	6	0	6
	Canker	- Botryosphaeria	2	0	2
		- Hypoxylon	1	0	1
	Chemical injury	- growth regulator	1	0	1
	Cultural	- girdling root	1	0	1
		- transplant shock	9	1	10
	Decline	- unknown	8	0	8
	Environmental stresses		8	1	9
	Inadequate specimen, no disease		18		18
	Insect injury		12	5	17
	Leaf scorch	- unknown	1	0	1
	Leaf spot	- Cristulariella	1	0	1
		- Marssonina	1	0	1
		- Phyllosticta	7	0	7
		- Septoria	1	0	1
	Lichen	- species	1	1	2
	Nutritional	- iron deficiency	2	0	2
		- potassium deficiency	1	0	1
	Sooty mold	- species	3	0	3
	Tar spot	- Rhytisma	7	1	8
	Wilt	- Verticillium	5	0	5
	Wood decay	- Hypoxylon	1	0	1

<i>CROP</i>	<i>DIAGNOSIS</i>	<i>CAUSAL AGENT</i>	<i>#1° DIAGs</i>	<i>#2° DIAGs</i>	<i>TOTAL</i>
MIMOSA (Albizzia)					
	Inadequate specimen		1		1
	Insect injury		1	0	1
MULBERRY (Morus)					
	Chemical injury	- growth regulator	2	0	2
	Leaf spot	- Phloeospora	4	0	4
NANDINA (Nandina)					
	Environmental	- heat injury	1	0	1
OAK (Quercus)					
	Anthracnose	- Apiognomonina	4	1	5
	Bacterial scorch	- Xylella	21	0	21
	Canker	- Botryosphaeria	4	0	4
		- Hypoxylon	1	0	1
	Chemical injury	- growth regulator	8	1	9
	Decline	- unknown	1	0	1
	Environmental stresses		2	0	2
	Insect injury		19	6	25
	Leaf blister	- Taphrina	2	1	3
	Leaf scorch	- unknown	1	0	1
	Leaf spot	- Discula	1	0	1
		- Elsinoe	2	0	2
		- Tubakia	9	8	17
	No disease		14		14
	Nutritional	- iron deficiency	6	0	6
	Physical injury	- ice	1	0	1
		- unknown	1	0	1
	Root rot	- Armillaria	1	0	1
	Twig blight	- Botryosphaeria	1	0	1
	Wood decay	- Hypoxylon	1	0	1
PAULOWNIA (Paulownia)					
	No disease		1		1
PEACH (Prunus)					
	Gummosis	- unknown	1	0	1
	Leaf curl	- Taphrina	1	0	1
	Nutritional	- general	1	0	1
PEAR (Pyrus)					
	Chemical injury	- growth regulator	0	1	1
	Cultural	- transplant shock	2	0	2
	Decline	- unknown	3	0	3
	Environmental stresses		3	1	4
	Fire blight	- Erwinia	5	0	5
	Insect injury		5	3	8
	Leaf scorch	- unknown	3	0	3
	Lichen	- species	2	0	2
	No disease		4		4
PERSIMMON (Diospyros)					
	Insect injury		1	0	1
	Sooty mold	- species	0	1	1

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PHOTINIA (Photinia)					
	Leaf spot	- Entomosporium	2	0	2
PIERIS (Pieris)					
	Leaf blight	- Phytophthora	3	0	3
	No disease		8		8
PINE (Pinus)					
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	2	0	2
	Decline	- unknown	1	0	1
	Environmental stresses		4	0	4
	Insect injury		4	0	4
	Needle blight	- Dothistroma	1	0	1
	Needle drop	- normal	2	0	2
	No disease		11		11
	Nutritional	- pH high	0	1	1
	Physical injury	- unknown	1	0	1
	Root rot	- Phytophthora	3	0	3
	Tip blight	- Diplodia	4	0	4
	White pine decline	- environmental	11	0	11
	White pine root decline	- Verticicladiella	1	0	1
PLUM (Prunus)					
	Bacterial leaf spot	- Xanthomonas	1	0	1
	Black knot	- Apiosporina	5	0	5
	Insect injury		1	0	1
POPLAR and COTTONWOOD (Populus)					
	Canker	- Phomopsis	1	0	1
	Decline	- unknown	1	0	1
	Insect injury		0	1	1
	No disease		1		1
PRIVET (Ligustrum)					
	Inadequate specimen		1		1
	Leaf scorch	- unknown	1	0	1
PYRACANTHA (Pyracantha)					
	Insect injury		1	0	1
REDBUD (Cercis)					
	Anthracnose	- Collectotrichum	0	1	1
	Chemical injury	- growth regulator	1	0	1
	Downy mildew	- Plasmopora	1	0	1
	Environmental	- cold injury	1	0	1
	Insect injury		5	0	5
	Leaf spot	- Cercospora	1	0	1
		- Pseudocercospora	0	1	1
	No disease		4		4

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RHODODENDRON and AZALEA (Rhododendron)					
	Canker	- Botryosphaeria	2	0	2
	Cultural	- transplant shock	7	0	7
	Decline	- unknown	1	0	1
	Environmental	- cold injury	1	0	1
	Inadequate specimen, no disease		48		48
	Insect injury		15	1	16
	Leaf blight	- Phytophthora	22	0	22
	Leaf/Flower gall	- Exobasidium	2	0	2
	Leaf spot	- Pestalotia	1	0	1
	Lichen	- species	0	1	1
	Nutritional	- iron deficiency	1	0	1
	Physical injury	- unknown	1	0	1
	Root/Collar rot	- Phytophthora	1	0	1
	Root rot	- Phytophthora	1	0	1
	Sooty mold	- species	1	0	1
ROSE (Rosa)					
	Black spot	- Diplocarpon	15	1	16
	Canker	- Coniothyrium	1	0	1
		- Phomopsis	1	0	1
	Chemical injury	- growth regulator	4	0	4
		- herbicide	2	0	2
		- unknown	1	0	1
	Cultural	- transplant shock	4	0	4
	Dieback	- unknown	1	0	1
	Downy mildew	- Peronospora	1	0	1
	Environmental	- winter injury	1	0	1
	Insect injury		16	3	19
	Leaf spot	- Cercospora	0	3	3
	No disease		10		10
	Nutritional	- acid soil	0	1	1
		- nitrogen deficiency	1	0	1
	Powdery mildew	- Podosphaera	3	0	3
	Virus	- Rose rosette	5	0	5
RUSSIAN CYPRESS (Microbiota)					
	Root/Crown rot	- Phytophthora	1	0	1
SERVICEBERRY (Amelanchier)					
	Insect injury		2	1	3
	Rust	- Gymnosporangium	0	1	1
SMOKETREE (Cotinus)					
	Leaf spot	- fungal	1	0	1
	No disease		2		2
	Wilt	- Verticillium	1	0	1
SNOWBELL (Styrax)					
	No disease		2		2
SOURWOOD (Oxydendrum)					
	Cultural	- transplant shock	1	0	1

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SPIREA (Spiraea)					
	Dieback	- unknown	1	0	1
	Environmental	- cold injury	1	0	1
SPRUCE (Picea)					
	Canker	- Cytospora	2	0	2
	Cultural	- transplant shock	6	1	7
	Decline	- unknown	2	0	2
	Environmental stresses		2	0	2
	Insect injury		12	1	13
	Needle blight	- Stigmina	0	1	1
	Needle cast	- Rhizosphaera	9	0	9
	Physical injury	- bird	1	0	1
	Root rot	- Phytophthora	3	0	3
	Sooty mold	- species	1	0	1
ST. JOHN'S WORT (Hypericum)					
	Anthracnose	- fungal	1	0	1
	Root/Stem rot	- Phytophthora	1	0	1
STEWARTIA (Stewartia)					
	Bacterial scorch	- Xylella	1	0	1
SUMAC (Rhus)					
	Canker	- Botryosphaeria	1	0	1
SWEETGUM (Liquidambar)					
	Environmental	- stresses	2	0	2
SYCAMORE (Platanus)					
	Anthracnose	- Apiognomonia	1	0	1
	Bacterial scorch	- Xylella	2	0	2
	Nutritional	- iron deficiency	1	0	1
TAXUS (Taxus)					
	Environmental	- stress	2	0	2
	No disease		3		3
	Root rot	- Phytophthora	2	0	2
	Root/Crown rot	- Phytophthora	1	0	1
TULIPTREE (Liriodendron)					
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	1	0	1
	Dieback	- unknown	1	0	1
	Insect injury		4	2	6
	No disease		8		8
	Powdery mildew	- Oidium	5	0	5
	Sooty mold	- species	0	1	1
	Tar spot	- Rhytisma	0	1	1
VIBURNUM (Viburnum)					
	Environmental stresses		2	0	2
	Inadequate specimen, no disease		13		13
	Insect injury		3	0	3
	Leaf spot	- Septoria	1	0	1
	Root rot	- Phytophthora	1	0	1

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WAHOO (Euonymus)					
	Leaf spot	- unknown	1	0	1
WALNUT (Juglans)					
	Anthracnose	- Gnomonia	1	0	1
	Insect injury		1	0	1
	No disease		2	0	2
WILLOW (Salix)					
	Canker	- Botryosphaeria	1	0	1
		- Cryptodiaporthe	1	0	1
		- fungal	1	0	1
	Cultural	- transplant shock	1	0	1
	Environmental	- stress	1	0	1
	Insect injury		0	1	1
	Leaf spot	- Cercospora	3	1	4
		- fungal	1	0	1
	No disease		1		1
	Sooty mold	- species	1	1	2
WISTERIA (Wisteria)					
	Chemical injury	- growth regulator	1	0	1
YELLOWWOOD (Cladrastis)					
	Anthracnose	- Gloeosporium	1	0	1
	No disease		1		1

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VEGETABLES					
ASPARAGUS (Asparagus)					
	No disease		2	0	2
BEAN (Phaseolus)					
	Anthrachnose	- Colletotrichum	8	0	8
	Chemical injury	- growth regulator	1	1	2
		- herbicide	1	0	1
		- unknown	2	0	2
	Common blight	- Xanthomonas	3	0	3
	Environmental	- sunscald	2	0	2
	Inadequate specimen, no disease		3		3
	Insect injury		2	0	2
	Leaf spot	- Cercospora	0	1	1
		- Phaeoisariopsis	1	0	1
	Nutritional	- general	1	0	1
		- nitrogen deficiency	0	1	1
		- phosphorus deficiency	1	0	1
		- potassium deficiency	0	1	1
		- pH high	1	0	1
		- soluble salts	1	1	2
	Root rot	- Pythium	3	0	3
	Root/stem rot	- Fusarium	0	2	2
		- Rhizoctonia	8	1	9
	Rust	- Uromyces	1	0	1
	Southern blight	- Sclerotium	1	0	1
	Web blight	- Rhizoctonia	1	0	1
BEET (Beta)					
	Bacterial leaf spot	- Pseudomonas	1	0	1
	No disease		1		1
	Root rot	- Rhizoctonia	2	0	2
BROCCOLI - See listing under CRUCIFERS					
CABBAGE - See listing under CRUCIFERS					
CANTALOUPE - See listing under CUCURBITS					
CARROT (Daucus)					
	Environmental	- compaction	1	0	1
CAULIFLOWER - See listing under CRUCIFERS					
CORN, SWEET (Zea)					
	Bacterial stalk rot	- Erwinia	1	0	1
	Insect injury		2	0	2
	Northern corn leaf blight	- Setosphaeria	2	1	3
	Nutritional	- phosphorus deficiency	1	0	1
		- potassium deficiency	0	1	1
		- zinc deficiency	1	0	1
	Rust	- Puccinia	0	1	1
	Stewart's wilt	- Erwinia	4	0	4
	Virus	- Maize dwarf mosaic	0	1	1

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CRUCIFERS - BROCCOLI, CABBAGE, CAULIFLOWER, KALE, and TURNIP (Brassica)					
	Black rot	- Xanthomonas	1	0	1
	Environmental	- compaction	1	0	1
		- flooding	1	0	1
	Insect injury		1	0	1
	Leaf spot	- Alternaria	2	1	3
		- Cercospora	0	1	1
	No disease		3		3
	Nutritional	- general	3	1	4
	Root/Stem rot	- Rhizoctonia	2	0	2
	Root rot	- Phytophthora	1	0	1
CUCUMBER - See listing under CUCURBITS					
CUCURBITS - CANTALOUPE, CUCUMBER, MELON (Cucumis), GOURD, PUMPKIN, SQUASH (Cucurbita) and WATERMELON (Citrullus)					
	Angular leaf spot	- Pseudomonas	2	0	2
	Anthrachnose	- Colletotrichum	8	0	8
	Bacterial wilt	- Erwinia	6	0	6
	Blight	- Plectosporium	3	1	4
	Blossom end rot	- calcium deficiency/dry	1	0	1
	Blotches	- physiological	0	1	1
	Chemical injury	- herbicide	5	0	5
	Cottony leak	- Pythium	1	0	1
	Downy mildew	- Pseudoperonospora	6	0	6
	Environmental stresses		4	0	4
	Fruit rot	- Fusarium	1	0	1
	Gummy stem blight	- Didymella	0	1	1
	Inadequate specimen, no disease		20		20
	Injury	- unknown	0	1	1
	Insect injury		3	1	4
	Leaf blight	- Alternaria	6	0	6
	Leaf spot	- Cercospora	3	0	3
	Nutritional	- magnesium deficiency	3	1	4
		- manganese toxicity	1	0	1
		- nitrogen deficiency	1	0	1
		- soluble salts	0	2	2
	Pollination problem	- no bees	1	0	1
	Powdery mildew	- Erysiphe	6	1	7
		- Oidium	1	0	1
		- Sphaerotheca	0	1	1
	Rind necrosis	- Erwinia	1	0	1
	Root rot	- Pythium	7	1	8
	Root/stem rot	- Rhizoctonia	2	1	3
	Soft rot	- Erwinia	1	0	1
	Slime mold	- Physarum	1	0	1
	Virus	- potyvirus	1	0	1
		- unknown	2	0	2
	Wet rot	- Choanephora	1	0	1
	Wilt	- Fusarium	1	0	1

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EGGPLANT (Solanum)					
	Chemical injury	- herbicide	1	0	1
KALE	- See listing under CRUCIFERS				
LETTUCE (Lactuca)					
	Environmental	- unknown	0	1	1
	Nutritional	- calcium deficiency	1	0	1
	White rust	- Albugo	1	0	1
PEA (Pisum)					
	Root/Stem rot	- Rhizoctonia	1	0	1
PEANUT (Arachis)					
	Southern blight	- Sclerotium	1	0	1
PEPPER (Capsicum)					
	Bacterial canker	- Clavibacter	1	0	1
	Bacterial spot	- Xanthomonas	5	0	5
	Chemical injury	- herbicide	1	0	1
	Environmental stresses		4	0	4
	Fruit rot	- Cladosporium	1	0	1
	Inadequate specimen, no disease		5		5
	Insect injury		3	0	3
	Nutritional	- general	1	0	1
		- nitrogen deficiency	1	0	1
		- soluble salts	0	1	1
	Physical injury	- unknown	1	0	1
	Root rot	- Pythium	3	1	4
		- Phytophthora	1	0	1
	Root/stem rot	- Rhizoctonia	2	1	3
	Southern blight	- Sclerotium	5	0	5
	Stem injury	- unknown	1	0	1
	Virus	- pepper mild mottle	3	0	3
POTATO (Solanum)					
	Black leg	- Erwinia	3	0	3
	Chemical injury	- growth regulator	3	0	3
	Dry rot	- Fusarium	1	1	2
	No disease		2		2
	Nutritional	- general	1	0	1
	Root rot	- Rhizoctonia	1	0	1
	Scab	- Streptomyces	2	0	2
	Tuber rot	- Phoma	1	0	1
PUMPKIN	- See listing under CUCURBITS				
RHUBARB (Rheum)					
	Bacterial crown rot	- Erwinia	1	0	1
	Crown/Petiole rot	- Collectotrichum	1	0	1
SQUASH	- See listing under CUCURBITS				

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SWEETPOTATO (Ipomoea)					
	Chemical injury	- unknown	1	0	1
	Intumescence	- physiological	1	0	1
	No disease		1		1
	Scurf	- <i>Monilochaetes</i>	2	0	2
	Soft rot	- <i>Rhizopus</i>	1	0	1
TOMATO (Lycopersicon)					
	Anthracnose	- <i>Colletotrichum</i>	2	0	2
	Bacterial canker	- <i>Clavibacter</i>	8	0	8
	Bacterial speck	- <i>Pseudomonas</i>	2	0	2
	Bacterial spot	- <i>Xanthomonas</i>	13	1	14
	Blossom end rot	- calcium deficiency/dry	5	2	7
	Buckeye rot	- <i>Phytophthora</i>	5	0	5
	Catfacing	- environmental	2	0	2
	Chemical injury	- fungicide	1	0	1
		- growth regulator	23	0	23
		- herbicide	10	0	10
		- unknown	3	1	4
	Cultural	- transplant shock	2	1	3
	Early blight	- <i>Alternaria</i>	17	6	23
	Environmental stresses		7	4	11
	Fruit rot	- <i>Alternaria</i>	1	0	1
	Gray mold	- <i>Botrytis</i>	2	0	2
	Growth crack	- physiological	1	1	2
	Inadequate specimen, no disease		32		32
	Insect injury		9	7	16
	Late blight	- <i>Phytophthora</i>	28	0	28
	Leaf mold	- <i>Fulvia</i>	1	0	1
		- <i>Phoma</i>	2	0	2
		- <i>Septoria</i>	33	1	34
	Nutritional	- excessive nitrogen	2	0	2
		- fertilizer burn	2	1	3
		- general	4	0	4
		- magnesium deficiency	2	0	2
		- nitrogen deficiency	4	1	5
		- soluble salts	3	1	4
	Pith necrosis	- <i>Pseudomonas</i>	1	0	1
	Puffiness	- physiological	1	0	1
	Root knot nematode	- <i>Meloidogyne</i>	1	0	1
	Root rot	- <i>Pythium</i>	15	1	16
		- <i>Fusarium</i>	1	0	1
	Root/stem rot	- <i>Rhizoctonia</i>	1	1	2
		- <i>Sclerotium</i>	4	0	4
	Southern blight	- <i>Sclerotium</i>	4	0	4
	Stem girdling	- physical injury	1	0	1
	Stem rot	- <i>Botrytis</i>	0	1	1
		- <i>Rhizoctonia</i>	1	0	1
		- <i>Sclerotinia</i>	9	1	10
	Target spot	- <i>Corynespora</i>	1	0	1
	Virus	- Tobacco mosaic	4	0	4
		- Tomato spotted wilt	1	0	1
		- unknown	1	0	1
		- juglone	2	0	2
	Walnut wilt	- <i>Fusarium</i>	4	1	5
	Wilt	- unknown	1	2	3
	Yellow shoulder	- unknown	1	2	3

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	TURNIP - See listing under CRUCIFERS				
	WATERMELON - See listing under CUCURBITS				

	TOTALS		4010	383	4393