

UK UNIVERSITY OF KENTUCKY
College of Agriculture

Plant Diseases in Kentucky

**Plant Disease Diagnostic Laboratory
Summary**

2007

by:

P.R. Bachi

J.W. Beale

J.R. Hartman

D.E. Hershman

S.J. Long

K.W. Seebold

P. Vincelli

UK

UNIVERSITY
OF KENTUCKY

College of Agriculture
Department of Plant Pathology

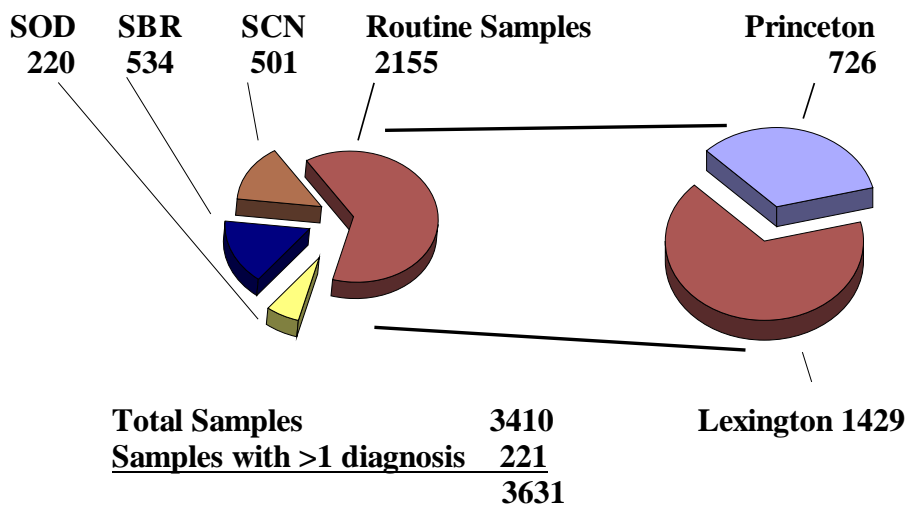
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INTRODUCTION

The Plant Disease Diagnostic Laboratory (Lexington and Princeton) handled 2909 plant samples and 501 nematode soil samples during 2007. Plant samples with more than one problem numbered 221 bringing the total number of actual diagnoses to 3130. The Lexington Laboratory diagnosed 1649 specimens. Of that number there were 1429 routine plant samples; and 148 Nursery and 72 Stream-baiting samples from the survey work for the occurrence of the Sudden Oak Death (SOD) pathogen. The SOD samples are included in the total number of samples in Figure 1 below but not in the rest of this summary, except for pages 23-24. The Princeton Laboratory's specimens totaled 1761: of that number 726 were plant samples; 534 were Soybean Rust (SBR) sentinel plot samples; and 501 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 rest of this summary. In addition to the specimens processed in the laboratory, 132 cases were also submitted in 2007 through the Digital Consulting System for consultation by the Diagnosticians and Extension Specialists (see Table 10, page 22). Plant samples plus SCN samples are summarized in Figure 1 below:

Plant Disease Diagnostic Laboratory - 2007



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 the new 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 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 Temperatures and Above Normal Precipitation

Temperatures for January 2007 averaged 37.4 degrees across the state which was 4.3 degrees above normal. High temperatures averaged from 44 in the West to 45 in the East. Departure from normal high temperatures ranged from 1 degree above normal in the West to 6 degrees above normal in the East. Low temperatures averaged from 30 degrees in the West to 32 degrees in the East. Departure from normal low temperature ranged from 6 degrees above normal in the West to 9 degrees above normal in the East.

Precipitation (liq. equ.) for the month totaled 4.21 inches statewide which was 0.49 inches above normal. Precipitation totals by climate division, West 5.40 inches, Central 4.33 inches, Bluegrass 3.81 inches and East 4.49 inches, which was +1.69, +0.31, +0.36 and -0.20 inches, respectively, from normal.

February: Much Below Normal Temperatures and Below Normal Precipitation

Temperatures for February 2007 averaged 29.7 degrees across the state which was 7.7 degrees below normal. High temperatures averaged from 40 in the West to 38 in the East. Departure from normal high temperatures ranged from 10 degrees below normal in the West to 6 degrees below normal in the East. Low temperatures averaged from 23 degrees in the West to 22 degrees in the East. Departure from normal low temperature ranged from 4 degrees below normal in the West to 4 degrees below normal in the East.

Precipitation (liq. equ.) for the period totaled 2.30 inches statewide which was 1.45 inches below normal. Precipitation totals by climate division, West 3.12 inches, Central 2.29 inches, Bluegrass 2.57 inches and East 1.50 inches, which was 0.93, 1.84, 0.86 and 1.97 inches, respectively, below normal.

March: Much Above Normal Temperatures and Below Normal Rainfall

Temperatures for the period averaged 52.8 degrees across the state which was 6.3 degrees above normal. High temperatures averaged from 68 in the West to 66 in the East. Departure from normal high temperatures ranged from 7 degrees above normal in the West to 11 degrees above normal in the East. Low temperatures averaged from 45 degrees in the West to 44 degrees in the East. Departure from normal low temperature ranged from 9 degrees above normal in the West to 9 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 2.76 inches statewide which was 1.81 inches below normal. Precipitation totals by climate division, West 2.16 inches, Central 2.36 inches, Bluegrass 3.29 inches and East 3.16 inches, which was 2.52, 2.51, 1.06 and 1.24 inches, respectively, below normal.

April: Below Normal Temperatures and Slightly Below Normal Rainfall

The month started very warm for the first 3 days, and after one of the warmest March's on record. But from April 5-9, historic (record) cold air provided hard freezes for the entire state with low

temperatures in the low 20s for the 4 day period.

Temperatures for the April 2007 averaged 53.3 degrees across the state which was 2 degrees below normal and nearly the same average temperature as for the previous month. High temperatures averaged from 67 in the West to 65 in the East. Departure from normal high temperatures ranged from 5 degrees below normal in the West to 1 degrees below normal in the East. Low temperatures averaged from 44 degrees in the West to 44 degrees in the East. Departure from normal low temperature ranged from 2 degrees below normal in the West to 1 degrees below normal in the East.

Precipitation (liq. equ.) for the month totaled 3.94 inches statewide which was 0.16 inches below normal and 96 percent of normal for the entire state. Precipitation totals by climate division, West 3.59 inches, Central 3.26 inches, Bluegrass 3.88 inches and East 4.73 inches, which was -0.93, -0.94, -0.02 and +0.91 inches, respectively, from normal.

May: Above Normal Temperatures and Below Normal Rainfall

Temperatures for May 2007 averaged 67.7 degrees across the state which was 3.3 degrees above normal and 14 degrees warmer than the previous month. High temperatures averaged from 82 in the West to 80 in the East. Departure from normal high temperatures ranged from 1 degree above normal in the West to 4 degrees above normal in the East. Low temperatures averaged from 58 degrees in the West to 55 degrees in the East. Departure from normal low temperature ranged from 2 degrees above normal in the West to near normal in the East.

Rainfall for the month totaled 2.43 inches statewide which was 2.56 inches below normal and only 49 percent of normal. Rainfall totals by climate division, West 2.50 inches, Central 3.33 inches, Bluegrass 1.62 inches and East 2.28 inches, which was 2.49, 1.93, 3.29 and 2.57 inches, respectively, below normal.

June: Above Normal Temperatures and Below Normal Rainfall

Temperatures for the period averaged 73.9 degrees across the state which was 1.6 degree above normal and 6 degrees warmer than the previous month. High temperatures averaged from 87 in the West to 86 in the East. Departure from normal high temperatures ranged from near normal in the West to 3 degrees above normal in the East. Low temperatures averaged from 64 degrees in the West to 63 degrees in the East. Departure from normal low temperature ranged from 1 degree above normal in the West to near normal in the East.

Rainfall for the period totaled 3.38 inches statewide which was 0.88 inches below normal. Rainfall totals by climate division, West 3.88 inches, Central 3.81 inches, Bluegrass 2.91 inches and East 3.01 inches, which was 0.10, 0.55, 1.44 and 1.32 inches, respectively, below normal.

July: Below Normal Temperatures and Slightly Below Normal Rainfall

Temperatures for the period averaged 74.7 degrees across the state which was 1.7 degrees below normal. High temperatures averaged from 88 in the West to 85 in the East. Departure from normal high temperatures ranged from 2 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 1 degree below normal in the West to 2 degrees below normal in the East.

Rainfall for the period totaled 4.25 inches statewide which was 0.15 inches below normal. Rainfall totals by climate division, West 3.09 inches, Central 3.14 inches, Bluegrass 5.45 inches and East 5.31 inches, which was -1.02, -1.38, +0.93 and +0.81 inches, respectively, from normal.

August: Much Above Normal Temperatures and Much Below Normal Rainfall

Temperatures for the period averaged 81.1 degrees across the state which was 6.1 degrees above

normal. High temperatures averaged from 95 in the West to 93 in the East. Departure from normal high temperatures ranged from 8 degrees above normal in the West to 9 degrees above normal in the East. Low temperatures averaged from 69 degrees in the West to 69 degrees in the East. Departure from normal low temperature ranged from 5 degrees above normal in the West to 7 degrees above normal in the East.

Rainfall for the period totaled 1.91 inches statewide which was 1.67 inches below normal. Rainfall totals by climate division, West 1.49 inches, Central 1.91 inches, Bluegrass 2.72 inches and East 1.77 inches, which was 1.70, 1.61, 1.01 and 2.13 inches, respectively, below normal.

September: Above normal temperatures and below normal rainfall

Temperatures for the period averaged 73 degrees across the state which was 6 degrees above normal. High temperatures averaged from 86 in the West to 85 in the East. Departure from normal high temperatures ranged from 5 degrees above normal in the West to 8 degrees above normal in the East. Low temperatures averaged from 61 degrees in the West to 60 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 2.33 inches statewide which was 1.16 inches below normal. Rainfall totals by climate division, West 3.22 inches, Central 3.25 inches, Bluegrass 1.65 inches and East 1.43 inches, which was 0.16, 0.65, 1.61 and 1.98 inches, respectively, below normal.

October: Above average temperatures and rainfall

Temperatures for the period averaged 62.3 degrees across the state which was 5.3 degrees above normal. High temperatures averaged from 74 in the West to 74 in the East. Departure from normal high temperatures ranged from 3 degrees above normal in the West to 6 degrees above normal in the East. Low temperatures averaged from 52 degrees in the West to 52 degrees in the East. Departure from normal low temperature ranged from 4 degrees above normal in the West to 7 degrees above normal in the East.

Rainfall for the period totaled 5.42 inches statewide which was 2.36 inches above normal. Rainfall totals by climate division, West 6.26 inches, Central 7.48 inches, Bluegrass 5.62 inches and East 3.16 inches, which was 3.08, 4.27, 2.68 and 0.23 inches, respectively, above normal.

November: Below normal temperatures and rainfall

Temperatures for the period averaged 45.6 degrees across the state which was 1 degree below normal and 16.7 degrees above last month. High temperatures averaged from 56 in the West to 54 in the East. Departure from normal high temperatures ranged from 2 degrees below normal in the West to 0 degrees from normal in the East. Low temperatures averaged from 37 degrees in the West to 36 degrees in the East. Departure from normal low temperature ranged from 0 degrees from normal in the West to 4 degrees above normal in the East.

Rainfall for the period totaled 3.55 inches statewide which was 0.49 inches below normal. Rainfall totals by climate division, West 3.09 inches, Central 4.12 inches, Bluegrass 3.68 inches and East 3.73 inches, which was 1.44, 0.17, 0.28 and 0.15 inches, respectively, below normal.

December: Above normal temperatures and rainfall

Temperatures for the period averaged 40.5 degrees across the state which was 3.2 degrees above normal and 4.9 degrees below last month. High temperatures averaged from 46 in the West to 48 in the East. Departure from normal high temperatures ranged from 0 degrees from normal in the West to 4 degrees above normal in the East. Low temperatures averaged from 32 degrees in the West to 34 degrees in the East. Departure from normal low temperature ranged from 3 degrees above normal in the

West to 10 degrees above normal in the East.

Rainfall for the period totaled 7.37 inches statewide which was 3.09 inches above normal. Rainfall totals by climate division, West 8.98 inches, Central 9.55 inches, Bluegrass 6.87 inches and East 4.91 inches, which was 4.40, 4.73, 2.89 and 1.04 inches, respectively, above normal.

CROP SUMMARIES

Tobacco: The number of tobacco samples for 2007 (374) was down significantly from 2006 (536) and 2005 (528) and was the lowest total since 1976, the earliest year of accurate records. For the third year in a row, the first reported case of Blue Mold (*Peronospora tabacina*) in the U.S. was found in Kentucky. The number of blue mold cases was very low. Despite significantly lower numbers of tobacco samples, the number of Black Shank (*Phytophthora parasitica* var. *nicotianae*) samples was slightly more than last year's number, which was up significantly from those posted for the previous two years. The number of cases of Tomato Spotted Wilt virus was down from last year, comparable to the 2004 level.

Other agronomic crops:

Corn: There was only 1 corn sample that had a primary diagnosis caused by a pathogenic organism, Charcoal rot (*Macrophomina phaseolina*).

Soybean: Australasian Soybean Rust (SBR; *Phakopsora pachyrhizi*) was detected in Kentucky on September 20, 2007. The fungus was found on soybean leaves within the sentinel plot located at the UK Research and Education Center in Princeton. In all, SBR was found on 7 samples; all soybeans, none on kudzu. It is interesting to note that we saw only one soybean sample with severe thrips injury early in the season, unlike the previous two years in which thrips injury was very common.

Small Grains: There were only 12 small grains samples, and of that number there was one wheat sample with Soilborne Wheat Mosaic Virus (SBWMV) and one sorghum sample with Gray leaf spot (*Cercospora sorghi*).

Forages: There were only 18 forage samples, and half of those had one of several common foliar diseases.

Fruit and Vegetable Plant Disease Observations:

Diagnosing fruit and vegetable diseases involves a great deal of research into the possible causes of the problems. Most visual diagnoses include 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 immunosorbant assay (ELISA), polymerase chain reaction (PCR) assay, electron microscopy, nematode extraction, or soil pH and soluble salts tests. Diagnoses which require consultation with U.K. faculty plant pathologists and horticulturists, and which need culturing, ELISA or PCR are common for commercial fruits and vegetables. The Extension plant pathology group has tested, in our laboratory, protocols for PCR detection of several pathogens of interest to fruit and vegetable growers. These include the difficult-to-diagnose pathogens causing bacterial wilt, bacterial leaf spot, yellow vine decline and Pierce's disease. The laboratory also has a role in monitoring pathogen resistance to fungicides and bactericides. These exceptional measures are efforts well spent because fruits and vegetables are high value crops. Computer-based laboratory records are maintained to provide information used for conducting plant disease surveys, identifying new disease outbreaks, and formulating educational programs.

Because fruits and vegetables are high value crops, and many of them are new or expanding crops in

Kentucky, the Plant Disease Diagnostic Laboratory should be an important resource for Extension Agents and the growers they assist. Several new vegetable diseases were investigated in 2007 due to the teamwork of Extension personnel and growers. The information gained from diagnostic experiments will help to improve production practices and reduce disease in the future. We urge county Extension agents to stress in their programming the need for accurate diagnosis of diseases of high value crops, and the importance of timely sample submission. In this way Kentucky fruit and vegetable producers can have the best possible information on diseases and their management.

The 2007 growing season in Kentucky provided some of the coldest and hottest temperatures on record. Historic low temperatures, in the low 20s, occurred in a period from April 5-9, later known as the "Easter Freeze". Temperatures during the two weeks preceding the freeze reached 80 F in some locations and advanced floral developmental stages were two to two and a half weeks ahead of normal. These temperatures also made the new growth particularly tender. Most growers lost all or major portions of their fruit crop. Loss of tree fruit, blueberries, and blackberries were nearly 100%. Raspberries were unharmed for the most part. Grape and strawberry loss estimates were about 50%. Nut crop loss was estimated at 60-100% depending on the tree type. Separating symptoms of freeze damage from those of diseases was made very difficult. Tree fruit sample numbers dropped ~80% from 2006 levels. August was the hottest on record in Kentucky averaging 6.1 degrees above normal. In addition to the hot temperatures, rainfall was well below normal for the period April through August, reaching a deficit of 9 inches in western Kentucky. While drought conditions reduced incidences of fungal infections when vegetable crops were trickle irrigated, they forced some growers to use overhead irrigation systems, increasing their risk of diseases.

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

Pierce's disease of grape caused by *Xylella fastidiosa* was detected using ELISA and confirmed via PCR in one vineyard in Kentucky. This disease was first detected in Kentucky in 2001. Since that time, growers and Extension Agents have been urged to scout 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.

- Grape crown gall caused by *Agrobacterium vitis* continues to affect vineyards, particularly in vines with freeze injury or other wounding.
- Bacterial canker caused by *Clavibacter michiganensis* subsp. *michiganensis* continues to affect tomato production and was also diagnosed in eggplant.
- Tobacco mosaic virus is being seen in tomato plantings more frequently due to the rise in popularity of heirloom tomato varieties, most of which have no resistance to TMV.
- Rhizopus stem rot (*Rhizopus* sp.) was found in one commercial tomato field. Predisposing factors in this unusual case may have been very hot temperatures and overhead irrigation. Further investigation is being conducted.
- Sclerotinia diseases--stem rot of kale caused by *Sclerotinia sclerotiorum* and lettuce drop caused by *S. sclerotiorum* (and sometimes *S. minor*)-were problematic in high tunnel production.
- Stem rot of cabbage caused by *Phytophthora drechsleri* was diagnosed; this is the first definitive report of this disease in the U.S.

Tree Fruit Diseases:

Pome Fruits: Most of the common foliar diseases of apple were minimal this year, except for cedar-apple rust (*Gymnosporangium juniperi-virginianae*), which was prevalent. Although forecasting data prior to the April 5th freeze predicted several fire blight (*Erwinia amylovora*) infection periods in

late March, most of these infections were eliminated by the freeze. Of the fire blight infections that did occur, most were in pear and Asian pear.

Stone Fruits: Scab (*Cladosporium carpophilum*) was diagnosed on nectarine, but overall stone fruit diseases were minimal.

Small Fruit Diseases:

Grapes: Pierce's disease (*Xylella fastidiosa*) was confirmed in one vineyard (see above). Crown gall (*Agrobacterium vitis*) continues to damage certain plantings. Foliar diseases were not as common as in wetter years, but black rot (*Guignardia bidwellii*) did occur in some plantings, as did anthracnose (*Elsinoe ampelina*), Phomopsis cane and leaf spot (*Phomopsis viticola*), and powdery mildew (*Uncinula necator*). Heavy spider mite infestations affected many vineyards, prompted by the persistent dry weather.

Brambles: Cane and leaf rust, caused by *Kuehneola uredinis*, was diagnosed on blackberry; this disease differs from the systemic orange rust that we see in some years. Fire blight (*Erwinia amylovora*) and crown gall (*Agrobacterium tumefaciens*) were also diagnosed on blackberry.

Blueberries: Root and collar rot caused by *Phytophthora* spp. was diagnosed. Twig and branch canker diseases caused by fungi which attack stressed blueberries were common.

Strawberries: Leaf spot (*Mycosphaerella fragariae*), leaf blight (*Phomopsis obscurans*), anthracnose crown rot (*Colletotrichum acutatum*) and gray mold (*Botrytis cinerea*) were diagnosed, but were only seen at low levels.

Vegetable diseases:

Vegetable transplants: Pythium (*Pythium* sp.) root rot and/or damping off were seen in vegetable transplants, including cabbage, cucumber, pepper and tomato.

Cucurbits: Bacterial wilt (*Erwinia tracheiphila*), which is vectored primarily by the striped cucumber beetle (*Acalymma vittatum*) was problematic in cucurbit crops this year, including cucumber, melon, squash and pumpkin. Anthracnose (*Colletotrichum orbiculare*) was also common in many cucurbits with the leaf spot, stem lesion and fruit decay phases being observed. Fusarium fruit decay (*Fusarium* sp.) affected pumpkin and cucumber.

Tomatoes: Foliar diseases such as early blight (*Alternaria solani*) and Septoria leaf spot (*Septoria lycopersici*) were much less common this year than usual due to exceptionally dry weather throughout the growing season, although both did occur, particularly in unsprayed, irrigated home gardens. Timber rot (*Sclerotinia sclerotiorum*) was diagnosed from several locations. Bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*) was found in some commercial plantings, while foliar bacterial diseases (particularly bacterial spot [*Xanthomonas campestris* pv. *vesicatoria*] and bacterial speck [*Pseudomonas syringae* pv. *tomato*]) were fairly uncommon. Fusarium wilt (*Fusarium oxysporum* f. sp. *lycopersici*) was diagnosed a number of times, most often in home garden plantings and heirloom or older varieties lacking wilt resistance. Rhizopus stem rot (*Rhizopus* sp.) was diagnosed and is being investigated further (see above). Tobacco mosaic virus (see above) and tomato spotted wilt virus were diagnosed.

Peppers: Bacterial spot (*Xanthomonas campestris* pv. *vesicatoria*) was the most common disease of pepper this year. Anthracnose (*Colletotrichum gloeosporioides*), southern blight (*Sclerotium rolfsii*), and stem rot (*Rhizoctonia* sp.) were also seen. A Fusarium disease of pepper is currently being investigated; at this point, it is unclear whether the disease is limited to a root/stem rot or whether it has colonized the vascular tissues. Experiments to identify the species of Fusarium present and determine which plant tissues are affected are being conducted.

Cole crops: In addition to the *Phytophthora* stem rot in cabbage (see above), *Pythium* stem rot (*Pythium* sp.) was found in broccoli. Black rot (*Xanthomonas campestris* pv. *campestris*) was diagnosed in cabbage, as were *Rhizoctonia* wirestem (*Rhizoctonia solani*), *Alternaria* leaf spot (*Alternaria* sp.) and bacterial soft rot (various species). The bacterial soft rot was occurring in cut stems of heads harvested during very hot weather. White spot was diagnosed on turnip (*Mycosphaerella capsellae*).

Other vegetables: Bean and pea diseases were not very prevalent and were limited to root/stem rot complex caused by species of *Rhizoctonia* and *Fusarium*, and anthracnose pod infection (*Colletotrichum lindemuthianum*). Bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*) was diagnosed on eggplant (see above); *Verticillium* wilt (*Verticillium* sp.) was also found on eggplant.

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.

To assist County Extension Agents in dealing with plant disease issues, we also rely on our digital consulting system utilizing photographic images. When the system is used to assist in diagnosis, the images can help us determine where and how agents should collect samples for submission to the laboratory. 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. Of more than 1200 digital consulting cases, 30-35% dealt with landscape and nursery plants.

The 2007 growing season in Kentucky was not kind to most woody landscape plants. January temperatures statewide were 6 or 7 degrees above normal, and then February was the 11th coldest and 26th driest in the past 112 years. A particularly warm spring featured March and very early April temperatures 9 to 13 degrees above normal with 13 to 25 days having temperatures 70 degrees or above. Some locations had as many as 12 days above 80. These warm temperatures broke dormancy and accelerated flowering and shoot growth so that plant development was advanced by 2 or 3 weeks.

A record-setting Easter-time freeze dropped temperatures drastically; indeed, in some Kentucky locations, the temperature dropped from 80 to 29 degrees on April 5. This was followed by 5 consecutive days with low temperatures below 30 degrees statewide, with lows of about 22 degrees for several nights, and with some locations falling to 18 degrees F. Summer was hot and dry with temperatures 90 F or above for 44 days as compared to 20 days in most years. Depending on the location, temperatures were above normal as much as 7 degrees F in May, 5 degrees in June, 2 degrees in July, 9 degrees in August, and 8 degrees in September. Severe drought conditions dominated throughout the summer and rainfall was localized across the state. Some locations were as much as 16 inches behind in rainfall by the end of September.

With wetness affecting early season disease development, there were sufficient days with rain in most of Kentucky during March and the first days of April. Thus, there were limited opportunities for rain-based development of some spring plant diseases such as scab and cedar-quince rust; warm temperature combined with wet conditions favored fire blight, especially in the early-blooming

flowering pears and crabapples. Seventy and 80 F temperatures in late March maximized fire blight infection, although in some cases, disease failed to develop due to subsequent freeze injury of infected tissues.

This was a moderate year for landscape plant disease incidence with diseases favored by drought or spring freeze injury being the most common. The following important or unusual diseases were observed:

Deciduous trees:

- Ash, dogwood, oak and redbud canker (*Botryosphaeria*) promoted by stresses relating to spring freeze and summer drought
- Ash, hickory, and maple anthracnose (*Discula* and *Kabatella*) and dogwood spot anthracnose (*Elsinoe*)
- Crabapple scab (*Venturia*)
- Dogwood, oak and tuliptree powdery mildew (*Microsphaera*, *Phyllactinia*)
- Flowering pear, serviceberry, and flowering crabapple fire blight (*Erwinia*)
- Flowering plum and flowering cherry black knot (*Apiosporina*)
- Hackberry, maple, oak and sycamore bacterial leaf scorch (*Xylella*)
- Honey locust and aspen leaf spot (*Cercospora*)
- Maple tar spot (*Rhytisma*)
- Oak Actinopelte leaf spot (*Tubakia*)
- Redbud wilt (*Verticillium*)
- Many tree species winter drying (broad-leaved evergreens), spring freeze and summer drought-related woes including loss of bark and vertical trunk splits, especially on young trees

Needle Evergreens:

- Leyland cypress blight (*Seridium*)
- Juniper tip blight (*Kabatina*, *Phomopsis*) and juniper rusts (*Gymnosporangium*)
- Pine tip blight (*Diplodia*) and needle casts (*Mycosphaerella*, *Lophodermium*)
- Taxus root rot (*Phytophthora*)
- White pine, spruce, and white fir root rot (*Phytophthora*)
- White pine blister rust (*Cronartium*) and white pine decline (physiological)

Shrubs:

- Boxwood cold injury, canker (*Pseudonectria*) and root rot (*Pythium*)
- Euonymus powdery mildew (*Erysiphe*) and crown gall (*Agrobacterium*)
- Forsythia gall (*Phomopsis*)
- Holly black root rot (*Thielaviopsis*)
- Hydrangea leaf spot (*Cercospora*), root rot (*Phytophthora*)
- Rhododendron canker (*Botryosphaeria*)
- Rose black spot (*Diplocarpon*) powdery mildew (*Sphaerotheca*) and rosette (possible virus, leaf curl mite-transmitted)

Herbaceous Annuals and Perennials:

- Aster, fuchsia, and geranium rusts (*Coleosporium*, *Puccinia*)
- Chrysanthemum wilt (*Fusarium*) and root rot (*Pythium*, *Rhizoctonia*)
- Daylily leaf streak (*Aureobasidium*) and cold injury
- Gaillardia white smut (*Entyloma*)
- Impatiens, pansy, and petunia black root rot (*Thielaviopsis*)
- Pachysandra stem canker and blight (*Volutella*)
- Phlox and sedum powdery mildew (*Oidium*)

- Balloon flower, begonia, dahlia, geranium, pansy, petunia, portulaca, rudbeckia, snapdragon, and zinnia root rots (*Pythium*, *Rhizoctonia*)
- Vinca canker and root and stem rot (*Phoma*, *Rhizoctonia*)

A Shift in Sample Types:

As noted above, the number of tobacco samples for 2007 (374) was down significantly from 2006 (536) and 2005 (528) and was the lowest total since 1976, the earliest year of accurate records. 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 vegetable samples. An increasing number of these samples are of plant types which are less common and therefore require more work, 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 day-to-day diagnosis of samples, monitoring of several organisms and the diseases they cause is conducted by 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*

In addition to those mentioned above and the work with Asian soybean rust and Sudden oak death, the detection of soybean cyst nematodes in new areas of the state and in soil on commercial ornamental stock for export (e.g. to Canada and California) is 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 specialists in conducting research in turf, ornamentals, corn, tobacco, forages, and fruits as well as with the Soybean rust sentinel plot in Lexington. Lee Jordan worked with Ed as a part-time student assistant. Bernadette Amsden conducted

laboratory research on vegetables, tobacco, and ornamentals, including conducting diagnostic tests (PCR, ELISA, etc.) on many plant samples. Patricia de Sa' Guimares led our survey efforts with Sudden Oak Death sampling as well as developing PCR protocols. Terry Yielding works in Princeton and looked at all the Asian Soybean Rust samples as well as worked with Soybean Cyst Nematode analysis. Colette Laurent worked part-time in Princeton analyzing soybean cyst nematode samples. Mary Rachel Ray provided very capable, part-time assistance in the Princeton Laboratory. Brenda Kennedy joined the group Nov 1, 2007 as a research technician in Princeton and will be working with plot research and overseeing the Soybean Cyst Nematode and Asian Soybean Rust work.

Thanks also go to Pat Yancey and Mindy Thompson in Lexington and Mary Ann Kelley and Stephanie Farmer in Princeton, for their work in mailing thousands of diagnostic forms and IPM/PDDL Surveys.

Tom Priddy, Biosystems and Ag. Engineering - Meteorology, and his staff provided information for the summary of weather conditions for 2007.

Support from the Kentucky Integrated Pest Management Program for supplemental funding of additional diagnostic testing 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 2007. 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	23	2	3	1	5	6	40
Forages	4	13	0	0	4	4	25
Rapeseed (Canola)	0	0	0	0	0	1	1
Small grains	7	2	1	0	0	3	13
Soybeans	28	457*	3	0	5	498*	991
Tobacco	115	227	35	8	6	40	431
<u>Fruit</u>							
Small fruit	22	31	6	1	11	34	105
Tree fruit	5	30	0	1	5	9	50
<u>Herbs</u>							
	3	6	1	0	0	0	10
<u>Identifications</u>							
	0	18	0	0	0	0	18
<u>Ornamentals</u>							
Herbaceous and							
Houseplants	70	116	3	3	15	37	244
Turfgrass	19	73	2	2	1	33	130
Woody	244	231	18	11	94	232	830
<u>Vegetables</u>							
	89	161	34	20	35	62	401
<u>Miscellaneous</u>							
	0	4	0	0	0	118**	122
<u>Total</u>	629	1371	106	47	181	1077	3411

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 7 soybean samples with and 415 soybean samples without Asian Soybean Rust from the SBR sentinel plot system; and 430 soil samples with and 71 soil samples without Soybean Cyst Nematodes.

**Number includes 112 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	Other ²
<u>Agronomic</u>					
Corn	0	2	0	0	0
Forages	0	13	0	0	0
Rapeseed (Canola)	0	0	0	0	0
Small grains	0	1	0	1	0
Soybeans	0	25*	431**	1	0
Tobacco	5	185	0	35	2
<u>Fruit</u>					
Small fruit	5	24	0	2	0
Tree fruit	8	20	0	0	2
<u>Herbs</u>					
	0	6	0	0	0
<u>Identifications</u>					
	0	6	0	0	12
<u>Ornamentals</u>					
Herbaceous and					
Houseplants	7	102	1	5	1
Turfgrass	0	72	0	0	1
Woody	37	175	1	4	14
<u>Vegetables</u>					
	30	119	1	11	0
<u>Miscellaneous</u>					
	1	2	1	0	0
Total	93	752	435	59	32

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 Algae, Lichen and Phytoplasma.

* Number includes 7 soybean samples with Asian Soybean Rust from the SBR sentinel plot system.

**Number includes 430 soil samples with Soybean Cyst Nematodes.

Table 3. NUMBER OF PLANT SAMPLES BY CROP CATEGORY

Crop Category	Number of Plant Specimens	Percentage of Total Plant Specimens
Agronomic (-Tobacco + 422 Soybean SBRs)	548	20.4
Tobacco	374	13.9
Fruit	146	5.4
Herbs	9	0.3
Identifications	18	0.7
Ornamentals	1111	41.3
Vegetables	361	13.4
Miscellaneous (includes 112 Kudzu SBRs)	122	4.6
Total Plant Samples (includes SBRs)	2689	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	34	6	40
Forages	21	4	25
Rapeseed (Canola)	1	0	1
Small grains	12	1	13
Soybeans	981*	10	991
Tobacco	374	57	431
<u>Fruit</u>			
Small fruit	98	7	105
Tree fruit	48	2	50
<u>Herbs</u>			
	9	1	10
<u>Identifications</u>			
	18	0	18
<u>Ornamentals</u>			
<u>Herbaceous and</u>			
Houseplants	219	25	244
Turfgrass	119	11	130
Woody	773	57	830
<u>Vegetables</u>			
	361	40	401
<u>Miscellaneous**</u>			
	122	0	122
Total	3190	221	3411

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 + 501 SCN soil samples + 422 SBR samples

**Numbers include 112 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	
	Ext¹	Non-Ext²	Ext¹	Non-Ext²	Ext¹	Non-Ext²	Ext¹	Non-Ext²
<u>Agronomic</u>								
Corn	32	2	0	0	0	0	0	0
Forages	17	2	0	0	0	2	0	0
Rapeseed (Canola)	0	0	0	0	0	1	0	0
Small grains	11	1	0	0	0	0	0	0
Soybeans	50	6	0	0	0	2	0	0
Tobacco	336	26	0	0	0	12	0	0
<u>Fruit</u>								
Small Fruit	52	5	33	3	0	5	0	0
Tree Fruit	12	0	27	4	0	5	0	0
<u>Herbs</u>								
	4	0	2	0	0	1	0	2
<u>Identifications</u>								
	0	1	13	1	0	1	0	2
<u>Ornamental</u>								
Herbaceous and								
Houseplants	116	12	70	15	0	2	3	1
Turfgrass	15	33	44	1	0	5	6	15
Woody	129	69	512	23	0	20	16	4
<u>Vegetable</u>								
	146	14	177	9	6	9	0	0
<u>Miscellaneous</u>								
	2	1	7	0	0	0	0	0
<u>Total</u>	922	172	885	56	6	65	25	24
<u>Total/Grower Type</u>	1094		941		71		49	

Total number of samples received = 2155

¹ 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.	3	1	2	6	0	12
A&L Labs	0	0	0	1	0	1
Entomology Department	1	3	12	2	0	18
Horticulture Department	0	3	1	1	0	5
Mississippi State University	0	0	0	0	1	1
Plant & Soil Sciences Department	26	0	2	5	0	33
					<u>Total</u>	70
					<u>Total number of routine plant specimens</u>	2155
					<u>Percent of specimens referred outside Diagnostic Lab for diagnosis</u>	3.5

* 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)	11
Culturing	21
Enzyme-linked Immunosorbent Assay (ELISA)	175
Incubation	114
Microscope (705 routine plant samples +534 SBR)	1239
Nematode extraction (total = 502)	
Pinewood nematode	1
Soybean cyst nematode (SCN)	501
Nitrate test	1
Soil tests	93
Visual	1034
Total	3190

*** Based on 2155 routine plant samples, 534 SBR, and 501 SCN samples = 3190.
Does not include SOD work (see pages 23-24).**

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	6	0	4	0	1	1	0
ALLEN	10	0	3	2	1	4	0
ANDERSON	9	0	2	1	5	1	0
BALLARD	8	2	2	0	2	2	0
BARREN	24	2	7	1	9	5	0
BATH	9	1	2	0	5	1	0
BELL	3	0	0	1	2	0	0
BOONE	36	0	0	0	30	4	2
BOURBON	25	1	4	2	15	3	0
BOYD	3	0	0	0	2	0	1
BOYLE	29	1	1	1	22	3	1
BRACKEN	2	0	2	0	0	0	0
BREATHITT	9	0	0	0	8	1	0
BRECKINRIDGE	69	7	39	2	12	9	0
BULLITT	21	1	1	2	14	3	0
BUTLER	12	4	4	0	3	1	0
CALDWELL	57	8	13	7	17	12	0
CALLOWAY	51	7	18	2	17	7	0
CAMPBELL	8	0	1	0	3	4	0
CARLISLE	13	0	2	2	6	3	0
CARROLL	6	0	2	0	2	2	0
CARTER	12	0	2	0	10	0	0
CASEY	11	1	2	1	2	5	0
CHRISTIAN	75	4	16	2	34	19	0
CLARK	26	0	5	1	13	6	1
CLAY	2	0	1	0	0	1	0
CLINTON	5	0	0	0	5	0	0
CRITTENDEN	15	0	0	0	9	6	0
CUMBERLAND	11	0	0	2	4	4	1
DAVISS	88	13	18	3	32	20	2
EDMONSON	5	0	0	1	2	2	0
ELLIOTT	5	0	0	1	3	1	0
ESTILL	7	0	2	0	4	1	0
FA YETTE	290	6	16	22	222	20	4
FLEMING	21	2	7	1	7	4	0
FLOYD	8	0	0	1	3	4	0
FRANKLIN	18	0	0	0	9	8	1
FULTON	1	0	0	0	1	0	0
GALLATIN	1	0	0	0	1	0	0
GARRARD	10	0	3	0	7	0	0
GRANT	10	0	0	2	7	1	0
GRAVES	15	2	4	2	4	3	0
GRAYSON	17	1	3	2	9	2	0
GREEN	12	0	6	0	7	2	0
GREENUP	8	0	0	2	5	1	0
HANCOCK	9	1	4	0	2	2	0
HARDIN	11	0	2	1	7	1	0
HARLAN	4	0	0	0	4	0	0
HARRISON	6	0	0	0	2	2	2
HART	15	0	13	0	1	1	0
HENDERSON	30	3	3	3	15	6	0
HENRY	26	1	10	0	13	2	0
HICKMAN	3	2	1	0	0	0	0
HOPKINS	7	3	4	0	0	0	0
JACKSON	7	0	1	5	1	0	0
JEFFERSON	48	1	0	0	43	4	0
JESSAMINE	17	0	7	1	7	2	0
JOHNSON	0	0	0	0	0	0	0
KENTON	21	0	0	1	14	6	0
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	11	3	4	0	3	0	1
LAUREL	32	1	1	0	27	2	1
LAWRENCE	11	0	0	2	4	5	0
LEE	3	0	0	0	0	3	0
LESLIE	0	0	0	0	0	0	0
LETCHER	3	0	0	0	1	0	2
LEWIS	11	2	2	0	4	2	0
LINCOLN	27	2	3	2	13	7	0
LIVINGSTON	7	0	0	1	3	3	0
LOGAN	39	2	17	1	13	6	0
LYON	17	0	3	1	7	5	1
McCRACKEN	36	3	1	5	22	4	1
McCREARY	3	0	0	0	1	2	0
McLEAN	2	0	1	1	0	0	0
MADISON	53	0	1	5	44	1	2
MAGOFFIN	0	0	0	0	0	0	0
MARION	20	2	3	0	15	0	0
MARSHALL	42	2	0	3	24	13	0
MARTIN	6	0	0	1	4	1	0
MASON	3	0	1	0	1	1	0
MEADE	12	0	3	0	6	3	0
MENIFEE	3	0	1	0	1	1	0
MERCER	9	0	2	0	7	0	0
METCALFE	11	1	4	1	3	2	0
MONROE	16	0	5	1	6	4	0
MONTGOMERY	23	0	1	4	8	9	1
MORGAN	19	0	10	1	4	3	1
MUHLENBERG	13	2	4	0	5	2	0
NELSON	25	1	3	13	8	0	0
NICHOLAS	4	0	2	0	1	1	0
OHIO	1	0	1	0	0	0	0
OLDHAM	45	2	0	2	37	4	0
OWEN	3	0	1	1	1	0	0
OWSLEY	0	0	0	0	0	0	0
PENDELTON	0	0	0	0	0	0	0
PERRY	1	0	0	0	0	1	0
PIKE	1	0	0	0	1	0	0
POWELL	2	0	0	0	0	2	0
PULASKI	45	1	3	3	19	16	3
ROBERTSON	7	0	3	0	3	1	0
ROCKCASTLE	1	0	0	0	0	1	0
ROWAN	8	0	3	0	2	3	0
RUSSELL	18	1	0	3	6	5	3
SCOTT	16	0	1	1	10	4	0
SHELBY	15	3	5	1	3	3	0
SIMPSON	20	4	7	3	5	1	0
SPENCER	11	0	3	0	8	0	0
TAYLOR	21	4	9	0	3	5	0
TODD	17	1	5	3	5	3	0
TRIGG	26	2	5	1	11	3	4
TRIMBLE	8	2	3	0	2	1	0
UNION	13	4	0	0	6	3	0
WARREN	48	2	5	2	29	9	1
WASHINGTON	16	0	1	5	8	2	0
WAYNE	8	0	2	1	3	2	0
WEBSTER	9	4	4	0	0	1	0
WHITLEY	8	0	1	0	6	1	0
WOLFE	6	0	0	1	3	2	0
WOODFORD	32	1	7	4	16	4	0
Out-of-State (none)	0	0	0	0	0	0	0
TOTALS	2155	126	374	146	1111	361	37

¹ Does not include SBR or SCN 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 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	1043	31
Berberich, SG	Horticulture	1	0
Bessin, RT	Entomology	6	5
Coolong, T	Horticulture	0	1
Fountain, WM	Horticulture	0	1
Green, JD	Plant & Soil Sciences	7	0
Hartman, JR	Plant Pathology	37	20
Kurtural, SK	Horticulture	0	7
Lee, CD	Plant & Soil Sciences	2	5
Long, SJ	Plant Pathology	234	2
Palmer, GK	Plant & Soil Sciences	14	1
Pearce, BC	Plant & Soil Sciences	1	0
Powell, AJ	Plant & Soil Sciences	0	4
Schwab, GJ	Plant & Soil Sciences	0	4
Seebold, KW	Plant Pathology	25	10
Strang, JG	Horticulture	3	2
Townsend, LH	Entomology	15	7
Vincelli, P	Plant Pathology	39	8
Witt, WW	Plant & Soil Sciences	4	0
PRINCETON			
Bachi, PR (Diagnostician)	Plant Pathology	673	20
Bailey, WA	Plant & Soil Sciences	17	22
Dunwell, WC	Horticulture	7	9
Herbek, JH	Plant & Soil Sciences	6	4
Hershman, DE	Plant Pathology	0	5
Johnson, DW	Entomology	4	0
Lacefield, GD	Plant & Soil Sciences	2	1
Masabni, JG	Horticulture	4	6
Martin, JR	Plant & Soil Sciences	6	3
Murdock, LW	Plant & Soil Sciences	8	3
Yielding, TL	Plant Pathology	530	0
Wurts, WA	Kentucky State Univ.	1	0

¹ The specialist or diagnostician signing the Plant Disease Diagnostic Form was considered the primary diagnoser.

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.

**132 cases were submitted in 2007 by a total of 42 submitters.
Cases came from a total of 43 counties.**

Plant/Crop	CountOfPlant/Crop
Corn	6
Herb	1
Herbaceous ornamental	9
Landscape shrub	11
Landscape tree	28
other (soil mound)	1
Small fruit	8
Soybean	5
Tobacco	17
Tree fruit	5
Turf grass	2
Vegetable	39

Early Detection Survey for *Phytophthora ramorum* in Kentucky, 2007

Patricia B. de Sá¹, Chris Barton², Rupal Patel², Katie Adank², Amy Bateman¹, John Hartman¹
¹Department of Plant Pathology and ²Department of Forestry

Note: A more complete report of this work can be found in the UK Agricultural Experiment Station publication, PR-554, <http://www.ca.uky.edu/agc/pubs/pr/pr554/pr554.pdf>

Acknowledgments In addition to the USDA Forest Service who funded and provided technical support, we also wish to thank the private landowners who gave permission to perform the survey on their property.

Nature of Work

Phytophthora ramorum causes Ramorum leaf blight, shoot dieback and stem cankers on woody trees and shrubs, herbaceous plants and ferns; on mature oak and tanoak trees this pathogen causes sudden oak death. *Phytophthora ramorum* and many other *Phytophthora* species can spread in rain splash and irrigation water, and monitoring for *P. ramorum* in water in ponds and streams has been carried out in several locations within the United States.

An early detection survey of *P. ramorum* in Kentucky streams was conducted by scientists from the Department of Plant Pathology and the Department of Forestry at the University of Kentucky during 2007. Each watershed was sampled using rhododendron leaves placed in two net bags that were immersed in the water for periods of one to two weeks during five months. *Phytophthora* propagules in the water infect the leaves and the pathogen can be isolated from them. After the period of immersion in the stream the bags were retrieved, the leaves were double bagged, maintained at low temperature and taken to the Plant Pathology Diagnostic Lab (PPDL) at the University of Kentucky. Measurements of water temperature and pH were taken and small water samples were collected from each stream for future analysis should any sample test positive for *P. ramorum*.

It is not possible to determine if the lesions on a leaf are caused by *P. ramorum* by visual inspection, the pathogen has to be cultured in a selective culture medium for development of differentiating structures or a method like PCR must be used. The leaves collected from one of the bags were used for isolation in selective medium at the PPDL and those from the second bag were sent to another lab for testing by PCR and confirmation of the results obtained in the Lexington lab.

Results and Discussion

Eight streams were baited over a five month period and bait bags were placed within private property with consent of the owners where it was possible to do so. This allowed for protection of the bags against tampering and for easy access for researchers placing and collecting the bags. Streams not within private property were sampled with permission for sampling for research purposes from the appropriate organizations.

The survey was carried out for five months and eight streams were sampled with two bags at each sampling period resulting in 80 baiting opportunities. Some bags were lost and sampling was not possible in two streams in late summer due to drought. At the end of the of the five month sampling period there were 72 successful baiting trials yielding composite leaf samples for analysis. Leaves collected from one bait bag were used for isolations in the Plant Pathology Diagnostic Laboratory and many *Phytophthora* species were isolated, but not *Phytophthora ramorum*. The leaves collected from the second bag were sent to a partnering lab for analysis by PCR as an independent secondary diagnostic.

Phytophthora ramorum was not isolated by culturing and no samples were positive in PCR for this pathogen in Kentucky in 2007.

National Nursery Survey for *Phytophthora ramorum* in Kentucky, 2007

Patricia B. de Sá¹, Janet Lensing², Joe Collins², Carl Harper², John Obrycki², John Hartman¹.

¹Department of Plant Pathology and ²Department of Entomology.

Note: A more complete report of this work can be found in the UK Agricultural Experiment Station publication, PR-554, <http://www.ca.uky.edu/agc/pubs/pr/pr554/pr554.pdf>

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Nature of Work

Phytophthora ramorum has been recognized as presenting a risk to the nursery industry and to rhododendrons and oak trees in landscaped and wild areas. Although this pathogen affects mostly camellias, rhododendrons, viburnums, oaks and tanoaks, many woody shrubs and trees, herbaceous plants and ferns can also become infected and develop Ramorum blight with varying levels of severity.

The National Nursery Survey in Kentucky in 2007 was performed by collaboration 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. Procedures for collecting and testing were according to protocols established by the USDA-APHIS-PPQ. Thirty seven nurseries and retail outlets were surveyed for detection of *P. ramorum* mostly in central and eastern Kentucky, parts of the state that may be at higher risk for establishment of the pathogen. Risk was based on one or more of these factors: composition of native plants in the area, favorable climate and weather conditions and presence of nursery receiving plants from areas where the pathogen is present.

Research and experience in nurseries have indicated that six genera of plants seem to be very susceptible to infection and are considered high risk plants: *Camellia*, *Rhododendron* (excluding the type of azaleas that have small leaves), *Viburnum*, *Pieris*, *Kalmia* (mountain laurel) and *Syringa* (lilac). Samples of leaves, apical shoots and/or flower buds showing symptoms typical of Ramorum blight were collected mostly from the six high risk genera. However, some samples were also taken from other plants showing suspicious symptoms. All samples were double-bagged and transported to the Plant Pathology Diagnostic Lab at the University of Kentucky for testing.

The samples were tested using ELISA; an assay based on immunological detection of proteins that are present in organisms in the genus *Phytophthora* and indicates infection by any one of several species. DNA was extracted from the samples that tested positive in ELISA and was sent to the USDA-APHIS for testing by PCR for *P. ramorum*, as required by the survey protocol.

Results and Discussion

Samples were collected from 36 nurseries and retail outlets in 18 counties: Boone, Boyd, Boyle, Breathitt, Bullitt, Campbell, Clark, Fayette, Franklin, Jefferson, Jessamine, Johnson, Laurel, Nelson, Oldham, Pulaski, Shelby and Taylor. Of the 148 composite samples collected 26 samples tested positive in ELISA for the genus *Phytophthora*. DNA was extracted from the ELISA positive samples and was sent to the USDA-APHIS for testing by PCR, and no samples tested positive in PCR for *Phytophthora ramorum*. No samples tested PCR positive for *Phytophthora ramorum* in the nursery survey of 2007 in Kentucky, although it is likely that some plants were infected by another species of *Phytophthora* that is not necessarily as damaging as *P. ramorum*.

AGRONOMIC CROPS

CORN

CORN (Zea) (includes Popcorn)

Charcoal rot	-	Macrophomina	1	0	1
Chemical injury	-	growth regulator	1	0	1
	-	herbicide	2	0	2
Environmental stresses			7	2	9
Gray leaf spot	-	Cercospora	0	1	1
Inadequate specimen, no disease			7		7
Insect injury			2	3	5
Nutritional	-	acid soil	1	0	1
	-	magnesium deficiency	3	0	3
	-	phosphorus deficiency	1	0	1
	-	potassium deficiency	4	0	4
	-	zinc deficiency	5	0	5

FORAGES

ALFALFA (Medicago)

Anthracnose	-	Colletotrichum	1	0	1
Environmental stresses			2	0	2
Insect injury			1	2	3
Leaf spot	-	Cercospora	0	1	1
	-	Leptosphaerulina	3	1	4
No disease			1		1
Nutritional	-	general	2	0	2
Spring black stem	-	Phoma	2	0	2
Summer black stem	-	Cercospora	1	0	1

BERMUDAGRASS (Cynodon)

Leaf spot	-	Bipolaris	1	0	1
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BIG BLUESTEM (Andropogon)

No disease			1		1
Rust	-	Puccinia	1	0	1

ORCHARDGRASS (Dactylis)

Brown stripe	-	Cercosporidium	1	0	1
Insect injury			1	0	1
No disease			2		2

RAPSEED

“CANOLA” (Brassica)

No disease			1		1
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SOYBEAN

SOYBEAN (Glycine)

Asian soybean rust	- Phakopsora	7	0	7
Brown spot	- Septoria	0	1	1
Charcoal rot	- Macrophomina	3	0	3
Chemical injury	- growth regulator	3	0	3
Downy mildew	- Peronospora	3	0	3
Environmental stresses		10	0	10
Insect injury		3	2	5
Leaf blight	- Cercospora	1	0	1
Leaf spot	- Phyllosticta	0	1	1
No disease		427		427
Nutritional	- general	0	1	1
	- magnesium deficiency	1	0	1
	- potassium deficiency	14	1	15
Root/stem rot	- Phytophthora	3	0	3
	- Rhizoctonia	1	2	3
Soybean cyst nematode	- Heterodera			
	on plant samples	1	0	1
	* in soil samples	430		430
	* absent in soil samples	71		71
	(*soil submitted to Nematode Analysis Laboratory)			
Sudden death	- Fusarium	1	1	2
Wilt	- Fusarium	1	0	1
Virus	- Soybean mosaic	0	1	1

SMALL GRAINS

SORGHUM (Sorghum)

Gray leaf spot	- Cercospora	1	0	1
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TEFF (Tef)

Gray leaf spot	- Pyricularia	1	0	1
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WHEAT (Triticum)

Chemical injury	- growth regulator	1	0	1
Cultural	- planted too deep	1	0	1
Environmental stresses		4	1	5
No disease		3		3
Nutritional	- acid soil	1	0	1
Virus	- Soilborne wheat mosaic	1	0	1

TOBACCO

TOBACCO (Nicotiana)

Algae	- species	1	0	1
Black leg	- Erwinia	2	1	3
Black root rot	- Thielaviopsis	1	1	2
Black shank	- Phytophthora	99	1	100
Blue mold	- Peronospora	11	0	11
Brown spot	- Alternaria	1	2	3
Chemical injury	- fungicide	9	2	11
	- growth regulator	8	0	8
	- herbicide	8	2	10
Cultural	- unknown	5	1	6
	- transplant shock	9	4	13
	- Rhizoctonia	4	1	5
Damping-off	- Rhizoctonia	4	1	5
Environmental	- cold injury	6	0	6
	- weather scald	11	1	12
	- others	11	4	15
Frenching	- metabolites	3	0	3
Frogeye	- Cercospora	3	1	4
Hollow stalk	- Erwinia	2	0	1
Inadequate specimen, no disease		48		48
Insect injury		5	1	6
Leaf breakdown	- physiological	1	1	2
	- acid soil	4	3	7
Nutritional	- boron deficiency	1	0	1
	- fertilizer burn	1	0	1
	- general	3	5	8
	- high nitrate	2	0	2
	- manganese toxicity	8	1	9
	- nitrogen deficiency	3	0	3
	- potassium deficiency	7	0	7
	- soluble salts	12	1	13
	- temp. phosphorus def.	6	2	8
	- physiological	1	0	1
	Root rot	- Pythium	22	3
Root/stem rot	- Rhizoctonia	1	1	12
Sore shin	- Rhizoctonia	2	5	7
Stem rot	- Pythium	0	1	1
Target spot	- Rhizoctonia	13	4	17
Virus	- Alfalfa mosaic	1	0	1
	- Potyvirus complex	1	0	1
	- Tobacco ringspot	0	1	1
	- Tobacco streak	3	0	3
	- Tomato spotted wilt	24	5	29
Weather fleck	- ozone	2	1	3
Wilt	- Fusarium	8	0	8

CROP	DIAGNOSIS	CAUSAL AGENT			#
FRUIT CROPS					
<u>SMALL FRUITS</u>					
BLUEBERRY (Vaccinium)					
	Environmental stresses		2	0	2
	Leaf scorch	- environmental	1	0	1
		- unknown	1	0	1
	No disease		6		6
	Nutritional	- acid soil	1	0	1
		- iron deficiency	5	0	5
	Root rot	- Phytophthora	1	0	1
BRAMBLES - BLACKBERRY, and RASPBERRY (Rubus)					
	Anthracnose	- Elsinoe	1	0	1
	Cane/leaf rust	- Kuehneola	1	0	1
	Crown gall	- Agrobacterium	1	0	1
	Fire blight	- Erwinia	1	0	1
	Insect injury		3	2	5
	No disease		4		4
	Root rot	- Phytophthora	2	0	2
	Rust	- Pucciniastrum	1	0	1
	Virus	- unknown	2	0	2
GRAPE (Vitis)					
	Anthracnose	- Elsinoe	1	0	1
	Black rot	- Guignardia	6	0	6
	Cane blight/Leaf spot	- Phomopsis	1	0	1
	Chemical injury	- fungicide	1	0	1
		- growth regulator	1	0	1
		- herbicide	1	0	1
		- unknown	2	0	2
	Crown gall	- Agrobacterium	1	0	1
	Environmental	- drought	1	0	1
	Inadequate specimen, no disease		21		21
	Insect injury		4	1	5
	Leaf spot	- physiological	2	0	2
	Nutritional	- potassium deficiency	1	2	3
		- phosphorus deficiency	2	0	2
	Pierce's Disease	- Xylella	2	0	2
	Powdery mildew	- Uncinula	1	0	1
	Root rot	- Phytophthora	1	0	1
STRAWBERRY (Fragaria)					
	Anthracnose	- Colletotrichum	2	0	2
	Chemical injury	- herbicide	1	0	1
	Environmental stresses		2	0	2
	Gray mold	- Botrytis	1	0	1
	Leaf blight	- Phomopsis	2	0	2
	Leaf spot	- Mycosphaerella	2	0	2
	No disease		4		4
	Nutritional	- phosphorus deficiency	0	1	1
		- potassium deficiency	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
<u>TREE FRUITS</u>					
APPLE (Malus)					
	Cedar apple rust	- Gymnosporangium	13	0	13
	Environmental	- drought	2	0	2
	Fire blight	- Erwinia	4	0	4
	Frogeye	- Botryosphaeria	1	1	2
	Insect injury		1	0	1
	Lichen	- species	1	0	1
	No disease		5		5
CHERRY (Prunus)					
	No disease		1		1
PEACH, APRICOT and NECTARINE (Prunus)					
	Gummosis	- unknown	1	0	1
	Insect injury		1	1	2
	No disease		2		2
	Nutritional	- nitrogen deficiency	2	0	2
	Scab	- Cladosporium	1	0	1
PEAR (Pyrus)					
	Fire blight	- Erwinia	4	0	4
	Insect injury		1		1
PECAN (Carya)					
	Inadequate specimen, no disease		2		2
	Insect injury		1	0	1
	Physical injury	- rodent	1	0	1
PLUM (Prunus)					
	Black knot	- Apiosporina	4	0	4
	Environmental	- wet feet	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
HERBS					
FEVERFEW (Tanacetum)					
Nutritional	-	nitrogen deficiency	1	0	1
Root rot	-	Pythium	2	0	2
GLASSWORT (Salicornia)					
Nutritional	-	soluble salts	1	0	1
OREGANO (Origanum)					
Blight	-	Botrytis	1	0	1
ROSEMARY (Rosmarinus)					
Blight	-	Botrytis	1	0	1
Chemical injury	-	insecticide	1	0	1
THYME (Thymus)					
Root/Crown rot	-	Rhizoctonia	2	0	2
MISCELLANEOUS					
DRYWALL					
No disease			1		1
KUDZU (Pueraria) (part of survey work for Asian Soybean Rust)					
No disease			112		112
MISCELLANEOUS					
No disease			1		1
MULCH					
No disease			1		1
Slime mold	-	species	2	0	2
MUSHROOM SPAWN					
Bacterial soft rot	-	Erwinia	1	0	1
POKEWEED (Phytolacca)					
No disease			1		1
POTTING SOIL					
No disease			1		1
SOIL					
No disease			1		1
Root knot nematode	-	Meloidogyne	1	0	1

IDENTIFICATIONS

FUNGAL IDENTIFICATIONS

Basidiomycete	- species	1	1
Cyathus	- striatus	1	1
Inocybe	- species	1	1
Slime mold	- species	1	1
Sphaerobolus	- species	1	1

LICHEN IDENTIFICATIONS

Lichen	- species	1	1
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PLANT IDENTIFICATIONS

Bacopa	- rotundifolia	1	1
Cereus	- species	1	1
Fagus	- grandifolia	1	1
Gloeocapsa	- species	1	1
Hibiscus	- coccineus	1	1
Liverwort	- species	1	1
Paulownia	- tomentosa	1	1
Setcreasea	- purpurea	1	1
Solanum	- carolinense		
Solanum	- melanoserasum	1	1
Ulmus	- species	1	1

CROP	DIAGNOSIS	CAUSAL AGENT			
ORNAMENTALS					
<u>HERBACEOUS ORNAMENTALS and INDOOR PLANTS</u>					
AMARYLLIS (Amaryllis)					
Bulb rot	-	Penicillium	1	0	1
ASTER (Aster)					
Rust	-	Coleosporium	1	0	1
BALLOON FLOWER (Platycodon)					
Root/stem rot	-	Rhizoctonia	1	0	1
BEGONIA (Begonia)					
Anthracnose	-	Colletotrichum	1	0	1
Environmental	-	sunscaud	1	0	1
Inadequate specimen, no disease			3		3
Nutritional	-	soluble salts	1	0	1
Root rot	-	Pythium	1	1	2
	-	Rhizoctonia	1	0	1
BISHOP'S WEED (Aegopodium)					
Leaf spot	-	Septoria	1	0	1
BIRD OF PARADISE (Caesalpinia)					
Cultural	-	overwatering	1	0	1
BLANKET FLOWER (Gaillardia)					
White smut	-	Entyloma	2	0	2
BLEEDING HEART (Dicentra)					
No disease			1		1
CACTUS (Cereus)					
Insect injury			1	0	1
CALIBRACHOA (Calibrachoa)					
Nutritional	-	pH high	1	0	1
CHRYSANTHEMUM (Chrysanthemum)					
Chemical injury	-	herbicide	1	0	1
Crown rot	-	Fusarium	1	0	1
Cultural	-	over watering	1	2	3
Insect injury			1	0	1
No disease			7		7
Nutritional	-	calcium deficiency	2	0	2
	-	general	3	2	5
	-	iron deficiency	4	1	5
	-	manganese deficiency	2	0	2
Root/Stem rot	-	Pythium	10	1	11
	-	Rhizoctonia	4	0	4
Wilt	-	Fusarium	2	0	2

CROP	DIAGNOSIS		CAUSAL AGENT			
CLIVIA (Clivia)						
	Sooty mold	-	species	1	0	1
COLEUS (Coleus)						
	Virus	-	Impatiens necrotic spot	1	0	1
CONEFLOWER (Echinacea)						
	Aster yellows	-	Phytoplasma	1	0	1
COREOPSIS (Coreopsis)						
	Environmental	-	cold injury	1	0	1
CUPHEA (Cuphea)						
	No disease			1		1
DAHLIA (Dahlia)						
	Stem rot	-	Rhizoctonia	1	0	1
DAISY (Gerbera)						
	Bacterial soft rot	-	Erwinia	1	0	1
	No disease			1		1
	Stem rot	-	Fusarium	1	0	1
DAYLILY (Hemerocallis)						
	Bacterial soft rot	-	Erwinia	0	1	1
	Leaf streak	-	Aureobasidium	2	0	2
DIANTHUS (Dianthus)						
	Chemical injury	-	unknown	1	0	1
DIPLEDINIA (Dipledinia)						
	Root rot	-	Pythium	1	0	1
DRACAENA (Dracaena)						
	Bacterial blight	-	Pseudomonas	1	0	1
	No disease			1		1
ECHINACEA (Echinacea)						
	Air pollution	-	ozone	1	1	1
	Root rot	-	Pythium	1	0	1
ELEPHANT EAR (Alocasia)						
	No disease			1		1
EPIMEDIUM						
	Anthracnose	-	Colletotrichum	1	0	1
FERN (various)						
	No disease			1		1
	Web blight	-	Rhizoctonia	1	0	1
FICUS (Fig)						
	No disease			1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
FUCHSIA (Fuchsia)					
Rust	-	Pucciniastrum	1	0	1
GARDENIA (Gardenia)					
Nutritional	-	acid soil	1	0	1
GERANIUM (Pelargonium)					
Cultural	-	oedema	5	1	6
No disease			5		5
Nutritional	-	acid soil	1	0	1
	-	general	2	0	2
	-	iron deficiency	1	0	1
	-	magnesium deficiency	1	0	1
Physical injury	-	overhead watering	1	0	1
Root rot	-	Pythium	0	1	1
Rust	-	Puccinia	1	0	1
Virus	-	Pelargonium flower break	2	0	2
GERBERA (Gerbera)					
Insect injury			1	0	1
GLADIOLUS (Gladiolus)					
Insect injury			1	0	1
HOSTA (Hosta)					
Environmental	-	stress	1	0	1
IMPATIENS (Impatiens)					
Black root rot	-	Thielaviopsis	0	1	1
No disease			3		3
Nutritional	-	general	1	0	1
Root/crown rot	-	Phytophthora	1	0	1
Stem rot	-	Pythium	1	0	1
Virus	-	Impatiens necrotic spot	1	0	1
IRIS (Iris)					
Bacterial soft rot	-	Erwinia	0	1	1
Insect injury			1	0	1
Leaf spot	-	Mycosphaerella	1	0	1
IVY (Hedera and others)					
Anthraxnose	-	Colletotrichum	1	0	1
Bacterial spot	-	Xanthomonas	1	0	1
Environmental	-	winter injury	1	0	1
No disease			1		1
Root rot	-	Pythium	1	0	1
LEMON (Citrus)					
Insect injury			1	0	1
LILY (Lilium)					
No disease			1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
LIRIOPE (Liriope)					
Environmental	- stress		1	0	1
Nutritional	- soluble salts		1	1	2
MAIDENGRASS (Miscanthus)					
No disease			1		1
MANDEVILLA (Mandevilla)					
No disease			2		2
Root rot	- Pythium		1	0	1
MARIGOLD (Tagetes)					
Insect injury			3	0	3
Nutritional	- fertilizer burn		1	0	1
NEMESIA (Nemesia)					
Virus	- Impatiens necrotic spot		1	0	1
PACHYSANDRA (Pachysandra)					
Leaf/Stem blight	- Volutella		6	0	6
Insect injury			0	1	1
PALM (Arecaceae)					
No disease			2		2
PANSY (Viola)					
Black root rot	- Thielaviopsis		2	0	2
Environmental	- cold injury		1	0	1
Gray mold	- Botrytis		1	0	1
Nutritional	- fertilizer burn		3	0	3
	- general		1	0	1
Physical injury	- unknown		1	0	1
Root rot	- Pythium		1	1	2
PEONY (Paeonia)					
Anthracnose	- Gloeosporium		2	0	2
Environmental	- freeze		1	0	1
No disease			1		1
Red spot	- Cladosporium		0	1	1
PERIWINKLE (Vinca)					
Canker/Dieback	- Phoma		1	0	1
PETUNIA (Petunia)					
Bacterial soft rot	- Erwinia		1	0	1
Black root rot	- Thielaviopsis		3	1	4
Gray mold	- Botrytis		0	1	1
Insect injury			2	0	2
No disease			1		1
Nutritional	- general		2	0	2
	- iron deficiency		2	0	2
Root rot	- Phytophthora		2	0	2
	- Pythium		2	2	4
Root/Stem rot	- Rhizoctonia		4	1	5

CROP	DIAGNOSIS	CAUSAL AGENT			
PHILODENDRON (Philodendron)					
Cultural	- overwatering		1	0	1
PHLOX (Phlox)					
Inadequate specimen, no disease			1		1
Powdery mildew	- Oidium		1	0	1
Root/stem rot	- Rhizoctonia		1	0	1
POINSETTIA (Euphorbia)					
Chemical injury	- growth regulator		1	0	1
No disease			1		1
Nutritional	- general		2	0	2
Root rot	- Pythium		1	0	1
PORTULACA (Portulaca)					
Root rot	- Pythium		1	0	1
RUDBECKIA (Rudbeckia)					
Leaf spot	- Septoria		2	0	2
Root rot	- Rhizoctonia		1	0	1
Southern blight	- Sclerotium		1	0	1
Stem rot	- Sclerotinia		1	0	1
SALVIA (Salvia)					
Root rot	- Rhizoctonia		1	0	1
SCHEFFLERA (Brassaia)					
Cultural	- overwatering		1	0	1
Insect injury			1	0	1
No disease			1		1
SEDUM (Sedum)					
Powdery mildew	- Oidium		1	0	1
Root knot nematode	- Meloidogyne		1	0	1
SNAPDRAGON (Antirrhinum)					
Inadequate specimen			1		1
Root/Stem rot	- Rhizoctonia		1	0	1
SPATHIPHYLLUM (Spathiphyllum)					
Environmental	- stress		1	0	1
TULIP (Tulipa)					
Blight	- Botrytis		1	0	1
VINCA (Vinca)					
Black root rot	- Thielaviopsis		1	0	1
Canker/dieback	- Phoma		3	0	3
Gray mold	- Botrytis		1	0	1
No disease			1		1
Nutritional	- iron deficiency		1	0	1
Root rot	- Pythium		0	1	1
Root/Stem rot	- Rhizoctonia		2	0	2

CROP	DIAGNOSIS	CAUSAL AGENT			
YARROW (Achillea)					
	Anthracnose	- Colletotrichum	1	0	1
ZINNIA (Zinnia)					
	Bacterial spot	- Xanthomonas	1	0	1
	Root/Stem rot	- Rhizoctonia	1	0	1
<u>TURFGRASS</u>					
BENTGRASS (Agrostis)					
	Anthracnose	- Colletotrichum	3	0	3
	Blight	- Pythium	1	0	1
	Cultural	- black layer	1	0	1
		- heavy thatch	1	0	1
	Dollar spot	- Sclerotinia	2	0	2
	Environmental stresses		2	0	2
	Fairy ring	- Basidiomycete	2	0	2
	No disease		12		12
	Patch	- Microdochium	1	0	1
	Root disfunction	- Pythium	2	0	2
	Root rot	- Pythium	5	0	5
		- Rhizoctonia	1	0	1
	Take-all patch	- Gaeumannomyces	4	0	4
	Yellow patch	- Rhizoctonia	1	0	1
BERMUDAGRASS (Cynodon)					
	Environmental	- stress	1	0	1
	No disease		1		1
	Root rot	- Bipolaris	1	0	1
	Spring dead spot	- Ophiosphaerella	1	0	1
BLUEGRASS (Poa)					
	Brown patch	- Rhizoctonia	3	0	3
	Chemical injury	- unknown	0	1	1
	No disease		1		1
	Root rot	- Pythium	0	1	1
	Rust	- Puccinia	1	0	1
	Summer patch	- Magnaporthe	5	0	5
FESCUE (Festuca)					
	Anthracnose	- Colletotrichum	0	2	2
	Brown patch	- Rhizoctonia	7	0	7
	Environmental stresses		5	0	5
	Gray leaf spot	- Pyricularia	0	1	1
	Inadequate specimen, no disease		9		9
	Net blotch	- Drechslera	1	1	2
	Loose smut	- Ustilago	1	0	1
	Nutritional	- soluble salts	2	0	2
	Red thread	- Laetisaria	1	0	1
	Root rot	- Pythium	1	0	1
	Rust	- Puccinia	2	0	2
	Slime mold	- species	2	0	2
	Take-all patch	- Gaeumannomyces	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
RYEGRASS (Lolium)					
	Cultural	- heavy thatch	4	0	4
	Environmental	- drought	1	0	1
	Gray leaf spot	- Pyricularia	3	0	3
	Leaf spot	- Curvularia	0	1	1
		- Drechslera	1	0	1
	No disease		5		5
	Red thread	- Laetisaria	1	0	1
	Root rot	- Rhizoctonia	0	1	1
TURF (unspecified)					
	Algae	- unknown	1	0	1
	Brown patch	- Rhizoctonia	2	0	2
	Leaf spot	- Curvularia	2	0	2
		- Drechslera	2	2	4
	No disease		5		5
	Necrotic ring spot	- Leptosphaerulina	1	0	1
	Southern blight	- Sclerotium	1	0	1
ZOYSIA (Zoysia)					
	Blight	- Curvularia	0	1	1
	Environmental	- stress	1	0	1
	No disease		2	0	2
	Root decline	- Gaeumannomyces	3	0	3

CROP	DIAGNOSIS	CAUSAL AGENT			
<u>WOODY ORNAMENTALS</u>					
ARBORVITAE (Thuja)					
	Cultural	- transplant shock	3	0	3
	Dieback	- Botryosphaeria	0	1	1
	Environmental stresses		3	0	3
	No disease		6		6
ASH (Fraxinus)					
	Anthracnose	- Apiognomonina	1	0	1
	Bacterial scorch	- Xylella	1	0	1
	Canker	- Botryosphaeria	1	0	1
	Environmental stress		1	0	1
	Sooty mold	- species	0	1	1
ASPEN - See listed under POPLAR					
AUCUBA (Aucuba)					
	No disease		1		1
AZALEA - See listing under RHODODENDRON					
BARBERRY (Berberis)					
	Lichen	- species	1	0	1
	No disease		1		1
BEECH (Fagus)					
	Root rot	- Phytophthora	1	0	1
BIRCH (Betula)					
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	1	0	1
	Insect injury		0	1	1
	No disease		1		1
	Nutritional	- iron deficiency	2	0	2
BLACK GUM (Tupelo)					
	Leaf spot	- unknown	1	0	1
	No disease		1		1
BOXELDER (Acer)					
	Chemical injury	- unknown	1	0	1
	Leaf spot	- Phyllosticta	1	0	1
	No disease		1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
BOXWOOD (Buxus)					
	Canker	- Pseudonectria	4	0	4
	Cultural	- overwatering	1	0	1
		- transplant shock	2	0	2
	Environmental stresses		8	0	8
	Insect injury		1	3	4
	No disease		5		5
	Nutritional	- manganese toxicity	1	0	1
	Root rot	- Pythium	1	2	3
BUCKEYE (Aesculus)					
	Shoestring root rot	- Armillaria	1	0	1
BUDDLEIA (Buddleia)					
	Insect injury		1	0	1
CEDAR (Cedrus)					
	No disease		2		2
CHAMAECYPARIS (Chamaecyparis)					
	No disease		1		1
CHERRY (Prunus)					
	Basidiomycete	- species	1	0	1
	Cultural	- transplant shock	1	0	1
	Environmental	- freeze injury	5	0	5
	Insect injury		1	0	1
	No disease		1		1
CHERRYLAUREL (Prunus)					
	Environmental	- stresses	3	0	3
	Inadequate specimen, no disease		2		2
	Insect injury		2	0	2
	Leaf spot	- Cercospora	1	0	1
		- fungal	1	0	1
	Root rot	- Phytophthora	1	0	1
CHESTNUT (Castanea)					
	No disease		3		3
	Root rot	- Phytophthora	1	0	1
	Wood decay	- Polyporus	1	0	1
COTTONWOOD - See listing under Poplar					
CRABAPPLE (Malus)					
	Leaf scorch	- environmental	0	1	1
	No disease		1		1
	Scab	- Venturia	3	0	3
	Sudden death	- unknown	1	0	1
CRAPE MYRTLE (Lagerstroemia)					
	Chemical injury	- growth regulator	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			#
CYPRESS (Cupressocyparis)					
	No disease		1		1
DOGWOOD (Cornus)					
	Canker	- Botryosphaeria	1	0	1
	Chemical injury	- insecticide	1	0	1
	Cultural	- transplant shock	2	0	2
	Environmental stresses		1	0	1
	Inadequate specimen, no disease		2		2
	Insect injury		0	1	1
	Physical injury	- unknown	1	0	1
	Powdery mildew	- Microsphaera	2	1	3
		- Oidium	2	0	2
	Root rot	- Pythium	4	1	5
		- Rhizoctonia	3	4	7
	Spot anthracnose	- Elsinoe	1	1	2
DOUGLAS FIR (Pseudotsuga)					
	Canker	- Cytospora	1	0	1
	No disease		1		1
	Twig blight	- Phomopsis	1	0	1
ELM (Ulmus)					
	Anthracnose	- Glomerella	1	0	1
	Cultural	- deep planting	1	0	1
	Environmental stresses		1	1	2
	Insect injury		3	1	4
	No disease		1		1
EUONYMUS (Euonymus)					
	Black root rot	- Thielaviopsis	1	0	1
	Chemical injury	- growth regulator	1	0	1
	Crown gall	- Agrobacterium	1	0	1
	Dieback	- unknown	1	0	1
	Environmental	- winter injury	1	0	1
	Insect injury		11	0	11
	No disease		1		1
	Powdery mildew	- Microsphaera	0	1	1
FORSYTHIA (Forsythia)					
	Chemical injury	- growth regulator	1	0	1
		- unknown	1	0	1
	Gall	- Phomopsis	3	0	3
	No disease		1		1
	Root rot	- Phytophthora	1	0	1
FRINGETREE (Chionanthus)					
	No disease		1		1
GINKGO (Ginkgo)					
	No disease		1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
GOLDENCHAIN TREE (Laburnum x watereri)					
	Cultural	- transplant shock	1	0	1
	Leaf spot	- Phylosticta	0	1	1
HACKBERRY (Celtis)					
	Bacterial scorch	- Xylella	1	0	1
	Insect injury		1	0	1
HAZELNUT (Corylus)					
	No disease		1		1
HEMLOCK (Tsuga)					
	Canker	- Cytospora	1	0	1
	Environmental	- drought	1	0	1
	Insect injury		1	0	1
	No disease		6		6
HIBISCUS (Hibiscus)					
	Cultural	- oedema	1	0	1
	Insect injury		1	0	1
	No disease		3		3
	Virus	- unknown	1	0	1
HICKORY (Carya)					
	Anthrachnose	- Colletotrichum	1	0	1
	Environmental	- drought	1	0	1
	Insect injury		3	0	3
	No disease		1		1
HOLLY (Ilex)					
	Black root rot	- Thielaviopsis	14	0	14
	Canker	- Phomopsis	2	1	3
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	3	0	3
		- wet feet	2	0	2
	Decline	- unknown	1	1	2
	Environmental stresses		32	1	33
	Inadequate specimen, no disease		25		25
	Insect injury		7	2	9
	Leaf scorch	- winter drying	3	0	3
	Nutritional	- iron deficiency	1	0	1
		- pH high	2	0	2
		- soluble salts	1	0	1
HONEYLOCUST (Gleditsia)					
	Environmental	- drought	4	0	4
	Leaf spot	- Cercospora	1	0	1
	No disease		2		2
HONEYSUCKLE (Lonicera)					
	No disease		1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
HORNBEAM (Ostrya)					
Cultural	-	transplant shock	1	0	1
HYDRANGEA (Hydrangea)					
Cultural	-	oedema	1	0	1
	-	transplant shock	2	0	2
Environmental	-	sunscald	1	0	1
Inadequate specimen, no disease			5		5
Insect injury			1	0	1
Leaf spot	-	Cercospora	1	0	1
Root rot	-	Pythium	1	0	1
Rust	-	Puccinia	1	0	1
JUNIPER and RED CEDAR (Juniperus)					
Cedar/Apple rust	-	Gymnosporangium	1	0	1
Cultural	-	transplant shock	1	0	1
Environmental stresses			4	0	4
Inadequate specimen, no disease			14		14
Insect injury			2	0	2
Nutritional	-	acid soil	1	0	1
Physical injury	-	rodent	0	1	1
Slime mold	-	species	1	0	1
Tip blight	-	Pestalotiopsis	1	0	1
Twig blight	-	Phomopsis	2	0	2
KY COFFEETREE (Gymnocladus)					
No disease			1		1
LEUCOTHOE (Leucothoe)					
Cultural	-	transplant shock	1	0	1
Leaf spot	-	Phyllosticta	1	0	1
LEYLAND CYPRESS (X Cupressocyparis)					
Canker	-	Seiridium	2	0	2
Environmental stresses			2	0	2
No disease			3		3
LILAC (Syringa)					
Chemical injury	-	unknown	1	0	1
Environmental stresses			1	1	2
LINDEN (Tilia)					
Environmental	-	freeze	1	0	1
No disease			1		1
LOCUST (Robinia)					
Powdery mildew	-	Oidium	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
MAGNOLIA (Magnolia)					
	Black mildew	- species	1	0	1
	Cultural	- transplant shock	1	0	1
	Dieback	- unknown	1	0	1
	Environmental	- winter injury	6	0	6
	Insect injury		2	0	2
	Leaf scorch	- winter drying	2	0	2
	No disease		3		3
	Nutritional	- iron deficiency	0	1	1
	Wilt	- Verticillium	1	0	1
MAPLE (Acer)					
	Air pollution	- ozone	1	0	1
	Anthracnose	- Aureobasidium	1	0	1
		- Kabatiella	2	0	2
	Bacterial scorch	- Xylella	2	0	2
	Canker	- Hypoxylon	2	0	2
		- Phytophthora	1	0	1
	Chemical injury	- growth regulator	1	0	1
	Cultural	- improper depth	1	0	1
		- transplant shock	1	0	1
	Decline	- unknown	2	0	2
	Environmental stresses		5	2	7
	Insect injury		7	2	9
	Leaf scorch	- environmental	1	0	1
	Leaf spot	- Marssonina	1	0	1
	Lichen	- species	2	0	2
	No disease		17		17
	Powdery mildew	- Phyllactinia	0	1	1
	Root rot	- Phytophthora	1	0	1
	Sooty mold	- species	0	1	1
	Tar spot	- Rhytisma	2	0	2
MT. LAUREL (Kalmia)					
	No disease		1		1
MULBERRY (Morus)					
	Insect injury		1	0	1
NANDINA (Nandina)					
	Environmental	- winter injury	2	0	2

CROP	DIAGNOSIS	CAUSAL AGENT			
OAK (Quercus)					
	Bacterial scorch	- Xylella	21	0	21
	Basidiomycete	- unknown	1	0	1
	Chemical injury	- growth regulator	2	0	2
	Cultural	- transplant shock	1	0	1
	Decline	- environmental	1	1	2
	Environmental stresses		11	0	11
	Insect injury		7	0	7
	Leaf spot	- unknown	0	1	1
	Lichen	- species	2	0	2
	No disease		16		16
	Nutritional	- general	1	0	1
		- iron deficiency	2	1	3
	Physical injury	- rodent	1	0	1
		- unknown	1	0	1
	Powdery mildew	- Oidium	0	1	1
		- Phyllactinia	0	1	1
		- species	2	0	2
	Wetwood	- bacterial	1	0	1
	Wilt	- Ceratocystis	1	0	1
	Wood decay	- Basidiomycete	1	0	1
OREGON GRAPE HOLLY (Mahonia)					
	Environmental	- stress	1	0	1
PEACH (Prunus)					
	Insect injury		1	0	1
PEAR (Pyrus)					
	Cedar/Quince rust	- Gymnosporangium	1	0	1
	Decline	- environmental	1	0	1
		- unknown	0	1	1
	Environmental stresses		4	0	4
	Fire blight	- Erwinia	6	0	6
	Leaf scorch	- environmental	1	0	1
		- unknown	1	0	1
	Leaf spot	- fungal	1	0	1
	No disease		3		3
PHOTINIA (Photinia)					
	Leaf spot	- Entomosporium	1	0	1
PIERIS (Pieris)					
	Dieback	- unknown	1	0	1
	No disease		1		1
	Root rot	- Phytophthora	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
PINE (Pinus)					
	Air pollution	- ozone	1	0	1
	Brown spot	- Mycosphaerella	1	0	1
	Chemical	- growth regulator	0	1	1
	Cultural	- transplant shock	2	0	2
	Decline	- unknown	1	0	1
	Environmental	- wet feet	1	0	1
	Insect injury		3	0	3
	No disease		16		16
	Needle blight	- Dothistroma	1	0	1
	Needle cast	- Lophodermium	1	0	1
	Needle drop	- normal	2	0	2
	Nutritional	- pH	1	0	1
	Physical injury	- bird	2	0	2
	Pinewood nematode	- Bursaphelenchus	1	0	1
	Root rot	- Phytophthora	1	0	1
		- Pythium	1	0	1
	Sooty mold	- species	1	0	1
	Tip blight	- Sphaeropsis	6	0	6
	White pine Blister rust	- Cronartium	1	0	1
	White pine decline	- environmental	13	0	13
PISTACHE (Pistacia)					
	Environmental	- freeze	1	0	1
PLUM (Prunus)					
	Black knot	- Apiosporina	1	0	1
	Cultural	- transplant shock	1	0	1
	Environmental	- stress	1	0	1
	Insect injury		1	0	1
POPLAR and ASPEN and COTTONWOOD (Populus)					
	Canker	- Phomopsis	1	0	1
	Insect injury		0	1	1
	Leaf spot	- Cercospora	1	0	1
	Wood decay	- Basidiomycete	1	0	1
	Wood rot	- Schizophyllum	1	0	1
PYRACANTHA (Pyracantha)					
	Scab	- Spilocaea	1	0	1
REDBUD (Cercis)					
	Canker	- Botryosphaeria	1	0	1
	Cultural	- transplant shock	1	0	1
	No disease		5		5
	Wilt	- Verticillium	2	0	2

CROP	DIAGNOSIS	CAUSAL AGENT			
RHODODENDRON and AZALEA (Rhododendron)					
	Canker	- Botryosphaeria	5	0	5
	Chemical injury	- growth regulator	1	0	1
	Cultural	- improper depth	1	0	1
		- transplant shock	2	0	2
	Dieback	- Botryosphaeria	1	0	1
		- unknown	1	0	1
	Inadequate specimen, no disease		11		11
	Insect injury		5	2	7
	Leaf blight	- Phytophthora	1	0	1
	Leaf spot	- Pestalotia	0	1	1
	Lichen	- species	1	0	1
	Nutritional	- acid soil	1	0	1
		- iron deficiency	2	0	2
		- pH high	1	0	1
	Physical injury	- unknown	1	1	2
	Root/crown rot	- Phytophthora	1	0	1
ROSE (Rosa)					
	Black spot	- Diplocarpon	2	0	2
	Chemical injury	- herbicide	1	0	1
	Environmental	- wet feet	1	0	1
	Insect injury		2	0	2
	Leaf spot	- Cercospora	1	0	1
	No disease		5		5
	Nutritional	- soluble salts	1	0	1
	Virus	- Rose rosette	2	0	2
ROSE OF SHARON (Hibiscus)					
	Inadequate specimen		1		1
SASSAFRAS (Sassafras)					
	Chemical injury	- growth regulator	1	0	1
SERVICEBERRY (Amelanchier)					
	Chemical injury	- growth regulator	1	0	1
	Fire blight	- Erwinia	2	0	2
	No disease		1		1
SEVEN-SON FLOWER (Heptacodium)					
	Cultural	- transplant shock	1	0	1
	Environmental	- wet feet	1	0	1
SMOKETREE (Cotinus)					
	No disease		1		1
SOURWOOD (Oxydendrum)					
	No disease		1		1
SPIREA (Spiraea)					
	Virus	- Spirea yellow leaf spot virus	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
SPRUCE (Picea)					
	Canker	- Cytospora	1	0	1
	Cultural	- transplant shock	8	0	8
	Environmental stresses		6	0	6
	Insect injury		12	2	14
	Lichen	- species	1	0	1
	Needle cast	- Rhizosphaera	1	0	1
		- Stigmina	5	1	6
	Nutritional	- magnesium deficiency	2	0	2
		- soluble salts	2	0	2
	Root rot	- Phytophthora	1	0	1
ST. JOHNSWORT (Hypericum)					
	Rust	- Uromyces	1	0	1
SWEETGUM (Liquidambar)					
	Decline	- environmental	1	0	1
	Lichen	- species	1	0	1
SWEETSPIRE (Itea)					
	Chemical injury	- growth regulator	0	1	1
	Nutritional	- iron deficiency	1	0	1
SYCAMORE (Platanus)					
	Anthracnose	- Apiognomonina	1	0	1
	Bacterial scorch	- Xylella	2	0	2
	No disease		2		2
TAXUS (Taxus)					
	Canker	- Botryosphaeria	1	0	1
	Cultural	- improper depth	1	0	1
		- transplant shock	1	0	1
	Dieback	- unknown	1	0	1
	Environmental stresses		2	2	4
	No disease		18		18
	Physical injury	- bird	1	0	1
	Root rot	- Phytophthora	10	0	10
	Tip blight	- Pestalotiopsis	1	0	1
TULIPTREE (Liriodendron)					
	Cultural	- transplant shock	1	0	1
	Environmental	- drought	0	1	1
	Insect injury		3	0	3
	Powdery mildew	- species	1	0	1
VIBURNUM (Viburnum)					
	No disease		3		3
	Physical injury	- bird	1	0	1
WALNUT (Juglans)					
	Inadequate specimen		1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
WILLOW (Salix)					
	Canker	- Cytospora	1	0	1
	Environmental	- freeze	1	0	1
	Insect injury		1		1
WISTERIA (Wisteria)					
	Leaf scorch	- unknown	1	0	1
WITCH HAZEL (Hamamelis)					
	Physical injury	- unknown	1	0	1
VEGETABLES					
ASPARAGUS (Asparagus)					
	No disease		1	0	1
BEAN (Phaseolus)					
	Anthracnose	- Colletotrichum	5	0	5
	Chemical injury	- unknown	1	0	1
	Inadequate specimen, no disease		5		5
	Insect injury		4	0	4
	Nutritional	- fertilizer burn	1	0	1
		- soluble salts	1	0	1
	Root/stem rot	- Fusarium	6	0	6
		- Rhizoctonia	2	3	5
BROCCOLI - See listing under CRUCIFERS					
CABBAGE - See listing under CRUCIFERS					
CANTALOUPE - See listing under CUCURBITS					
CORN, SWEET (Zea)					
	Bacterial wilt	- Erwinia	1	0	1
	Environmental	- drought	1	3	4
	Insect injury		2	0	2
	Leaf blight	- Alternaria	0	1	1
	No ear	- genetic	1	0	1
	Nutritional	- general	1	0	1
		- soluble salts	1	0	1
		- zinc deficiency	4	0	4
	Rust	- Puccinia	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
CRUCIFERS - BROCCOLI, CABBAGE, KALE, and TURNIP (Brassica)					
	Bacterial soft rot	- Erwinia	2	0	2
	Black rot	- Xanthomonas	2	0	2
	Brown bud	- calcium deficiency	0	1	1
	Chemical injury	- burn	1	0	1
		- unknown	1	0	1
	Cultural	- transplant shock	1	0	1
	Hollow stalk	- boron deficiency	1	0	1
	Insect injury		1	0	1
	Leaf spot	- Alternaria	1	0	1
		- Cercospora	1	0	1
		- fungal	1	0	1
	No disease		2		2
	Nutritional	- boron deficiency	1	0	1
	Root/stem rot	- Pythium	2	0	2
	Root/stem rot	- Phytophthora	2	0	2
	Stem rot	- Sclerotinia	1	0	1
	Tip burn	- calcium deficiency	1	0	1
	Wire stem	- Rhizoctonia	2	0	2
CUCUMBER - See listing under CUCURBITS					
CUCURBITS - CANTALOUPE, CUCUMBER, MELON (Cucumis), GOURD, PUMPKIN, SQUASH (Cucurbita) and WATERMELON (Citrulus)					
	Air pollution	- ozone	1	0	1
	Anthraxnose	- Colletotrichum	5	0	5
	Bacterial soft rot	- Erwinia	0	1	1
	Bacterial wilt	- Erwinia	8	0	8
	Belly rot	- Rhizoctonia	1	0	1
	Blight	- Microdochium	0	1	1
	Blossom end rot	- calcium deficiency/dry	3	0	3
	Chemical injury	- herbicide	2	1	3
	Environmental stresses		3	0	3
	Fruit decay	- Fusarium	3	1	4
	Gummy stem blight	- Didymella	1	0	1
	Inadequate specimen, no disease		24		24
	Insect injury		10	1	11
	Leaf blight	- Alternaria	2	0	2
	Nutritional	- fertilizer burn	1	0	1
		- general	1	0	1
		- magnesium deficiency	2	0	2
		- manganese toxicity	1	0	1
		- molybdenum deficiency	1	0	1
		- soluble salts	0	1	1
	Pollination problem	- unknown	1	0	1
	Powdery mildew	- Oidium	1	2	3
		- Sphaerotheca	0	1	1
	Root knot nematode	- Meloidogyne	1	0	1
	Root rot	- Pythium	2	0	2
	Root/stem rot	- Rhizoctonia	1	0	1
	Virus	- Cucumber mosaic	1	0	1
		- potyvirus	1	0	1
	Wilt	- Fusarium	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
EGGPLANT (Solanum)					
	Bacterial canker	- Clavibacter	1	0	1
	Insect injury		1	1	1
	Wilt	- Verticillium	1	0	1
GOURD - See listing under CUCURBITS					
KALE - See listing under CRUCIFERS					
LETTUCE (Lactuca)					
	Drop	- Sclerotinia	2	0	2
	Gray mold	- Botrytis	1	0	1
	Powdery mildew	- Erysiphe	1	0	1
	Virus	- Lettuce mosaic	1	0	1
OKRA (Abelmoschus)					
	No disease		1		1
ONION (Allium)					
	Bacterial soft rot	- Erwinia	1	0	1
PEA (Pisum)					
	No disease		1		1
	Root/stem rot	- Rhizoctonia	1	0	1
	Wilt	- Fusarium	1	0	1
PEPPER (Capsicum)					
	Anthracnose	- Colletotrichum	1	0	1
	Bacterial spot	- Xanthomonas	6	0	6
	Blossom end rot	- calcium deficiency/dry	1	0	1
	Damping-off	- Pythium	0	1	1
		- Rhizoctonia	0	1	1
	Environmental	- sunscald	2	0	2
	Inadequate specimen, no disease		9		9
	Insect injury		1	0	1
	Nutritional	- general	3	0	3
		- pH high	1	1	2
		- soluble salts	3	0	3
	Root/stem rot	- Rhizoctonia	1	1	2
	Southern blight	- Sclerotium	1	0	1
	Stem girdling	- unknown	1	0	1
	Wilt complex	- Fusarium	3	0	3
POTATO (Solanum)					
	Growth crack	- physiological	1	0	1
	Insect injury		1	0	1
	No disease		1		1
	Nutritional	- fertilizer burn	1	0	1
PUMPKIN - See listing under CUCURBITS					
RHUBARB (Rheum)					
	Crown/petiole rot	- Rhizoctonia	1	0	1
	Inadequate specimen		1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
SPINACH (Spinacia)					
	Bacterial soft rot	- Erwinia	1	0	1
	Cultural	- high temperature	1	0	1
	Insect injury		1	0	1
SQUASH - See listing under CUCURBITS					
SWEETPOTATO (Ipomoea)					
	Scurf	- Monilochaetes	1	0	1
TOMATO (Lycopersicon)					
	Bacterial canker	- Clavibacter	4	0	4
	Bacterial spot	- Xanthomonas	1	0	1
	Bacterial stem rot	- Erwinia	2	0	2
	Blossom end rot	- calcium deficiency/dry	6	1	7
	Buckeye rot	- Phytophthora	1	0	1
	Chemical injury	- growth regulator	20	1	21
		- herbicide	6	1	7
	Cultural	- oedema	1	0	1
		- transplant shock	1	0	1
	Early blight	- Alternaria	9	1	10
	Environmental stresses		8	2	10
	Gray mold	- Botrytis	1	0	1
	Inadequate specimen, no disease		37		37
	Insect injury		9	3	12
	Leaf spot	- Septoria	11	1	12
	Nutritional	- fertilizer burn	2	1	3
		- general	5	0	5
		- magnesium deficiency	2	1	3
		- pH high	0	1	1
		- potassium deficiency	1	0	1
		- soluble salts	2	0	2
	Physiological	- growth crack	1	0	1
	Rain check	- unknown	0	1	1
	Root rot	- Pythium	5	3	8
	Root/crown rot	- Fusarium	2	0	2
	Root/stem rot	- Rhizoctonia	3	1	4
	Stem rot	- Rhizopus	1	0	1
	Stem rot	- Sclerotinia	4	0	4
	Virus	- Tobacco mosaic	3	0	3
		- Tomato spotted wilt	5	0	5
	Walnut wilt	- juglone	1	0	1
	Wilt	- fungal	1	0	1
		- Fusarium	7	0	7
	Yellow shoulder	- unknown	1	0	1
TURNIP - See listing under CRUCIFERS					
WATERMELON - See listing under CUCURBITS					

TOTALS			3190	221	3411