

UK UNIVERSITY OF KENTUCKY
College of Agriculture

Plant Diseases in Kentucky

**Plant Disease Diagnostic Laboratory
Summary**

2006

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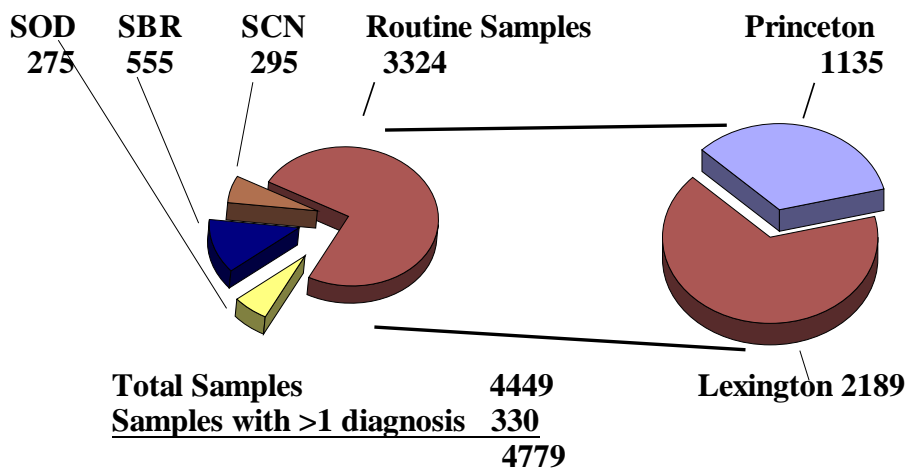
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INTRODUCTION

The Plant Disease Diagnostic Laboratory (Lexington and Princeton) handled 4154 plant samples and 295 nematode soil samples during 2006. Plant samples with more than one problem numbered 330 bringing the total number of actual diagnoses to 4779. The Lexington Laboratory diagnosed 2480 specimens. Of that number there were 2189 routine plant samples; 16 Soybean Rust (SBR) sentinel plot samples; and 192 Nursery, 54 Forest/Parks, and 29 Early detection/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 22-24. The SBR samples are included in the total number of samples in Figure 1 below and in the rest of this summary. The Princeton Laboratory's specimens totaled 1969: of that number 1135 were plant samples; 539 were Soybean Rust (SBR) sentinel plot samples; and 295 were soil samples submitted exclusively for soybean cyst nematode analysis. In addition to the 4449 specimens processed in the laboratory, 192 cases were also submitted in 2006 through the Digital Consulting System for consultation by the Diagnosticians and Extension Specialists (see Table 10, page 22). Plant samples (routine) plus SOD, SBR, and SCN samples are summarized in Figure 1 below:

Plant Disease Diagnostic Laboratory - 2006



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 landscape disease problems through the Kentucky Pest News newsletter, radio and television tapes, and plant health care workshops. New homeland security rules now require reporting of all diagnoses of plant diseases to USDA-APHIS on a real-time basis and our laboratories are working to meet that requirement. 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 the period averaged 42.6 degrees across the state which was 9.5 degrees above normal. High temperatures averaged from 53 in the West to 53 in the East. Departure from normal high temperatures ranged from 9 degrees above normal in the West to 14 degrees above normal in the East. Low temperatures averaged from 35 degrees in the West to 36 degrees in the East. Departure from normal low temperature ranged from 11 degrees above normal in the West to 14 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 5.45 inches statewide which was 1.73 inches above normal. Precipitation totals by climate division, West 5.86 inches, Central 5.95 inches, Bluegrass 5.12 inches and East 5.01 inches, which was 2.16, 1.93, 1.68 and 1.32 inches respectively above normal.

February: Below Normal Temperatures and Below Normal Precipitation

Temperatures for February 2006 averaged 35.6 degrees across the state which was 1.6 degree below normal. High temperatures averaged from 47 in the West to 46 in the East. Departure from normal high temperatures ranged from 4 degrees below normal in the West to 2 degrees above normal in the East. Low temperatures averaged from 28 degrees in the West to 29 degrees in the East. Departure from normal low temperatures ranged from 1 degree above normal in the West to 2 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 2.36 inches statewide which was 1.38 inches below normal. Precipitation totals by climate division, West 2.84 inches, Central 2.92 inches, Bluegrass 1.83 inches and East 1.96 inches, which was 1.20, 1.20, 1.60 and 1.51 inches respectively below normal.

March: Below Normal Temperatures and Below Normal Precipitation

Temperatures for the period averaged 45.7 degrees across the state which was 1 degree below normal. High temperatures averaged from 58 in the West to 57 in the East. Departure from normal high temperatures ranged from -3 degrees below normal in the West to 2 degrees above normal in the East. Low temperatures averaged from 38 degrees in the West to 37 degrees in the East. Departure from normal low temperature ranged from 2 degrees below normal in the West to 2 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 3.46 inches statewide which was 1.11 inches below normal. Precipitation totals by climate division, West 5.12 inches, Central 2.90 inches, Bluegrass 3.53 inches and East 2.54 inches, which was +0.44, -1.97, -0.82 and -1.86 inches respectively from normal.

April: Above Normal Temperatures and Slightly Above Normal Precipitation

Temperatures for April 2006 averaged 60.2 degrees across the state which was 4.6 degrees above normal. High temperatures averaged from 73 in the West to 72 in the East. Departure from normal high

temperatures ranged from 2 degrees above normal in the West to 7 degrees above normal in the East. Low temperatures averaged from 51 degrees in the West to 49 degrees in the East. Departure from normal low temperature ranged from 4 degrees above normal in the West to 5 degrees above normal in the East. Corn growing degree days (base 50 mod.) accumulations were 32 percent above normal for the month.

Precipitation (liq. equ.) for the month totaled 4.48 inches statewide which was 0.39 inches above normal. Precipitation totals by climate division, West 3.21 inches, Central 3.67 inches, Bluegrass 5.07 inches and East 5.65 inches, which was -1.32, -0.53, +1.18 and +1.82 inches respectively from normal.

May: Below Normal Temperatures and Below Normal Precipitation

Temperatures for the month averaged 63 degrees across the state which was 1.5 degrees below 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 2 degrees below normal in the East. Low temperatures averaged from 55 degrees in the West to 52 degrees in the East. Departure from normal low temperature ranged from 2 degrees below normal in the West to 3 degrees below normal in the East.

Precipitation (liq. equ.) for the month totaled 3.96 inches statewide which was 1.03 inches below normal. Precipitation totals by climate division, West 5.08 inches, Central 3.74 inches, Bluegrass 3.61 inches and East 3.48 inches, which was +0.10, -1.52, -1.30 and -1.37 inches respectively from normal.

June: Below Normal Temperatures and Below Normal Precipitation

Temperatures for the month averaged 71.6 degrees across the state which was 0.7 degrees below normal and 8.6 degrees warmer than the May temperature. High temperatures averaged from 87 in the West to 84 in the East. Departure from normal high temperatures ranged from 1 degree below normal in the West to near normal in the East. Low temperatures averaged from 63 degrees in the West to 60 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 month totaled 3.80 inches statewide which was 0.54 inches below normal. Precipitation totals by climate division, West 3.24 inches, Central 3.93 inches, Bluegrass 3.87 inches and East 4.09 inches, which was 0.75, 0.43, 0.48 and 0.24 inches respectively below normal.

July: Above Normal Temperatures and Above Normal Precipitation

Temperatures for the period averaged 76.8 degrees across the state which was 0.4 degrees above normal and 5.2 degrees warmer than the June temperature. High temperatures averaged from 88 in the West to 87 in the East. Departure from normal high temperatures ranged from 1 degree below normal in the West to 1 degree above normal in the East. Low temperatures averaged from 68 degrees in the West to 67 degrees in the East. Departure from normal low temperature ranged from 2 degrees above normal in the West to 3 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 4.73 inches statewide which was +0.33 inches from normal. Precipitation totals by climate division, West 6.34 inches, Central 4.25 inches, Bluegrass 4.50 inches and East 3.98 inches, which was +2.23, -0.27, -0.02 and -0.47 inches respectively from normal.

August: Above Normal Temperatures and Much Above Normal Precipitation

Temperatures for the period averaged 77.4 degrees across the state which was 2.4 degrees above normal and 0.6 degrees above the previous months average. High temperatures averaged from 88 in the West to 87 in the East. Departure from normal high temperatures ranged from 1 degree above normal in the West to 3 degrees above normal in the East. Low temperatures averaged from 69 degrees in the West to 68 degrees in the East. Departure from normal low temperature ranged from 4 degrees above

normal in the West to 6 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 4.15 inches statewide which was 0.55 inches above normal. Precipitation totals by climate division, West 3.80 inches, Central 4.52 inches, Bluegrass 4.12 inches and East 4.31 inches, which was 0.61, 0.99, 0.40 and 0.27 inches respectively above normal.

September: Below Normal Temperatures and Above Normal Precipitation

Temperatures for the period averaged 65 degrees across the state which was 3.3 degrees below normal and over 12 degrees cooler than last month. 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 3 degrees below normal in the East. Low temperatures averaged from 55 degrees in the West to 55 degrees in the East. Departure from normal low temperature ranged from 3 degrees below normal in the West to near normal in the East. No frost occurred during the month.

Rainfall for the month of September totaled 7.84 inches statewide which was 4.36 inches above normal. Rainfall totals by climate division, West 8.29 inches, Central 7.71 inches, Bluegrass 8.35 inches and East 7.24 inches, which was 4.92, 3.81, 5.09 and 3.83 inches respectively above normal.

October: Below Normal Temperatures and Above Normal Precipitation

Temperatures for the period averaged 54 degrees across the state which was 3 degrees below normal and 11 degrees cooler than last month. High temperatures averaged from 64 in the West to 63 in the East. Departure from normal high temperatures ranged from 7 degrees below normal in the West to 4 degrees below 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 3 degrees below normal in the West to near degrees from normal in the East.

Precipitation (liq. equ.) for the period totaled 4.76 inches statewide which was 1.71 inches above normal. Precipitation totals by climate division, West 4.62 inches, Central 4.43 inches, Bluegrass 5.26 inches and East 4.78 inches, which was 1.45, 1.23, 2.33 and 1.85 inches respectively from normal.

November: Above Normal Temperatures and Below Normal Precipitation

Temperatures for the period averaged 47 degrees across the state which was 0.5 degrees above normal. High temperatures averaged from 56 in the West to 58 in the East. Departure from normal high temperatures ranged from 2 degrees below normal in the West to 3 degrees above normal in the East. Low temperatures averaged from 38 degrees in the West to 39 degrees in the East. Departure from normal low temperature ranged from 1 degree above normal in the West to 6 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 3.27 inches statewide which was 0.77 inches below normal. Precipitation totals by climate division, West 4.33 inches, Central 3.49 inches, Bluegrass 2.24 inches and East 2.98 inches, which was 0.19, -0.80, -1.44 and -0.75 inches respectively from normal.

December: Above Normal Temperatures and Below Normal Precipitation

Temperatures for December 2006 averaged 41 degrees across the state which was 4 degrees above normal and 6 degrees cooler than November. High temperatures averaged from 51 in the West to 52 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 35 degrees in the West to 34 degrees in the East. Departure from normal low temperature ranged from 5 degrees above normal in the West to 11 degrees above normal in the East.

Precipitation (liq. equ.) for the period totaled 2.99 inches statewide which was - 1.29 inches below normal. Precipitation totals by climate division, West 4.29 inches, Central 3.31 inches, Bluegrass 2.88 inches and East 1.84 inches, which was 0.28, 1.52, 1.10 and 2.02 inches respectively below normal.

CROP SUMMARIES

Tobacco: The number of tobacco samples for 2006 (536) was barely above 2005 (528) which was the second lowest since 1976; the lowest being the drought year of 1988. For the second year in a row, the first reported case of Blue Mold (*Peronospora tabacina*) in the U.S. was found in Kentucky. The first cases were all found on plants raised from “mini-plugs” produced in Florida. Numbers of Black Shank (*Phytophthora parasitica* var. *nicotianae*) samples were up significantly from those posted for the last two years. Bacterial diseases were up due to the hot, wet weather. The number of cases of Fusarium Wilt Complex declined. The number of cases of Tomato Spotted Wilt virus were comparable to the last two years but still small compared to 2001 levels.

Other agronomic crops:

Corn: The number of corn samples with diseases were relatively few across the spectrum of corn diseases. One note of interest was a leaf sample diagnosed with Diplodia leaf streak (*Stenocarpella macrospora*) which is rarely seen in Kentucky.

Soybean: Australasian Soybean Rust (SBR; *Phakopsora pachyrhizi*) was detected in Kentucky for the first time on soybean on October 6, 2006. The fungus was found on leaves within the sentinel plot located at the UK Research and Education Center in Princeton. In all SBR was found on 26 samples with 25 on soybean and 1 on kudzu. 556 samples from SBR sentinel plots were examined.

For the first time, we saw a significant number of cases of Stem Canker (*Diaporthe phaseolorum* var. *caulivora* and *Diaporthe phaseolorum* var. *meridionalis*).

Although not a disease, for the second year in a row we saw a significant number of cases of severe thrips injury early in the season.

Small Grains: We saw a fair number of samples infected with the Barley Yellow Dwarf Virus and others with the Wheat Streak Mosaic Virus.

Forages: With rather a wet growing season, leaf diseases were common: Spring black stem (*Phoma medicaginis*), Summer black stem (*Cercospora medicaginis*), Lepto leaf spot (*Leptosphaerulina briosiana*) and Rhizoctonia web blight (*Rhizoctonia solani*).

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 involved. In addition, many specimens require special tests such as moist chamber incubation, culturing, enzyme-linked immunosorbant assay (ELISA), polymerase chain reaction (PCR) assay, nematode extraction, or soil pH and soluble salts tests. Diagnoses which require consultation with U.K. faculty plant pathologists, entomologists, and horticulturists, and which need culturing, PCR and ELISA assays 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 canker, bacterial leaf spot, bacterial speck, bacterial wilt, Phytophthora blights, Pierce’s disease, powdery mildews, and yellow vine decline. 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. New homeland security rules now require reporting of all diagnoses of plant diseases to USDA-APHIS on a real-time basis and our laboratories are working to

meet that requirement.

Temperatures dropped to 28F on April 9, well after fruit crops had broken dormancy and may have caused some injury. Rainfall in central and western Kentucky was near normal during most months, but was well below normal in eastern Kentucky with some areas reporting a shortfall of 10 inches of rain until September. In September, record-setting high levels of rain occurred statewide. With wetness affecting early season disease development, the percentage of days with rain in central and western Kentucky averaged over 40-50% during April and May. Thus, there were ample opportunities for rain-based plant disease development.

Results and Discussion

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

- Grape crown gall caused by *Agrobacterium vitis* continues to plague vineyards, even to the extent of forcing the replanting of some vineyards
- Apple leaf blotch caused by *Alternaria alternata*
- Peach fruit rot caused by a species of *Colletotrichum*
- Persimmon “Khaki sudden death” is a new and unsolved problem.
- Cucurbit yellow vine disease caused by *Serratia marsescens*
- Downy mildew of cucurbits, caused by *Pseudoperonospora cubensis*, particularly on pumpkin.
- Bacterial canker of tomato caused by *Clavibacter michiganensis* subsp. *michiganensis*
- Copper-resistant bacterial speck of tomatoes caused by *Pseudomonas syringae* pv. *tomato*
- Root knot nematode (*Meloidogyne* spp.) is becoming a major problem on several crops due to reduced crop rotation and use of old tobacco fields as vegetable sites
- Soybean rust occurred for the first time in Kentucky this fall; many vegetable legumes are also hosts
- An unknown Begomovirus was diagnosed on tomatoes being grown in a greenhouse; disease incidence was near 100%.

Tree Fruit Diseases:

Pome fruits: With periodic warm spring temperatures, fire blight (*Erwinia amylovora*) was observed frequently, and in many orchards was severe. Wet spring weather promoted apple scab (*Venturia inaequalis*) and cedar rusts of apple (*Gymnosporangium juniperi-virginianae*, *G. clavipes*, and *G. globosum*). Apples also showed symptoms of twig canker and frogeye leaf spot (*Botryosphaeria obtusa*). Powdery mildew (*Podosphaera leucotricha*) appeared early and sooty blotch (*Peltaster fruticola*, *Geastrumia polystigmatis*, *Leptodontium elatius*, and other fungi) and flyspeck (*Zygothiala jamaicensis*) appeared later in the season along with bitter rot (*Colletotrichum acutatum* and *C. gloeosporioides*). Pears were observed with fire blight and leaf spot (*Diplocarpon mespili*).

Stone Fruits: Some stone fruits suffered cold temperature injury to trunk phloem and cambial tissues from the February cold period. Peach leaf curl (*Taphrina deformans*), brown rot (*Monilinia fruticola*), and scab (*Cladosporium carpophilum*) were common. Plum black knot (*Apiosporina morbosum*) symptoms were widespread, possibly due to favorable infection conditions the year before.

Persimmons: “Khaki sudden death” a disease of unknown etiology was killing oriental persimmons grafted to native persimmon rootstock.

Small Fruit Diseases:

Grapes: Black rot (*Guignardia bidwellii*), and anthracnose (*Elsinoe ampelina*) were widespread and downy mildew (*Plasmopara viticola*), Phomopsis cane and leaf spot (*Phomopsis viticola*), powdery

mildew (*Uncinula necator*) and crown gall (*Agrobacterium vitis*) were also observed. No new cases of Pierce's disease (*Xylella fastidiosa*) were found.

Brambles: Blackberry rosette or double blossom (*Cercospora rubi*) was widespread this year. Cane blight and canker diseases (*Leptosphaeria coniothyrium*, *Botryosphaeria dothidea*) were also observed on blackberry. Raspberry and blackberry sterility were seen and are possibly related to virus infections.

Blueberries: Root rots caused by *Phytophthora* sp. and *Pythium* sp. were diagnosed.

Strawberries: Leaf spot (*Mycosphaerella fragariae*) was frequently observed. Bacterial angular leaf spot (*Xanthomonas fragariae*) and southern blight (*Sclerotium rolfsii*) were also diagnosed.

Vegetable Diseases:

Vegetable transplants. *Pythium* root rot (*Pythium* spp.) appeared in tomato, cantaloupe, squash and pepper fields this year, along with several cases of *Rhizoctonia* root rot, and may have originated in transplant production.

Cole crops. Cabbage black bacterial soft rot (*Erwinia* spp.) was observed.

Tomatoes. Early blight (*Alternaria solani*) and Septoria leaf spot (*Septoria lycopersici*) were very common and damaging to unsprayed tomato plantings. Commercial tomato plantings were affected by several bacterial diseases, especially bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*), but also bacterial spot (*Xanthomonas campestris* pv. *vesicatoria*), and bacterial speck (*Pseudomonas syringae* pv. *tomato*). Southern stem blight (*Sclerotium rolfsii*) and timber rot (*Sclerotinia sclerotiorum*) were found at several locations. Blossom end rot was the major fruit problem, but ripe rot (*Colletotrichum coccodes*) also occurred. Fusarium wilt (*Fusarium oxysporum* f.sp. *lycopersici*) root knot nematode (*Meloidogyne* sp.) and tomato spotted wilt virus appeared in several tomato fields.

Peppers. Bacterial leaf spot (*Xanthomonas campestris* pv. *vesicatoria*) remains an important problem.

Cucurbits. Anthracnose (*Colletotrichum* spp.), gummy stem blight/black rot (*Didymella bryoniae*), and *Alternaria* leaf spot (*Alternaria cucumerina*) were found at serious levels in fields of several different cucurbit crops. Powdery mildew (*Erysiphe cichoracearum*) caused losses for all cucurbit crops and Fusarium fruit rot of pumpkin (*Fusarium* sp.) also caused losses. Downy mildew (*Pseudoperonospora cubensis*) was observed. Bacterial wilt (*Erwinia tracheiphila*) was serious in 2006, but cucurbit yellow vine decline caused by *Serratia marsescens* was not. Numerous cases of viral diseases (virus complex) were reported on squash and pumpkins.

Other vegetables. Anthracnose (*Colletotrichum lindemuthianum*) was very widespread on beans this year and angular leaf spot (*Phaeoisariopsis griseola*) also occurred. Bean root rots (*Rhizoctonia solani*), (*Pythium* sp.) and (*Fusarium solani* f.sp. *phaseoli*) were also problematic. Potato scab (*Streptomyces scabies*) was also reported.

Growers are urged to notify their County Extension Agent of new outbreaks and disease trends in their fields. We want to be especially watchful of the new spectrum of microbes and diseases that may occur with changes in fungicide use patterns, from broad-spectrum protectant fungicides such as mancozeb and chlorothalonil, to new chemicals such as the strobilurins (Quadris, Amistar, Cabrio, Sovran, and Abound). These new chemicals present a greater risk of pathogen resistance to the fungicide while incurring reduced risks to human health and the environment. For example, we have noted increased bacterial diseases in tomatoes and want to know if this is due to use of new chemicals or how we raise our crops, manage other diseases, or import seeds and transplants. Because fruits and vegetables are high value crops, the plant disease diagnostic laboratory should be a

great value to commercial growers. Growers should consult consistently with their County Extension Agents so that appropriate plant specimens are sent to the laboratory quickly. We urge County Extension Agents to stress in their Extension programming the need for accurate diagnosis of diseases of high-value crops. Growers can work with their agents so that Kentucky growers have the best possible information on fruit and vegetable diseases.

Landscape Plant Disease Observations:

As previously mentioned 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 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 is also using polymerase-chain-reaction (PCR) testing which, although very expensive, allows more precise and accurate diagnoses. 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 landscape disease problems through the Kentucky Pest News newsletter, radio and television tapes, and plant health care workshops.

To assist County Extension Agents in dealing with plant disease issues, we also operate a web-based digital consulting system utilizing photographic images. When the system is used to assist in diagnosis, the images can be used to help determine where best to 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 1100 digital consulting cases, 30-35% dealt with landscape and nursery plants. With wetness affecting early season disease development, the percentage of days with rain in central and western Kentucky averaged over 40-50% during April and May. Thus, there were ample opportunities for rain-based development of spring plant diseases such as scab, cedar-quince rust, shade tree anthracnose and numerous leaf spot diseases. April and May temperatures were also quite variable alternating from warm to cool. Cool temperatures extended crabapple and flowering pear bloom periods and warm periods promoted bacterial growth so that these ornamentals were more vulnerable to fire blight than usual.

This was a big year for landscape plant disease incidence. The following important or unusual diseases were observed:

Deciduous trees

- Ash, dogwood, maple, oak, sycamore and walnut anthracnose (*Discula*, *Gnomonia*, *Kabatella*, and *Apiognomonia*) and dogwood spot anthracnose (*Elsinoe*)
- Beech, birch, hawthorn, maple, and London plane leaf spot (*Phyllosticta*)
- Cherry, honeylocust, and maple leaf spot (*Cercospora*)
- Cherry leaf spot (*Phloeosporrella*) and leaf rust (*Tranzchelia*)
- Maple tar spot (*Rhytisma*)
- Crabapple scab (*Venturia*)
- Dogwood and poplar leaf spot (*Septoria*)
- Oak Actinopelte leaf spot (*Tubakia*)
- Oak leaf blister (*Taphrina*)
- Horse chestnut leaf blotch (*Guignardia*)

- Dogwood, oak and walnut powdery mildew (*Microspheera*, *Phyllactinia*)
- Hawthorn, serviceberry and crabapple cedar rusts (*Gymnosporangium juniperi-virginianae*, *G. clavipes*, *G. globosum*)
- Birch, blackgum, cherry, dogwood, maple, oak, redbud, and yellowwood canker (*Botryosphaeria*)
- Flowering pear and flowering crabapple fire blight (*Erwinia*)
- Flowering plum and flowering cherry black knot (*Apiosporina*)
- Magnolia and smoke tree wilt (*Verticillium*)
- Mimosa wilt (*Fusarium*)
- Elm Dutch elm disease (*Ophiostoma*)
- Hackberry, maple, oak and sycamore bacterial leaf scorch (*Xylella*)
- Oak and apple root rot (*Xylaria*)

Needle Evergreens

- Juniper and arborvitae tip blight (*Kabatina*, *Phomopsis*) and juniper rusts (*Gymnosporangium*)
- Pine tip blight (*Diplodia*), brown spot needle blight (*Mycosphaerella*), and wilt (*Bursaphelenchus*)
- Spruce needle cast (*Rhizosphaera*) and canker (*Cytospora*)

Shrubs

- Hydrangea leaf spot (*Cercospora*, *Pseudomonas*)
- Lilac leaf spot (*Cercospora*) and bacterial blight (*Pseudomonas*)
- Rose black spot (*Diplocarpon*) powdery mildew (*Sphaerotheca*) and rosette (possible virus, leaf curl mite-transmitted)
- Euonymus powdery mildew (*Erysiphe*)
- Hydrangea, leucothoe, rhododendron, rose, and viburnum canker (*Botryosphaeria*)
- Boxwood Volutella canker (*Pseudonectria*)
- Rhododendron, taxus, hydrangea, and cherry laurel root rot (*Phytophthora*)
- Holly black root rot (*Thielaviopsis*)

Herbaceous Annuals and Perennials

- Aster and Amsonia rusts (*Coleosporium*)
- Dianthus, hosta, and lily anthracnose (*Colletotrichum*)
- Daylily leaf streak (*Aureobasidium*)
- Astilbe and goat's beard leaf spot (*Cercospora*)
- Peony leaf spots and blights (*Alternaria*, *Botrytis*, *Cercospora*, *Cladosporium*, and *Septoria*)
- Iris leaf spot (*Didymellina*) and bacterial soft rot (*Erwinia*)
- Chrysanthemum leaf spot (*Macrophoma*), blight (*Erwinia*), wilt (*Fusarium*) and root rot (*Pythium*, *Rhizoctonia*)
- Pachysandra stem canker and blight (*Volutella*)
- Anemone, celosia and hosta southern blight (*Sclerotium*)
- Catharanthus, petunia, and scaevola black root rot (*Thielaviopsis*)
- Begonia, delphinium, diplodina, English ivy, geranium, hosta, impatiens, lavender, lily, petunia, rudbeckia, sage, and vinca root rots (*Pythium*, *Rhizoctonia*)

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. This report is a synopsis of useful information about plant disease provided for landscape professionals.

A Shift in Sample Types:

As noted above, the number of tobacco samples for 2006 (536) was barely above 2005 (528) which itself was the second lowest since 1976. 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, 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. Sara also provides much-needed assistance to the Lexington laboratory in sample triage, diagnostic and technical support. During Julie Beale's study leave to Australia (January - March 2006), Sara coordinated Specialists' examination of commercial samples and diagnosed many of the homeowner samples.

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. Tobias Fullwood, a summer intern, worked with Ed and provided very capable part-time

assistance. Bernadette Amsden conducted laboratory research on vegetables, tobacco, ornamentals as well as helping conduct 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. Colette Laurent works part-time in Princeton analyzing soybean cyst nematode samples. Mary Rachel Ray provided very capable part-time assistance in the Princeton Laboratory. Terry Yielding also works in Princeton and helped coordinate all the data from the Asian soybean rust sentinel plots. Terry along with Carol Nash scrutinized tens of thousands of soybean and kudzu leaves generated by the sentinel plot cooperators in Kentucky, looking for signs of the Asian soybean rust pathogen.

Thanks also go to Pat Yancey 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 2006.

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 resource 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 2006. 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 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	25	27	5	0	5	16	78
Forages	17	47	0	1	20	10	95
Small grains	1	26	0	0	0	4	31
Soybeans	45	329*	10	0	11	495*	890
Tobacco	130	361	40	3	5	52	591
<u>Fruit</u>							
Small fruit	24	67	9	0	4	23	127
Tree fruit	20	108	5	4	26	24	187
<u>Herbs</u>							
	0	7	0	0	1	0	8
<u>Identifications</u>							
	0	44	0	2	0	2	48
<u>Ornamentals</u>							
<u>Herbaceous and</u>							
Houseplants	42	148	11	6	28	44	279
Turfgrass	14	94	1	2	0	39	150
Woody	314	460	59	17	272	383	1505
<u>Vegetables</u>							
	60	188	31	23	16	59	377
<u>Miscellaneous</u>							
	2	2**	0	1	0	133**	138
<u>Total</u>	694	1908	171	59	388	1284	4504

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 23 soybean samples with and 403 soybean samples without Asian Soybean Rust from the SBR sentinel plot system; and 223 soil samples with and 72 soil samples without Soybean Cyst Nematodes.

**Numbers include 1 Kudzu sample with and 128 Kudzu samples without Asian Soybean Rust from the SBR sentinel plot system.

Table 2. SUMMARY OF BIOTIC PROBLEMS BY CROP CATEGORY.

Crop Category	Bacterial	Fungal	Nematode	Virus	Other¹
<u>Agronomic</u>					
Corn	0	24	0	3	0
Forages	0	47	0	0	0
Small grains	1	8	0	17	0
Soybeans	0	99*	228**	1	1
Tobacco	13	298	0	50	0
<u>Fruit</u>					
Small fruit	3	55	0	8	1
Tree fruit	8	99	0	0	1
<u>Herbs</u>					
	0	6	0	1	0
<u>Identifications</u>					
	0	30	0	0	14
<u>Ornamentals</u>					
<u>Herbaceous and</u>					
Houseplants	5	138	0	3	2
Turfgrass	0	93	0	0	1
Woody	51	394	2	3	10
<u>Vegetables</u>					
	31	129	2	26	0
<u>Miscellaneous</u>					
	0	2***	0	0	0
Total	112	1422	232	112	30

¹ Other includes these categories: Animal (rodent and bird damage), Plant (plant identifications), and Algae, Lichen and Phytoplasma.

* Number includes 23 soybean samples with Asian Soybean Rust from the SBR sentinel plot system.

**Number includes 223 soil samples with Soybean Cyst Nematodes.

***Number includes 1 Kudzu sample with Asian Soybean Rust from the SBR sentinel plot system.

Table 3. NUMBER OF PLANT SAMPLES BY CROP CATEGORY

Crop Category	Number of Plant Specimens	Percentage of Total Plant Specimens
Agronomic (-Tobacco + 411 Soybean SBRs)	740	19.1
Tobacco	536	13.8
Fruit	286	7.4
Herbs	8	0.2
Identifications	48	1.2
Ornamentals	1784	46.0
Vegetables	339	8.7
Miscellaneous (includes 129 Kudzu, SBRs)	138	3.6
Total Plant Samples (includes SBRs)	3879	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	68	10	78
Forages	76	19	95
Small grains	28	3	31
Soybeans	863*	27	890
Tobacco	536	55	591
<u>Fruit</u>			
Small fruit	122	5	127
Tree fruit	164	23	187
<u>Herbs</u>			
	8	0	8
<u>Identifications</u>			
	48	0	48
<u>Ornamentals</u>			
Herbaceous and			
Houseplants	249	30	279
Turfgrass	139	11	150
Woody	1396	109	1505
<u>Vegetables</u>			
	339	38	377
<u>Miscellaneous**</u>			
	138	0	138
<u>Total</u>	4174	330	4504

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 + 295 SCN soil samples + 426 SBR samples

**Numbers include 129 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	55	9	0	0	0	4	0	0
Forages	70	6	0	0	0	0	0	0
Small grains	22	2	0	0	0	4	0	0
Soybeans	128	11	0	0	2	1	0	0
Tobacco	500	22	0	0	1	12	0	1
<u>Fruit</u>								
Small Fruit	49	6	62	1	0	4	0	0
Tree Fruit	26	1	136	0	0	1	0	0
<u>Herbs</u>								
	4	0	3	0	0	1	0	0
<u>Identifications</u>								
	1	6	29	3	0	0	1	8
<u>Ornamental</u>								
Herbaceous and								
Houseplants	95	18	121	4	2	3	3	3
Turfgrass	19	42	52	2	0	7	2	15
Woody	184	71	1064	37	0	20	11	9
<u>Vegetable</u>								
	120	6	192	3	0	11	3	4
<u>Miscellaneous</u>								
	3	0	3	0	2	0	0	1
<u>Total</u>	1276	200	1662	50	7	68	20	41
<u>Total/Grower Type</u>	1476		1712		75		61	

Total number of samples received = 3324

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.	7	0	1	2	0	10
Agronomy Department	35	0	2	1	0	38
Entomology Department	9	5	30	1	0	45
Horticulture Department	0	2	4	0	5	11
					<u>Total</u>	104
					<u>Total number of routine plant specimens</u>	3325
					<u>Percent of specimens referred outside Diagnostic Lab for diagnosis</u>	3.1

* 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)	10
Culturing	32
Enzyme-linked Immunosorbent Assay (ELISA)	146
Indicator plants	1
Incubation	297
Nematode extraction (total = 146)	
Pinewood nematode	6
Soybean cyst nematode	295
Soil tests (total = 239)	
pH	77
pH/Soluble Salts	61
Saturated media extract	1
Soluble salts	14
Quick nitrate	4

*** Based on 3325 routine plant samples, 555 SBR, and 295 SCN samples.
Does not include SOD work (see pages 23-24).**

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	5	1	2	0	2	0	0
ALLEN	9	2	3	0	1	3	0
ANDERSON	30	0	6	2	13	9	0
BALLARD	39	33	1	0	5	0	0
BARREN	42	12	12	0	10	8	0
BATH	18	4	5	2	7	0	0
BELL	12	0	0	1	9	2	0
BOONE	27	0	2	0	22	1	2
BOURBON	36	4	5	4	20	3	0
BOYD	6	1	0	2	2	1	0
BOYLE	31	0	3	2	22	1	3
BRACKEN	13	4	3	5	0	0	1
BREATHITT	10	0	1	0	8	1	0
BRECKINRIDGE	98	18	52	5	19	3	1
BULLITT	57	0	1	10	41	2	3
BUTLER	7	1	1	1	4	0	0
CALDWELL	131	42	7	19	26	10	27
CALLOWAY	146	47	36	8	41	14	0
CAMPBELL	21	0	1	1	13	6	0
CARLISLE	9	2	0	0	3	4	0
CARROLL	10	1	4	0	2	3	0
CARTER	11	0	4	2	2	2	1
CASEY	3	1	1	0	0	1	0
CHRISTIAN	103	20	10	5	40	28	0
CLARK	24	2	9	1	11	1	0
CLAY	3	0	1	0	0	2	0
CLINTON	5	2	2	0	1	0	0
CRITTENDEN	28	2	0	3	15	8	0
CUMBERLAND	12	0	0	3	9	0	0
DAVISS	121	35	23	12	38	12	1
EDMONSON	13	1	0	2	8	2	0
ELLIOTT	7	0	0	2	5	0	0
ESTILL	7	2	2	0	2	1	0
FA YETTE	572	10	19	19	480	33	11
FLEMING	21	1	5	2	7	5	1
FLOYD	11	0	0	5	5	1	0
FRANKLIN	90	2	2	3	75	8	0
FULTON	65	21	0	1	3	0	40
GALLATIN	2	0	0	0	2	0	0
GARRARD	2	0	2	0	0	0	0
GRANT	23	1	4	3	7	7	1
GRAVES	74	9	13	4	21	8	19
GRAYSON	15	3	1	1	8	2	0
GREEN	6	2	2	0	2	0	0
GREENUP	8	0	1	2	2	2	1
HANCOCK	14	2	2	1	6	3	0
HARDIN	69	42	7	2	17	0	1
HARLAN	7	0	0	1	5	1	0
HARRISON	23	2	2	1	16	2	0
HART	12	2	2	1	4	2	1
HENDERSON	61	25	7	2	21	6	0
HENRY	37	0	16	4	17	0	0
HICKMAN	31	5	0	2	2	2	20
HOPKINS	19	4	4	0	8	3	0
JACKSON	20	1	3	4	11	0	1
JEFFERSON	32	0	0	1	27	3	1
JESSAMINE	29	0	3	1	24	0	1
JOHNSON	0	0	0	0	0	0	0
KENTON	32	0	2	2	27	1	0
KNOTT	0	0	0	0	0	0	0
KNOX	10	0	0	0	3	0	7

COUNTY	Total	Agronomic ¹	Tobacco	Fruit	Ornamental	Vegetable	Other
LARUE	27	4	7	4	10	1	1
LAUREL	25	0	0	2	18	3	2
LAWRENCE	3	0	0	1	1	1	0
LEE	2	0	0	0	2	0	0
LESLIE	0	0	0	0	0	0	0
LETCHER	10	0	0	0	7	3	0
LEWIS	10	0	5	1	4	0	1
LINCOLN	18	2	5	2	7	2	0
LIVINGSTON	2	0	0	1	1	0	0
LOGAN	84	31	19	9	21	4	0
LYON	34	7	8	3	13	2	1
McCRACKEN	65	2	2	8	39	12	2
McCREARY	0	0	0	0	0	0	0
McLEAN	27	17	5	0	1	4	0
MADISON	52	1	4	6	40	1	0
MAGOFFIN	11	0	3	0	0	0	8
MARION	10	1	2	2	5	0	0
MARSHALL	45	3	0	4	32	5	1
MARTIN	1	0	0	0	1	0	0
MASON	2	0	1	0	1	0	0
MEADE	29	10	2	1	13	3	0
MENIFEE	4	0	2	0	2	0	0
MERCER	22	3	9	0	7	2	1
METCALFE	14	2	3	4	5	0	0
MONROE	10	1	4	2	3	0	0
MONTGOMERY	34	1	5	4	14	9	1
MORGAN	17	1	6	3	4	2	1
MUHLENBERG	12	2	2	0	4	4	0
NELSON	27	5	3	1	17	1	0
NICHOLAS	10	0	10	0	0	0	0
OHIO	5	1	2	0	0	1	0
OLDHAM	98	31	2	1	60	2	2
OWEN	11	1	1	8	0	1	0
OWSLEY	2	1	0	0	1	0	0
PENDELTON	2	1	1	0	0	0	0
PERRY	18	0	0	0	3	0	15
PIKE	0	0	0	0	0	0	0
POWELL	0	0	0	0	0	0	0
PULASKI	55	11	10	4	15	11	4
ROBERTSON	17	1	9	2	4	1	0
ROCKCASTLE	3	0	1	0	2	0	0
ROWAN	12	0	4	1	6	1	0
RUSSELL	36	3	4	3	15	9	2
SCOTT	19	3	2	0	14	0	0
SHELBY	44	20	3	3	17	1	0
SIMPSON	47	7	8	9	18	3	2
SPENCER	12	3	1	0	8	0	0
TAYLOR	40	15	10	2	12	1	0
TODD	79	35	24	7	6	7	0
TRIGG	40	8	3	4	19	2	4
TRIMBLE	13	0	10	0	1	2	0
UNION	52	40	0	0	12	0	0
WARREN	102	35	8	8	43	8	0
WASHINGTON	21	0	3	6	11	0	1
WAYNE	32	8	7	4	9	4	0
WEBSTER	52	39	6	3	4	0	0
WHITLEY	30	1	3	5	17	4	0
WOLFE	7	0	2	1	2	2	0
WOODFORD	27	1	11	3	12	0	0
Out-of-State (none)	0	0	0	0	0	0	0
TOTALS	3879	740	536	286	1784	339	194

¹ Includes SBR 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 Diagnosis¹	Consultations²
LEXINGTON			
Beale, JW (Diagnostician)	Plant Pathology	1664	47
Bessin, RT	Entomology	4	0
Fountain, WM	Horticulture	4	6
Ghabrial, SA	Plant Pathology	0	1
Green, JD	Plant & Soil Sciences	2	2
Hartman, JR	Plant Pathology	134	32
Lee, CD	Plant & Soil Sciences	3	0
Long, SJ	Plant Pathology	257	0
Palmer, GK	Plant & Soil Sciences	22	3
Pearce, BC	Plant & Soil Sciences	3	0
Rowell, AB	Horticulture	1	0
Schwab, GJ	Plant & Soil Sciences	0	2
Seebold, KW	Plant Pathology	28	9
Smigell, CG	Horticulture	0	1
Strang, JG	Horticulture	1	2
Townsend, LH	Entomology	29	11
Ulrich, JE	Horticulture	2	4
Vaillancourt, LJ	Plant Pathology	0	1
Vincelli, P	Plant Pathology	39	8
Witt, WW	Plant & Soil Sciences	1	0
PRINCETON			
Bachi, PR (Diagnostician)	Plant Pathology	1070	19
Bailey, WA	Plant & Soil Sciences	13	10
Dunwell, WC	Horticulture	6	4
Herbek, JH	Plant & Soil Sciences	4	2
Hershman, DE	Plant Pathology	0	8
Johnson, DW	Entomology	3	6
Lacefield, GD	Plant & Soil Sciences	7	3
Masabni, JG	Horticulture	2	2
Martin, JR	Plant & Soil Sciences	12	12
Murdock, LW	Plant & Soil Sciences	8	1
Rasnake, M	Plant & Soil Sciences	1	0
Yielding, TL	Plant Pathology	514	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.

**192 cases were submitted in 2006 by a total of 62 submitters.
Cases came from a total of 54 counties.**

Plant/Crop	CountOfPlant/Crop
Corn	3
Forage crop	5
Forest tree	3
Fruit tree	1
Herbaceous ornamental	12
Landscape shrub	14
Landscape tree	55
Mushroom	2
other (fungi)	1
Small fruit	7
Small grain	3
Soybean	8
Tobacco	23
Tree fruit	13
Turf grass	4
Vegetable	38

SURVEY FOR *Phytophthora ramorum* IN WATER SHEDS IN KENTUCKY

*Patricia B. de Sá, Chris Barton, John Hartman, David Colett, Ana Maria Holdcroft,
and Wiphawee Leesuthiphonchai* Departments of Plant Pathology, Forestry and Entomology

Kentucky was a collaborator in the stream sampling for *P. ramorum* pilot project for forests in the eastern United States funded and supported by the USDA - Forest Service. The survey was carried out as collaboration between the Plant Pathology Dept. and the Dept. of Forestry. Six (6) watersheds drained by perennial streams were sampled for the presence of *P. ramorum*. Sampling was performed by using rhododendron leaves as baits for *Phytophthora* species. Rhododendron leaves were placed in screen bags. The bags were placed in the stream and tied down. After two weeks in the stream, the leaves were removed from the bags and leaf disks were collected from areas showing symptoms. DNA was extracted from leaf disks and used as the template in a nested PCR procedure to detect *P. ramorum*. Samples were collected over a six (6) month period. Remaining leaves were shipped to a quality control lab for testing. Leaf disks were also used to culture *Phytophthora* species on PARPH-V8 medium.

Twenty nine (29) composite samples were collected in total. Many *Phytophthora* isolates were collected but no samples were found to be positive for *Phytophthora ramorum*. The survey will be repeated in 2007.

National Nursery Perimeter and Forest Survey for *Phytophthora ramorum* in Kentucky, 2006

Patricia B. de Sá, John Hartman, Wiphawee Leesutthiphonchai, Ana Maria Holdcroft, Pierre-Yves Dymarski, Sarah L. Hall,
Jacob P. Royse and Janet Lensing.

Departments of Plant Pathology, Forestry and Entomology.

Note: A more complete report of this work can be found in the UK Agricultural Experiment Station publication, PR-537, <http://www.ca.uky.edu/agc/pubs/pr/pr537/pr537.pdf>

Acknowledgements: This Survey was carried out in cooperation with the Kentucky Division of Forestry (KDF). Thanks to the Kentucky Commerce Cabinet Department of Parks for providing us with a Scientific Research Permit and to the USDA-FS for permission to sample in the Daniel Boone National Forest. Thanks to the following organizations for help in identifying suitable areas, giving us permission to sample and accompanying the survey group on the field: KDF, Camp Nelson Heritage Park, Lexington-Fayette Urban County Government, Division of Parks and Recreation, Robinson Forest, Griffiths Woods and to the private nursery and forest owners who gave us permission to perform the survey and sample in their property.

Nature of Work

Phytophthora ramorum is considered to be a nursery and forest problem and a major disease threat to forests in the Appalachian region according to disease risk models generated by the USDA Forest Service.

The forest and nursery perimeter survey was carried out as collaboration between the USDA - FS, the Kentucky Division of Forestry and the Departments of Plant Pathology, Forestry and Entomology of the University of Kentucky. It was performed according to a protocol devised by USDA Forest Service, Forest Health Monitoring. Sampling was performed on 30 locations across the state, on the perimeter of 21 nurseries and in nine forested or wooded areas that had not been previously surveyed. The areas selected were considered high risk based on having received plants from west coast states where *P. ramorum* is present, the type of vegetation, proximity to urban areas that may have received infected plants and areas that may be subject to high tourist traffic.

Composite leaf samples and bark samples from individual trees were collected from plants showing symptoms of infection by *Phytophthora* species in 11 genera: *Acer*, *Aesculus*, *Castanea*, *Fagus Hammamelis*, *Kalmia*, *Lonicera*, *Quercus*, *Rhododendron*, *Vaccinium*, and *Viburnum*. All samples were double bagged, maintained at low temperature and taken to the Plant Pathology Department of the University of Kentucky. Replicate samples were shipped overnight to a collaborating laboratory for analysis and for confirmation of the results. Leaves and bark were sub-sampled under containment conditions for DNA extraction and PCR using nested primers for detection of *P. ramorum*.

Results and Discussion

Thirty locations were surveyed in 18 counties, and the breakdown of locations in each county is the following: Bath (1), Boone (3), Breathitt (2), Bullitt (1), Clark (1), Fayette (3), Franklin (1), Gallatin (1), Harrison (1), Jackson (1), Jefferson (4), Jessamine (2), Kenton (2), Laurel (2), Madison (1), Menifee (2), Mercer (1), Russell (1).

From the 30 locations surveyed 57 leaf and bark samples from plants showing symptoms indicative of infection by a *Phytophthora* species were collected. DNA was extracted from all samples and PCR was performed to test for *P. ramorum*.

No samples collected from nursery perimeters, forests and wooded areas in Kentucky were found to be positive for *P. ramorum* in 2006.

National Nursery Survey for *Phytophthora ramorum* in Kentucky, 2006.

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Note: A more complete report of this work can be found in the UK Agricultural Experiment Station publication, PR-537, <http://www.ca.uky.edu/agc/pubs/pr/pr537/pr537.pdf>

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Nature of Work

Phytophthora ramorum is at present the major *Phytophthora* species of concern for the ornamental nursery industry in the US. Although this pathogen affects mostly camellias, rhododendrons, viburnums, oaks and tanoaks, many other plants including 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 2006 was performed through collaboration between the Departments of Plant Pathology and Entomology, the Office of State Entomologist at the University of Kentucky, and the USDA – APHIS. Procedures for collecting and testing were according to protocols established by the USDA-APHIS-PPQ. Forty six nurseries and retail outlets were surveyed for detection of *P. ramorum* in parts of the state that may be at higher risk for establishment of *P. ramorum*. Risk in this case is based on the composition of native plants in the area, climate and weather conditions and presence of a trace forward nursery, a nursery that has received plants from another nursery that had plant proven to be infected with *P. ramorum*.

Research and experience in nurseries have indicated that although many plants are hosts to *P. ramorum* or have been found associated with it, six genera of plants seem to be very susceptible to infection and plants in these genera are considered high risk plants. The genera are: *Camellia*, *Rhododendron* (excluding azaleas that have small leaves), *Viburnum*, *Pieris*, *Kalmia* (mountain laurel) and *Syringa* (lilac). Collection of plants for the survey was concentrated on these genera, however some other plants showing symptoms of infection by *Phytophthora* were also collected. Leaves, apical shoots and flower buds showing symptoms typical of Ramorum blight were collected, placed in a bag with zip closure and was placed into a second bag closed in the same way. The bags were labeled, placed in a cooler, and taken to the Plant Pathology Department of the University of Kentucky for analysis.

All the collected samples were tested using a direct DAS ELISA (Double Antibody Sandwich Enzyme Linked Immunosorbent Assay). This is a very sensitive assay but not specific enough to differentiate between species, and it may also detect some organisms in the genus *Pythium*. It is a good pre-screening assay and samples that were positive in ELISA were tested further using a more specific and sensitive assay: PCR with nested primers for amplification of *P. ramorum* DNA. For all the samples that tested positive in ELISA, DNA was extracted and the DNA was sent to the USDA-APHIS for testing by PCR for *P. ramorum*, according to the protocol.

Results and Discussion

A total number of 14,936 plants were inspected for Ramorum blight in 46 nurseries and retail outlets in 20 counties, of these 687 showed symptoms indicative of infection by an organism in the genus *Phytophthora* and 192 composite samples were collected.

No samples collected from nurseries in the state of Kentucky were found to be positive for *P. ramorum* in the 2006 nursery survey.

AGRONOMIC CROPS

CORN

CORN (Zea) (includes Popcorn)

Anthracnose, stem rot	- Colletotrichum	1	0	1
Charcoal rot	- Macrophomina	1	0	1
Chemical injury	- growth regulator	1	0	1
	- herbicide	4	0	4
Ear/Kernel rots	- Fusarium	0	1	1
	- Stenocarpella	2	0	2
Environmental	- compaction	3	2	5
Gray leaf spot	- Cercospora	5	1	6
Insect injury		5	0	5
Leaf streak	- Stenocarpella	1	0	1
No disease		16		16
Northern leaf blight	- Setosphaeria	2	0	2
Northern leaf spot	- Bipolaris	0	1	1
Nutritional	- acid soil	2	1	3
	- magnesium deficiency	1	0	1
	- manganese toxicity	1	0	1
	- nitrogen deficiency	1	0	1
	- phosphorus deficiency	3	1	4
	- potassium deficiency	4	0	4
	- zinc deficiency	5	0	5
Pollination problem	- unknown	1	0	1
Root rot	- Fusarium	0	1	1
	- Rhizoctonia	1	0	1
Rust, common	- Puccinia	0	1	1
Seedling blight	- Fusarium	2	0	2
Stalk rot	- Fusarium	1	0	1
	- Gibberella	2	0	2
	- Stenocarpella	1	0	1
Virus	- Maize chlorotic dwarf	1	0	1
	- Maize dwarf mosaic	1	1	2

CROP	DIAGNOSIS	CAUSAL AGENT			
<u>FORAGES</u>					
ALFALFA (Medicago)					
	Anthracnose	- Colletotrichum	3	1	4
	Crown/root rot	- Rhizoctonia	5	1	6
		- Sclerotinia	1	0	1
	Cultural	- Fescue competition	1	0	1
	Environmental	- stress	1	0	1
	Insect injury		7	5	12
	Leaf spot	- Leptosphaerulina	6	1	7
	No disease		5		5
	Nutritional	- boron deficiency	5	2	7
		- general	1	0	1
		- nitrogen	1	0	1
		- phosphorus deficiency	1	0	1
	Root rot	- Phytophthora	1	0	1
		- Pythium	1	0	1
	Spring black stem	- Phoma	8	0	8
	Stem canker	- Rhizoctonia	2	0	2
	Summer black stem	- Cercospora	3	0	3
	Web blight	- Rhizoctonia	0	2	2
BERMUDAGRASS (Cynodon)					
	Environmental	- cold injury	1	0	1
CLOVER (Trifolium)					
	Crown/root rot	- Pythium	1	0	1
		- Rhizoctonia	0	1	1
	Inadequate specimen		1		1
	Insect injury		0	1	1
	Leaf spot	- Curvularia	1	0	1
	Web blight	- Rhizoctonia	1	0	1
FESCUE (Festuca)					
	No disease		1		1
MILLET (Panicum)					
	Gray leaf spot	- Pyricularia	3	0	13
ORCHARDGRASS (Dactylis)					
	Environmental	- stress	0	4	4
	Insect injury		5	0	5
	Leaf blight	- Sclerotrichum	4	0	4
	No disease		3		3
TIMOTHY (Phleum)					
	Insect injury		2	0	2
	No disease		1		1

SOYBEAN

SOYBEAN (Glycine)

Anthracnose	- Colletotrichum	1	0	1
Asian soybean rust	- Phakopsora	25	0	25
Breakover	- unknown	1	0	1
Charcoal rot	- Macrophomina	3	2	5
Chemical injury	- growth regulator	4	1	5
	- herbicide	3	0	3
	- unknown	2	0	2
Downy mildew	- Peronospora	7	4	11
Environmental stresses		12	0	12
Frogeye	- Cercospora	2	7	9
Insect injury		9	2	11
Leaf blight	- Cercospora	1	1	2
Leaf scorch	- environmental	5	0	5
Leaf spot	- Phyllosticta	1	0	1
No disease		408		408
No nodules	- unknown	1	0	1
Nutritional	- magnesium deficiency	1	0	1
	- nitrogen deficiency	1	0	1
	- potassium deficiency	23	1	24
Physical injury	- deer	1	0	1
Pod/seed decay	- Alternaria	0	1	1
Pod and stem blight	- Diaporthe	3	0	3
Root knot nematode	- Meloidogyne	1	0	1
Root/stem rot	- Fusarium	1	1	2
	- Phytophthora	5	2	7
	- Rhizoctonia	6	1	7
Soybean cyst nematode	- Heterodera			
	on plant samples	1	3	4
	* in soil samples	223		223
	* absent in soil samples	72		72
	(*soil submitted to Nematode Analysis Laboratory)			
Stem canker	- Diaporthe	10	1	11
Sudden death	- Fusarium	13	0	13
Target spot	- Corynespora	1	0	1
Virus	- unknown	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT				#
<u>SMALL GRAINS</u>						
OAT (Avena)						
	Virus	- Barley yellow dwarf	1	0		1
SORGHUM (Sorghum)						
	Root rot	- Fusarium	1	0		1
TEFF (Tef)						
	Gray leaf spot	- Pyricularia	1	0		1
WHEAT (Triticum)						
	Bacterial streak	- Xanthomonas	0	1		1
	Glume blotch	- Stagonospora	1	0		1
	Head blight	- Fusarium	2	0		2
	Leaf spot	- Bipolaris	1	0		1
	No disease		4			4
	Nutritional	- nitrogen deficiency	1	0		1
	Powdery mildew	- Erysiphe	0	1		1
	Take-all	- Gaeumannomyces	1	0		1
	Virus	- Barley yellow dwarf	10	0		10
		- Wheat spindle streak	0	1		1
		- Wheat streak mosaic	4	0		4

CROP	DIAGNOSIS	CAUSAL AGENT			#
<u>TOBACCO</u>					
TOBACCO (Nicotiana)					
	Angular leaf spot	- Pseudomonas	3	0	3
	Bacterial black stalk	- Erwinia	1	0	1
	Bacterial soft rot	- Erwinia	4	0	4
	Black leg	- Erwinia	0	1	1
	Black root rot	- Thielaviopsis	3	0	3
	Black shank	- Phytophthora	96	0	96
	Blue mold	- Peronospora	71	0	71
	Brown spot	- Alternaria	7	3	10
	Chemical injury	- fungicide	6	3	9
		- growth regulator	7	0	7
		- herbicide	10	0	10
		- sucker agent	2	0	2
		- surfactant	1	0	1
		- unknown	11	0	11
	Collar rot	- Sclerotinia	5	0	5
	Cultural stresses		20	0	20
	Damping-off	- Rhizoctonia	5	1	6
	Early flowering	- environmental	3	0	3
	Environmental	- cold injury	8	1	9
		- compaction	2	0	2
		- frost injury	1	0	1
		- lightning	5	0	5
		- stress	4	0	4
		- sunbleaching	1	0	1
		- weather scald	4	4	8
		- wet feet	3	0	3
	False broomrape	- unknown	0	1	1
	Frenching	- metabolites	1	0	1
	Frogeye	- Cercospora	18	8	20
	Hollow stalk	- Erwinia	3	0	3
	House burn	- Erwinia	1	0	1
	Inadequate specimen, no disease		55		55
	Insect injury		5	0	5
	Leaf breakdown	- physiological	2	0	2
	Mutation	- genetic	2	0	2
	Nutritional	- acid soil	14	2	16
		- fertilizer burn	4	0	4
		- manganese toxicity	15	2	17
		- nitrogen deficiency	6	0	6
		- potassium deficiency	6	0	6
		- soluble salts	1	1	2
		- temp. phosphorus def.	4	3	7
	Physical injury	- unknown	1	0	1
	Powdery mildew	- Erysiphe	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT		
(Tobacco, continued)				
Root rot	- Pythium	29	2	31
Root rot	- Rhizoctonia	1	0	1
Root/stem rot	- Pythium	3	0	3
Slime mold	- species	1	0	1
Sore shin	- Rhizoctonia	9	4	13
Stem girdling	- Rhizoctonia	4	0	4
	- unknown	1	0	1
Storage mold	- Cladosporium	1	0	1
	- Penicillium	1	0	1
Target spot	- Rhizoctonia	14	6	20
Virus	- Alfalfa mosaic	0	2	2
	- Tobacco ringspot	4	0	4
	- Tomato ringspot	0	1	1
	- Tobacco streak	1	0	1
	- Tomato spotted wilt	37	5	42
Weather fleck	- ozone	5	3	8
Wilt	- Fusarium	4	1	5

CROP	DIAGNOSIS	CAUSAL AGENT			
FRUIT CROPS					
<u>SMALL FRUITS</u>					
BLUEBERRY (Vaccinium)					
Cultural	-	transplant shock	3	0	3
Environmental	-	wet feet	2	0	2
Leaf scorch	-	environmental	1	0	1
No disease			5		5
Nutritional	-	acid soil	1	0	1
	-	iron deficiency	2	0	2
	-	nitrogen deficiency	1	0	1
Root rot	-	Phytophthora	2	0	2
	-	Pythium	1	0	1
BRAMBLES - BLACKBERRY, and RASPBERRY (Rubus)					
Anthraxnose	-	Colletotrichum	1	0	1
Cane blight	-	Leptosphaeria	2	0	2
Crown gall	-	Agrobacterium	1	0	1
Cultural	-	transplant shock	1	0	1
Double blossom	-	Cercospora	4	0	4
Insect injury			2	1	3
Leaf spot	-	Phoma	1	0	1
	-	Septoria	1	0	1
	-	Sphaerulina	1	0	1
No disease			5		5
Nutritional	-	nitrogen deficiency	1	0	1
	-	phosphorus deficiency	0	1	1
Orange rust	-	Gymnoconia	1	0	1
Root rot	-	Pythium	1	0	1
Slime mold	-	species	2	0	2
Virus	-	sterility	3	0	3
	-	unknown	5	0	5
White druplet disorder	-	physiological	2	0	2
GRAPE (Vitis)					
Anthraxnose	-	Elsinoe	5	0	5
Black rot	-	Guignardia	13	1	13
Cane blight/Leaf spot	-	Phomopsis	1	0	1
Chemical injury	-	growth regulator	5	0	5
	-	unknown	3	0	3
Crown gall	-	Agrobacterium	1	0	1
Downy mildew	-	Plasmopora	2	0	2
Environmental	-	drought	1	0	1
Leaf blight	-	Isariopsis	0	1	1
	-	Pestalotiopsis	2	0	2
No disease			9		9
Nutritional	-	phosphorus deficiency	1	0	1
Physical injury	-	bird	1	0	1
Powdery mildew	-	Uncinula	1	0	1
Root rot	-	Cylindrocladium	1	0	1
	-	Pythium	0	1	1
Stem rot	-	Pestalotiopsis	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			#
STRAWBERRY (Fragaria)					
	Angular leaf spot	- Xanthomonas	1	0	1
	Black root rot	- Rhizoctonia	1	0	1
	Environmental stresses		3	0	3
	Fruit rot	- Rhizoctonia	1	0	1
	Insect injury		1	0	1
	Leaf blight	- Phomopsis	1	0	1
	Leaf spot	- Mycosphaerella	3	1	4
	No disease		4		4
	Nutritional	- fertilizer burn	1	0	1
		- iron deficiency	1	0	1
	Root rot	- Pythium	2	0	2
	Southern blight	- Sclerotium	1	0	1
<u>TREE FRUITS</u>					
APPLE (Malus)					
	Bitter pit	- calcium deficiency	1	0	1
	Bitter rot	- Glomerella	3	0	3
	Black rot	- Botryosphaeria	1	1	2
	Burr knot	- physiological	1	0	1
	Canker	- Botryosphaeria	1	0	1
	Cedar apple rust	- Gymnosporangium	34	1	35
	Cork spot	- calcium deficiency	1	1	2
	Dieback	- Botryosphaeria	1	0	1
	Environmental stresses		4	1	5
	Fire blight	- Erwinia	6	0	6
	Flyspeck	- Schizothyrium	0	2	2
	Frogeye	- Botryosphaeria	6	2	8
	Insect injury		2	5	7
	Leaf blotch	- Alternaria	1	0	1
	Leaf spot	- Phoma	1	0	1
		- unknown	1	0	1
	Lichen	- species	1	0	1
	No disease		3		3
	Physical injury	- unknown	1	0	1
	Powdery mildew	- Podosphaera	1	1	2
	Scab	- Venturia	1	0	1
	Sooty blotch	- species	2	0	2
	Southern blight	- Sclerotium	1	0	1
CHERRY (Prunus)					
	Canker	- Botryosphaeria	1	0	1
		- Phomopsis	1	0	1
		- unknown	1	0	1
	Chemical injury	- growth regulator	1	0	1
	Environmental	- freeze injury	2	0	2
	Inadequate specimen, no disease		6		6
CUDRANIA (Cudrania)					
	Chemical injury	- Unknown	1	0	1
	Insect injury		0	1	1

CROP	DIAGNOSIS	CAUSAL AGENT			
PEACH, APRICOT and NECTARINE (Prunus)					
	Brown rot	- Monilinia	10	0	10
	Chemical injury	- fungicide	2	0	2
	Dieback	- unknown	1	0	1
	Inadequate specimen, no disease		6		6
	Insect injury		5	3	8
	Leaf curl	- Taphrina	4	0	4
	Nutritional	- nitrogen deficiency	2	0	2
	Scab	- Cladosporium	4	2	6
PEAR (Pyrus)					
	Chemical injury	- growth regulator	1	0	1
	Cork spot	- calcium deficiency	1	0	1
	Fire blight	- Erwinia	2	0	2
	Inadequate specimen, no disease		4		4
	Leaf spot	- Entomosporium	1	0	1
		- Fabraea	2	0	2
PECAN (Carya)					
	Insect injury		8	2	10
	No disease		5		5
	Poor kernel fill	- unknown	3	0	3
PERSIMMON (Dispyros)					
	Inadequate specimen, no disease		2		2
	Leaf spot	- Cladosporium	1	0	1
		- Phyllosticta	0	1	1
	Root/Collar rot	- Phytophthora	1	0	1
PLUM (Prunus)					
	Black knot	- Apiosporina	7	0	7
	No disease		1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
HERBS					
BASIL (Ocimum)	Wilt	- Fusarium	1	0	1
GARLIC (Allium)	Virus	- poty virus	1	0	1
GINSENG (Panax)	Blight	- Alternaria	1	0	1
LAVENDER (Lavandula)	Root rot	- Pythium	1	0	1
LUO HAN GUO (Siraitia)	Anthraco nose	- Colletotrichum	1	0	1
PARSLEY (Petroselinum)	Insect injury		1	0	1
ROSEMARY (Rosmarinus)	Powdery mildew	- Sphaerotheca	1	0	1
SAGE (Salvia)	Root/Stem rot	- Rhizoctonia	1	0	1
MISCELLANEOUS					
KUDZU (Pueraria)	Asian soybean rust	- Phakopsora	1	0	1
	No disease		130		130
MISCELLANEOUS	Inadequate specimen, no disease		4		4
SOIL	Nutritional	- acid soil	1	0	1
		- general	1	0	1
WOOD PLANK	Wood decay	- unknown	1	0	1

IDENTIFICATIONS

FUNGAL IDENTIFICATIONS

Auricularia	- auricula	1	1
Calvatia	- cyathiformis	1	1
	- gigantea	1	1
	- species	2	2
	- striatus	1	1
Cyathus	- species	1	1
Galerina	- species	1	1
Ganoderma	- species	3	3
Gomphidius	- species	2	2
Gyrodon	- meruliodes		
Inadequate specimen, or no fungal material found		3	3
Laccaria	- ochropurpurea	1	1
Lycoperdon	- species	2	2
Peziza	- species	1	1
Pleurotus	- ostreatus	1	1
Polyporus	- frondosus	1	1
	- sulphureus	1	1
Pulcherricium	- caeruleum	1	1
Ramaria	- botrytis	1	1
Russula	- species	1	1
	- xerampelina	1	1
Russulaceae	- species	1	1
Scleroderma	- aurantium	1	1
Slime mold	- species	1	1
Xylaria	- species	1	1

LICHEN IDENTIFICATIONS

Lichen	- species	1	1
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PLANT IDENTIFICATIONS

Aster	- species	1	1
Cornus	- kousa	1	1
Cucumis	- melo	1	1
Diospyros	- species	1	1
Elaeagnus	- umbellata	1	1
Hepatica	- acutiloba	1	1
Hymenocallis	- species	1	1
No identification		1	1
Poa	- pratensis	1	1
Rhamnus	- frangula	1	1
Spirea	- species	1	1
x Cuppressocypari	- leylandii	1	1
Zoysia	- species	1	1

CROP	DIAGNOSIS	CAUSAL AGENT			
ORNAMENTALS					
<u>HERBACEOUS ORNAMENTALS and INDOOR PLANTS</u>					
AFRICAN VIOLET (Saintpaulia)					
	Insect injury		1	0	1
	Powdery mildew	- Oidium	1	0	1
ANEMONE (Anemone)					
	No disease		1		1
	Southern blight	- Sclerotium	1	0	1
ANGELONIA (Angelonia)					
	Virus	- unknown	1	0	1
ARGYRANTHEMUM (Argyranthemum)					
	Chemical injury	- unknown	1	0	1
ASTER (Aster)					
	Blight	- Botrytis	1	0	1
	Root/Stem rot	- Rhizoctonia	1	0	1
	Rust	- Coleosporium	0	1	1
		- Puccinia	1	0	1
ASTILBE (Astilbe)					
	Leaf spot	- Cercospora	1	0	1
	No disease		1		1
BAPTISTA (Baptista)					
	No disease		1		1
BEGONIA (Begonia)					
	Bacterial leaf spot	- Xanthomonas	1	0	1
	Damping-off	- Pythium	0	1	1
	No disease		1		1
	Nutritional	- pH high	1	0	1
		- soluble salts	2	0	2
	Root rot	- Rhizoctonia	0	1	1
BISHOP'S WEED (Aegopodium)					
	Leaf spot	- Septoria	1	0	1
BLUESTEM (Andropogon)					
	Leaf spot	- Septoria	1	0	1
	Rust	- Puccinia	1	0	1
CALADIUM (Caladium)					
	No disease		1		1
CALIBRACHOA (Calibrachoa)					
	Nutritional	- soluble salts	1	1	2
	Root rot	- Pythium	2	0	2
	Sooty mold	- species	0	1	1

CROP	DIAGNOSIS	CAUSAL AGENT			
CALLA LILY (Zantedeschia)					
	Bacterial soft rot	- Erwinia	2	0	2
CARYOPTERIS (Caryopteris)					
	Insect injury		2	0	2
CATHARANTHUS (Catharanthus)					
	Black root rot	- Thielaviopsis	1	0	1
	Blight	- Phytophthora	1	0	1
	Root rot	- Pythium	1	0	1
CELOSIA (Celosia)					
	Southern blight	- Sclerotium	1	0	1
CEREUS (Cereus)					
	No disease		1		1
CHRYSANTHEMUM (Chrysanthemum)					
	Bacterial blight	- Erwinia	1	0	1
	Chemical injury	- growth regulator	1	0	1
		- herbicide	1	0	1
	Cultural	- high temperature	1	0	1
		- over watering	1	0	1
	Flower blight	- Alternaria	1	0	1
	No disease		3		3
	Nutritional	- general	2	0	2
		- manganese deficiency	2	0	2
	Root/Stem rot	- Pythium	2	8	10
		- Rhizoctonia	8	0	8
	Wilt	- Fusarium	3	0	3
CHRYSOGONUM (Chrysogonum)					
	Root rot	- Rhizoctonia	1	0	1
COLEUS (Coleus)					
	Root rot	- Pythium	1	0	1
CORAL BELLS (Heuchera)					
	No disease		1		1
COREOPSIS (Coreopsis)					
	Root rot	- Rhizoctonia	1	0	1
DAHLIA (Dahlia)					
	Chemical injury	- growth regulator	1	0	1
	Insect injury		2	0	2
	Leaf spot	- Cercospora	0	1	1
DAISY (Gerbera)					
	Gray mold	- Botrytis	1	0	1
	Nutritional	- soluble salts	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
DAYLILY (Hemerocallis)					
	Chemical injury	- herbicide	1	0	1
	Insect injury		1	0	1
	Leaf streak	- Aureobasidium	2	0	2
	No disease		3		3
DELPHINIUM (Delphinium)					
	Root rot	- Pythium	1	0	1
DIANTHUS (Dianthus)					
	Anthracnose	- Colletotrichum	1	0	1
	Root rot	- Pythium	1	0	1
DIPLEDINIA (Dipledinia)					
	Root rot	- Pythium	1	0	1
DRACAENA (Dracaena)					
	Insect injury		1	0	1
ELEPHANT EAR (Alocasia)					
	No disease		1		1
FERN (various)					
	Crown/Root rot	- Rhizoctonia	1	0	1
	No disease		1		1
	Nutritional	- soluble salts	1	0	1
FICUS (Ficus)					
	Environmental	- sunscald	1	0	1
	No disease		2		2
FOXGLOVE (Digitalis)					
	Inadequate specimen		1		1
FUCHSIA (Fuchsia)					
	Inadequate specimen		1		1
GAMAGRASS (Tripsacum)					
	Seed rot	- Fusarium	1	0	1
		- Paecilomyces	1	0	1
GARDENIA (Gardenia)					
	Insect injury		1	0	1
	Rot	- Penicillium	0	1	1
GENTIANA (Gentiana)					
	Insect injury		1	0	1
GERANIUM (Pelargonium)					
	Cultural	- oedema	1	0	1
	Inadequate specimen, no disease		3		3
	Insect injury		0	1	1
	Root rot	- Pythium	1	0	1
		- Rhizoctonia	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			#
GOATSB Beard (Aruncus)					
Leaf spot	- Cercospora	1	0	1	
GRAPEFRUIT (Citrus)					
Insect injury		1	0	1	
HOLLYHOCK (Althaea)					
Leaf spot	- Phyllosticta	1	0	1	
No disease		1		1	
Rust	- Puccinia	3	0	3	
HOSTA (Hosta)					
Anthracnose	- Colletotrichum	1	0	1	
Cultural	- poor site	1	0	1	
Environmental	- stress	2	0	2	
No disease		4		4	
Root rot	- Rhizoctonia	2	0	2	
Southern blight	- Sclerotium	1	0	1	
Virus	- unknown	2	0	2	
HOYA (Hoya)					
Cultural	- oedema	1	0	1	
IMPATIENS (Impatiens)					
Dodder	- Cuscuta	1	0	1	
Environmental	- compaction	0	1	1	
Inadequate specimen, no disease		2		2	
Insect injury		1	0	1	
Nutritional	- soluble salts	1	0	1	
Root rot	- Pythium	1	0	1	
	- Rhizoctonia	1	0	1	
IRIS (Iris)					
Bacterial soft rot	- Erwinia	1	0	1	
IVY (Hedera and others)					
Cultural	- oedema	2	0	2	
Leaf spot	- Colletotrichum	1	0	1	
	- Gloeosporium	1	2	3	
	- Guignardia	1	0	1	
No disease		1		1	
Root rot	- Phytophthora	1	0	1	
JADE (Crassula)					
No disease		1		1	
LAMB'S EAR (Stachys)					
Insect injury		1	0	1	
LANTANA (Lantana)					
Environmental	- cold injury	1	0	1	
LEMON (Citrus)					
No disease		1		1	

CROP	DIAGNOSIS	CAUSAL AGENT			#
LEOPARD'S BANE (Arnica)					
	No disease		1		1
LILY (Lilium)					
	Anthracnose	- Colletotrichum	2	0	2
	Blight	- Botrytis	1	0	1
	Root rot	- Pythium	1	0	1
LIPSTICK PLANT (Aeschynanthus)					
	No disease		1		1
LIRIOPE (Liriope)					
	Anthracnose	- Colletotrichum	1	0	1
	Crown rot	- Phytophthora	1	0	1
MANDEVILLA (Mandevilla)					
	No disease		1		1
MARIGOLD (Tagetes)					
	Insect injury		1	0	1
	Nutritional	- phosphorus deficiency	1	0	1
MONDO GRASS (Ophiopogon)					
	Anthracnose	- Colletotrichum	1	0	1
	Root rot	- Pythium	1	0	1
NORFOLK ISLAND PINE (Araucaria)					
	Nutritional	- iron deficiency	1	0	1
OSTEOSPERMUM (Osteospermum)					
	Blight	- Botrytis	1	0	1
PACHYSANDRA (Pachysandra)					
	Leaf/Stem blight	- Volutella	3	1	4
	Physical injury	- rodent	1	0	1
PANSY (Viola)					
	Chemical injury	- herbicide	1	0	1
	Gray mold	- Botrytis	1	0	1
	Insect injury		1	0	1
	Leaf spot	- Ascochyta	1	0	1
	No disease		2		2
	Nutritional	- general	1	0	1
	Root rot	- Pythium	1	1	2
PEONY (Paeonia)					
	Gray mold	- Botrytis	2	0	2
	Insect injury		1	0	1
	Leaf blotch	- Cladosporium	1	0	1
	Leaf spot	- Alternaria	1	0	1
		- Cercospora	1	0	1
		- Septoria	1	0	1
	No disease		2		2

CROP	DIAGNOSIS	CAUSAL AGENT			#
PETUNIA (Petunia)					
	Black root rot	- Thielaviopsis	4	0	4
	Chemical injury	- growth regulator	2	0	2
		- unknown	1	0	1
	Cultural	- stresses	1	0	1
	Gray mold	- Botrytis	1	0	1
	Insect injury		1	0	1
	No disease		1		1
	Nutritional	- fertilizer burn	1	0	1
		- iron deficiency	1	0	1
		- manganese deficiency	2	0	2
	Root rot	- Pythium	4	2	6
	Root/Stem rot	- Rhizoctonia	6	2	8
	Stem rot	- Sclerotinia	1	0	1
	Web blight	- Rhizoctonia	0	1	1
PHLOX (Phlox)					
	Insect injury		2	0	2
	No disease		1		1
POINSETTIA (Euphorbia)					
	Cultural	- overwatering	0	1	1
	Insect injury		1	0	1
	Nutritional	- soluble salts	1	0	1
	Root rot	- Pythium	1	0	1
	Stem rot	- fungal	0	1	1
RUDBECKIA (Rudbeckia)					
	Chemical injury	- growth regulator	1	0	1
	No disease		4		4
	Root/Stem rot	- Rhizoctonia	2	0	2
SALVIA (Salvia)					
	Chemical injury	- growth regulator	1	0	1
SCAEVOLA (Scaevola)					
	Black root rot	- Thielaviopsis	1	0	1
SCHEFFLERA (Brassaia)					
	Insect injury		3	0	3
	Leaf spot	- Macrophoma	1	0	1
SHAMROCK (Oxalis)					
	Leaf spot	- Colletotrichum	1	0	1
	Leaf scorch	- unknown	0	1	1
SHASTA DAISY (Chrysanthemum)					
	Inadequate specimen		1		1
SNAPDRAGON (Antirrhinum)					
	Root/Stem rot	- Rhizoctonia	1	0	1
SPIDER WORT (Tradescantia)					
	No disease		1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
SUNFLOWER (Helianthus)					
	Environmental	- stresses	1	0	1
	No disease		1		1
SWEET POTATO VINE (Ipomoea)					
	Insect injury		1	0	1
	Root rot	- Pythium	1	0	1
TULIP (Tulipa)					
	Blue mold rot	- Penicillium	1	0	1
VERBENA (Verbena)					
	Insect injury		1	0	1
	Nutritional	- soluble salts	0	1	1
	Root rot	- Pythium	1	0	1
	Web blight	- Rhizoctonia	1	0	1
VINCA (Vinca)					
	Canker/dieback	- Phoma	1	0	1
	Environmental	- cold injury	1	0	1
	Gray mold	- Botrytis	2	0	2
	Root/Stem rot	- Rhizoctonia	1	0	1
ZEBRAGRASS (Miscanthus)					
	Anthracnose	- Colletotrichum	1	0	1
ZINNIA (Zinnia)					
	Environmental	- cold injury	1	0	1
	Gray mold	- Botrytis	1	0	1
<u>TURFGRASS</u>					
BENTGRASS (Agrostis)					
	Anthracnose	- Colletotrichum	2	0	2
	Blight	- Pythium	4	0	4
	Brown patch	- Rhizoctonia	3	0	3
	Dollar spot	- Sclerotinia	4	0	4
	Environmental stresses		5	0	5
	Leaf blight	- Leptosphaerulina	1	0	1
	No disease		12		12
	Patch	- Microdochium	1	0	1
	Root disfunction	- Pythium	2	0	2
	Root rot	- Pythium	8	1	9
	Summer patch	- Magnaporthe	1	0	1
	Take-all patch	- Gaeumannomyces	4	1	5
	Yellow patch	- Rhizoctonia	1	0	1
BERMUDAGRASS (Cynodon)					
	No disease		1		1
	Smut	- Ustilago	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
BLUEGRASS (Poa)					
	Anthracnose	- Colletotrichum	1	1	2
	Brown patch	- Rhizoctonia	2	0	2
	Dollar spot	- Sclerotinia	1	0	1
	Leaf spot	- Curvularia	0	1	1
	Necrotic ring spot	- Leptosphaeria	0	2	2
	No disease		3		3
	Pink snow mold	- Microdochium	1	0	1
	Powdery mildew	- Erysiphe	2	0	2
		- Oidium	1	0	1
	Red thread	- Laetisaria	0	1	1
	Root rot	- Pythium	1	0	1
	Rust	- Puccinia	2	0	2
	Summer patch	- Magnaporthe	5	0	5
	Yellow patch	- Rhizoctonia	2	0	2
FESCUE (Festuca)					
	Anthracnose	- Colletotrichum	2	0	2
	Brown patch	- Rhizoctonia	5	1	6
	Burn	- animal urine	1	0	1
	Chemical injury	- unknown	1	0	1
	Cultural	- heavy thatch	1	0	1
	Dollar spot	- Sclerotinia	1	0	1
	Environmental	- stress	1	0	1
	Fading out	- Curvularia	1	0	1
	Gray leaf spot	- Pyricularia	1	0	1
	No disease		12		12
	Nutritional	- nitrogen deficiency	1	0	1
	Red thread	- Laetisaria	1	0	1
	Slime mold	- species	2	0	2
RYEGRASS (Lolium)					
	Blight	- Pythium	1	0	1
	Dollar spot	- Sclerotinia	1	0	1
	Leaf spot	- Cercospora	1	0	1
		- Curvularia	1	0	1
		- Drechslera	2	0	2
	Nutritional	- fertilizer burn	1	0	1
	No disease		4		4
TURF (unspecified)					
	Anthracnose	- Colletotrichum	0	1	1
	Brown patch	- Rhizoctonia	5	0	5
	Cultural	- heavy thatch	2	0	2
	Inadequate specimen, no disease		8		8
	Nutritional	- pH high	1	0	1
	Red thread	- Laetisaria	1	0	1
	Rust	- Puccinia	0	1	1
	Slime mold	- species	2	0	2
	Summer patch	- Magnaporthe	5	0	5
ZOYSIA (Zoysia)					
	No disease		1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
<u>WOODY ORNAMENTALS</u>					
AMSONIA (Amsonia)					
Rust	-	Coleosporium	1	0	1
ARBORVITAE (Thuja)					
Chemical injury	-	insecticide	1	0	1
Cultural	-	improper depth	1	0	1
	-	transplant shock	5	0	5
Environmental stresses			5	2	7
Insect injury			11	0	11
No disease			10		10
Twig blight	-	Pestalotiopsis	1	0	1
	-	Kabatina	2	0	2
ASH (Fraxinus)					
Anthracnose	-	Apiognomonina	8	0	8
Ash yellows	-	Phytoplasma	1	0	1
Bacterial scorch	-	Xylella	1	0	1
Canker	-	Botryosphaeria	1	0	1
Chemical injury	-	growth regulator	1	0	1
Cultural	-	transplant shock	1	0	1
Insect injury			4	1	5
No disease			8		8
Red spot	-	Cladosporium	0	1	1
AZALEA - See listing under RHODODENDRON					
BALDCYPRESS (Taxodium)					
No disease			1		1
BARBERRY (Berberis)					
Black root rot	-	Thielaviopsis	1	0	1
Cultural	-	transplant shock	1	0	1
Lichen	-	species	1	0	1
Nutritional	-	acid soil	1	0	1
Verticillium wilt	-	Verticillium	1	0	1
BAYBERRY (Myrica)					
Environmental	-	winter injury	1	0	1
BEECH (Fagus)					
Environmental	-	compaction	1	0	1
Leaf scorch	-	unknown	1	0	1
Leaf spot	-	Phyllosticta	1	0	1
No disease			1		1
BIRCH (Betula)					
Canker	-	Cytospora	1	0	1
Cultural	-	transplant shock	1	0	1
Dieback	-	Botryosphaeria	1	0	1
	-	Melanconium	2	0	2
Insect injury			9	0	9

CROP	DIAGNOSIS	CAUSAL AGENT			
BIRCH (Betula) (cont)					
Leaf spot	-	Cristulariella	1	0	1
	-	Cryptocline	0	1	1
	-	Phyllosticta	2	0	2
No disease			3		3
Nutritional	-	iron deficiency	0	1	1
BLACK GUM (Tupelo)					
Canker	-	Botryosphaeria	1	0	1
Cultural	-	transplant shock	1	0	1
BOXELDER (Acer)					
No disease			1		1
BOXWOOD (Buxus)					
Canker	-	Pseudonectria	6	0	6
Chemical injury	-	herbicide	1	0	1
	-	unknown	1	0	1
Cultural	-	transplant shock	3	0	3
Environmental stresses			7	1	8
Insect injury			8	2	10
Leaf spot	-	Macrophoma	3	0	3
	-	Phyllosticta	0	1	1
No disease			8		8
Physical injury	-	unknown	1	0	1
Root rot	-	Rhizoctonia	1	0	1
BUCKEYE (Aesculus)					
Physical injury	-	rodent	1	0	1
CAMELLIA (Camellia)					
Environmental	-	stress	1	0	1
CATALPA (Catalpa)					
No disease			3		3
CHAMAECYPARIS (Chamaecyparis)					
Cultural	-	transplant shock	1	0	1
No disease			1		1
CHERRY (Prunus)					
Bacterial spot	-	Xanthomonas	1	0	1
Canker	-	Botryosphaeria	3	0	3
Crown rot	-	Phytophthora	1	0	1
Cultural	-	transplant shock	5	1	6
Dieback	-	unknown	2	0	2
Environmental	-	freeze injury	3	0	3
Inadequate specimen, no disease			16		16
Leaf spot	-	Cercospora	2	0	2
	-	Coccomyces	1	0	1
	-	Phloeospora	1	0	1
Nutritional	-	nitrogen deficiency	1	0	1
Physical injury	-	pruning	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
CHERRYLAUREL (Prunus)					
	Cultural	- transplant shock	2	0	2
	Dieback	- Botryosphaeria	2	0	2
	Insect injury		2	0	2
	No disease		3		3
	Root rot	- Phytophthora	1	0	1
CHESTNUT (Castanea)					
	Blight	- Cryphonectria	1	0	1
	Cultural	- wet feet	2	0	2
	Mutation	- genetic	1	0	1
	No disease		3		3
	Root rot	- Oomycete	1	0	1
		- Rhizoctonia	1	0	1
CHOKEBERRY (Aronia)					
	No disease		1		1
CLEMATIS (Clematis)					
	Insect injury		1	0	1
	Leaf spot	- Ascochyta	1	0	1
	No disease		5		5
COTONEASTER (Cotoneaster)					
	Physical injury	- construction	1	0	1
CRABAPPLE (Malus)					
	Cultural	- improper depth	1	0	1
	Fire blight	- Erwinia	6	1	6
	No disease		5		5
	Physical injury	- unknown	1	0	1
	Scab	- Venturia	8	0	8
	Southern blight	- Sclerotium	1	0	1
CRYPTOMERIA (Cryptomeria)					
	Tip blight	- Sphaeropsis	1	0	1
CYPRESS (Cupressocyparis)					
	Chemical injury	- growth regulator	1	0	1
	Cultural	- transplant shock	1	0	1
	Environmental	- cold injury	1	0	1
	Insect injury		1	0	1
	No disease		1		1
	Twig blight	- Seiridium	1	0	1
DAPHNE (Daphne)					
	Cultural	- transplant shock	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
DOGWOOD (Cornus)					
	Anthracnose	- Discula	14	0	14
	Canker	- Botryosphaeria	1	0	1
	Chemical injury	- fungicide	1	0	1
		- growth regulator	5	0	5
	Cultural	- transplant shock	12	0	12
		- wet feet	1	0	1
	Decline	- unknown	5	0	5
	Environmental stresses		6	0	6
	Inadequate specimen, no disease		31		31
	Insect injury		0	1	1
	Leaf reddening	- unknown	1	0	1
	Leaf scorch	- environmental	1	1	2
		- unknown	1	0	1
	Leaf spot	- Septoria	5	1	6
		- unknown	1	0	1
	Nutritional	- soluble salts	0	1	1
	Powdery mildew	- Microsphaera	5	0	5
		- Oidium	1	2	3
	Root rot	- Pythium	3	0	3
		- Rhizoctonia	1	1	2
	Spot anthracnose	- Elsinoe	10	5	15
ELM (Ulmus)					
	Black spot	- Stegophora	0	1	1
	Decline	- unknown	1	0	1
	Dutch elm disease	- Ophiostoma	2	0	2
	Environmental	- stress	1	1	2
	Graft problems	- incompatible	1	0	1
	Insect injury		3	1	4
	No disease		6		6
	Physical injury	- topping	1	0	1
EUONYMUS (Euonymus)					
	Chemical injury	- salt injury	1	0	1
	Cultural	- improper depth	0	1	1
		- oedema	1	0	1
		- transplant shock	2	0	2
	Inadequate specimen, no disease		4		4
	Insect injury		21	0	21
	Powdery mildew	- Microsphaera	2	0	2
FALSECYPRESS (Chamaecyparis)					
	No disease		1		1
FILBERT (Corylus)					
	Canker	- Botryosphaeria	1	0	1
FIR (Abies)					
	Canker	- Phomopsis	1	0	1
	Cultural	- wet feet	1	0	1
	No disease		1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
FORSYTHIA (Forsythia)					
	Anthracnose	- Colletotrichum	1	0	1
	Gall	- Phomopsis	1	1	2
		- unknown	1	0	1
	No disease		1		1
	Physical injury	- unknown	1	0	1
FOTHERGILLA (Fothergilla)					
	No disease		1		1
GINKGO (Ginkgo)					
	Environmental	- wet feet	1	0	1
GOLDENRAINTREE (Koelreuteria)					
	No disease		1		1
HACKBERRY (Celtis)					
	Bacterial scorch	- Xylella	1	0	1
	Inadequate specimen		1		1
HAWTHORN (Crataegus)					
	Cedar-quince rust	- Gymnosporangium	7	0	7
	Insect injury		3	0	3
	Leaf spot	- Phyllosticta	1	0	1
	Root rot	- Phytophthora	1	0	1
HAZELNUT (Corylus)					
	Canker	- Botryosphaeria	1	0	1
HEMLOCK (Tsuga)					
	Environmental	- drought	1	0	1
	Insect injury		4	0	4
	No disease		10		10
	Root rot	- Cylindrocladium	1	0	1
HIBISCUS (Hibiscus)					
	Chemical injury	- growth regulator	1	0	1
	Leaf spot	- Alternaria	1	0	1
	No disease		1		1
HICKORY (Carya)					
	Insect injury		7	0	7
	No disease		1		1
	Wood decay	- Basidiomycete	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
HOLLY (Ilex)					
	Bacterial blight	- Clavibacter	1	0	1
	Black root rot	- Thielaviopsis	12	2	14
	Crown/Root rot	- Phytophthora	1	0	1
	Cultural	- transplant shock	2	0	2
	Dieback	- unknown	2	0	2
	Environmental stresses		4	0	4
	Insect injury		10	2	12
	Leaf scorch	- winter drying	3	0	3
	Leaf spot	- fungal	0	1	1
	No disease		29		29
	Nutritional	- iron deficiency	4	0	4
		- nitrogen deficiency	1	0	1
		- pH high	1	1	2
		- soluble salts	1	0	1
	Root rot	- unknown	1	0	1
	Sooty mold	- species	0	3	3
HONEYLOCUST (Gleditsia)					
	Butt rot	- Ganoderma	1	0	1
	Canker	- Thyronectria	1	0	1
	Environmental	- stress	3	0	3
	Insect injury		3	2	5
	Leaf spot	- Cercospora	1	0	1
	No disease		3		3
HONEYSUCKLE (Lonicera)					
	Cultural	- wet feet	1	0	1
	No disease		3		3
HORSECHESTNUT (Castanea)					
	Leaf blotch	- Guignardia	2	0	1
HYDRANGEA (Hydrangea)					
	Anthraxnose	- Colletotrichum	0	1	1
	Bacterial spot	- Pseudomonas	1	0	1
		- Xanthomonas	1	0	1
	Canker	- Boytryosphaeria	1	1	2
	Chemical injury	- growth regulator	1	0	1
	Dieback	- unknown	3	0	3
	Insect injury		1	0	1
	Leaf spot	- Cercospora	9	0	9
	No disease		1		1
	Nutritional	- iron deficiency	0	1	1
	Root rot	- Phytophthora	1	0	1
JUNIPER and RED CEDAR (Juniperus)					
	Cultural	- transplant shock	2	0	2
	Dieback	- unknown	1	0	1
	Insect injury		2	1	3
	No disease		7		7
	Twig blight	- Kabatina	1	0	1
		- Phomopsis	2	0	2

CROP	DIAGNOSIS	CAUSAL AGENT			
KATSURATREE (Katsura)					
	No disease		1		1
KERRIA (Kerria)					
	Leaf spot	- Septoria	2	0	2
LEUCOTHOE (Leucothoe)					
	Chemical injury	- unknown	1	0	1
	Dieback	- Botryosphaeria	1	0	1
LILAC (Syringa)					
	Bacterial blight	- Pseudomonas	3	0	3
	Canker	- Fusarium	1	0	1
	Cultural	- transplant shock	2	0	2
	Decline	- unknown	1	0	1
	Environmental stresses		2	0	2
	Insect injury		1	0	1
	Leaf scorch	- unknown	1	0	1
	Leaf spot	- Cercospora	1	1	2
	No disease		11		11
	Powdery mildew	- Microsphaera	2	1	3
LINDEN (Tilia)					
	No disease		1		1
LOCUST (Robinia)					
	Cultural	- transplant shock	1	0	1
	No disease		1		1
MAACKIA (Maackia)					
	No disease		1		1
MAGNOLIA (Magnolia)					
	Chemical injury	- growth regulator	2	0	2
	Cultural stresses		4	0	4
	Environmental	- cold injury	1	0	1
	Insect injury		1	1	2
	Leaf scorch	- winter drying	3	0	3
	Leaf spot	- Pestalotia	1	0	1
	No disease		10		10
	Sooty mold	- species	1	0	1
	Wilt	- Verticillium	1	0	1
MAHONIA (Mahonia)					
	Cultural	- transplant shock	1	0	1
	No disease		1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
MAPLE (Acer)					
Anthracnose	-	Discula	0	1	1
	-	Kabatiella	12	0	12
Bacterial scorch	-	Xylella	3	0	3
Bull's eye spot	-	Cristulariella	1	0	1
Canker	-	Botryosphaeria	2	0	2
	-	Hypoxylon	1	0	1
Chemical injury	-	growth regulator	2	1	3
	-	herbicide	1	0	1
	-	insecticide	1	0	1
	-	unknown	1	0	1
Cultural	-	improper depth	1	0	1
	-	overwatering	1	0	1
	-	transplant shock	7	1	8
Decline	-	environmental	8	1	9
	-	unknown	8	0	8
Environmental stresses			12	0	12
Inadequate specimen, no disease			47		47
Insect injury			28	4	32
Leaf scorch	-	unknown	2	0	2
Leaf spot	-	Cercospora	1	0	1
	-	fungal	0	1	1
	-	Marssonina	1	0	1
	-	Phyllosticta	11	2	13
Nutritional	-	manganese deficiency	0	1	1
Tar spot	-	Rhytisma	4	3	7
Wilt	-	Verticillium	1	0	1
MIMOSA (Albizzia)					
Wilt	-	Fusarium	1	0	1
MOCKORANGE (Philadelphus)					
Inadequate specimen			1		1
MULBERRY (Morus)					
Bacterial blight	-	Pseudomonas	1	0	1
Cultural	-	transplant shock	1	0	1
Insect injury			1	0	1
Leaf spot	-	Cercospora	1	0	1
	-	Phloeospora	2	1	3
NANDINA (Nandina)					
Cultural	-	transplant shock	1	0	1
No disease			1		1

CROP	DIAGNOSIS	CAUSAL AGENT			
OAK (Quercus)					
	Anthracnose	- Apioognomonina	5	0	5
	Bacterial scorch	- Xylella	17	0	17
	Canker	- Botryosphaeria	1	0	1
		- Hypoxylon	1	0	1
	Chemical injury	- growth regulator	10	1	11
		- herbicide	1	0	1
	Cultural	- wet feet	1	0	1
	Decline	- unknown	3	0	3
	Environmental stresses		2	1	3
	Insect injury		35	6	41
	Leaf blister	- Taphrina	1	2	3
	Leaf distortion	- unknown	1	0	1
	Leaf spot	- Elsinoe	0	1	1
		- Tubakia	9	1	10
	No disease		18		18
	Nutritional	- iron deficiency	4	1	5
	Physical injury	- rodent	1	0	1
	Powdery mildew	- Phyllactinia	3	0	3
		- Oidium	3	2	5
	Root rot	- Cythrodcladium	1	0	1
	Trunk decay	- Ganoderma	1	0	1
	Wetwood	- bacterial	1	0	1
	Wood decay	- Schizophyllum	1	0	1
OLEANDER (Oleander)					
	Insect injury		1	1	2
OLIVE (Elaeagnus)					
	Root rot	- Pythium	1	0	1
PALM (Arecaceae)					
	Insect injury		1	0	1
PEACH (Prunus)					
	Insect injury		2	1	3
	No disease		1		1
PEAR (Pyrus)					
	Blight	- bacterial	1	0	1
	Chemical injury	- growth regulator	5	0	5
		- herbicide	2	0	2
		- unknown	2	0	2
		- transplant shock	1	0	1
	Decline	- environmental	6	1	7
		- unknown	1	0	1
	Environmental stresses		2	1	3
	Fire blight	- Erwinia	7	0	7
	Insect injury		3	0	3
	Leaf scorch	- unknown	2	0	2
	Leaf spot	- Fabraea	1	0	1
	No disease		1		1
	Nutritional	- acid soil	0	1	1

CROP	DIAGNOSIS	CAUSAL AGENT			
PHOTINIA (Photinia)					
Leaf spot	-	Entomosporium	1	0	1
PIERIS (Pieris)					
Cultural	-	transplant shock	1	0	1
No disease			1		1
Nutritional	-	pH high	1	0	1
	-	soluble salts	0	1	1
PINE (Pinus)					
Air pollution	-	ozone	6	0	6
Brown spot	-	Mycosphaerella	2	0	2
Canker	-	Botryosphaeria	1	0	1
	-	unknown	1	0	1
Cultural	-	improper depth	1	1	2
	-	transplant shock	6	0	6
Environmental stresses			2	0	2
Inadequate specimen, no disease			18		18
Insect injury			11	2	13
Needle blight	-	Dothistroma	1	0	1
Needle cast	-	Ploioderma	1	0	1
Needle drop	-	normal	1	0	1
Needle rust	-	Coleosporium	1	0	1
Physical injury	-	squirrel	1	0	1
Pinewood nematode	-	Bursaphelenchus	2	0	2
Root rot	-	Phytophthora	3	1	4
Tip blight	-	Sphaeropsis	14	0	14
White pine decline	-	environmental	24	0	24
PLUM (Prunus)					
Black knot	-	Apiosporina	10	0	10
No disease			2		2
PLUMERIA (Plumeria)					
Bacterial spot	-	bacterial	1	0	1
POPLAR (Populus)					
Leaf spot	-	Septoria	2	0	2
No disease			1		1
PRIVET (Ligustrum)					
Insect injury			1	0	1
Leaf scorch	-	winter drying	1	0	1
No disease			1		1
PYRACANTHA (Pyracantha)					
No disease			1		1
Scab	-	Spilocaea	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
REDBUD (Cercis)					
	Anthracnose	- Kabatiella	0	1	1
	Canker	- Botryosphaeria	1	0	1
	Chemical injury	- herbicide	1	0	1
	Cultural	- improper depth	1	0	1
		- transplant shock	1	0	1
	Environmental	- cold injury	1	0	1
	Insect injury		2	1	3
	Leaf scorch	- unknown	1	0	1
	Leaf spot	- Phyllosticta	1	0	1
		- unknown	0	1	1
	No disease		5		5
RHODODENDRON and AZALEA (Rhododendron)					
	Canker	- Botryosphaeria	2	0	2
	Cultural	- oedema	1	0	1
		- transplant shock	4	0	4
		- wet feet	1	0	1
	Dieback	- Botryosphaeria	3	0	3
	Inadequate specimen, no disease		7		7
	Insect injury		17	3	20
	Leaf/flower gall	- Exobasidium	1	0	1
	Leaf scorch	- winter drying	5	0	5
	Leaf spot	- Cercospora	1	0	1
		- Pestalotia	3	0	3
		- Septoria	1	0	1
	Lichen	- species	2	0	2
	Nutritional	- iron deficiency	2	0	2
		- soluble salts	0	1	1
	Root/crown rot	- Phytophthora	1	0	1
	Sooty mold	- species	1	1	2
ROSE (Rosa)					
	Black spot	- Diplocarpon	5	0	5
	Blight	- Botrytis	1	0	1
		- unknown	2	0	2
	Canker	- Botryosphaeria	1	0	1
	Chemical injury	- growth regulator	1	0	1
		- herbicide	1	0	1
		- unknown	3	2	5
	Crown gall	- Agrobacterium	1	0	1
	Cultural	- insufficient water	1	0	1
		- transplant shock	2	0	2
	Dieback	- Phomopsis	1	0	1
	Environmental	- freeze injury	1	0	1
	Gray mold	- Botrytis	1	0	1
	Inadequate specimen, no disease		10		10
	Insect injury		5	1	6
	Nutritional	- unknown	0	1	1
	Powdery mildew	- Oidium	1	0	1
		- Sphaerotheca	3	1	4
	Sooty mold	- species	0	1	1
	Virus	- Rose rosette	3	0	3

CROP	DIAGNOSIS	CAUSAL AGENT			
ROSE OF SHARON (Hibiscus)					
Cultural	-	transplant shock	1	0	1
SERVICEBERRY (Amelanchier)					
Chemical injury	-	growth regulator	1	0	1
Cultural	-	improper depth	1	0	1
Frogeye	-	Sphaeropsis	1	0	1
No disease			2		2
Root rot	-	Phytophthora	1	0	1
SMOKETREE (Cotinus)					
Wilt	-	Verticillium	3	0	3
SPICEBUSH (Lindera)					
No disease			1		1
SPIREA (Spiraea)					
Nutritional	-	general	1	0	1
SPRUCE (Picea)					
Canker	-	Cytospora	1	0	1
Chemical injury	-	unknown	1	0	1
Collar rot	-	Phytophthora	1	0	1
Cultural	-	transplant shock	6	0	6
Environmental stresses			2	0	2
Inadequate specimen, no disease			37		37
Insect injury			22	2	24
Needle cast	-	Rhizosphaera	8	0	8
	-	Stigmina	2	0	2
Physical injury	-	unknown	1	0	1
Root rot	-	Phytophthora	1	0	1
Tip blight	-	Sphaeropsis	1	0	1
Twig blight	-	Phomopsis	1	0	1
ST. JOHNSWORT (Hypericum)					
No disease			2	0	2
SUMAC (Rhus)					
No disease			1	0	1
SWEETGUM (Liquidambar)					
Canker	-	Botryosphaeria	1	0	1
Leaf scorch	-	environmental	1	0	1
Lichen	-	species	1	0	1
No disease			4		4
Wood decay	-	Polyporus	1	0	1
SWEETSPIRE (Itea)					
Chemical injury	-	growth regulator	1	0	1
Cultural	-	transplant shock	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT				
SYCAMORE and PLANETREE (Platanus)						
	Anthracnose	-	Apiognomonina	5	0	5
	Bacterial scorch	-	Xylella	1	0	1
	Butt rot	-	Ganoderma	1	0	1
	Leaf spot	-	Phyllosticta	1	0	1
TAXUS (Taxus)						
	Chemical injury	-	growth regulator	1	0	1
	Cultural	-	wet feet	2	0	2
	Dieback	-	unknown	2	0	2
	Inadequate specimen, no disease			15		15
	Insect injury			4	0	4
	Nutritional	-	acid soil	1	0	1
	Root rot	-	Phytophthora	2	0	2
	Twig blight	-	Pestalotiopsis	1	0	1
TREE LILAC (Syringa)						
	Anthracnose	-	Apiognomonina	1	0	1
	Canker	-	Botryosphaeria	1	0	1
TULIPTREE (Liriodendron)						
	Chemical injury	-	growth regulator	1	0	1
	Insect injury			5	0	5
	No disease			1		1
	Sooty mold	-	species	0	3	3
VIBURNUM (Viburnum)						
	Canker	-	Botryosphaeria	2	0	2
	Cultural	-	transplant shock	1	0	1
	Insect injury			4	0	4
	No disease			3		3
WALNUT (Juglans)						
	Anthracnose	-	Gnomonia	1	0	1
	Bacterial blight	-	Xanthomonas	1	0	1
	Environmental stresses			2	0	2
	Inadequate specimen			1	0	1
	Insect injury			2	0	2
	Leaf spot	-	Cylindrocladium	1	0	1
	Powdery mildew	-	Oidium	1	0	1
WEIGELA (Weigela)						
	Canker	-	Botryosphaeria	1	0	1
WILLOW (Salix)						
	Crown gall	-	Agrobacterium	1	0	1
	Insect injury			3	1	4
	Leaf spot	-	unknown	3	0	3
	No disease			2		2
	Physiological	-	adventitious roots	1	0	1
WISTERIA (Wisteria)						
	Insect injury			1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
YELLOWROOT (Xanthorhiza)					
Root/Stem rot	-	Rhizoctonia	1	0	1
YELLOWWOOD (Cladrastis)					
Butt rot	-	Ganoderma	1	0	1
Dieback	-	Botryosphaeria	1	0	1
Physical injury	-	unknown	0	1	1
Wilt	-	Verticillium	1	0	1
ZELKOVA (Zelkova)					
Chemical injury	-	herbicide	1	0	1
VEGETABLES					
ASPARAGUS (Asparagus)					
Leaf spot	-	Cercospora	1	0	1
BEAN (Phaseolus)					
Aerial blight	-	Rhizoctonia	0	1	1
Angular leaf spot	-	Isariopsis	2	1	3
Anthracnose	-	Colletotrichum	8	1	9
Chemical injury	-	growth regulator	3	0	3
	-	unknown	1	0	1
Insect injury			2	0	2
Leaf spot	-	Phyllosticta	1	0	1
No disease			8		8
Nutritional	-	general	1	0	1
Root rot	-	Fusarium	2	0	2
Root/stem rot	-	Rhizoctonia	5	0	5
Stem break	-	unknown	1	0	1
Southern blight	-	Sclerotium	1	0	1
Virus	-	Bean yellow mosaic	1	0	1
BROCCOLI - See listing under CRUCIFERS					
CABBAGE - See listing under CRUCIFERS					
CANTALOUPE - See listing under CUCURBITS					
CAULIFLOWER - See listing under CRUCIFERS					
COLLARD - See listing under CRUCIFERS					
CORN, SWEET (Zea)					
Bacterial stalk rot	-	Erwinia	1	0	1
Gray leaf spot	-	Cercospora	1	0	1
Insect injury			1	1	2
No disease			3		3
No ear	-	genetic	1	0	1
Nutritional	-	fertilizer burn	1	0	1
	-	manganese toxicity	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
CORN (Zea) cont					
Root rot	- Fusarium	1	0	1	
Root/Stem rot	- Rhizoctonia	1	0	1	
Virus	- Maize chlorotic dwarf	1	0	1	
	- Maize dwarf mosaic	0	1	1	
CRUCIFERS - BROCCOLI, CABBAGE, CAULIFLOWER, COLLARD, KALE, TURNIP (Brassica)					
Anthracnose	- Colletotrichum	1	0	1	
Bacterial soft rot	- Erwinia	0	1	1	
Environmental	- compaction	1	0	1	
Leaf spot	- Alternaria	1	0	1	
	- Cercospora	1	0	1	
Insect injury		0	1	1	
No disease		2		2	
Nutritional	- boron deficiency	1	0	1	
	- general	1	0	1	
	- nitrogen deficiency	1	0	1	
Tip burn	- calcium deficiency	1	0	1	
CUCUMBER - See listing under CUCURBITS					
CUCURBITS - CANTALOUPE, CUCUMBER (Cucumis), GOURD, PUMPKIN, SQUASH (Cucurbita) and WATERMELON (Citrulus)					
Anthracnose	- Colletotrichum	4	0	4	
Bacterial spot	- Xanthomonas	1	0	1	
Bacterial wilt	- Erwinia	5	0	5	
Chemical injury	- unknown	1	0	1	
Cultural	- improper depth	1	0	1	
Downy mildew	- Pseudoperonospora	3	0	3	
Environmental stresses		2	1	3	
Fruit rot	- Choanephora	1	0	1	
	- Fusarium	2	0	2	
Gummy stem blight	- Didymella	2	0	2	
Inadequate specimen, no disease		20		20	
Insect injury		4	1	5	
Leaf blight	- Alternaria	5	2	7	
Nutritional	- acid soil	0	1	1	
	- general	1	0	1	
	- iron deficiency	1	0	1	
	- nitrogen deficiency	1	0	1	
	- pH high	1	0	1	
Pollination problem	- unknown	1	0	1	
Powdery mildew	- Oidium	2	2	4	
	- Sphaerotheca	0	1	1	
Root rot	- Pythium	2	0	2	
Virus	- potyvirus	1	0	1	

GOURD - See listing under CUCURBITS

KALE - See listing under CRUCIFERS

CROP	DIAGNOSIS	CAUSAL AGENT			
LETTUCE (Lactuca)					
	Drop	- Sclerotinia	1	0	1
	Gray mold	- Botrytis	1	0	1
	Nutritional	- soluble salts	0	1	1
	Root rot	- Pythium	1	0	1
OKRA (Abelmoschus)					
	No disease		1		1
	Wilt	- fungal	1	0	1
ONION (Allium)					
	Chemical injury	- unknown	1	0	1
	Neck rot	- Botrytis	1	0	1
PEA (Pisum)					
	Chemical injury	- growth regulator	1	0	1
	Leaf spot	- Alternaria	0	1	1
	No disease		1		1
	Root/stem rot	- Rhizoctonia	2	0	2
PEPPER (Capsicum)					
	Bacterial spot	- Xanthomonas	8	0	8
	Chemical injury	- growth regulator	1	0	1
		- unknown	1	0	1
	Cultural	- high temperature	1	0	1
	Inadequate specimen, no disease		8		8
	Leaf spot	- Stemphylium	2	0	2
	Nutritional	- nitrogen deficiency	1	0	1
	Root rot	- Pythium	1	0	1
	Southern blight	- Sclerotium	1	0	1
	Stem rot	- Rhizoctonia	1	0	1
	Virus	- unknown	2	0	2
POTATO (Solanum)					
	Bacterial soft rot	- Erwinia	1	0	1
	Black leg	- Erwinia	1	0	1
	Environmental	- sunscald	1	0	1
	Inadequate specimen, no disease		3		3
	Scab	- Streptomyces	4	0	4
	Wilt	- Fusarium	1	0	1
PUMPKIN - See listing under CUCURBITS					
RHUBARB (Rheum)					
	Bacterial soft rot	- Erwinia	1	0	1
SQUASH - See listing under CUCURBITS					
SWEET POTATO (Ipomoea)					
	Environmental	- growth crack	1	0	1
	Scurf	- Monilochaetes	0	2	2
	Soft rot	- Rhizopus	1	0	1

CROP	DIAGNOSIS	CAUSAL AGENT			
TOMATILLO (Physalis)					
Nutritional	- general		1	0	1
TOMATO (Lycopersicon)					
Anthracnose	- Colletotrichum		1	0	1
Bacterial canker	- Clavibacter		6	1	7
Bacterial spot	- Xanthomonas		1	1	2
Blossom end rot	- calcium deficiency/dry		4	1	5
Catfacing	- environmental		2	1	3
Chemical injury	- growth regulator		11	0	11
	- fungicide		0	2	2
	- herbicide		4	0	4
	- unknown		5	1	6
Cultural	- high temperature		1	0	1
	- oedema		1	0	1
Early blight	- Alternaria		16	4	20
Environmental stresses			5	0	5
Gray mold	- Botrytis		2	0	2
Inadequate specimen, no disease			36		36
Insect injury			6	0	6
Late blight	- Phytophthora		1	0	1
Leaf scorch	- unknown		0	1	1
Leaf spot	- Septoria		13	4	17
Nutritional	- general		2	0	2
	- magnesium deficiency		4	0	4
	- nitrogen deficiency		5	0	5
	- soluble salts		2	0	2
Pollination problem	- unknown		1	0	1
Root knot nematode	- Meloidogyne		1	1	2
Root rot	- Pythium		2	0	2
Root/stem rot	- Rhizoctonia		2	0	2
Southern blight	- Sclerotium		2	0	2
Stem canker	- Alternaria		0	1	1
Stem rot	- Sclerotinia		5	0	5
Virus	- Tobacco mosaic		1	0	1
	- Tomato mosaic virus		0	1	1
	- Tomato spotted wilt		18	0	18
Walnut wilt	- juglone		1	0	1
Wilt	- Fusarium		3	0	3
Yellow shoulder	- unknown		1	1	2

TURNIP - See listing under CRUCIFERS

WATERMELON - See listing under CUCURBITS

TOTALS			4174	330	4504
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