Annual Report
2003

Purdue University Cooperative Extension Service

PURDUE
UNIVERSITY

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Tables and Figures

ACKNOWLEDGMENTS

Purdue's Plant and Pest Diagnostic Lab (P&PDL) is recognized as a source of unbiased, quality, diagnostic information. This recognition, earned over the years, is a result of the hard work and dedication of P&PDL diagnosticians and volunteer faculty and staff who have given of their time and expertise to the P&PDL samples and clientele. Special thanks to you all!

Thank you also to our computer support specialist who keeps us 'on-line, to our departmental extension secretary for her webmaster assistance and to our P&PDL secretary whose patience and friendly phone etiquette provides a welcome introduction to our clientele.

To the administration at Purdue University, I thank you for recognizing the vital role of the P&PDL in addressing Indiana's plant and pest diagnostic needs, especially during this time of heightened awareness of agro-biosecurity concerns.

Gail E. Ruhl
Interim Director, P&PDL

"…to enable people to improve their lives and communities through learning partnerships that put knowledge to work" (Extension mission as per the National Association of State Universities and Land Grant Colleges, 2001)

2003
Annual Report of the
Plant and Pest Diagnostic Laboratory

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MISSION

The Plant and Pest Diagnostic Laboratory (P&PDL) at Purdue University is an interdisciplinary laboratory, first established in 1990 with funding from the Crossroads initiative. The mission of the P&PDL is to provide accurate and rapid identification of plants, pests, and plant problems; suggest management strategies, when requested; and serve as a source of unbiased information for plant and pest related problems.

The Laboratory provides technical expertise to specialists and county extension educators of the Purdue University Cooperative Extension Service (CES) and the University's research faculty and staff; to the Director of the Entomology and Plant Pathology Division of the Indiana Department of Natural Resources (IDNR) and associated inspectors; as well as routine pest and plant problem diagnoses for private businesses and citizens of Indiana.

STAFF

Purdue faculty and staff from the departments of Agronomy, Botany and Plant Pathology, Entomology, Forestry and Natural Resources, and Horticulture and Landscape Architecture serve as diagnosticians for the P&PDL on a part time basis as a portion of their total commitment to their respective departments. Staffing responsibilities in the P&PDL and the department to which they belong, are listed on the next page:

Botany and Plant Pathology	
Interim Director	Gail Ruhl
Secretary and Receptionist	Janet Whaley
Webmaster and Extension Assistance	Amy Deitrich
Disease diagnosis and control	Gail Ruhl, Karen Rane
Weed identification, control, and diagnosis of herbicide injury on field crops	Glenn Nice
Computer support	Robert Mitchell
Entomology	
Invertebrate and other pest identification and control	Timothy Gibb, Clifford Sadof
Horticulture	
Identification of horticultural plants and plant problems	B. Rosie Lerner
Agronomy	
Fertility, soil and environmentally related problems of corn	Robert Nielsen
Turfgrass management	Zac Reicher, Glenn Hardebeck
Forestry and Natural Resources	
Tree identification	Rita McKenzie

The P&PDL is fortunate to have the support and assistance of numerous faculty and staff in the School of Agriculture. During 2003, 30 additional faculty and staff members assisted with sample diagnoses **(Table 1)**. The P&PDL also employs a student hourly worker throughout the year to help with sample distribution, filing and other general duties in the laboratory.

Table 1. Departmental faculty and staff that assisted with diagnoses of samples submitted to the *Plant and Pest Diagnostic Laboratory* during 2003.[1]

Faculty/Staff	Number of Diagnoses	Faculty/Staff	Number of Diagnoses
Agronomy	**110 (4%)**	**Entomology**	**185 (6%)**
Brouder	1	L. Bledsoe	9
E. Christmas	27	R. Foster	5
G. Hardebeck[2]	13	**T. Gibb**	92
K. Johnson	9	J. Obermeyer	8
R. Nielsen	37	**C. Sadof**	67
Z. Reicher	23	M. Schwarf	2
		R. Williams	2
Botany & Plant Pathology	**2546 (85%)**		
		Forestry & Natural Resources	**2 (*)**
L. Dunkle	1	J. McKenna	2
R. Green	3	H. Holt	1
P. Harmon	1		
B. Johnson	18	**Horticulture & Landscape Architecture**	**157 (5%)**
R. Latin	32		
C. Lembi	10	B. Bordelon	2
D. Lubelski	1	M. Dana	45
G. Nice	76	P.A. Hammer	27
P. Pecknold	4	P. Hirst	2
K. Rane	1233	**R. Lerner**	18
G. Ruhl	1157	L. Maynard	2
M. Scholler	1	B. Moser	28
G. Shaner	9	S. Weller	32
Other	**2 (*)**	**State Chemist**	**2 (*)**
J. Hernandez	1	L. Nees	2
Palm	1		
		Total Diagnoses	**3,004**

[1] The total number of diagnoses exceeds the total number of samples due to multiple problems/diagnoses per sample. More than one person may assist with a diagnosis.
[2] Names in bold type were designated by departments as 2003 P&PDL diagnosticians.
* Less than 1%

ADVISORY COMMITTEES

The inter-departmental nature of the P&PDL demands frequent and free-flowing exchange of information among the participating departments. This communication takes place on at least three different levels.

The Steering Committee

The Steering Committee provides a forum to discuss matters that relate to the daily operation of the P&PDL. Input from the diagnosticians is considered essential for smooth functioning of the Lab. The Committee meets as needed and reports periodically to the Operations Committee. The Committee is chaired by the Director of the P&PDL and is composed of diagnosticians, and the secretary.

The Operations Committee

The Operations Committee provides a forum for discussion of operational matters and facilitates communication among diagnosticians and other specialists. The Committee meets annually or as needed and reports periodically to the Management and Policy Committee. The Committee is chaired by the Director of the P&PDL and is composed of the Steering Committee, one Extension specialist from each participating department and the Department Head charged with administrative overview of the laboratory. Departmental Extension Specialists are appointed on a three-year rotating basis.

The Management and Policy Committee

The Management and Policy Committee provides administrative overview for the P&PDL. The Committee is composed of the Heads of the participating Departments and administrators from the Cooperative Extension Service and the Agricultural Experiment Station. The Committee is chaired by the Director of the Cooperative Extension Service. The Committee meets annually or as needed.

2003 COMMITTEE STRUCTURE

The Steering Committee: Gail Ruhl (Chair, Interim Part Time Director of P&PDL; plant disease diagnosis and control), Janet Whaley (Secretary), Karen Rane (Plant disease diagnosis and control), Glenn Nice (Weed identification and control, and diagnosis of herbicide injury on field crops), Tim Gibb and Cliff Sadof (Arthropod identification and control), B. Rosie Lerner (Identification of horticultural plants), Bob Nielsen (Fertility and soil-related problems of corn), Zac Reicher and Glenn Hardebeck (Turf-grass Management), Rita McKenzie (Forestry), Bob Mitchell (Database programming, web page management and computer support)

The Operations Committee: Gail Ruhl (Chair, Interim Part Time Director of P&PDL), Steering Committee members, Ray Martyn [Department Head (administrative overview)], Keith Johnson (Agronomy), Greg Shaner (Botany and Plant Pathology), Rick Foster (Entomology), Rita McKenzie (Forestry and Natural Resources), Allen Hammer (Horticulture and Landscape Architecture)

The Management and Policy Committee: Dave Petritz (Chair, Director of CES), Tom Jordan (Assistant Director of CES & Agriculture and Natural Resources), Marshal Martin (Associate Director of Agriculture Research Programs), Craig Beyrouty (Head, Department of Agronomy), Ray Martyn (Head, Department of Botany and Plant Pathology), Steve Yaninek (Head,

Department of Entomology), Ed Ashworth (Head, Department of Horticulture), Dennis LeMaster (Head, Department of Forestry and Natural Resources), and Gail Ruhl (Interim Part Time Director of P&PDL)

FINANCIAL SUPPORT

In 1990 the Crossroads initiative provided funding to establish an interdisciplinary diagnostic laboratory, the P&PDL. Each diagnostician is paid from their respective departmental budgets. The general operating expense budget for the P&PDL comes from the handling and testing fees charged for sample diagnosis **(Table 2)**.

LABORATORY OPERATIONS

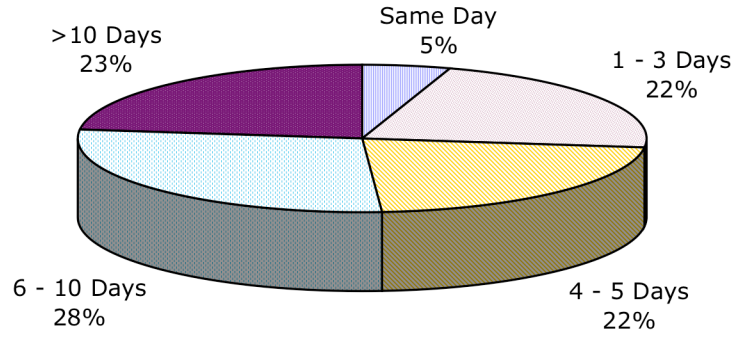
County offices of the Cooperative Extension Service (CES) are provided with a supply of sample submission forms, alcohol vials and mailing boxes to facilitate the submission of plant specimens and insects to the P&PDL. Submission forms are also available online and may be downloaded from the P&PDL web page. Completed submission forms are to accompany all sample submissions. Digital images may be submitted as well, from the P&PDL web page (http://www.ppdl.org).

Diagnosis Process

Information from the sample submission form is logged into the P&PDL computer database and the sample is assigned a unique number. Samples are then distributed to the appropriate diagnostician. If the diagnosis requires pathogen isolation or some other lengthy procedure (determined by the diagnostician), a preliminary reply, including a tentative diagnosis and projected final completion date, is returned to the client. When the diagnosis has been completed the identification and management recommendations (when requested) are entered into the database, printed, and the final response along with any supporting information is returned to the client and/or submitter via electronic mail and/or FAX, and US mail (as requested by the submitter on the submission form).

Turn-around time
Turn-around time is the length of time between when a sample is received and when the final diagnosis is returned. Same day service was provided for 5% of the samples received during 2003 and 27% of the samples were completed in three days or less. A total of 49% of the samples received during 2003 were diagnosed within five working days and 77% of all samples received were answered within 10 working days. An extended turn-around time of greater than 10 days (23% of samples) was documented for those samples requiring more extensive culture work and laboratory testing **(Figure 1)**.

Figure 1. Turn-around time for all samples received in 2003*



* Turn-around time is the number of working days between receipt of samples and date of final reply completion.

Fees
Service fees of $11.00 (in-state) and $22.00 (out-of-state) are charged for processing all samples **(Table 2)**. There is an additional fee of $25.00 for serological testing. To provide for contract work or exceptionally time-consuming diagnosis there is a fee of $22.00/hour. Fees incurred for samples referred to the departments of Entomology and Horticulture and Landscape Architecture for nematode analysis or analysis of artificial potting media, respectively, are not tracked by the P&PDL. Educational "Dave" samples are provided to county Educators at the Director of Extension's expense. This service was instituted as a way to assist Educators in the diagnostic learning process.

Table 2. Fees assessed by the Plant and Pest Diagnostic Laboratory in 2003.

Service	Fee	No. of Samples	Income
Routine diagnosis			
In State	$11.00	1454	$15,994.00
Out of State pd by IN	$22.00	17	$374.00
Out of State	$22.00	282	$6,204.00
Serological Testing (additional charge)	$25.00	201[1]	$5,025.00
Misc. charges - AGDIA, etc.		4[1]	$329.00
Educational "Dave" Samples for Educators[2]	$11.00	34	$374.00
Fee Waived			
• Insufficient sample/resubmission	N/A	85	$0.00
TOTAL		1872	$28,300.00

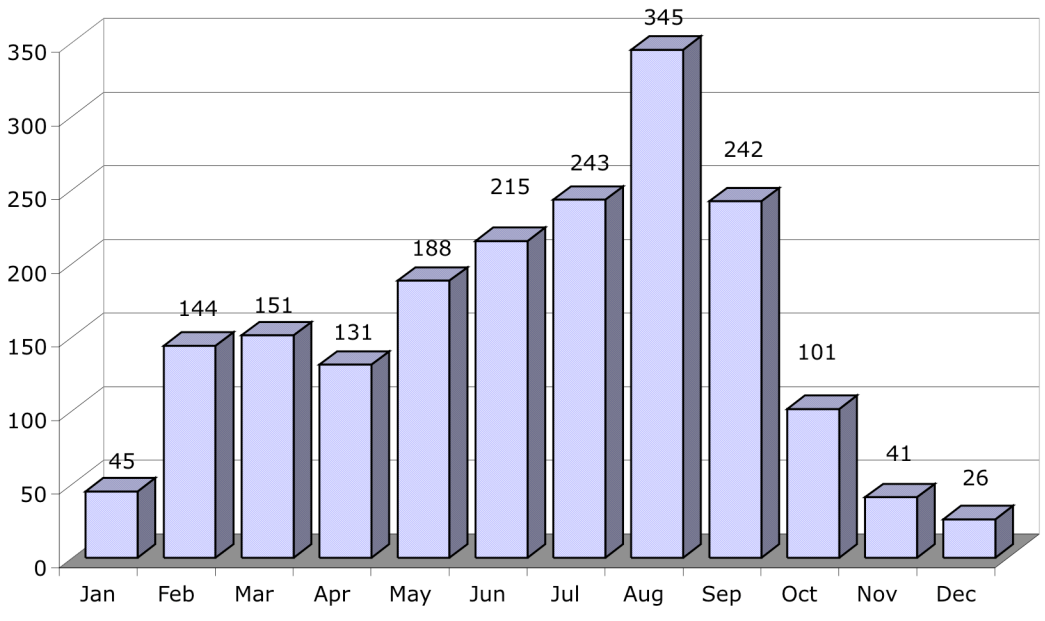
[1] Not included in the total. Already counted as a sample under routine diagnosis.
[2] Charge to Dr. David Petritz

DIAGNOSES AND SAMPLES

Monthly Activity

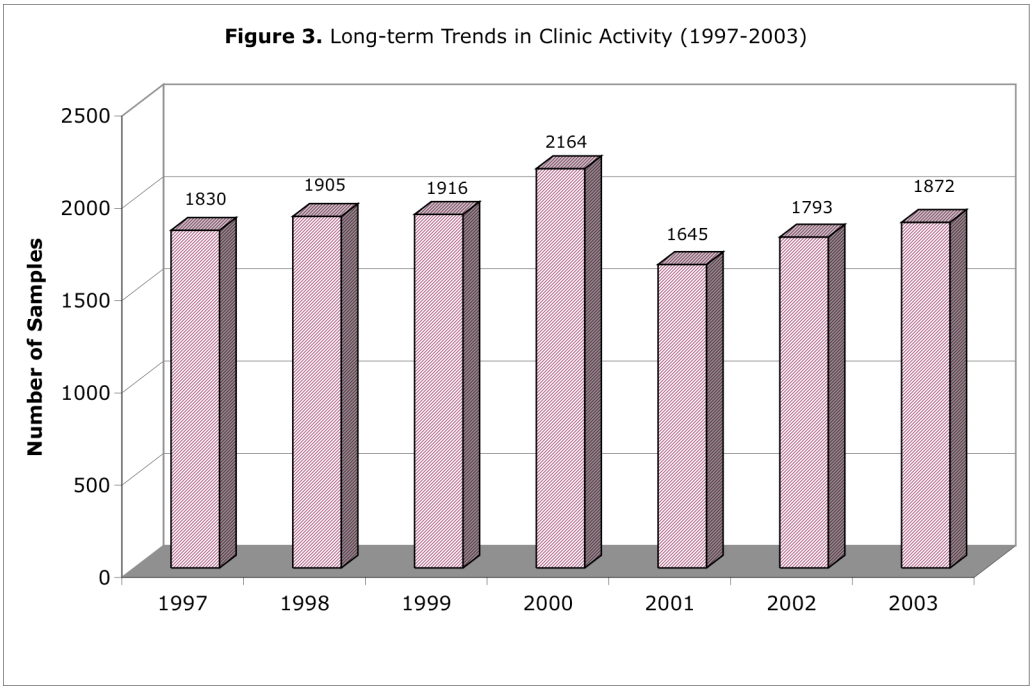
During 2003, the Laboratory diagnosed a total of 1872 samples, of which 53 were submitted electronically as digital images and 652 were delivered personally to the office. Forty-six of the digital samples were submitted strictly as electronic submissions of digital images via a standard web-based method (http://www.ppdl.org) made available in 2003 to all Indiana educators as well as the general public. July, August, and September were the three months of greatest activity in the P&PDL based on the number of samples submitted in 2003 **(Figure 2).** Nearly half of the year's samples were processed in the laboratory during these three months.

Figure 2. Number of samples received per month during 2003.



Long-Term Trends

A review of annual sample submissions over the past seven years indicates a relative stability in the numbers of samples submitted for diagnosis during rather stressful economic conditions **(Figure 3)**.



Commodities Diagnosed

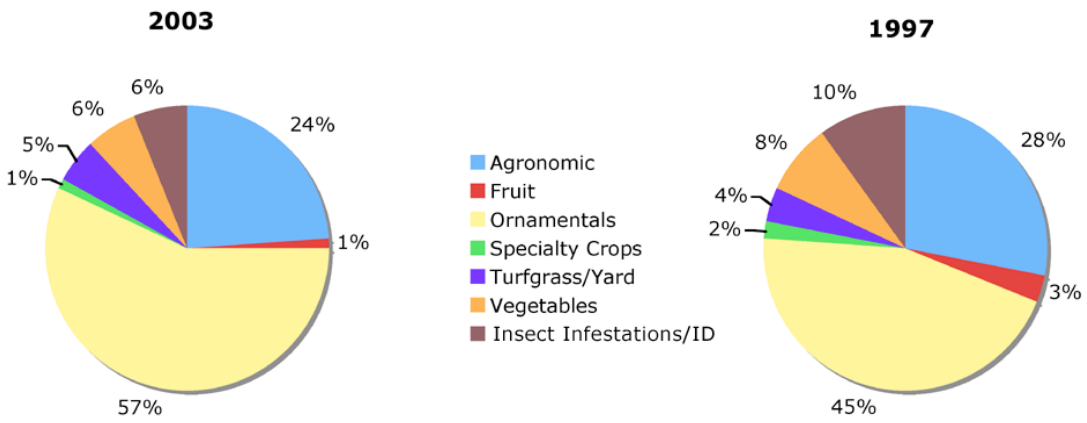
Table 3 and **Figure 3b** compare the number of specimens submitted in each commodity group, for 2003 and 1997. The percentages are relatively similar for both 1997 and 2003. The majority of samples were from the ornamental commodity group, followed by agronomic samples. Problems and questions dealing with ornamental plants comprised the largest proportion (57%) of samples submitted during 2003, followed by agronomic crops (24%), vegetables (6%) and insects infesting homes and other buildings (6%). The remaining 7% of the samples were distributed between the other commodity groups **(Table 3** and **Figure 3b)**.

Table 3. Samples sorted by commodity group

	2003		1997	
Commodity	**Number of Specimens**	**%[1]**	**Number of Specimens**	**%[1]**
Agronomic	**447**	**24**	**505**	**28**
Alfalfa	16	1		
Barley	4	*		
Corn	290	16		
Oats/Wheat	16	1		
Soybeans	105	6		
Forage – dried	3	*		
Forage – in field	2	*		
Pasture	3	*		
Popcorn	1	*		
Plant ID[2]	7	*		
Fruit	**35**	**1**	**59**	**3**
Small Fruit	7	*	25	1
Tree Fruit	28	1	34	2
Ornamentals	**1060**	**57**	**827**	**45**
Flowers	479	26	217	12
Interior Plants	11	1	34	2
Grnd Cvrs/Vines	21	1	28	2
Shrubs	139	7	131	7
Trees	410	22	417	23
Specialty Crops	**19**	**1**	**34**	**2**
Field	3	*		
Hort	16	1		
Turfgrass/Yard	**89**	**5**	**73**	**4**
Vegetables	**111**	**6**	**149**	**8**
Insect Infestations/ID**	**111**	**6**	**183**	**10**
Animal/Human	11	1	15	*
Aquatic	7	*	N/A	N/A
Home/Bldg	71	4	83	5
Other	17	1	60	3
Stored Foods/Grains	4	*	7	*
Unclassified	1	*	18	*
Total Specimens	**1872**	**100**	**1830**	**100**

[1] Percent of total samples submitted during the year
[2] Unclassified – Commodity group was not provided on submission form
***** Less than 1%
** and miscellaneous insect ID's

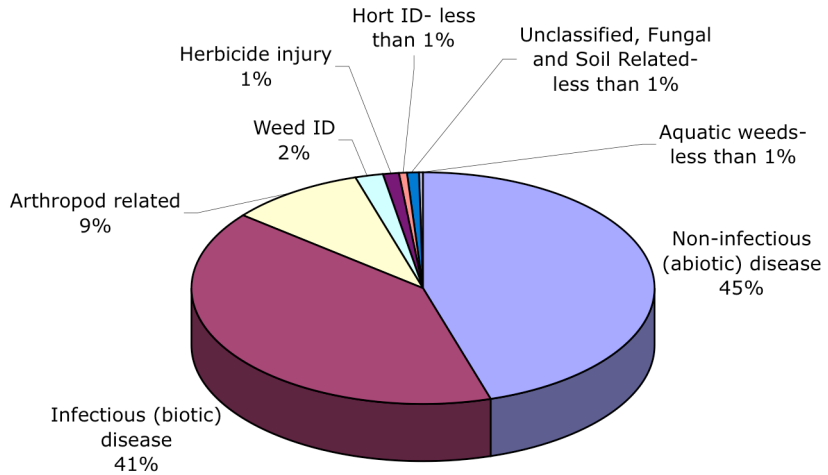
Figure 3b. Samples sorted by commodity group



Type of Diagnosis

Many of the samples received multiple diagnoses due to more than one causal agent. However, the primary agents, determined by the type of diagnosis made, were mostly noninfectious (abiotic) disorders (45%), followed by infectious diseases (41%), arthropods (9%), weed identification (2%), and herbicide injury (1%) **(Figure 4)**.

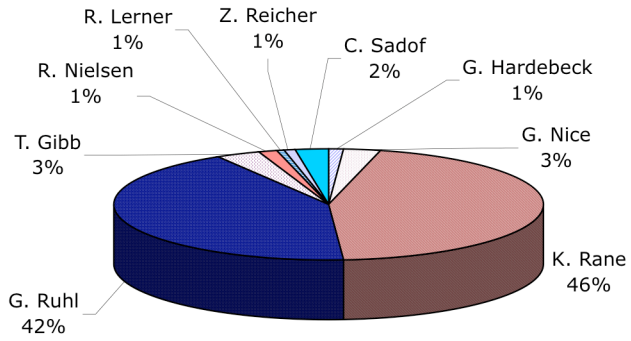
Figure 4. Proportion of primary diagnoses in 2003



Diagnoses per Diagnostician

A comparison of the proportion of total diagnoses made according to diagnostician is given in **Figure 5**.

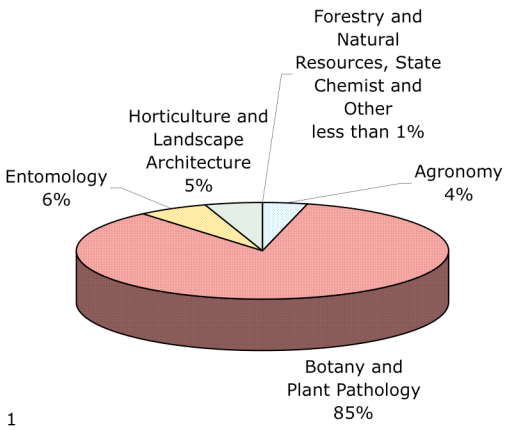
Figure 5. Percentage of diagnoses made by each P&PDL diagnostician in 2003



Diagnoses per Department

A comparison of the proportion of total diagnoses made according to participating departments is given in **Figure 6**.

Figure 6. Proportion of total diagnoses made by faculty and staff in participating departments* in 2003



* See Table 1

Commodity Group Causal Agents

The number and proportion of samples with abiotic (noninfectious) and biotic (infectious disease, arthropod and weed) problems by commodity groups are presented in **Table 4**.

Table 4. Types of Primary Problems Diagnosed on Selected Commodity Groups[1] in 2003

Commodity	Number of samples	Abiotic Problems		Biotic Problems							
				Disease		Arthropods		Weeds		Fungal/ Plant ID	
		Number	%[2]	Number	%	Number	%	Number	%	Number	%
Animal/ Human	11	-	-	-	-	11	(6)	-	-	-	-
Agronomic Crops	447	131	(15)	296	(40)	7	(4)	13	(24)	-	-
Aquatic	7	-	-	-	-	1	(*)	6	(11)	-	-
Flowers	479	289	(33)	167	(23)	19	(10)	4	(8)	-	-
Fruits, small	7	3	(*)	3	(*)	-	-	1	(2)	-	-
Fruits, tree	28	8	(1)	17	(2)	1	(*)	1	(2)	1	(11)
Ground covers/Vines	21	1	(*)	17	(2)	2	(1)	1	(2)	-	-
Home/ Building	71	1	(*)	1	(*)	67	(35)	2	(4)	-	-
Interior Plants	11	8	(1)	1	(*)	2	(1)	-	-	-	-
Shrubs	139	89	(10)	31	(4)	16	(9)	-	-	3	(33)
Specialty Crops	19	7	(1)	11	(2)	1	(*)	-	-	-	-
Stored Foods/ Grains	4	-	-	-	-	4	(2)	-	-	-	-
Trees	410	251	(28)	107	(15)	44	(23)	5	(9)	3	(33)
Turfgrass/ yard	89	33	(4)	32	(4)	5	(3)	17	(32)	2	(23)
Vegetables	111	51	(6)	53	(7)	7	(4)	-	-	-	-
Other	18	8	(1)	4	(1)	3	(2)	3	(6)	-	-

[1] Sample numbers do not equal the number of diagnoses because not all samples represented problems (e.g. horticultural plant and weed identification, etc.)

[2] Numbers in parentheses are the proportion of the total number of samples for that commodity group.

* Less than 1%

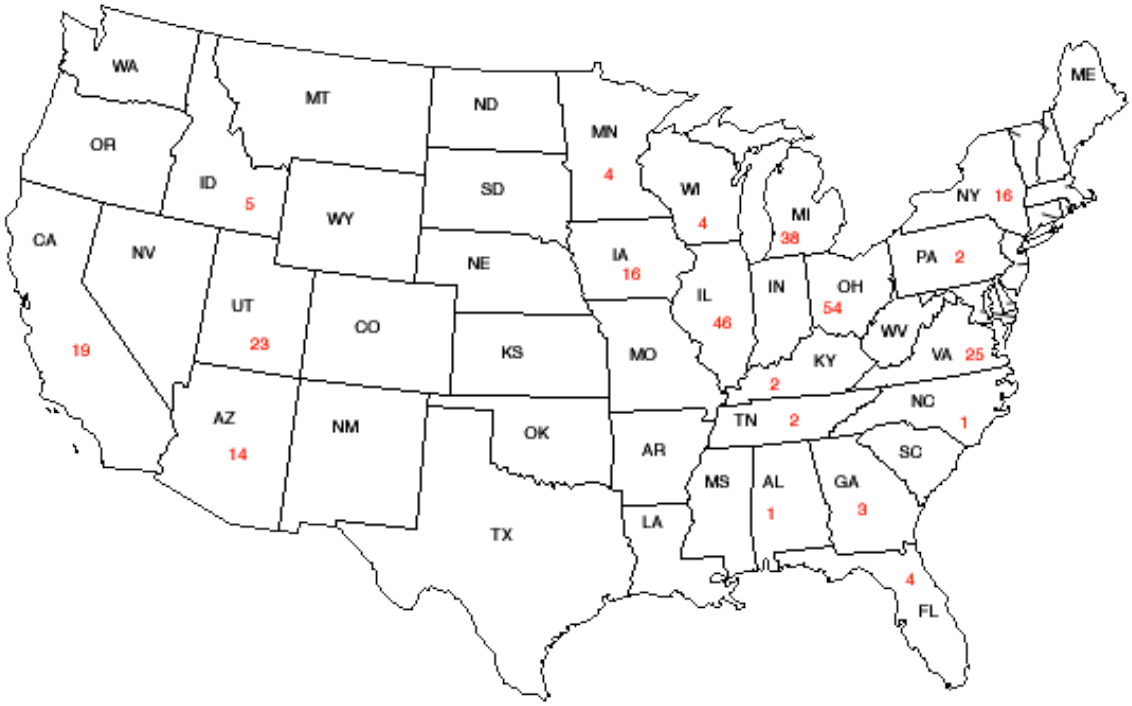
SAMPLE ORIGIN

The Laboratory is primarily intended to serve residents of Indiana, however, due to the P&PDL's national reputation, diagnostic services were also provided for 304 samples submitted from 23 other states during 2003.
(Table 5; Figure 7)

Table 5. Out of State Submissions to the P&PDL in 2003.

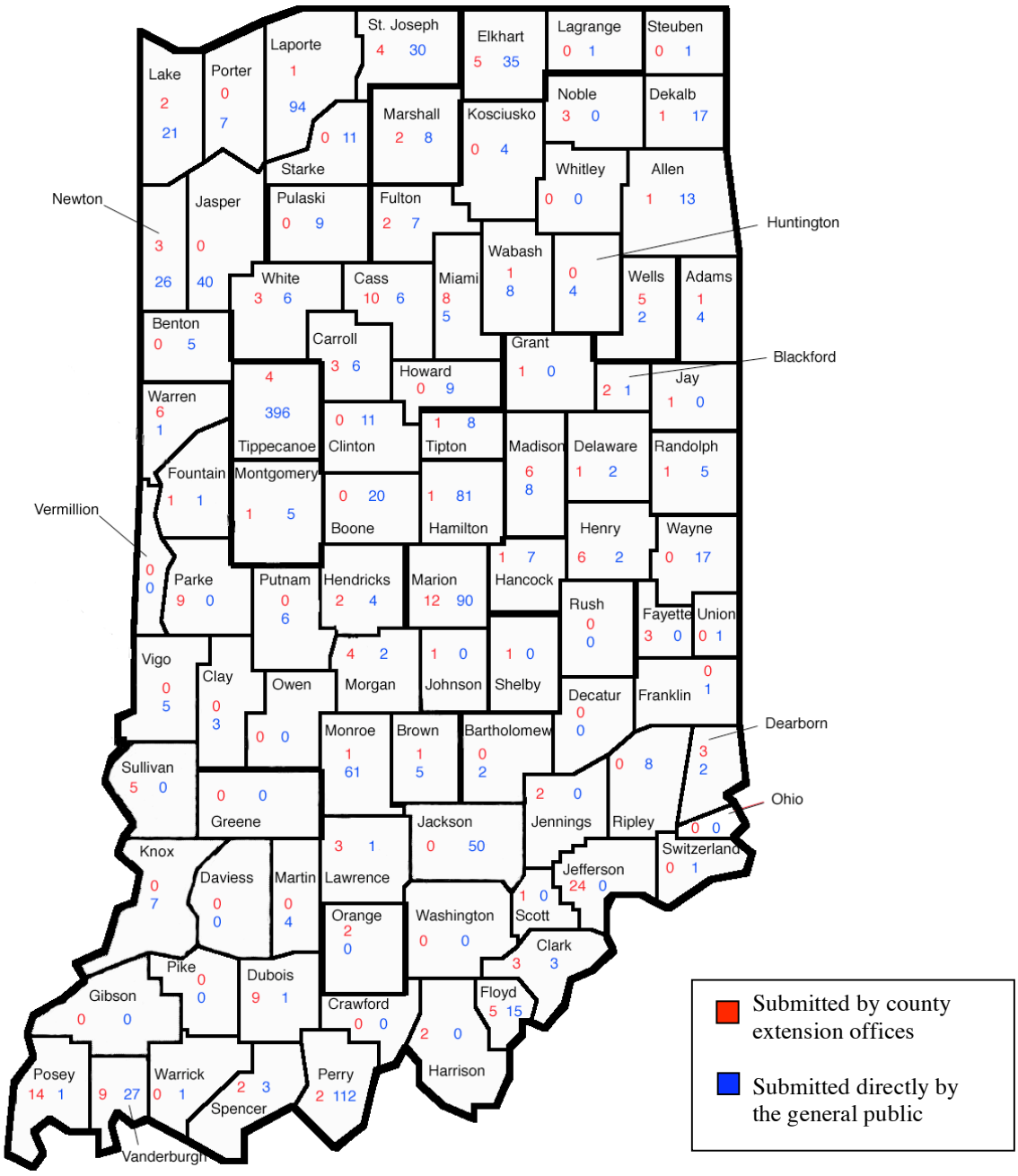
State	Homeowner	Commercial	Other	Total
Alabama		1		1
Arizona		14		14
California	1	18		19
Florida		1	3	4
Georgia			3	3
Idaho		5		5
Illinois	2	43	1	46
Iowa		15	1	16
Kentucky	2			2
Massachusetts		2		2
Maryland		2		2
Michigan	5	32	1	38
Minnesota		2	2	4
North Carolina		1		1
New Hampshire		19		19
New Jersey		1	1	2
New York		16		16
Ohio		53	1	54
Pennsylvania	1	1		2
Tennessee		2		2
Utah		23		23
Virginia		6	19	25
Wisconsin		4		4
Totals	11	261	32	304

Figure 7. Distribution of samples received from outside Indiana by the Plant and Pest Diagnostic Laboratory in 2003.



Submitters
With the obvious exception of Tippecanoe county, distribution of samples from within the State was correlated to population distribution when mapped as either samples submitted from CES Educators or as samples submitted directly by the public **(Figure 8)**.

Figure 8. Distribution of samples submitted directly from Purdue Cooperative Extension Offices and directly from the general public in 2003.



As noted on **Tables 6 and 7**, the vast majority (89%) of the commercial samples submitted by Indiana clientele were sent directly to the P&PDL by the commercial clients rather than submitted via their county extension educators (11%). This trend is also reflected in the homeowner submission. The majority of homeowners (54%) submitted their samples directly to the P&PDL, with 46% submitting them through their county extension educator.

Table 6. Samples submitted in 2003 by Indiana CES[1] for various clientele

County	CES	Homeowner	Commercial	Regulatory and Other	Total
Adams		1			1
Allen				1	1
Blackford		2			2
Brown		1			1
Carroll		3			3
Cass		7	3		10
Clark		1	2		3
Dearborn		2	1		3
Dekalb			1		1
Delaware		1			1
Dubois		4	5		9
Elkhart		5			5
Fayette		3			3
Floyd		1	4		5
Fountain			1		1
Fulton		1	1		2
Grant		1			1
Hamilton		1			1
Hancock		1			1
Harrison			2		2
Hendricks		1	1		2
Henry		6			6
Jasper		5	6		11
Jay		1			1
Jefferson		19	4	1	24
Jennings		1	1		2
Johnson		1			1
Lake		1		1	2
LaPorte		1			1
Lawrence		3			3
Madison	1	5			6
Marion	2	1	9		12
Marshall	2				2
Miami	7		1		8
Monroe		1			1
Montgomery		1			1
Morgan		4			4

Table 6 cont'd. Samples submitted in 2003 by Indiana CES[1] for various clientele

County	CES	Homeowner	Commercial	Regulatory and Other	Total
Newton		3			3
Orange		2			2
Noble			3		3
Parke	3	2	4		9
Perry		1		1	2
Posey		10	4		14
Randolph			1		1
Saint Joseph		2	2		4
Scott		1			1
Shelby		1			1
Spencer		2			2
Sullivan		5			5
Tippecanoe		2	2		4
Tipton		1			1
Vanderburgh		5	3	1	9
Wabash	1	4	1	2	8
Warren		6			6
Wells		4	1		5
White		2	1		3
Totals	16 (7%)	139 (62%)	64 (28%)	7 (3%)	226 (100%)

[1] CES = Cooperative Extension Service County Offices

Table 7. Samples submitted in 2003 directly by Indiana general public

County	Purdue Not-Educator	Homeowner	Commercial	Regulatory and Other	Total
Adams			3	1	4
Allen		1	11	1	13
Bartholomew			2		2
Benton		1	3	1	5
Blackford		1			1
Boone		2	18		20
Brown			5		5
Carroll			6		6
Cass		4	2		6
Clark			3		3
Clay		1	2		3
Clinton		3	8		11
Dearborn			2		2
DeKalb				17	17
Delaware		1	1		2
Dubois			1		1
Elkhart		1	33	1	35
Floyd			1	14	15
Fountain		1			1
Franklin		1			1
Fulton		2	1	4	7
Hamilton		11	68	2	81
Hancock		2	5		7
Hendricks			4		4
Henry		2			2
Howard		5	4		9
Huntington		1	3		4
Jackson			9	40	49
Jasper		4	19	6	29
Knox	3		3	1	7
Kosciusko		2	2		4
LaGrange			1		1
Lake		15	4	2	21
LaPorte	9	4	39	42	94
Lawrence				1	1
Madison			8		8
Marion	2	4	22	62	90
Marshall		2	5	1	8
Martin			4		4
Miami		1	4		5
Monroe		9	2	50	61

Table 7 continued. Samples submitted in 2003 directly by Indiana general public					
County	**Purdue Not-Educator**	**Homeowner**	**Commercial**	**Regulatory and Other**	**Total**
Montgomery		4	1		5
Morgan			2		2
Newton			19	7	26
Perry				112	112
Porter		3	3	1	7
Posey		1			1
Pulaski		2	6	1	9
Putnam		1	4	1	6
Randolph			5		5
Ripley		1	7		8
Saint Joseph		4	25	1	30
Spencer			3		3
Starke		1	10		11
Steuben			1		1
Switzerland		1			1
Tippecanoe	46	59	74	218	397
Tipton			7	1	8
Union			1		1
Vanderburgh			26	1	27
Vigo			5		5
Wabash		1			1
Warren			1		1
Warrick			1		1
Wayne		1	13	3	17
Wells		2			2
White			5	1	6
Totals	60 (4%)	162 (12%)	527 (40%)	593 (44%)	1342

The most frequent users (88%) of the P&PDL in 2003 were the general public (commercial and non-commercial) who directly submitted 1342 samples for diagnosis **(Table 8)**. County extension educators submitted only 226 samples (12%). In fact, archived P&PDL annual reports document that this has been the trend for the past ten years. County Extension Educators have not been the most frequent P&PDL users since 1993. Regulatory samples (consisting of corn and soybean samples submitted for phytosanitary certification diagnostics and geraniums submitted for *Ralstonia solanacearum* Race 3 Biovar 2 testing) comprised the majority of the "Regulatory and other" sample submissions in 2003.

Clientele Groups

Samples were submitted to the P&PDL by homeowners, farmers, dealer/industry representatives, consultants, greenhouse growers, golf course superintendents, landscapers, pest control operators, lawn and tree care specialists, garden center and nursery personnel, University employees and others **(Table 8).** The majority of samples submitted to the P&PDL in 2003 came

from homeowners (16%) and greenhouse growers (16%), followed by the Indiana Department of Natural Resources (15%). A comparison of 2003 data with 1997 data clearly illustrates a shift in some of our clientele groups over the past five years. Greenhouse growers submitted 10% more samples in 2003 than in 1997 while dealer/industry reps submitted 9% less samples in 2003. The increase in greenhouse samples is in part due to referrals sent to the P&PDL from a commercial serological testing service based in Elkhart, Indiana. Commercial greenhouse clientele, pleased with the multidisciplinary aspect of our lab and the diagnostic accuracy and expediency of replies, have become repeat submitters over the past several years. The decrease in samples submitted by dealer/industry reps could be due to an increased use of their own company diagnostic facilities. It is also feasible that our Extension training sessions and literature have provided the private sector with the tools they need to become better diagnosticians.

Table 8. Affiliation of persons submitting samples to the Plant and Pest Diagnostic Laboratory Comparison of 2003 & 1997

Affiliation	Submitted by CES[1]			Submitted by Public			Total[3]		Percentage[4]	
	Physical Samples		Digital[2] Samples	Physical Samples		Digital Samples				
	2003	1997	2003	2003	1997	2003	2003	1997	2003	1997
Consultant	-	1	-	51	97	-	51	98	3%	5%
Dealer/Industry Rep	3	13	-	134	286	1	138	299	7%	16%
Garden Center	-	-	-	16	18	1	17	18	1%	1%
Golf Course	-	1	-	18	12	-	18	13	1%	1%
Greenhouse	18	11	-	285	89	1	304	100	16%	6%
Homeowner	114	179	31	160	210	6	311	389	16%	21%
Grower-Ag	22		1	17		-	40		2%	
Grower-Fruit/Veg	9		-	28		-	37		2%	
Grower-Ornamental	2		1	14		1	18		1%	
Landscaper	2	2	1	33	67	1	37	69	2%	4%
Lawn/Tree Care	2	-	-	140	116	2	144	116	8%	6%
Nursery	1	6	-	48	35	1	50	41	2%	2%
Pest Control	2	2	-	35	29	-	37	31	2%	2%
Other-Misc	7		-	50		-	57		3%	
ICIA	-		-	178		-	178		10%	
ICIA-NAPIS	-		-	1		-	1		<1%	
IDNR	-		-	274		-	274		15%	
IDNR-Forestry	-		-	40		-	40		2%	
State Chemist	-		-	28		-	28		2%	
USDA	-		-	14		-	14		1%	
Purdue-not Educator[5]	-	1	-	67	190	1	68	191	4%	11%
Extn – no client	8	115	2	-	-	-	10	115	<1%	6%
Total	190	399	36	1631	1431	15	1872	1830	100%	100%
Proportion of submitted samples[6]	**(22%)**			**(78%)**						
	226 (12%)			**1646 (88%)**						

[1] CES = Cooperative Extension Service County Office
[2] These digitals were electronically submitted as a part of the P&PDL Digital Diagnostics Project
[3] These figures are the sums of the four un-shaded columns or two shaded columns (reading across)
[4] Percentage of total samples received by affiliation
[5] Research, Grounds, State Chemist Office, ADDL, White River Gardens, Faculty & Staff
[6] Proportion of samples submitted by CES vs. proportion of samples submitted by public in 1997 and 2002

AN INFORMATION SOURCE

The P&PDL staff not only provide accurate and timely identification of plants and pests, diagnose plant problems, and suggest management strategies, but also serve as a resource of information for plant and pest-related problems. The team cooperates with university personnel to provide accurate and up-to-date information to clientele.

Webpage

The Virtual Plant and Pest Diagnostic Laboratory, the P&PDL World Wide Web Home Page, (URL: http://www.ppdl.purdue.edu) was put "on-line" in June of 1995. The web server, now maintained by Bob Mitchell, IT manager for the Dept. of Botany and Plant Pathology and Amy Deitrich as webmaster, is an invaluable educational tool accessible not only to the citizens of Indiana, but throughout the United States and the world. The page not only provides a "picture of the week", up-to-date information on "What's Hot" in the P&PDL and links to informational sources but also provides access to seven years of archived web page information. There is a keyword searchable database of past questions and answers, current questions and answers (many include pictures), a digital library and access to submit digital samples to the P&PDL. Web server statistics for the Plant and Pest Diagnostic Laboratory reported an average of 2,161 requests per day for P&PDL web pages from January 1 through December 31, 2003.

Electronic Update

As a way of maintaining communication among CES county educators specialists, and other interested persons, an electronic update is sent periodically to listserve subscribers during the growing season. These updates include information on plant problems that are common throughout the state and a summary of past features and important announcements posted on the P&PDL web page.

Extension Activities

P&PDL staff members annually participate in a variety of Purdue University sponsored events and educational programs. Some of these events and educational programs in 2003 included Garden Day, Master Gardener Training, Turf and Ornamentals Workshops, Pesticide Applicator Training, and Certified Crop Advisor Training.

HOMELAND SECURITY AND THE NATIONAL PLANT DIAGNOSTIC NETWORK

As a result of the 9-11-02 terrorist attacks on the World Trade Centers and the Pentagon, Congress created a new U.S. Department of Homeland Security. With heightened awareness and concern for potential acts of bioterrorism directed at the U.S. Food and Agricultural System, the Department of Homeland Security provided funds for USDA/CSREES to develop a National Plant Diagnostic Network (NPDN), in which the land grant plant diagnostic laboratories comprised the backbone of the system. The nation was divided into five regions, with a regional center designated for each of the five regions. The P&PDL, as part of the North Central Plant Diagnostic Network (NCPDN) region has been working with their counterparts at other land grant institutions to prepare against plant diseases and pests that might pose a threat to American agriculture. Part of this response includes providing training protocols for threat pathogens for the "first detectors." First detectors typically include individuals such as county extension educators, growers, crop consultants and regulatory field inspectors. Once trained, first detectors will be on the look-out for unusual or new diseases to submit to the diagnostic laboratories. This will greatly reduce the time between introduction and detection and, subsequently remediation.

In light of this national initiative, the P&PDL provided a 2003 training session to ANR educators on Homeland Security and the threat of bioterrorist attacks on agriculture. The training included information on the NPDN, the NCPDN, Soybean Rust, and how the newly formed National Plant Diagnostic Network will help provide real-time diagnostics and training opportunities through the Plant Diagnostic Information Service (PDIS).

P&PDL AND THE INDIANA DEPARTMENT OF NATURAL RESOURCES

The Plant and Pest Diagnostic Laboratory serves as the plant disease diagnostic facility for the IDNR and thus the expertise of P&PDL plant disease diagnosticians is an integral part of the regulatory function performed by the Indiana Department of Natural Resources (IDNR). The IDNR and the Purdue Plant and Pest Diagnostic Laboratory worked together during the outbreak of *Ralstonia solanacearum* Race 3 Biovar 2 (RsR3B2) in geraniums in February 2003. This pathogen causes southern bacterial wilt in potatoes and other solanaceous crops, and is listed on USDA Agricultural Bioterrorism Act of 2002 Select Agents and Toxins List. The pathogen was unintentionally introduced to numerous greenhouses in the US in 2003 during the routine and normal importation of geranium cuttings from Kenya by a US company. The Plant and Pest Diagnostic Laboratory was the first university diagnostic clinic to detect the pathogen and provide samples to USDA-APHIS for biovar and race determination. The plant disease diagnosticians also contacted Robert Waltz, IDNR State Plant Health Regulatory Officer, to alert him to the situation. As a result, Indiana was among the first states to organize a regulatory response to the *Ralstonia* outbreak. The P&PDL provided information to the IDNR on symptoms and etiology of the disease to aid the field inspectors in their collection of potentially infected plants. The P&PDL also provided testing of 250 samples collected by nursery inspectors, and forwarded samples positive for *Ralstonia solanacearum* in initial tests to USDA-APHIS for race and biovar determination. Four Indiana greenhouses were found to have infected plants, and the P&PDL consulted with IDNR officials in their quarantine and sanitation efforts in those greenhouses. IDNR and P&PDL staff also collaborated in formal meetings to assess the Indiana response to the *Ralstonia* outbreak.

The P&PDL also provided disease diagnosis on 149 corn and 31 soybean fields for the IDNR Phytosanitary Certification Program as well as disease diagnosis on 68 cornfield samples for entry into the National Agricultural Plant Information System (NAPIS) database.

APPENDIX A **Master Table. Summary of All Diagnoses by Crop Category and Causal Agent Type. 2003**

Commodity Group	Number of Samples Submitted	Abiotic[1] Problems	Infectious Diseases	Herbicide Injury	Insect Injury	Insect ID	Weed & Plant ID	Fungal ID	Insufficient Sample Information	Vertebrate Related	Total Diagnoses[2]	% Diagnoses
Agronomic	**447 (24%)**										**816**	**32**
Alfalfa	16	2	20	1	6				2		31	1
Barley	4		5								5	*
Corn	290	65	445	28	3	2			12		555	22
Oats/Wheat	16	10	10	3			1				24	1
Soybeans	105	32	120	18	1				12		183	7
Forage - dried	3				2		2				4	*
Forage - in field	2						2				2	*
Pasture	3		2				2				4	*
Popcorn	1	1									1	*
Plant ID[3]	7						7				7	1
Fruit	**35 (1%)**										**42**	**1**
Small Fruit	7	3	2	1			1				7	*
Tree Fruit	28	10	20	2	1		1		1		35	1
Miscellaneous	**111 (6%)**										**119**	**5**
Animal/Human	11					10			2		12	*
Aquatic	7					1	9				10	*
Home/Bldg	71		1			67		1	2		71	3
Other	17	3	9			1	2	1	4		20	1
Stored Foods	4					5					5	*
Unknown	1								1		1	*
Ornamentals	**1060 (57%)**										**1299**	**51**
Flowers	479	289	220	1	22		6		8		546	21
Interior Plants	11	9	3		4						16	1
Grnd Cvrs/Vines	21	2	20		4		1		1		28	1
Shrubs	139	81	41	5	22		3		13	1	166	7
Trees	410	259	153	11	64	2	6	2	44	2	543	21
Specialty Crops	**19 (1%)**										**24**	**1**
Field	3	1	1		2						4	*
Hort	16	3	14		1				2		20	1
Turfgrass/Yard	**89 (5%)**	25	39	1	1	4	18	2	11		**101**	**4**
Vegetables	**111 (6%)**	46	67	3	7			1	15		**139**	**6**
Total	**1872 (100%)**	**841 (33%)**	**1192 (47%)**	**74 (3%)**	**140 (6%)**	**92 (4%)**	**61 (2%)**	**7 (*)**	**130 (5%)**	**3 (*)**	**2540**	**100%**

[1] Abiotic problems include cultural, environmental, soil and site related (not herbicide)

[2] The number of diagnoses may be greater than the number of samples submitted due to multiple problems diagnosed on one sample

[3] Unclassified - Commodity group was not provided on submission form

* Less than 1%

APPENDIX B: COMMODITY RELATED SUMMARIES

Vegetable Diseases, *Dan Egel, Region Pest Management Specialist, SWPAC, Purdue University*

The 2003 growing season will be remembered for the high amounts of rainfall that occurred over the summer in several northern areas of Indiana. As a result, agronomic as well as vegetable growers in much of the state suffered, not from diseases or pests, but from too much water too quickly. In the southern portion of the state, however, where much of the vegetable production takes place, rainfall was moderate. In this region, water was sufficient without being a nuisance. The exceptions to this were vegetable farms located along a river such as the Southwest Purdue Agricultural Center on the banks of the Wabash River.

Since rainfall is critical to many foliar plant diseases, normally important diseases such as gummy stem blight of watermelon, early blight of tomato and Alternaria leaf blight of muskmelon were not severe enough to limit production of these crops. Most muskmelon, pumpkin and watermelon growers reported excellent yields in part due to the lack of the foliar diseases mentioned above. However, not all diseases were quiescent in 2003.

Downy mildew was observed in a Knox county watermelon field on 22 July 2003. This disease, if it is spotted in southern Indiana at all, does not usually show up until late August or early September. At that time of year, downy mildew is most commonly a problem on pumpkins. Wind currents must bring spores of the downy mildew fungus up from the gulf region of the United States where the disease over winters. Such wind currents occurred this year in July.

Downy mildew in 2003 affected mostly watermelon growers. This disease requires leaf wetness, such as supplied by heavy dews, and cool temperatures. Weather this season supplied both of these conditions as well as the unfavorable wind currents mentioned above. In my own experimental plots, downy mildew went from unobserved in the control plots with no fungicide to 77 percent of the foliage affected in 10 days. Although this disease spreads rapidly, growers were warned of this threat; most growers were able to ward of losses from downy mildew with weekly fungicide applications.

Losses from soil borne disease this year included Fusarium wilt of watermelon and mature watermelon vine decline. The former is a perennial problem that seems to be unaffected by rainfall. Mature watermelon vine decline, a disease described in 2001, appears to be caused by an unknown soil organism. Although not severe in the year 2003, a few watermelon fields with MWVD were noted in areas with higher rainfall.

Tree Fruit Diseases, *Paul Pecknold, Professor, Botany & Plant Pathology, Purdue University*

Once again fireblight was the most prominent disease, causing significant damage throughout the state, but especially in areas of southern Indiana. First reports of fireblight were received from growers in the southern areas of the state and from there it proceeded northward. We suspect a major contributing factor to this year's fireblight was the continued build up of holdover cankers from the previous four years. Blister spot of Crispin, another bacterial disease, was also more evident this year. We suspect that extensive rainy periods in late spring contributed to the increased occurrence of blister spot. The season started off on the wet side, resulting in numerous early season primary scab infection periods along with an increase in cedar apple and cedar quince rust. However an early wet season gave way to a dry summer resulting in a diminished buildup of secondary scab or other summer diseases. The early wet weather did cause an increase in reports of phytopthora crown rot on both apples and stone fruit.

Agronomic Crop Diseases, *Greg Shaner, Professor, Botany & Plant Pathology, Purdue University*

Fusarium head blight of wheat was a problem in southern Indiana. The disease occurred at least as far north as the latitude of Lafayette, but severity was greater in the southern part of the state. In some fields, head blight symptoms were obvious, but in others head blight was not severe, yet the harvested grain contained fairly high concentrations of deoxynivalenol. Wet weather during and after flowering contributed to head blight and scabby grain. The development of DON in grain without severe head blight or visibly damaged kernels may have resulted from infection of grain somewhat later in development than normal. We saw some stripe rust again this year, but it was not severe and its development ceased as temperatures rose. Leaf and glume blotch were present, as usual, owing to the frequent rains during May. There was no major soybean disease in Indiana this year, but seedling blights were problems in some fields. Premature defoliation occurred in many fields during August. In a few cases this was from sudden death syndrome, but charcoal rot and Fusarium root rot were probably more widespread than sudden death syndrome. Frogeye leaf spot seemed not to be as severe this year in southern Indiana as in recent years. Corn diseases were light this year, despite the unfavorable growing conditions for corn planted in April. Woloshuk's ear rot survey revealed very little problem from this group of diseases.

Turfgrass Diseases, *Richard Latin, Professor, Botany & Plant Pathology, Purdue University*

A cool wet spring and moderate summer temperatures with two periods of heavy precipitation defined the turfgrass disease season for 2003. During the early spring, yellow patch (cool season brown patch) and necrotic ring spot were more prevalent than at any time during the past 5 years on creeping bentgrass/annual bluegrass golf greens. Outbreaks of melting out were common in lawn and low budget athletic turf during April and May. Turf managers normally to not address these diseases with fungicides, although there was at least one instance where a superintendent targeted a fungicide treatment towards necrotic ring spot. On golf courses, conditions during the first 3 weeks in May favored the establishment dollar spot on creeping bentgrass greens and fairways. Because of the relatively mild summer conditions, superintendents who did not avoid serious outbreaks in May seemed to battle dollar spot throughout the entire summer. Brief outbreaks of Pythium blight followed the heavy rains and high temperatures during the first week in July. The disease did not threaten again for the remainder of the summer. Initial outbreaks of brown patch also occurred shortly after the July 4 holiday; and the disease continued to develop intermittently through the Labor Day weekend (also marked by heavy rains). Brown patch symptom expression on creeping bentgrass fairways was quite severe compared to the previous 4 or 5 years.

Spring and summer of 2003 were also notable for the low incidence of summer patch and anthracnose on bluegrass species, and the absence of any confirmed reports of gray leaf spot on perennial ryegrass. Confirmed autumn diseases included leaf rust and dollar spot, both of which remained active into early November.

Weed Science, *Tom Bauman, Professor, Botany & Plant Pathology; Bill Johnson, Assistant Professor, Botany & Plant Pathology; and Glenn Nice, Weed Diagnostician, Botany & Plant Pathology, Purdue University*

We received a number of corn and soybean herbicide injury reports during 2003. In most cases, the cause of the injury was related to stressful weather conditions which reduced the plant's ability to metabolize or degrade the herbicide. In some cases, because corn was planted at such a rapid rate in late April and early May before rainy weather set in, growers and custom

applicators were not able to spray soil-applied herbicides before the crop emerged. As a result, many soil-applied products were put on emerged corn. This resulted in the corn plant receiving a much higher dose of herbicide than if the products were applied to the soil, and diluted before being absorbed by the corn plant.

Herbicide Injury Issues

Atrazine/chloroacetamide injury. A few cases of this type injury were observed when the products were applied to emerged corn and adjuvants, 2,4-D, simazine (Princep, others) were added to the mixture to control emerged weeds. In other cases the atrazine/chloroacetamide premix was applied in a liquid fertilizer solution to emerged corn. Symptomology observed was short, stunted corn with necrotic tissue on the leaf edges and lower leaves burned off. In addition, larger plants showed buggywhipping and twisted whorls. Although some stand loss was been observed in certain fields, in most cases the corn grew out of this injury when warm, sunny days return. The reasons for this occurrence include the following: 1) Most labels indicate that mixtures of 2,4-D with atrazine premixes should be applied 7-14 days before planting or 3-5 days after planting, but before corn emerges. These precautions are for two reasons: First, 2,4-D is very water soluble and has a relatively short half live. Applications at corn planting can result in the product being washed down into the seed furrow if enough precipitation is received. This results in a high concentration of herbicide around the corn seed and injury. Second, 2,4-D formulations tend to be somewhat oily and can function as a crop oil concentrate and increase uptake of other herbicides. 2) The use of liquid fertilizer solutions as the carrier is discouraged on most of the labels of these products if corn has emerged. Liquid fertilizer solutions can also act as adjuvants to increase uptake of herbicides. Liquid fertilizer solutions will also cause injury symptoms on corn in addition to acting as an adjuvant.

Lumax/Callisto and Balance Pro injury. Callisto is one of the components in Lumax. We observed a few cases of bleached corn caused by these products. Injury was typically located in low or wet areas on the field and on sandy soils. Symptomology observed was short, stunted plants with chlorotic tissue on older leaves with new leaves appearing normal in color. Injury was occasionally more severe when these products were applied with higher rates of atrazine (1.5 lb ai/A or more). Injury from these herbicides is typically more noticeable than most other herbicide families. Recovery and yield potential was good if less than 30% of the plant tissue was affected (chlorotic). Reasons for this injury include the following: 1) The bleaching or chlorosis injury can also occur on emerged plants if hard rains drive the corn leaf tips into the soil. Both Balance Pro and Callisto have relatively high water solubilities and can be taken up by corn foliage after corn emergence. 2) Balance Pro injury potential is higher on sandy soils with high pH. The Balance Pro label has very specific instructions regarding appropriate use rates on various soil textures and organic matter contents. The use rate matrix reminds me of the table in the Bladex label from years past. Essentially, we should think of Balance Pro in a similar manner as Bladex and pay very close attention to the rate instructions. This issue of use rate can be particularly difficult to interpret on the sand/muck soils in northern Indiana. 3) The activity of both herbicides is increased when used with atrazine. Although the synergistic activity of these combinations is valuable in terms of weed control, it can also cause higher incidences of crop injury.

Balance Pro and Callisto carryover to soybean. There were a number of fields in northern Indiana that showed signs of Balance Pro or Callisto carryover injury. The injury symptoms consisted of short, stunted plants with occasional bleaching and chlorosis of leaves. Injury was most prevalent on sandy, low organic matter fields that also had low pH (below 6.0). Soybean injury became noticeable during the hot dry spells of early July, and late July when soil moisture became limiting after prolonged periods of rainy weather and wet soil conditions. A few fields

that contained more than one variety showed that some varieties appear to be more sensitive to these herbicides than others. In most cases the injury was cosmetic and yield was not affected.

Weed Issues

Horseweed (aka marestail) is weed common to Indiana and much of the Midwest. It can emerge in the fall or spring and is listed as one of the more difficult weeds to control and increasingly problematic according to Indiana farmers surveyed between 1996 and 2000. A characteristic of horseweed is that it is well adapted to no-till systems typifing the response of winter annuals to the elimination of preplant tillage and subsequently infesting summer annual crops. Horseweed generally emerges in the fall (August – October), overwinters as a rosette, and produces seed the following spring or summer. However, some researchers reported that horseweed could emerge well into the spring and that spring emergence should be considered in no-till management systems.

Horseweed having an 8 to 13-fold resistance compared to a susceptible population was discovered in 2000 in Delaware in continuous no-till soybean production. Since this first report, glyphosate-resistant (GR) horseweed has also been discovered in Tennessee, Kentucky, Maryland, New Jersey, Ohio, Indiana, and Arkansas in similar cropping situations. Biotypes resistant to glyphosate and cloransulam are suspected in southern Indiana and northern Ohio, respectively.

Horseweed growth patterns following glyphosate application will differ between susceptible and resistant populations.

- Susceptible plants will have "yellowing" in the tops or meristematic region which will eventually spread throughout the plant with the growing point dying within a few weeks.
- Resistant plants may be initially stunted and even display some yellowing if the glyphosate rate was high enough. The growing point will rarely die, but if it does, then the bottom of the plant may generate branches resulting in a bushy plant with multiple growing points. This can also be observed when susceptible plants are allowed to get to big (typically more than 1 ft tall prior to initial herbicide application).
- Often glyphosate-resistant and susceptible plants can be found beside each other and interspersed throughout a field. If horseweed growth was uniform and most of the plants were the same size at the time of application then surviving plants in the midst of dead horseweed should be considered resistant.

Where are glyphosate- resistant horseweed populations located in Indiana? Four sites in four southeast Indiana (Bartholomew, Clark, Jackson, and Washington counties) have confirmed populations of glyphosate-resistant horseweed. Resistance is also suspected in Jefferson, Jennings, Scott, Shelby, Decatur, and Ripley counties in southwest Indiana. No populations have been reported in southwest or northern Indiana north of Indianapolis.

Ornamental Plant Disease Problems, *Paul Pecknold, Professor, Botany & Plant Pathology, Purdue University*

Wet, cool weather during the time of early leaf development resulted in a high incidence of shade tree anthracnose on ash, sycamore, oak and maple. Ash and sycamore showed moderate defoliation, however affected trees recovered without significant problems. As usual, apple scab was also evident during the spring period, but did not reach the epidemic levels that it has over the past few years. However, scab-susceptible crabapples showed extensive leaf yellowing and drop by the middle of June. Other prominent leaf diseases included Guignardia leaf blotch of horse chestnut and buckeye; powdery mildew of lilac, rose and susceptible shade trees; and cedar hawthorn rust. Of interest was the lack of blister leaf of oak and cedar quince rust, two diseases that have been fairly prominent over the past few years. Sphaeropsis tip blight continues to

devastate pine plantings throughout the state; especially Austrian and Scotch pines. A less obvious effect of the early wet conditions was poor root growth, especially for trees and shrubs in poorly drained locations. The resulting plant stress caused scorch, dieback/decline, and chlorosis to be common occurrences on many ornamentals. From this, it is anticipated that we will see an increase in Phytophthora and Pythium problems over the next few years.

Household Insects, Honeybees, Insects on Fruits and Vegetables, *Tim Gibb, Insect Diagnostician, Entomology, Purdue University*

Fruits and Vegetables:

Overall, insect pests attacking fruits and vegetables were at lower than normal levels in 2003. The unusual weather patterns resulted in the appearance of several rarely seen pests, but most of the major pests did not reach normal levels. The cool, wet spring resulted in higher than normal root and seed maggot problems and some aphid species were present in high numbers. Other common pests such as diamondback moth, European corn borer, striped cucumber beetle, corn earworm, and European red mite were present in unusually low numbers in 2003.

Honey Bees:

Honey bee problems continued during the summer and fall of 2003. Rains during the spring, summer and fall decreased the number of sunny days during which bees work and also interfered with the plant/bee interactions (esp. goldenrod and fall aster blooms) such that by the time they were producing nectar and pollen, it was too cold for the bees to work efficiently. Due to these and other constraints, many bees failed to make honey in the fall after the first harvest in August. As a result, many hives had very low reserves of honey going into winter and required feeding with sugar syrup. We can expect some substantial losses of bee hives in Indiana this winter due to starvation.

Household pests:

2003 was marked with an increase in homeowner complaints of insect nuisance pests. The unprecedented rains throughout the state increased the habitat for mosquito populations in low lying areas. More mosquitoes were found throughout the spring and summer months, however, certain species of mosquito such as Culex pipiens, (the major mosquito vector of west niles virus) had lower populations in 2003 than anticipated. Interestingly, the reduced Culex population was also thought to be rain related. The behavior of Culex is that it breeds in organically enriched stagnant pools of water. The flooding rains diluted and washed out such preferred habitats, resulting in decreased populations of Culex and a corresponding decrease in the incidence of west niles virus both in horses and in humans during 2003.

Nuisance insect pests in and around homes was higher in 2003 than in most years. Wet conditions in areas where high organic matter exists, fostered a longer and more intense battle with millipedes, sowbugs and pillbugs, especially during the spring and early summer time. Homeowners often complained of these nuisance pests covering sidewalks, patio and garage floors and even entering into basements through window cracks and utility ports.

Incidence of syrphid flies and Asian lady beetles attracted to homes in the late summer and fall is thought to be directly associated with the invasion of soybean aphid throughout the state. Syrphid flies were attracted to homes and yards in unprecedented numbers in late summer of 2003. These flies resemble sweat bees and elicited fears of being stung by many people. The reality of course, was that these are flies, incapable of stinging and presented an annoyance only. Asian lady beetles have become a nuisance pest throughout the eastern United States in recent years. Populations in the mid-west had been abating in recent years until 2003. Increased food resources (principally aphids) in 2003 is thought to have triggered a second resurgence of these pests. Homes and communities near soybean fields were especially troubled by both syrphid flies

and Asian lady beetles in 2003.

Cluster flies were much more prevalent inside homes during the fall of 2003. It is likely that the increased precipitation of 2003 directly influenced the abundance of earthworms of which this fly is parasitic. The increase of earthworms then led to higher cluster fly populations. These sluggish 'house fly-like' insects will be troublesome throughout the winter and into the spring or 2004.

Boxelder bugs were more common during 2003 than in previous years. The onset of cool weather in late summer and early fall signaled the beginning of the migration of these nuisance pests toward buildings where they seek overwintering shelter inside. Many more complaints of boxelder bugs were received during 2003 than usual.

More insects near homes, patios and gardens also gave rise to an increased population of spiders. Many orb-web weaving spiders inhabited windows sills, bushes, and garages in 2003, likely in response to the greater insect abundance that they prey upon.

Overall, turgrass insect pests were comparatively moderate during 2003. Japanese beetle damage was very spotty, some locations having increased problems and other locations experiencing reduced levels of Japanese beetle pressure compared to previous years. Increased precipitation throughout the state kept turfgrasses greener in the summer of 2003. This diluted the usual concentration of Japanese beetle egg laying to areas of irrigated turfgrass, and thus decreased the amount of turfgrass damage. However, Hoosiers should not be lulled into thinking that the populations were less. More normal weather conditions in 2004 may well yield even greater populations of Japanese beetles than ever.

Agronomic Crops – Insect Problems, John *Obermeyer, Integrated Pest Management Supervisor, Entomology, Purdue University*

Indiana's most prevalent insect pest in soybean for 2003 was the soybean aphid; an insect that has only been present in the Midwest for four years. Though this pest has been shown to successfully overwinter in the state, the outbreak that occurred this past season seemed to be stimulated by an influx of winged aphids carried on weather fronts from states to the north and west in early August. An already stressed and developmentally delayed soybean crop from a cool, wet spring and summer became infested with this sap-sucking insect during a dry period of the season. The aphid established and reproduced at an exponential rate, in part due to early low numbers of natural enemies (especially the Asian lady beetle). Yield comparisons where producers sprayed with insecticides saw two to twenty-two bushels per acre advantage to the untreated checks but most reported a 6-8 bushel difference.

The moisture extremes experienced in most areas of Indiana certainly influenced populations of corn insect pests. Wet soils and flooding during western corn rootworm egg hatch was detrimental to many larvae attempting to infest corn roots. Root removal by this pest was masked by root re-growth, possibly by abundant soil moisture during the plant recovery period. Not only was there less root damage, plant lodging, and yield reductions from this pest, but fewer beetles were present in soybean fields during the time of mating and egg laying. This should result in less risk of larval damage to corn for the 2004 season.

Ornamentals – Insect Problems, *Cliff Sadof, Professor, Entomology, Purdue University*

Outbreaks of half wing geometers and linden looper were found in south central Indiana in Jackson, Washington, Floyd, Perry, Harrison, Crawford and Clark counties this spring. Further to the east toward Madison, an outbreak of forest tent caterpillar defoliated ridge tops along the Ohio River. More red elms (Ulmus rubrum) continue to enter an age class that is more susceptible to outbreaks of Dutch Elm Disease.

A late frost in April and a hot wind in Early May caused widespread scorch in wide range of conifers in landscapes and Christmas tree plantations.

The rainy weather this spring stopped long enough during May and June to foster a healthy gypsy moth population. This year's survey of gypsy moth larvae in northern Indiana of 7 sites failed to find a single caterpillar with Entomophaga maiamaga in parts of the state where we have previously found the fungus. Although outbreaks of gypsy moth barely defoliated a dozen trees in the Fort Wayne area, urban residents were quite concerned about sharing their home yards with gypsy moths for the first time.

Widespread informal reports of gypsy moth egg masses throughout northern in Indiana counties suggests that the gypsy moth population is poised to flare under appropriate weather conditions.

Despite a cold January through March, marginally hardy species such as bagworm and mimosa webworm continued to thrive in north of their traditional areas.

Heavy rains over the 4th of July weekend dumped over 10" of rain along the Wabash Valley causing a 50-year flood event in North Central Indiana. Another 10" of rain fell on Labor Day weekend in Indianapolis causing more record flood events.

Cool weather in July fostered an outbreak of soybean aphid in much of northern Indiana. This was closely followed by complaints of slow flying" sweat bees" in much of the state in late August. These sweat bees turned out to be that turned out to be syrphid flies whose population boomed due to the presence of so many aphid prey. Aphids in the landscape turned out to be somewhat normal.

Cool weather in July and early August failed to produce substantial flights of Japanese beetles. Although defoliation was spotty as usual, overall it seemed to be lighter than normal. White grubs were hard to find in many turf research plots this August.

August also brought about another outbreak year of fall webworms. The outbreak seems to have spread from the north to as far south as Evansville. Dry weather in August caused a good scare for expression of borer and mite infestations.

Emerald ash borer is now only 2 miles east of Indiana in Hicksville, OH. Surveys of injured ash show in Indiana to date only show outward signs of native borers, with one exception. A regulatory action was taken in Winchester, IN, where 1 tree with EAB damage symptoms was detected. Live beetles or larvae have yet to be found on trees in our state.

Heavy rains and generally cool weather seemed to dampen outbreaks of both warm season and cool season mites. Eriophyid mite problems on baldcypress continue to be problematic.

Small Fruits, *Bruce Bordelon, Associate Professor, Horticulture and Landscape Architecture, Purdue University*

The fall and winter of 2002-2003 were fairly normal. September was mild and wet. First frosts generally occurred in mid October. The winter was colder than we have experienced in recent years, but not much below normal. The first cold snap occurred in early December with lows in the single digits and teens. The coldest temperatures of the winter occurred at the end of January, with lows about -15F across northern and central areas, and from -10 to 0F across the southern half of the state. The coldest recorded location was Crawfordsville at -25F and the mildest location was Tell City at 11F.

Scattered frosts occurred in late April and early May, which caused considerable damage in certain areas. Grapes and apples were hardest hit, but peaches, strawberries, blueberries, and brambles also were damaged in some areas.

Overall, temperatures were relatively cool during the spring, which delayed plant growth

and caused reduced fruit set in some crops. In general, crops matured about a week later than normal.

Rainfall was fairly well distributed in most areas. Southeast Indiana received excessive rains in the spring, which caused some problems. A few major rainfall events caused problems as well. An early July storm across northern Indiana led to major flooding along the Wabash and Tippecanoe rivers. Another major storm dumped up to 6 inches of rain over the Labor Day weekend.

Small Fruit and Grapes:

The winter temperatures caused damage to grapes and brambles this year. The frosts in May had mixed results. Some sites were severely damaged, especially on early budding varieties. Other plantings escaped significant injury.

Grapes

Early grape varieties such as Marechal Foch suffered bud damage in many areas from the April and May frosts. Yields were reduced considerably in some vineyards. The worst damage was in central areas where frost occurred after initiation of shoot growth.

Grape phylloxera (foliar form) was widespread this year. Infestation was severe enough to cause considerable defoliation on some varieties. Japanese beetles continue to be a problem in vineyards in many parts of the state and emergence seems to continue throughout the season. Live adults were seen in mid September in the Lafayette area. The Multi-colored Asian Lady Beetle was a significant problem in harvested grapes this year. The late grape ripening coincided with soybean senescence, so beetles moved onto grapes prior to harvest, especially in central and northern areas. Many growers applied insecticides to control this pest.

Excessive rains over the Labor Day weekend caused significant loss of fruit quality in areas where fruit ripening coincided with the heavy rains. Later ripening varieties, and northern and central areas had fewer problems.

Blueberries

Blueberry yields were above average with good fruit quality and good fruit size on most varieties. Some damage occurred from the May frosts in the major production areas. Harvest started a few days later than normal. Japanese beetles were as bad as ever and continue to plague growers. Loses are fairly high to this pest and control is very difficult due to PHIs and REIs of materials registered for use.

Brambles

Blackberries and raspberries both suffered from the winter injury in northern areas. Good yields were obtained only where freeze damage was not severe. Japanese beetles continue to be the worst insect problem, though tarnished plant bug has been noted on fall-bearing types. Multicolored Asian lady beetles also have been noted on overripe fruit.

Strawberries

The strawberry crop was good across the state this year where growers protected from frosts. Fruit size and quality were excellent in most areas due to the cooler than normal growing season. Eastern Flower thrips showed up again, but did not cause a major problem this season. Black root rot complex continues to be a major limiting factor to longevity in matted row plantings.

Ornamentals – Noninfectious Problems, *Bruno Moser, Professor, Horticulture and Landscape Architecture, Purdue University*

Numerous samples of both evergreen and deciduous species showing dieback and foliar browning in late summer and early fall were sent in this year. In most cases, damage was due to flooding conditions and soil waterlogging brought on by extensive summer rains and high

temperatures. Foliar damage was secondary to root damage due to exclusion of soil oxygen and death of young roots, which made it difficult for them to take up sufficient water and nutrients to sustain the foliage. In many cases, these plants will continue to decline over the coming months. Many of these samples were from mature "established" plants in the landscape that had not experienced this extent of summer waterlogged soil in the past.

A large number of samples also demonstrated dieback of the shoots and death of the plants due to girdling roots and root flares being too deep in the soil. These problems occurred on both recently transplanted as well as established trees. An effort to educate both nursery growers and landscape contractors to be aware of these problems and adapt practices to minimize them in the future is underway on a national level.

Problems due to mulch being applied too deep and "volcano" mulching around tree trunks were also numerous this year. Symptoms of chlorosis and dieback due to damage to the root system and transport tissues were evident.

A number of tree and conifer samples displaying dieback and death were diagnosed as due to waterlogged soil and accompanying root system damage from automated turf irrigation systems. Although shallow rooted turf can withstand frequent irrigation, deeper rooted shade trees and conifers growing in the same landscape cannot thrive under these conditions. Dieback and death occurs from exclusion of oxygen in the root zone with damage to the root system. The maximum of one inch of irrigation one time per week and then only during dry spells needs to be encouraged to minimize this growing problem.

This past year was dominated of root system damage from waterlogged soils due to several causes, both natural and man made. Unfortunately, the effects often showed up on older "established" landscape plants.

APPENDIX C – 2003 SAMPLE SUMMARY

How to Read the 2003 Sample Summary

The summary lists on the following pages are divided into sections according to type of information provided. The first pages contain the host list, which is the list of diseases and insects found in association with the given plant species (hosts). The last few pages contain the specimens sent in for identification, as when an individual insect was submitted.

The host list is grouped by the commodity to which the associated sample belonged. The commodity groups are: agronomic crops, forages, small and tree fruits, herbaceous and woody ornamentals, turf and vegetables. Within each commodity group the hosts are listed alphabetically by common name when a common name exists. For each host, there are three columns of information. The first column lists which specific agent caused the problem. The second column contains the manifestation of the problem it is was disease related (i.e. symptoms or common name of the disease), or the common name of the pest if the problem was arthropod related. The number of samples received that were attributed to that agent is listed in the third column.

Each diagnostician assigns a diagnostic level of confidence (confirmed, most likely, possibly, not enough information to diagnose) to each diagnosis. This Summary is only a partial listing of the total number of diagnoses made for 2003 since only the confirmed diagnoses for infectious diseases, insects and weeds are included. For abiotic problem diagnoses (those problems caused by non-living factors) 'most likely' and 'possibly' levels of diagnostic confidence are included.

Agronomic Crops

Barley – *Hordeum vulgare* (4 samples)

Disease		
Helminthosporium sp.	leaf spot	1
	seedling blight	1

Corn – *Zea mays* –field & popcorn (289 samples)

Abiotic problems		
Chemical		
ALS herbicide injury	bottle-brush roots	2
	foliar discoloration	1
	pinched ears	1
ALS-like symptoms	chlorosis	1
	shortened internodes	1
Chloroacetamides	foliar discoloration	1
	leaf deformity	1
Crop oil concentrate	leaf burn	1
Growth regulator-type	foliar distortion	2
Herbicide injury	bleaching	1
	chlorosis	1
	dieback	1
	foliar discoloration	7
	leaf burn	1
	poor growth	2
Triazine injury	foliar discoloration	3
Undetermined	uneven growth	1
Cultural		
Liquid fertilizer burn	foliar discoloration	2
Environmental		
Poor growing conditions	foliar discoloration	10
	uneven growth	2
Root stress	foliar discoloration	1
Strong winds	weather damage	1
Nutritional		
Nitrogen deficiency	stunting & yellowing	1
Noninfectious		
Undetermined	chlorosis	1
	distorted stalk tissue	1
	foliar discoloration	12
	mesocotyl damage	1
	purpling	2
	stunting	2
	twisted whorl	1
	uneven growth	2
Disease		
Bipolaris sp.	Northern corn leaf spot	28
Bipolaris maydis	Southern corn leaf blight	2
Cercospora zeae maydis	gray leaf spot	176
Colletotrichum graminicola	anthracnose	16
Exserohilum turcicum	Northern corn leaf blight	33
Fusarium sp.	root rot	3
	seedling blight	1
	stalk rot	1
Kabatiella zeae	eyespot	6
Pantoea stewartii	Stewart's disease	43
Peronosclerospora sorghi	sorghum downy mildew	1
Phyllosticta sp.	leaf spot	3
Puccinia sorghi	common rust	103
Rhizoctonia sp.	root rot	1
Rhizoctonia sp	seedling blight	1
Secondary fungi	stalk discoloration	1
Ustilago maydis	corn smut	2
Arthropod		
Feeding injury	foliar discoloration	1
Papaipema nebris	common stalk borer	1
Miscellaneous		
Healthy plants	no problem	6
Insufficient sample/information		12

Soybeans – *Glycine max* (105 samples)

Abiotic problems		
Chemical		
Growth regulator-type	cupped leaves	5
	foliar distortion	2
	leaf & shoot distortion	1
	stem callusing	2
	strapping & cupping of leaves	1
Herbicide injury	chlorosis	1
	foliar distortion	1
	poor growth	1
Triazine carryover	chlorosis	3
Cultural		
Compaction	stunting	2
Deep planting	swollen hypocotyls	1
Environmental		
Hail	stem wound	1
Nutritional		
Low pH	stunting	2
Low pH, compaction	stunting	1
Manganese deficiency	chlorosis	1
Noninfectious		
Undetermined	foliar discoloration	1
	leaf scorch	1
	vein distortion	1
	yellowing	1
Disease		
Cercospora kikuchii	leaf blight	18
Cercospora sojina	frogeye leaf spot	8
Colletotrichum sp.	anthracnose	12
Diaporthe/*Phomopsis* spp.	pod & stem blight	1
Macrophomina phaseolina	charcoal root rot	3
Fusarium sp.	root rot	5
Fusarium solani	sudden death syndrome	1
Peronospora manshurica	downy mildew	5
Phytophthora sp.	blight	1
	root rot	2
	root rot & stem canker	3
*Pseudomonas savastano*i pv. *glycinea*	bacterial blight	3
Pythium sp.	root rot	2
Rhizoctonia solani	root and stem rot	3
	stem canker	3
Septoria glycines	brown spot	21
Xanthomonas axonopodis pv. glycinea	bacterial pustule	2
Arthropod		
Aphis glycines	soybean aphid	1
Feeding injury	chlorosis	1
Nematodes		
Heterodera glycines	soybean cyst	12
Miscellaneous		
Healthy plants	no problem	1
Insufficient sample/information		9

Wheat – *Triticum aestivum* (14 samples)

Abiotic problems		
Chemical		
Herbicide injury	chlorosis	1
	dieback	1
	foliar discoloration	1
Cultural		
Shallow planting	stunting	2
Environmental		
Frost injury	foliar discoloration	2
Nutritional		
Low pH	stunting	1
N deficiency poor growth		1

Wheat – cont.

Disease		
Barley Yellow Dwarf Virus	leaf mosaic	1
Rhizoctonia sp.	root rot	1

Forages

Alfalfa – *Medicago sativa* (16 samples)

Abiotic problems		
Chemical		
Herbicide injury	chlorosis	1
Cultural		
Poor site conditions	stunting	1
Disease		
***Aphanomyces euteiches*	root rot	1
Colletotrichum sp.	anthracnose	1
Fusarium sp. and other fungi	crown and root rot	4
Mycoleptodiscus sp.	crown & root rot	1
Rhizoctonia sp.	root rot	1
Sclerotinia sp.	stem rot	1
Stemphyllium sp.	leaf spot	1
Various fungi	crown and root rot	2
	leaf spot	4
Arthropod		
Empoasca fabae	potato leafhopper	1
Sitonahispidulus	clover root curculio	4
Insufficient sample/information		2

Orchardgrass – *Dactylis glomerata* (1 sample)

Abiotic problems		
Environmental		
Freeze injury	collapsed stem tissue	1
Disease		
Colletotrichum sp.	anthracnose	1
Fusarium sp.	crown rot	1

Switchgrass – *Panicum virgatum* (3 samples)

Abiotic problems		
Environmental		
Saturated soils	root rot	1
Disease		
Pythium sp.	root rot	1
Rhizoctonia sp.	root rot	1

Unknown host – (1 sample)

Arthropod		
Leptoptema dolabrata	meadow plant bug	1

***New Report for Indiana**

Fruits, Small

Grape – *Vitus* sp. (1 sample)

Abiotic problems		
Chemical		
Growth regulator-type injury	foliar distortion	1

Raspberry, black - *Rubus occidentalis* (3 samples)

Abiotic problems		
Undetermined	dieback	1
Disease		
Elsinoe veneta	anthracnose	1

Fruits, Tree

Apple – *Malus* sp. (4 samples)

Abiotic problems		
Chemical		
Herbicide injury	foliar discoloration	1
Environmental		
Wind injury	foliar discoloration	2
Disease		
Botryosphaeria sp.	black rot	1
Botryosphaeria obtuse	frogeye leaf spot	1

Cherry, black – *Prunus serotina* – (2 samples)

Abiotic problems		
Herbicide injury	foliar discoloration	1
Disease		
Blumeriella sp.	leaf spot	1

Nectarine – *Prunus perisca* var. *nucipersica* – (1 sample)

Disesae		
Cladosporium carpophilum	scab	1

Peach – *Prunus persica* – (6 samples)

Abiotic problems		
Environmental		
Frost damage or poor pollination	poor fruit development	1
Disease		
Cladosporium carpophilum	scab	2
Leucostoma sp	canker	1
Monilinia sp.	brown rot	1
Taphrina deformans	peach leaf curl	1

****Pear** (fruit)– *Pyrus* sp. (3 samples)

Phytophthora sp.	Phytophthora	3

Pear – (fruit bearing) (4 samples)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1
Disease		
Erwinia amylovora	fire blight	1

Persimmon – *Diospyros virginiana* – (2 samples)

Arthropod		
sp.	cynipid wasp	1

**Pear fruit used as bait for disease check at Vallonia State Nursery 3

Herbaceous Ornamentals (including herbaceous house plants)

Aeschynanthus – *Aeschynanthus* sp. (3 samples)

Abiotic problems		
Undetermined	foliar discoloration	3

Ageranthemum – *Ageranthemum* sp. (1 sample)

Insufficient sample/information		1

Anthurium – *Anthurium* sp. (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Ajuga – *Ajuga* sp. (1 sample)

Arthropod		
sp.	fungus gnat larvae	1

Bacopa – *Sutera difusus* (1 sample)

Abiotic problems		

Bacopa – cont.

Abiotic problems -˜		
Nutritional		
High soluble salts	foliar discoloration	1

Basket plant – *Aeschynanthus* sp. (3 samples)

Disease		
Impatiens Necrotic Spot Virus	leaf mosaic	1
	ring spot	2

Begonia – *Begonia* sp. (6 samples)

Disease		
Impatiens Necrotic Spot Virus	leaf mosaic	1
	ring spot	1
Pythium sp.	blight	2

Begonia, Rex – *Begoniaceae x rex-cultorum* (5 samples)

Disease		
Xanthomonas campestris	bacterial leaf spot	3

Begonia, tuberous – *Begonia xtuberhybrida* (1 sample)

Disease		
Pythium sp	root rot	1

Bellflower – *Campanula* sp. (1 sample)

Disease		
Impatiens Necrotic Spot Virus	ring spot	1

Blazing star – *Liatris spicata* (1 sample)

Disease		
Sclerotinia sp	white mold	1

Boltonia – *Boltonia* sp. (1 sample)

Arthropod		
Acarina tetranychidae	spider mites	1

Calibrachoa – *Calibrachoa* sp. (1 sample)

Disease		
Pythium sp	root rot	1

Calathea – *Calathea* sp. (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Chrysanthemum – *Chrysanthemum* sp. (14 samples)

Abiotic problems		
Cultural		
Lack of nutrients & excessive moisture	foliar discoloration	1
Poor growing conditions	stunting	1
Environmental		
Hail damage	stem injury	1
Disease		
Alternaria sp.	leaf spot	1
Fusarium sp.	root and stem rot	1
Pythium sp.	root and stem rot	5
Phytophthora sp.	blight	1
Pseudomonas cichorii	bacterial leaf spot	2
Arthropod		
Frankliniella occidentalis	western flower thrips	1
sp.	thrips	1

Cockscomb – *Celosia cristata* (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	stunting	1

Coleus – *Coleus* sp. (3 samples)

Disease		
Disease – cont.		
Impatiens Necrotic Spot Virus	foliar discoloration	1

Columbine – *Aquilegia* sp. (1 sample)

Disease		
Thielaviopsis sp.	root rot	1

Cordyline – *Cordyline* sp.(1 sample)

Arthropod		
Mycetophillid sp.	fungus gnat larvae	1
Insufficient sample/information		1

Cyclamen – *Cyclamen* sp. (1 sample)

Disease		
Erwinia carotovora	soft rot	1
Arthropod		
sp.	fungus gnat larvae	1

Daylily – *Hemerocallis* sp.(5 samples)

Abiotic problems		
Cultural		
Undetermined	foliar discoloration	1
Disease		
Collecephalus hemerocalli	leaf streak	3

Daisy, Gerbera – *Gerbera jamesonii* (5 samples)

Arthropod		
sp.	thrips	1

Dianthus – *Dianthus* sp. (1 sample)

Disease		
Colletotrichum sp.	anthracnose	1
Rhizoctonia sp.	stem rot	1

Diascia – *Diascia x hybrida* (2 samples).

Disease		
Botrytis cinerea	blight	1

Fern, Boston – Nephrolepis exaltata (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Fuchsia – *Fuchsia* sp. (2 samples)

Disease		
Botrytis cinerea	blight	2
Cylindrocladium sp.	rot	1
Phytophthora sp.	blight	1

Gay Feather – *Liatris spicata* – (2 samples)

Disease		
Pythium sp.	root rot	1

Gazania – *Gazania rigens* – (1 sample)

Disease		
Sclerotinia sclerotiorum	crown rot	1

Geranium, ivy – *Pelargonium peltatum* (6 samples)

Abiotic problems		
Environmental		
Water imbalance	edema	1
Disease		
Pythium sp.	root rot	1

Geranium, zonal – *Pelargonium x hororum* (183 samples)

Abiotic problems		
Nutritional		
Low pH	foliar discoloration	1
Nutritional/cultural		
Undetermined	foliar discoloration	1

Geranium, zonal – cont.

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1
	leaf cupping	1
Disease		
Acidovorax sp.	leaf spot	1
Botrytis sp.	blight	1
Botrytis sp./*Cladosporium* sp.	fungal growth	1
Cladosporium sp	fungus	1
Pythium sp.	root rot	4
Ralstonia solanacearum	Southern wilt	10
Rhizoctonia sp..	root rot	1
Xanthomonas campestris pv.*pelargonii*	bacterial blight	3
	leaf spot	1
Insufficient sample/information		1

Heliotrope – *Heliotrope* sp. (2 samples)

Disease		
Botrytis cinerea	blight	1
Sclerotinia sp.	crown & stem rot	1

Hibiscus – *Hibiscus rosa-sinensis* (3 samples)

Abiotic problems		
Environmental		
Improper watering	edema	1
Arthropod		
Acarina tetranychidae	spider mite	1
sp.	aphid	2

Hosta – Hosta sp. (22 samples)

Abiotic problems		
Cultural		
Undetermined	foliar discoloration	1
	poor growth	1
Noninfectious		
Stress	leaf scorch	1
Disease		
Botrytis cinerea	blight	3
Colletotrichum sp.	anthracnose	6
Fusarium sp.	crown rot	1
	root rot	2
Impatiens Necrotic Spot Virus	ringspot	3
Pythium sp.	root rot	1
Sclerotinia sp.	blight	1
Arthropod		
sp.	fungus gnat	1
Nematodes		
Aphelenchoides sp.	foliar nematode	2

Impatiens – Impatiens sp. (6 samples)

Abiotic problems		
Noninfectious		
Undetermined	stunting	1

Impatiens, New Guinea – Impatiens sp. (7 samples)

Arthropod		
sp.	mites	1

Iris, Siberian – *Iris sibirica* (1 sample)

Arthropod		
sp.	fungus gnat	1

Ivy – *Hedera* sp. (3 samples)

Disease		
Anthracnose sp.	stem canker	1
Phytophthora sp.	root and stem rot	1
	stem rot	1
Xanthomonas campestris	bacterial leaf spot	1

Ivy – cont.

Arthropod		
sp.	fungus gnat	1

Ivy, English – *Hedera helix* (3 samples)

Disease		
Phytophthora sp.	blight	1

Ivy, Swedish – (Plectranthus sp. (1 sample)

Disease		
Rhizoctonia sp.	stem and leaf blight	1

Lavender – *Lavandula* sp. (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1
Disease		
Pythium sp.	root rot	1

Licorice plant – *Helichrysum petiolatum* (3 samples)

Disease		
Pythium sp	root rot	1

Lupine – *Lupinus* sp. (2 samples)

Abiotic problems		
Nutritional		
Nutrient deficiency	foliar discoloration	1

Lily, Easter – *Lillium* sp. (2 samples)

Arthropod		
sp.	melon aphids	1

Lily, Oriental – *Lillium* sp.(1 sample)

Disease		
Rhizoctonia sp.	foliar blight	1

Lily, Peace – Spathiphyllum sp. (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	leaf scorch	1

Mandevilla – *Dipladenia* sp. (1 sample)

Insufficient sample/information		1

Million Bells – *Calibrachoa* sp. (2 samples)

Abiotic problems		
Nutritional		
High soluble salts	foliar discoloration	1
Insufficient sample/information		1

Nemesia – *Nemesia* sp. (1 sample)

Disease		
Botrytis sp.	blight	1

Nicotiana – *Nicotiana* sp. (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Nierembergia – *Nierembergia* sp. (1 sample)

Disease		
Botrytis cinerea	blight	1
Rhizoctonia sp.	leaf blight	1

Obedient plant – *Physostegia* sp. (1 sample)

Arthropod		
Syngrapha falcifera	celery looper	1

Osteospermum – *Osteospermum* sp. (1 sample)

Disease		

Osteospermum – cont.

Disease		
Botrytis cinerea	blight	1

Pachysandra – *Pachysandra* sp. (1 sample)

Disease		
Volutella pachysandricola	blight	1

Pansy – *Viola x wittrockiana* – (20 samples)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1
	leaf curl	3
	poor rooting	1
Disease		
Phytophthora sp.	crown rot	1
Thielaviopsis sp.	root rot	5

Peony – *Paeonia lactiflora* (4 samples)

Disease		
Cladosporium paeoniae	leaf blotch	2

Petunia – *Petunia x hybrida* (21 samples)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1
	foliar distortion	2
Disease		
Pythium sp.	root rot	1
Phytophthora sp.	stem rot	1
Rhizoctonia sp.	crown rot	2
Thielaviopsis sp.	root rot	8
Arthropod		
sp.	fungus gnat	1
sp.	thrips	1

Petunia, wave – *Petunia* sp. (5 samples)

Disease		
Thielavopsis sp.	root rot	2
Arthropod		
sp.	thrips	1

Phlox, creeping – *Phlox sublata* (2 samples)

Disease		
Colletotrichum sp.	anthracnose	1
Pythium sp.	root rot	1
Rhizoctonia sp.	aerial blight	1
Thielaviopsis sp.	root rot	1

Pincushion flower – *Scabiosa* sp. (2 samples)

Disease		
Thielaviopsis sp.	root rot	1
Arthropod		
sp.	fungus gnat larvae	1

Poinsettia – *Euphorbia pulcherrima* (30 samples)

Abiotic problems		
Noninfectious		
Partial branch detachment	wilt	1
Undetermined	bract discoloration	1
Noninfectious		
	chlorosis	1
	foliar discoloration	6
Disease		
Botrytis cinerea	blight	4
Pythium sp.	root rot	2
	root & stem rot	2
Arthropod		
sp.	fungus gnat larvae	1

Primrose – *Primula vulgaris* (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	leaf spotting	1

Rose, Japanese – *Kerria japonica* (2 samples)

Abiotic problems		
Environmental		
Root stress	dieback	1
Disease		
Blumeriella kerriae	leaf spot	1

Rose, miniature – *Rosa* sp. (6 samples)

Disease		
Botrytis cinerea	blight	1
Cylindrocladium sp.	root rot	1
Peronospora sparsa	downy mildew	4
Rhizoctonia sp.	root rot	2

Salvia – *Salvia* sp. (3 samples)

Abiotic problems		
Chemical		
Growth regulator-type injury	stem distortion	1
Noninfectious		
Undetermined	foliar discoloration	1

Scaevola – *Scaveola* sp. (2 samples)

Disease		
Pseudomonas cichorii	leaf blight	1

Sedge – *Carex* sp. (2 samples)

Disease		
Pythium sp.	root rot	1
Rhizoctonia sp.	leaf blight	1

Snapdragon – *Antirrhinum majus* (3 samples)

Disease		
Impatiens Necrotic Spot Virus	leaf spot	1
Peronospora antirrhini	downy mildew	1
Unidentified sp.	powdery mildew	1

Streptacarpella – *Streptacarpella* sp. (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Torenia – *Torenia* sp. (3 samples)

Disease		
Botrytis cinerea	blight	1
Arthropod		
Polyphagotarsonemus latus	broad mites	2

Verbena – *Verbena x hybrida* (8 samples)

Disease		
Phytophthora sp	stem rot	1

Vinca – *Vinca major* – (15 samples)

Abiotic problems		
Nutritional		
Imbalance	dieback	1
Noninfectious		
Undetermined	foliar discoloration	2
Disease		
Botrytis cinerea	blight	2
	stem canker	1
Phytophthora sp.	blight	1
Thielaviopsis sp.	root rot	3
Arthropod		
Unidentified species	spider mites	1

Yarrow – *Achillea* sp. (1 sample)
Abiotic problems
Cultural
Planted too deeply — dieback — 1

Zinnia – *Zinnia elegans* (3 samples)
Abiotic problems
Nutritional
Calcium deficiency — foliar distortion — 3

Woody Ornamentals (including woody house plants)

Arborvitae – *Thuja* sp. (18 samples)
Abiotic problems
Environmental
Root stress — dieback — 3
foliar discoloration — 4
Winter desiccation — dieback — 1
Noninfectious
Root stress — dieback — 3
Undetermined — foliar discoloration — 3
Arthropod
Argyresthia thuiella — leafminer — 1
sp. — mites — 5

Arborvitae, American – Thuja occidentalis (1 sample)
Abiotic problems
Noninfectious
Undetermined — foliar discoloration — 1

Ash – *Fraxinus* sp. (8 samples)
Abiotic problems
Chemical
Growth regulator-type injury — foliar distortion — 1
Noninfectious
Undetermined — foliar discoloration — 1
Disease
Botryosphaeria sp. — canker — 1

Ash, green – *Fraxinus pennsylvanica* (3 samples)
Disease
Discula sp. — anthracnose — 2
Insufficient sample/information — 1

Ash, mountain – *Eucalytpus regnans* (2 samples)
Abiotic problems
Environmental
Root stress — leaf scorch — 1
Disease
Cladosporium sp. — scab — 1
Phyllosticta sp. — leaf spot — 1

Azalea – *Rhododendron* sp. (1 sample)
Abiotic problems
Environmental
Root stress — dieback — 1

Bayberry – *Myrica pensylvanica* (1 sample)
Disease
Septoria sp. — leaf spot — 1

Beech, copper – *Fagus sylvatica* cv. 'Atropunicea' (2 samples)
Abiotic problems
Environmental
Poor growing conditions — poor development — 1

Beech, European – *Fagus sylvatica* (1 sample)
Abiotic problems
Abiotic problems – cont.
Cultural
Transplant shock — foliar discoloration — 1

Birch – *Betula* sp. (1 sample)
Abiotic problems
Noninfectious
Undetermined — dieback — 1

Birch, river – *Betula nigra* (1 sample)
Abiotic problems
Nutritional
Iron deficiency — chlorosis — 1

Birch, white – *Betula papyrifera* (1 sample)
Arthropod
Mycetophilid sp. — fungus gnat — 1

Boxwood – *Buxus* sp. (6 samples)
Abiotic problems
Noninfectious
Undetermined — foliar discoloration — 1
Disease
Volutella sp. — blight — 2
Arthropod
sp. — spider mites — 2

Buckeye – *Aesculus glabra* (1 sample)
Disease
Uncinula sp. — powdery mildew — 1

Butternut – *Juglans cinera* (1 sample)
Arthropod
Eriophyid sp. — mites — 1

Burning bush – *Euonymus alatus* (2 samples)
Abiotic problems
Environmental/site
Stress — dieback — 1

Butterfly bush – *Buddleia* sp. (2 samples)
Disease
Unidentified sp. — downy mildew — 1

Cedar, red – *Juniperus virginiana* (1 sample)
Abiotic problems
Environmental
Winter injury — foliar discoloration — 1

Cherry, black – *Prunus serotina* (1 sample)
Disease
Fusarium sp. — damping-off — 1

Cherry, ornamental – *Prunus serrulata* (1 sample)
Insufficient sample/information — 1

Cherry, weeping – *Prunus subhirtella* – (2 samples)
Abiotic problems
Cultural
Transplant shock — leaf scorch — 1

Crabapple – *Malus* sp (5 samples)
Abiotic problems
Cultural
Transplant shock — leaf scorch — 1
Noninfectious
Undetermined — dieback — 1
Unidentified sp. — lichen — 1

Crabapple – cont.
Disease
Erwinia amylovora fireblight 1
Venturia inaequalis apple scab 1

Crabapple, flowering – *Malus* sp (2 samples)
Disease
Venturia inaequalis apple scab 1

Crabapple, weeping – Malus sp. (2 samples)
Abiotic problems
Noninfectious
Undetermined dieback 1
Diseae
Venturia inaequalis apple scab 1

Cranberry, European – *Viburnum opulus* 'Nanum' (1 sample)
Disease
Cercospora sp. leaf spot 1
Plasmopara viburni downy mildew 1

Cypress, bald – *Taxodium distichum* (1 sample)
Disease
Phomopsis sp. canker and dieback 1

Cypress, Italian – *Cupressus sempervirens* (1 sample)
Abiotic problems
Noninfectious
Undetermined dieback 1

Dogwood – *Cornus* sp. – (29 samples)
Abiotic problems
Cultural
Transplant shock dieback 1
Chemical
Growth regulator-type injury foliar distortion 1
Environmental
Root stress chlorosis 1
leaf scorch 1
Noninfectious
Undetermined leaf scorch 1
leaf spot 1
Disease
Botryosphaeria sp. stem canker 1
Discula destructiva dogwood anthracnose 6
Phyllosticta sp. leaf spot 1
Septoria sp. leaf spot 1
Unidentified sp. powdery mildew 7

Dogwood, Chinese – *Cornus kousa* (1 sample)
Abiotic problems
Environmental
Root stress dieback 1

Dogwood, flowering – *Cornus florida* (2 samples)
Disease
Discula destructiae dogwood anthracnose 1
Insufficient sample/information 1

Dogwood, red-twig – *Cornus sanguinea* – (1 sample)
Abiotic problems
Noninfectious
Undetermined dieback 1

Dogwood, white – Cornus alba – (1 sample)
Miscellaneous
Unidentified sp. wood rotter fungus 1

Elm – *Ulmus* sp. (3 samples)
Abiotic problems
Abiotic problems – cont.
Cultural
Fertilizer burn dieback 1
Transplant shock foliar discoloration 1
Arthropod
Unidentified sp. gall 1

Elm, American – *Ulmus americana* (1 sample)
Insufficient sample/information 1

Elm, Chinese – *Ulmus parvifolia* (1 sample)
Arthropod
Rynchaenus ephippiatus jumping flea weevil 1

Euonymus – *Euonymus* sp. (3 samples)
Abiotic problems
Noninfectious
Undetermined dieback 1
Arthropod
Unaspis euonymi scale 1

Euonymus, winged – *Euonymus alata* (2 samples)
Abiotic problems
Environmental
Root stress leaf scorch 1
Arthropod
sp. mites 1

Evergreen – (1 sample)
Abiotic problems
Noninfectious
Environmental stress tip dieback 1

Filbert, European –*Corylus Avellana* (1 sample)
Disease
Anisogramma anomola Eastern filbert blight 1

Fir – *Abies* sp. (4 samples)
Abiotic problems
Environmental
Root stress poor growth 1
Environmental/site
Root stress dieback 1
Environmental/site/cultural
Root stress dieback 1
Arthropod
Oligonychus ununguis spruce spider mite 1

Fir, Douglas – *Pseudotsuga menziesii* (7 samples)
Abiotic problems
Environmental/site
Root stress dieback 1
Miscellaneous
Healthy plant no problem 1

Fir, white – *Abies concolor* (2 samples)
Abiotic problems
Environmental
Wind or frost tip dieback 1
Insufficient sample/information 1

Forsythia – *Forsythia x intermedia* (1 sample)
Disease
Rhizoctonia sp. stem rot 1
Arthropod
Mycetophilid sp. fungus gnat larvae 1

Ginkgo – *Ginkgo biloba* (3 samples)
Abiotic problems

Ginkgo – cont.

Abiotic problems		
Environmental/cultural/site		
Root stress	chlorosis	1
Insufficient sample/information		1

Hawthorn – *Crataegus* sp. (2 samples)

Disease		
Various fungi	sooty mold	1

Hemlock – *Tsuga* sp. (6 samples)

Abiotic problems		
Environmental		
Root stress	dieback	2
Noninfectious		
Undetermined	dieback	2
Arthropod		
sp.	mites	1

Hemlock, Canadian – *Tsuga canadensis* (3 samples)

Abiotic problems		
Chemical		
Growth regulator-type injury	foliar distortion	1
Noninfectious		
Undetermined	foliar discoloration	1
Arthropod		
sp.	mites	1

Hemlock, eastern – *Tsuga canadensis* (1 sample)

Abiotic problems		
Noninfectious		
Root stress	defoliation	1

Hickory – *Carya* sp. (3 samples)

Abiotic problems		
Environmental/site		
Root stress	poor growth	1

Hickory, shagbark – *Carya ovata* (2 samples)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Holly – *Ilex* sp. (2 samples)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Hydrangea – *Hydrangea* sp. (13 samples)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1
Arthropod		
sp.	mites	1
Insufficient sample/information		2

Hydrangea, oakleaf – Hydrangea quercifolia (2 samples)

Disease		
Undetermined sp.	leaf spot	1

Juniper – *Juniperus* sp. (5 samples)

Abiotic problems		
Environmental		
Root stress	dieback	1
	foliar discoloration	2
Arthropod		
Acarina tetranchidae	spider mites	1
Carulaspis juniperi	juniper scale	1

Lilac – *Syringa vulgaris* (7 samples)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1
	leaf scorch	1
Disease		
Pseudomonas sp.	bacterial blight	1
Rhizoctonia sp.	root and stem rot	1
Miscellaneous		
Healthy plant	no problem	1

Linden – *Tilia* sp.(1 sample)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1

Magnolia – *Magnolia* sp. (4 samples)

Abiotic problems		
Environmental		
Root stress	foliar discoloration	1
Noninfectious		
Undetermined	leaf curl	1
Disease		
Undetermined	canker	1

Maple, - *Acer* sp. (40 samples)

Abiotic problems		
Chemical		
Growth regulator injury	leaf curl	1
Cultural		
Fertilizer burn	poor growth	1
Environmental		
Root stress	chlorosis	1
	dieback	2
	foliar discoloration	1
	leaf scorch	1
Temp. fluctuation injury	trunk crack	1
Wind desiccation	foliar discoloration	2
Environmental/site		
Stress	poor terminal growth	1
Noninfectious		
Physical injury	trunk wound	1
Root stress	premature leaf drop	2
Undetermined	branch discoloration	1
	leaf scorch	1
	trunk injury	1
Nutritional		
Manganese or iron deficiency	chlorosis	2
Disease		
Cytospora sp.	canker	1
Discula sp.	anthracnose	4
Kabatiella sp.	anthracnose	1
Rhytisma acerinum	tar spot	1
Verticillium sp.	wilt	1
Miscellaneous		
Healthy branch		2
Unidentified sp.	lichen	1
Insufficient sample/information		2

Maple, amur – Acer ginnala (2 samples)

Abiotic problems		
Cultural		
Fertilizer burn	leaf scorch	1
	stunted growth	1

Maple, hard – *Acer saccharum* – (1 sample)

Disease		
Verticillium sp.	wilt	1

Maple, Japanese – *Acer japonicum* (2 samples)

Abiotic problems		
Noninfectious		
Root stress	dieback	1

Maple, Norway – *Acer platanoides* (3 samples)

Abiotic problems		
Evnironmental		
Root stress	leaf drop	1
Disease		
Discula sp.	anthracnose	1

Maple, paperbark – *Acer griseum* (1 sample)

Abiotic problems		
Cultural/environmental/site		
Root stress	chlorosis	1

Maple, red – *Acer rubrum* (4 samples)

Abiotic problems		
Environmental		
Root stress	leaf scorch	1
Weather	tatters	1
Wind desiccation	foliar discoloration	1
Noninfectious		
Disease		
Discula sp.	anthracnose	1
Arthropod		
Neoclytus acuminatus	redheaded ash borer	1
Insufficient sample/information		1

Maple, silver – *Acer saccharinum* (1 sample)

Disease		
Rhizoctonia sp.	root rot	1

Maple, sugar – *Acer saccharum* (6 samples)

Abiotic problems		
Environmental		
Root stress	dieback	2
Wind desiccation	foliar discoloration	1
Noninfectious		
Undetermined	foliar discoloration	1
	leaf scorch	1
Disease		
Discula sp.	anthracnose	1
Kabatiella sp.	anthracnose	1
Arthropod		
sp.	leafhopper	1

Maple, Trident – *Acer Buergeranum* (1 sample)

Abiotic problems		
Cultural		
Fertilizer burn	leaf scorch	1

Mulberry – *Morus* sp. (2 samples)

Disease		
Ciboria carunculoides	popcorn disease	1
Arthropod		
Pseudolacaspis pentagona	white peach scale	1

Oak – *Quercus* sp. (27 samples)

Abiotic problems		
Chemical		
Growth regulator-type injury	foliar distortion	1
Environmental		
Root stress	defoliation	1
	leaf scorch	2
Wind desiccation injury	dieback	1
Noninfectious		
Insect/Weather	tatters	2
Physical wound	stem injury	1
Noninfectious – cont.		
Undetermined	leaf scorch	1
Disease		
Discula sp.	anthracnose	5
Tubakia dryina	leaf spot	4
Unidentified sp.	powdery mildew	1
Arthropod		
Anisota senatoria	orangestriped oakworm	1
Orgyia leucostigma	whitemarked tussock moth	1
sp.	leaf gall	1
sp.	leafhopper	1
sp.	oak spangles	1
Unidentified sp.	oak gall	1
Insufficient sample/information		1

Oak, pin – *Quercus palustris* (12 samples)

Abiotic problems		
Environmental/site		
Unfavorable growing conditionschlorosis		1
Nutritional		
Maganese or iron deficiency	chlorosis	1
Noninfectious		
Iron deficiency or root stress	chlorosis	1
Disease		
Phyllactinia sp.	powdery mildew	1
Tubakia dryina	leaf spot	2
Unidentified sp.	powdery mildew	4
Arthropod		
Melanaspis obscura	obscure scale	1
Neuroterus fragillis	fragile oak gall	1
Insufficient sample/information		2

Ornamentals, misc (9 samples)

Abiotic problems		
Chemical		
Growth regulator-type injury	foliar distortion	3
Herbicide injury	chlorosis	1
Environmental		
Stress	dieback	1
Wind injury	foliar discoloration	2
Noninfectious		
Undetermined	dieback	1
	foliar distortion	2
	growth distortion	1
Disease		
Discula sp.	anthracnose	2
Venturia inaequalis	apple scab	1
Insufficient sample/information		2

Ornamentals, unidentified (6 samples)

Arthropod		
sp.	millipede	1

Pear, callery – *Pyrus calleryana* 'Bradford' (6 samples)

Abiotic problems		
Environmental		
Root stress	leaf scorch	1
Noninfectious		
Undetermined	foliar discoloration	2
Insufficient sample/information		2

Pear, ornamental – *Pyrus* sp. (2 samples)

Abiotic problems		
Environmental		
Root stress	dieback	1

Pine – *Pinus* sp.(8 samples)

Abiotic problems		
Environmental		
Root stress	dieback	1

Pine – cont.

Disease		
Sphaeropsis sapinea	diplodia tip blight	1
	Sphaeropsis blight	3
Arthropod		
Ips sp.	bark beetle	1
Insufficient sample/information		1

Pine, Austrian – *Pinus nigra* (9 samples)

Disease		
Ploioderma lethale	Ploioderma needlecast	1
Sphaeropsis sapinea	blight	4

Pine, mugo – *Pinus mugo* (2 samples)

Arthropod		
Exotelia pinifliella	pine needle miner	1
sp.	spidermites	1
Insufficient sample/information		1

Pine, red – *Pinus resinosa* (2 samples)

Disease		
Sphaeropsis sapinea	blight	1

Pine, Scots – *Pinus sylvestris* (6 samples)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1
	needle loss	1
Disease		
Sphaeropsis sapinea	blight	2

Pine, white – *Pinus strobes* (30 samples)

Abiotic problems		
Environmental		
Root stress	decline	1
	dieback	3
Winter injury	foliar discoloration	2
Noninfectious		
Undetermined	distorted growth	1
Undetermined	foliar discoloration	2
	needle loss	1
	stem distortion	1
	stem wounds	1
Disease		
Pestalotiopsis sp.	dieback	1
Arthropod		
Ips sp.	bark beetle	1
	pine engraver	1
Pineus strobi	pine bark adelgid	1
Pissodes strobi	white pine weevil	1
	Monochamus titillatorpine sawyer beetle	
Insufficient sample/information		2

Poplar, tulip - *Liriodendron tulipifera* (6 samples)

Abiotic problems		
Chemical		
Growth regulator-type injury	foliar distortion	1
Noninfectious		
Physiological	leaf spot	2
Disease		
Various fungi	sooty mold	3
Arthropod		
Macrosiphum liriodendri	tuliptree aphid	1
Thecodiplosis liriodendri	tuliptree spot gall	1
Toumeyella liriodendri	tuliptree scale	2

Poplar, yellow – *Liriodendron tulipifera* (2 samples)

Abiotic problems		
Noninfectious		
Physiological	leaf spot	1
Disease		
Various fungi	soot mold	1
Arthropod		
Thecodiplosis liriodendri	tuliptree spot gall	1

Privet – *Ligustrum vulgare* (1 sample)

Arthropod		
Lepidosaphes ulmi	oystershell scale	1

Redbud – *Cercis canadensis* (6 samples)

Abiotic problems		
Chemical		
Growth regulator-type injury	foliar distortion	1
Noninfectious		
Undetermined	dieback	1
Insufficient sample/information		2

Rhingold – *Lutea Nana* (1 sample)

Abiotic problems		
Environmental		
Root stress	foliar discoloration	1

Rhododendron –*Rhododendron* sp. (6 samples)

Disease		
Phytophthora sp.	Phytophthora	2
Miscellaneous		
Leaf bait	*No Phytophthora	1

Rose – *Rosa* sp. (13 samples)

Abiotic problems		
Noninfectious		
Undetermined	stem breakage	1
Disease		
Pythium sp.	root rot	1
Various viruses	rose mosaic	1
Arthropod		
sp.	mites	1

Spruce – *Picea* sp. (26 samples)

Abiotic problems		
Chemical		
Herbicide	dieback	1
Cultural		
Transplant shock	dieback	1
Environmental		
Excessive winds	tip dieback	3
Root stress	dieback	4
	foliar discoloration	1
Noninfectious		
Shading-out	dieback	1
Undetermined 1	dieback	2
	foliar discoloration	1
	tip dieback	1
Arthropod		
sp.	mites	2
Thyridopteryx ephemeraeformis	bagworm	2
Insufficient sample/information		1

Spruce, Colorado blue – *Picea pungens* (12 samples)

Abiotic problems		
Cultural/environmental		
Root stress	dieback	1
Cultural/environmental/site		
Stress	purpling	1
Environmental		
Excessive winds	tip dieback	1
Environmental/site		
Root stress	foliar discoloration	1
Arthropod		
sp.	mites	1

Spruce, Colorado blue – cont.

Arthropod		
Hylobius pales	Pales weevil	1

Spruce, Norway – *Picea abies* (15 samples)

Abiotic problems		
Chemical		
Road salt or herbicide	foliar discoloration	1
Environmental		
Excessive winds	tip dieback	3
Root stress	dieback	1
Wind desiccation	foliar discoloration	1
Noninfectious		
Undetermined	foliar discoloration	3
	terminal bud death	1
Arthropod		
Acarina tetranychidae	spidermites	1
Chionaspis pinifoliae	pine needle scale	1
sp.	mites	1
Insufficient sample/information		1

Spruce, Serbian – *Picea omorkia* (2 samples)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Sumac – *Rhus* sp. (1 sample)

Abiotic problems		
Environmental		
Desiccation	leaf scorch	1

Sweetgum – *Liquidambar styraciflua* (2 samples)

Disease		
Pythium sp, *Fusarium* sp.	damping-off	1
Insufficient sample/information		1

Sycamore – *Platanus occidentalis* (3 samples)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1
Disease		
Apiognomonia veneta	anthracnose	1

Viburnum – *Viburnum* sp.(4 samples)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1
	foliar discoloration	1

Walnut – *Juglans* sp. (4 samples)

Abiotic problems		
Chemical		
Herbicide	dieback & leaf scorch	1
Disease		
Discula sp.	anthracnose	1
Microstroma sp.	downy spot	1

Walnut, black – Juglans nigra (4 samples)

Abiotic problems		
Noninfectious		
Trees not adapted to region	poor growth	1
Disease		
Marsonnina sp.	anthracnose	1
Arthropod		
Eriophyes caulis (*Acer caulis*)	black walnut petiole knot	1

Willow – *Salix* sp. (2 samples)

Disease		
Unidentified sp.	wood rotting fungus	1

Willow, pussy – *Salix matsudana* (2 samples)

Abiotic problems		
Noninfectious		
Fire injury	dieback	1

Wisteria – *Wisteria* sp. (1 sample)

Abiotic problems		
Chemical		
Herbicide	foliar distortion	1

Woodruff, sweet – *Galium odoratum* – (1 sample)

Disease		
Rhizoctonia sp.	blight	1

Yellowwood – *Cladrastis lutea* (1 sample)

Abiotic problems		
Environmental		
Root stress	dieback	1
Disease		
Discula sp.	anthracnose	

Yew – *Taxus* sp. (12 samples)

Abiotic problems		
Cultural		
Transplant shock	dieback	1
Environmental		
Root stress	dieback	1
	foliar discoloration	1
Noninfectious		
Undetermined	foliar discoloration	2
Arthropod		
Acarina tetranychidae	spider mites	1
Insufficient sample/information		1

*Rhododendron leaves used as leaf bait at Vallonia State Nursery

Specialty Field Crops

Ginseng – *Panax quinquefolius* (1 sample)

Arthropod		
Tipula abdominalis	crane fly	1

Milo – *Sorghum bicolor* (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1

Specialty Horticultural Crops

Arabidopsis – *Arabidopsis* sp. (2 samples)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1
	stem discoloration	1

Gourd – Gourd sp. (2 samples)

Disease		
Pseudoperonospora cubensis	downy mildew	1
Xanthomonas campestris pv. *Cucurbitae*	bacterial leaf spot	1

Grass, Ornamental – Grass sp. (3 samples)

Disease		
Rhizoctonia sp.	root rot	1

Grass, Blue Oat – *Helictotrichon sempervirens* (1 sample)

Disease		
Fusarium sp.	root rot	1

Grass, Blue Oat – cont.

Disease		
Pythium sp.	root rot	1
Arthropod		
sp.	fungus gnat larvae	1

Orchid – *Dendrobium* sp. (1 sample)

Disease		
Colletotrichum sp.	anthracnose	1

Parsley – *Petroselinum crispum* (2 samples)

Disease		
Fusarium sp.	crown rot	1
Pythium sp.	crown rot	1
Insufficient sample/information		1

Peppermint – *Mentha x piperita* (1 sample)

Disease		
Sphaceloma menthae	anthracnose	1

Rosemary – *Rosmarinum officinalis* (2 samples)

Disease		
Thielaviopsis sp.	root rot	2

Spearmint – *Mentha spicata* (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	chlorosis	1

Turf

Bentgrass – *Agrostis* sp. (7 samples)

Abiotic problems		
Environmental		
Root stress	dieback	2
Noninfectious		
Undetermined	dieback	1
Disease		
Colletotrichum graminicola	anthracnose	1
Leptosphaerulina australis	leaf blight	1

Bentgrass, creeping - *Agrostis palustris* (4 samples)

Abiotic problems		
Disease		
Various fungi	slime mold	1
Noninfectious		
Undetermined	foliar discoloration	1
Insufficient sample/information		1

Bentgrass/Bluegrass - *Agrostis* sp/*Poa* sp. (15 samples)

Abiotic problems		
Noninfectious		
Root stress	decline	3
Disease		
Colletotrichum sp.	anthracnose	3
Rhizoctonia cerealis	yellow patch	2

Bluegrass – *Poa pratensis* (3 samples)

Arthropod		
Unidentified sp.	maggots	1

Bluegrass, annual – *Poa annua* (1 sample)

Abiotic problems		
Noninfectious		
Root stress	dieback	1

Bluegrass, Kentucky – *Poa pratensis* (1 sample)

Disease		
Lanzia sp.	dollar spot	1

Bluegrass/Ryegrass *Poa* sp/*Lolium* sp. (2 samples)

Abiotic problems		
Environmental/Cultural		
drought stress,& excessive thatch	dieback	1
Disease		
Ascochyta sp	leaf blight	1
Curvularia sp.	foliar discoloration	1
Various sp.	rust	1

Vegetables

Beans, green – *Phaseolus* sp (4 samples)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1
	foliar discoloration	1
	poor fruit set	1

Bok choy - *Brassica rapa* – (1 sample)

Disease		
Cucumber Mosaic Virus	leaf mosaic	1

Cabbage – *Brassica oleracea* (2 samples)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1

Corn, sweet – *Zea mays* (1 sample)

Arthropod		
sp.	spider	1

Cucumber – *Cucumis sativus* (3 samples)

Abiotic problems		
Noninfectious		
Undetermined	yellowing	1
Disease		
Cucumber Mosaic Virus	leaf mosaic	1
Arthropod		
sp.	lady bettle	1

Horseradish – *Amoracia rusticana* (1 sample)

Disease		
Rhizoctonia sp.	root rot	1
Undetermined sp.	rot	1

Muskmelon – *Cucumis melo* (2 samples)

Abiotic problems		
Cultural		
Excessive moisture	poor growth	1
Noninfectious		
Undetermined sp.	foliar discoloration	1

Pepper – *Capsicum* sp. (6 samples)

Abotic problems		
Environmental		
Weather stress	sunscald	3
Arthropod		
sp.	fungus gnat larvae	1

Pepper, jalapeno – *Capsicum annum* (1 sample)

Abiotic problems		
Environmental/site		
Poor root growth conditions	poor growth	1
Disease		
Xanthomonas campestris pv. *vesicatoria*	bacterial spot	1

Potato – *Solanum tuberosum* (1 sample)

Abiotic problems		
Noninfectious		
Undetermined	dieback	1

Pumpkin – *Cucurbita* sp (11 samples)

Abiotic problems		
Noninfectious		
Undetermined	foliar discoloration	1
Disease		
Cladosporium sp, & *Alternaria* sp.	fruit rot	1
Phytophthora sp.	fruit rot	2
Pseudoperonospora cubensis	downy mildew	2
Unidentified sp.	powdery mildew	1
Insufficient sample/information		1

Rhubarb – *Rheun rhabarbarum* (1 sample)

Disease		
Phytophthora sp.	crown rot	1

Spinach – *Spinacia oleracea* – 1 sample)

Disease		
Pythium sp.	root rot	1

Squash – *Cucurbita* sp. (2 samples)

Disease		
WMV2, ZYMV, Poty	leaf mosaic	1
CMV, Poty	leaf mosaic	1

Tomato – *Lycopersicon esculentum* (59 samples)

Abiotic problems		
Chemical		
Growth regulator-type injury	foliar distortion	2
Herbicide injury	foliar discoloration	1
Environmental		
Wet soils	wilt	1
Noninfectious		
Undetermined	dieback	1
	foliar discoloration	2
	leaf curl	4
	stunting	2
Nutritional		
Noninfectious	blossom end rot	2
Undetermined	foliar discoloration	1
Disease		
Clavibacter michiganensis subsp. Mich	bacterial canker	1
Fulvia fulvum	leaf mold	2
Fusarium sp.	root rot	7
Pythium sp.	root rot	7
Rhizoctonia sp.	root rot	1
Sclerotinia sp.	blight	1
Septoria lycopersici	leaf spot	1
Xanthomonas compestris pv. vesicatoria	bacterial spot	1
Arthropod		
sp.	aphids	1
.	Syrphid fly	1
Insufficient sample/information		1

Vegetables, misc – (1 sample)

Abiotic problems		
Environmental		
Stress	leaf curl	1

Watermelon – *Citrullus lanatus* (10 samples)

Åbiotic problems		
Environmental		
Root stress	decline	1
Abiotic problems – cont.		
Noninfectious		
Undetermined	foliar discoloration	5
Disease		
Pythium sp.	root rot	2
Fusarium sp.	root rot	1
Arthropod		
sp.	mites	1
Unidentified sp.	leaf miner	1
Insufficient sample/information		1

Zucchini – *Cucurbita pepo* (2 samples)

Abiotic problems		
Nutritional		
Noninfectious	blossom end rot	1
Nutrient imbalance	foliar discoloration	1
Disease		
Choanephora sp.	fruit rot	1
Miscellaneous		
Healthy plant	no problem	1

Specimen Identifications

Woody Plants

Euonymus fortunei	wintercreeper	1
Fraxinus sp.	ash	1
Rubus sp.	blackberry	1

Herbaceous Broadleaf Weeds

Echinochloa crusgalli	barnyardgrass	1
Equisetum pratense	horsetail or scouring rush	1
Seteria viridis	green foxtail	1
Poa annua	annual bluegrass	1
Insufficient sample/information		1

Grasses

Festuca rubra	fine fescue	1

Aquatic Weeds

Algae	Spyrogyra	2
Cladophora sp.	Algae	1
Oedogonium sp.	Algae	1
Oscillatoria sp.	Blue-green algae	1
Pithophora	Horsehair algae	1
Potamogeton foliosus	Leafy pondweed	1
Trachelomonas sp.	Euglenoid	1

Insect and Other Invertebrate Identifications

Insects		
Acanthomyops interjectus	citronella ant	1
Acarus siro	grain mite	1
Agrostis ipsilon	black cutworm	1
Ahasverus advena	foreign grain beetle	3
Anthrenus verbasci	varied carpet beetle	2
Arilus cristatus	wheel bug	1
Ascanthomyops interjectus	citronella ant	2
Attagenus megatoma	black carpet beetle	1
Blatta orientalis	oriental cockroach	1
Camponotus sp.	carpenter ant	2
Chauliognathus pennsylvanica	soldier beetle larva	1
Cicindela sexguttata	tiger beetle	1
Cimex adjunctus	bat bug	1
Ctenocephalides felis	cat flea	1
Dermestes maculates	hide beetle	1
Dicerca sp.	flatheaded wood borer	1

Insects – cont.		
Drosophila sp.	vinegar fly	1
Eburia quadrigeminata	ivory marked longhorn	1
Formica exsectoides	Allegheny mound ant	1
*Leptoglossu*s sp.	leaf-footed bug	2
Megachilinae sp.	leafcutter bee	1
Megacyllene caryae	painted hickory borer	1
Musca domestica	house fly	1
Parcoblatta pennsylvanica	woods cockroach	1
Pediculus humanus capitis	head louse	1
Plodia interpunctella	Indian meal moth	1
Peophila casei	cheese skipper	1
Psorophora ciliata	gallinipper	1
Reticulitermes flavipes	subterranean termite (eastern)	2
sp.	drain fly	1
	flying ant	3
	fruit fly	1
	gall gnat	1
	mayfly	1
	midge	1
	millipede	1
	phorid fly	1
	psocid	1
.	springtail	3
	Braconid wasp	1
	velvet mite	1
.	weevil	1
Sciara sp.	dark-winged fungus gnat	2
Sitophilus granarius	granary weevil	1
Sphecius speciosus	cicada killer wasp	1
Tachys inornatus	ground beetle	1
Tinea bisselliella	webbing clothes moth	1
Tiphia vernalis	tiphia wasp	1
Triatoma sanguisuga	assassin bug	1
Other Invertebrates		
Chiracanthium sp.	yellow sac spider	2
Loxosceles reclusa	brown recluse spider	1
Lycossa sp.	wolf spider	1
Papilio polyxenes asterius	black swallowtail	1
Philodromus praelustris	crab spider	1
Sp.	worm	1
Miscellaneous – Other (17 samples)		
Disease		
Pseudomonas syringae	bacterial culture ID	2
Insufficient sample/information		6

Fungal ID

Botrytis sp.	fungal growth	1
Polyporus sp.	wood rotter fungus	1

Mushrooms

Chlorophyllum molybdites	green gill	1
Grifola frondosa (Polyporus)	hen of the woods	1
Laetiporus sulphureus	sulphur shelf	1