



Annual Report 2011

Purdue University Cooperative Extension Service

PURDUE
UNIVERSITY

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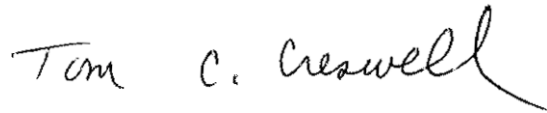
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ACKNOWLEDGMENTS

Purdue's Plant and Pest Diagnostic Lab (PPDL) is recognized as a source of unbiased, quality, diagnostic information. This recognition is a result of the hard work and dedication of PPDL diagnosticians and volunteer faculty and staff.

We are indebted to our computer support specialist for his database expertise, to our departmental extension Administrative Professional for her webmaster and database assistance and to our PPDL secretary/receptionist whose patience and friendly phone etiquette provides a welcome introduction to our clientele.

To the administration at Purdue University, we thank you for recognizing the vital role of the PPDL in addressing Indiana's plant and pest diagnostic needs.



Tom C. Creswell
Director, PPDL



Gail E. Ruhl
Senior Plant Disease Diagnostician

“...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)

MISSION

The Plant and Pest Diagnostic Laboratory (PPDL) at Purdue University is an interdisciplinary laboratory that was established in 1990 with funding from the Crossroads initiative to integrate the existing plant disease and weed diagnostic lab in the Department of Botany & Plant Pathology (est. 1979) with the identification services provided by the Departments of Entomology, Horticulture and Landscape Architecture, Agronomy and Forestry. The mission of the PPDL 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); to University research faculty and staff; to the Office of the Indiana State Chemist; to the Director of the Entomology and Plant Pathology Division of the Indiana Department of Natural Resources (IDNR) and associated nursery inspectors. The laboratory also provides routine pest and plant problem diagnoses for private businesses and citizens of Indiana.

COOPERATION WITH THE NATIONAL PLANT DIAGNOSTIC NETWORK

The National Plant Diagnostic Network (NPDN) was created in 2002 to help address concerns over potential bioterrorism attacks on U.S. food and feed crops. That mission has evolved over the years to one of strengthening diagnostic labs, improving training for diagnosticians and training “first detectors” for a broad range of problems including detecting and identifying invasive species.

The NPDN joins together plant and insect diagnostic laboratories at land grant universities across the U.S. and its territories into a system of five regions. The PPDL, as part of the North Central Plant Diagnostic Network (NCPDN) (<http://www.ncpdn.org/>) region has been working with counterparts at other land grant institutions to prepare for plant disease and pest introductions 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 are on the lookout for unusual or new diseases to submit to the diagnostic laboratories. This greatly reduces the time between introduction of plant pests and diseases and their detection.

TRAINING INITIATIVES

The PPDL conducts online Adobe Connect training sessions for Agriculture & Natural Resources (ANR) educators with the intent of improving their diagnostic capabilities for plant diseases and pests in Indiana. The training in 2011 included a review of major plant problems submitted to the clinic during the year. Clinic diagnosticians also conduct training for Master Gardener volunteers and speak at several grower group meetings and specialized training events each year. The trainings this year included speaking to several landscaper and turf professional groups about problems encountered with the turf herbicide Imprelis®.

SURVEY WORK

The PPDL participated in Cooperative Agricultural Pest Survey (CAPS) efforts in 2011 by conducting more than 500 laboratory tests on wine grape samples from 7 vineyards across the state. Tests for Grapevine yellows (Phytoplasma disease) were conducted monthly from June through September. In addition, the PPDL participated in CAPS survey efforts to check for the presence of *P. ramorum* in Indiana nurseries/big box stores that receive perennial woody plant material from the West Coast. The information gathered from these two surveys was provided to the NPDN national data repository as well as uploaded through the CAPS data system. This data helps researchers and regulatory agencies guide research and monitoring efforts.

PPDL AND THE INDIANA DEPARTMENT OF NATURAL RESOURCES

The Plant and Pest Diagnostic Laboratory serves as the plant disease diagnostic facility for the Indiana Department of Natural Resources (IDNR). The IDNR and the Purdue Plant and Pest Diagnostic Laboratory work together during outbreaks of diseases of regulatory concern.

The PPDL provided disease diagnosis on 122 corn samples for the IDNR Phytosanitary Certification Program and diagnosis of 44 ornamental samples submitted by IDNR Nursery Inspectors.

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 PPDL on a part-time basis as a portion of their total commitment to their respective departments. Staffing responsibilities in the PPDL and the department to which they belong, are listed below. This year we welcomed Anna Meier as our new secretary and receptionist.

Botany and Plant Pathology

Director	Tom Creswell
Secretary and Receptionist	Anna Meier
Webmaster and Extension Administrative Professional	Amy Deitrich
Disease diagnosis and control	Tom Creswell, Gail Ruhl
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
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Horticulture & Landscape Architecture

Identification of horticultural plants and plant problems	B. Rosie Lerner
Diagnosis of herbicide injury on horticultural plants	Mike Dana, Steve Weller

Agronomy

Fertility, soil and environmentally related problems of corn, small grains, and soybeans	Robert Nielsen, Jim Camberato
Turfgrass management	Shaun Casteel Aaron Patton

Forestry & Natural Resources

General Forestry issues	Lenny Farlee
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The PPDL is fortunate to have the support and assistance of numerous faculty and staff in the College of Agriculture. During 2011, more than 30 additional faculty and staff members assisted with sample diagnoses (**Table 1**).

Table 1. Departmental faculty and staff that assisted with diagnoses of samples submitted to the Plant and Pest Diagnostic Laboratory during 2011.¹

Faculty/Staff	Number of Diagnoses	Faculty/Staff	Number of Diagnoses
Agronomy	41 (1%)	Entomology	323 (10%)
J. Camberato	10	L. Bledsoe	3
S. Casteel	1	B. Brown	8
K. Johnson	1	Matt Ginzal	1
A. Patton	29	J. Faghihi	6
		R. Foster	5
Botany & Plant Pathology	2887 (86%)	T. Gibb	136
J. Beckerman	5	J. Obermeyer	5
T. Creswell	1391 ³	C. Sadof	159
D. Egel	2	Horticulture & Landscape Architecture	65 (2%)
B. Johnson	4	B. Bordelon	5
T. Jordan	3	M. Dana	11
R. Latin	3	R. Lerner	15
D. Lubelski	7	R. Lopez	5
G. Nice	62	M. Mickelbart	2
G. Ruhl	1466 ⁴	S. Weller	27
I. Thompson	2		
K. Wise	4		
		Other	47 (1%)
		Maryna Serdani, Oregon State	1
		Dimitre Molloy, Univ of MN	1
		Jan Byrne, MI State	42
		Melodie Putnam, Oregon State	1
		Phil Marshall, IDNR	1
		Wade Elmer, CAES	1
Total Diagnoses			3363

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 2011 PPDL diagnosticians.

³ 168 sample diagnoses were provided for Grapevine yellows survey samples.

⁴ 411 sample diagnoses were provided for *P. ramorum* nursery survey samples.

ADVISORY STEERING COMMITTEE

The inter-departmental nature of the PPD L demands frequent and free-flowing exchange of information among PPD L staff in participating departments. This communication takes place in an advisory capacity designated as the PPD L Steering Committee. The Steering Committee provides a forum to discuss matters that relate to the daily operation of the PPD L. Input from the diagnosticians is considered essential for smooth functioning of the Lab. The Committee meets as needed and reports to the Department Head of Botany and Plant Pathology. The Committee is chaired by the Director of the PPD L and is composed of diagnosticians, pertinent Extension Specialists and the Extension Administrative Professional.

LABORATORY OPERATIONS

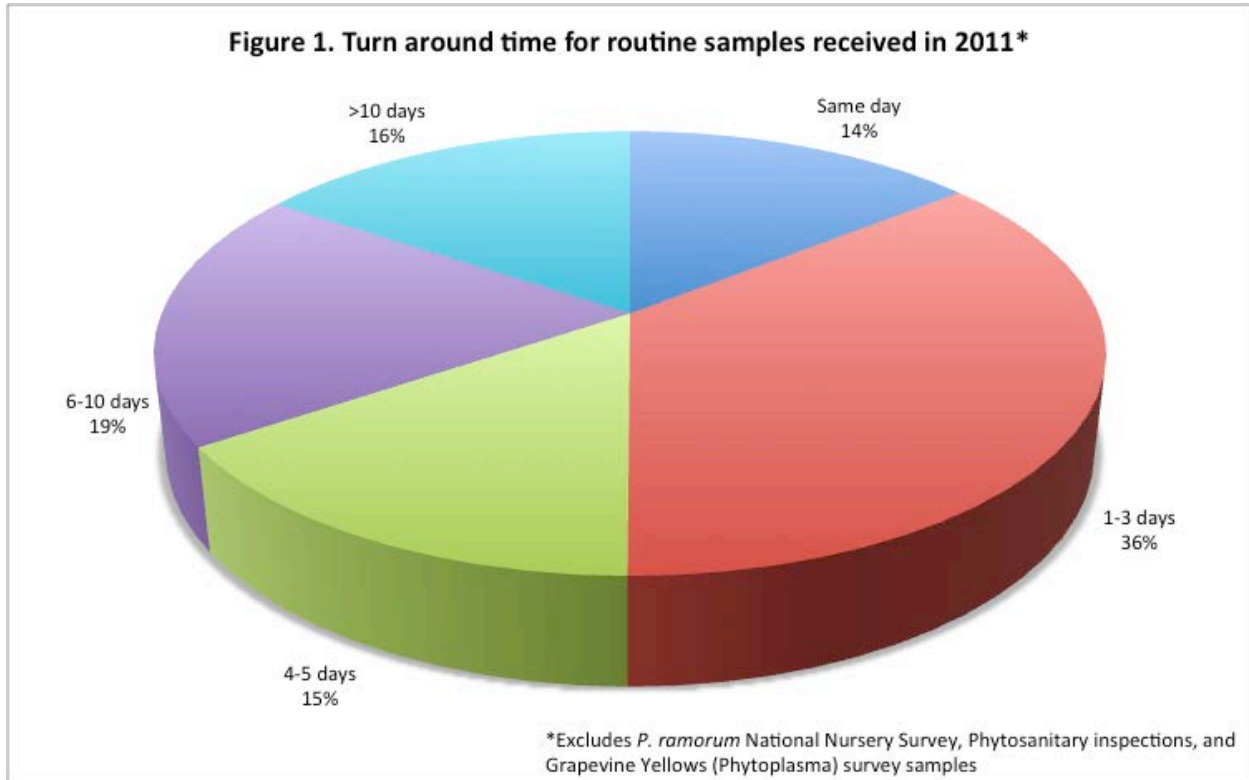
County offices of the Cooperative Extension Service (CES) are provided with a supply of sample submission forms, alcohol vials and mailing boxes to facilitate the submission of plant specimens and insects to the PPD L. Submission forms are available online and may be downloaded from the PPD L web page. Completed submission forms are to accompany all sample submissions. Digital images may be submitted, from the PPD L web page (<http://www.ppd.l.purdue.edu>).

Diagnosis Process

Information from the sample submission form is logged into the NPDL Plant Diagnostic Information System (PDIS) database and the sample is assigned a unique. 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).

Sample Processing (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 14% of the samples received during 2011 and 50% of the samples were completed in three days or less. A total of 65% of the samples received during 2011 were diagnosed within five working days and 84% of all routine samples received were answered within 10 working days. An extended turn-around time of greater than 10 days (16% of samples) was documented for those samples requiring more extensive culture work and laboratory testing (**Figure 1**). Preliminary reports were sent for samples requiring additional time for pathogen confirmation.



Sample Breakdown

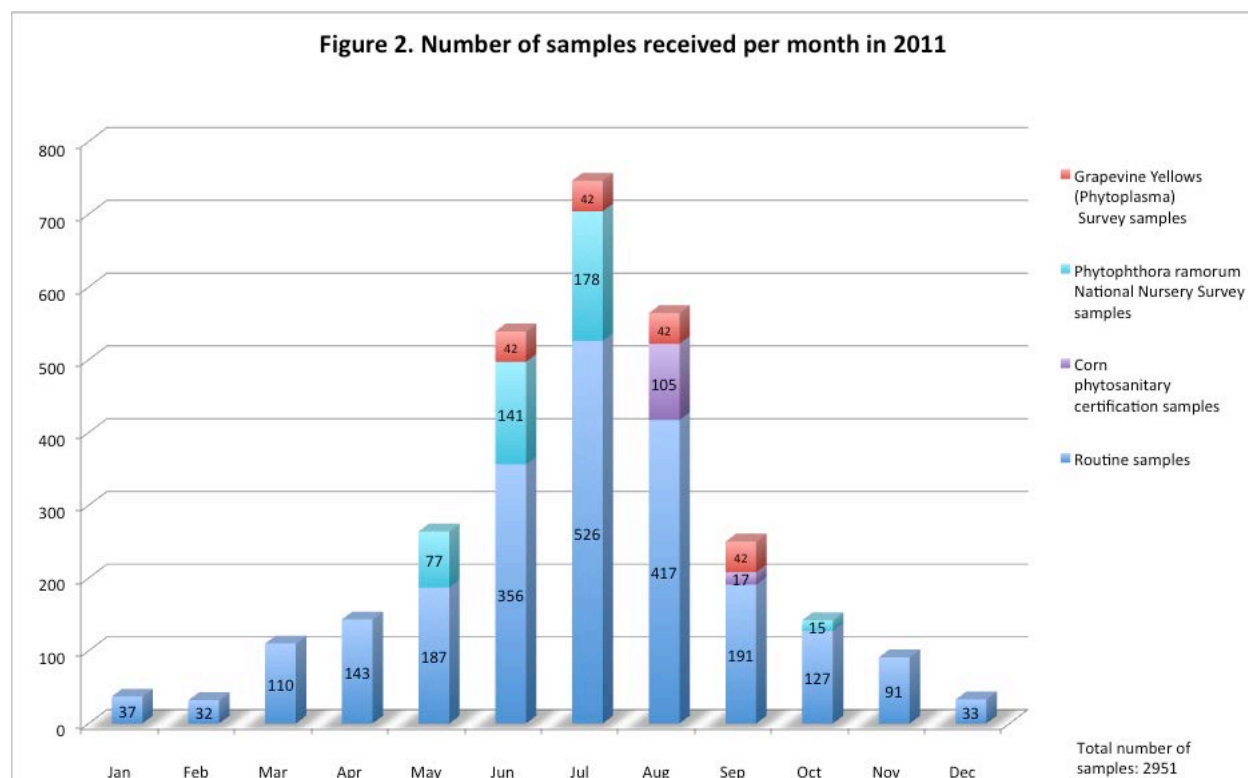
In addition to the 2250 routine samples diagnosed, 411 nursery samples were tested for the presence of *Phytophthora ramorum* as part of the Sudden Oak Death (Ramorum blight) National Survey. A total of 122 corn samples were submitted for disease diagnosis for phytosanitary certification (ICIA and IDNR). We handled 168 CAPS Survey samples for Grapevine Yellows (Phytoplasma) disease.

Table 2. Breakdown of total samples for 2011	
Routine samples	2250
Regulatory/survey samples	701
<i>CAPS Survey: Grape Phytoplasma</i>	168
<i>P. ramorum national survey samples</i>	411
<i>Phytosanitary certification samples (IDNR/ICIA)</i>	122
Total number of samples	2951

DIAGNOSES AND SAMPLES

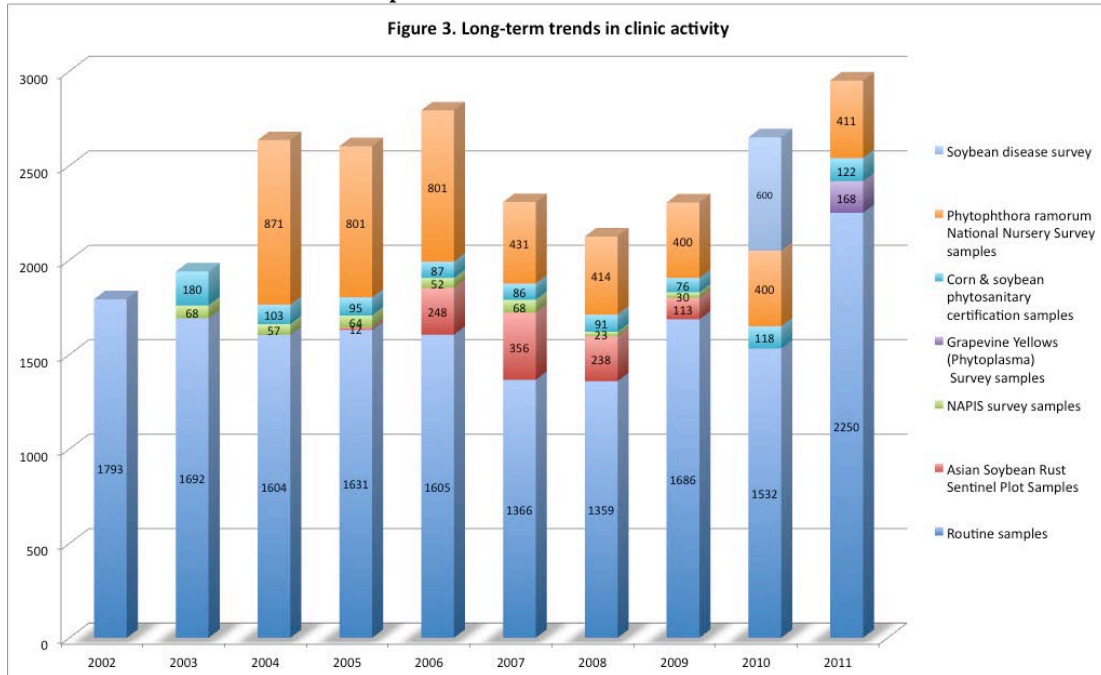
Monthly Activity

During 2011, the Laboratory diagnosed a total of 2250 routine samples. As illustrated in Figure 2, half of the year's routine samples were processed in the lab during the three months of June, July and August. The majority of the 2011 *Phytophthora ramorum* National Nursery Survey samples were submitted during July for diagnosis of the presence or absence of *P. ramorum*, the causal agent of Ramorum blight. During the months of August and September, ICIA and IDNR field inspectors submitted corn foliar samples to the PPDL for disease diagnosis required for phytosanitary certification of seed.



Long-Term Trends

Routine sample submissions have remained relatively stable for the past ten years, however the total number of samples show a consistent increase since 2008.



Commodities Diagnosed

Figure 4 and **Table 3** show the number of specimens submitted in each commodity group, for 2011. The majority of samples submitted for diagnosis (63%) were from the ornamentals commodity group. In descending order, agronomic crops (12%), turfgrass (7%), and insect identification (6%) comprised the other major commodities submitted for routine diagnosis. Several other minor commodity groups comprised the remaining 12% of the submitted samples (**Figure 4** and **Table 3**).

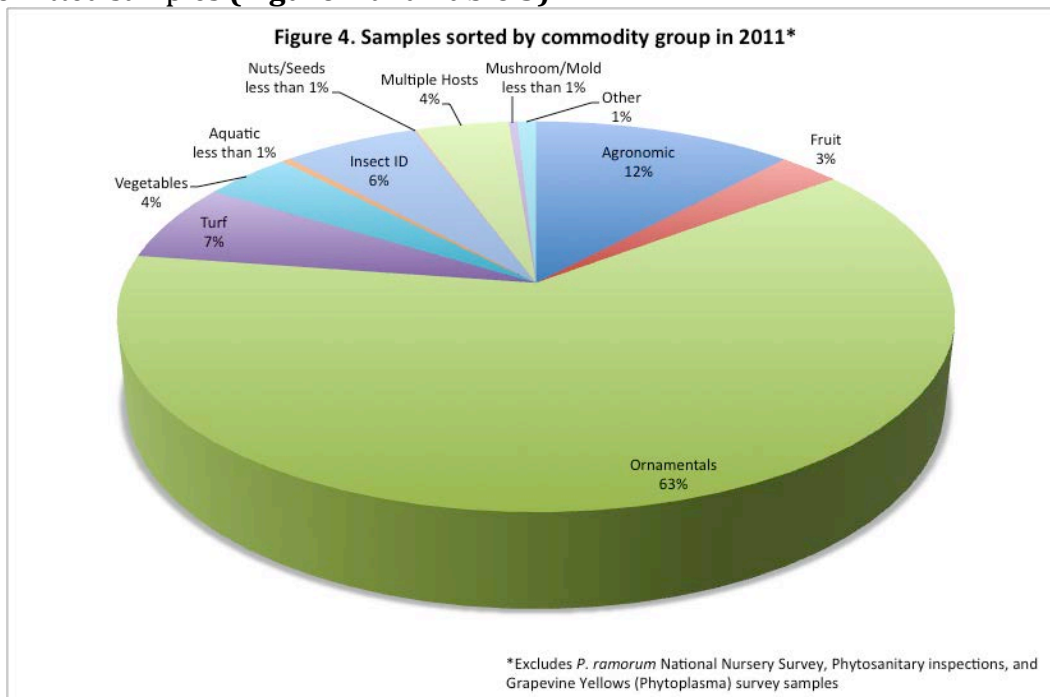
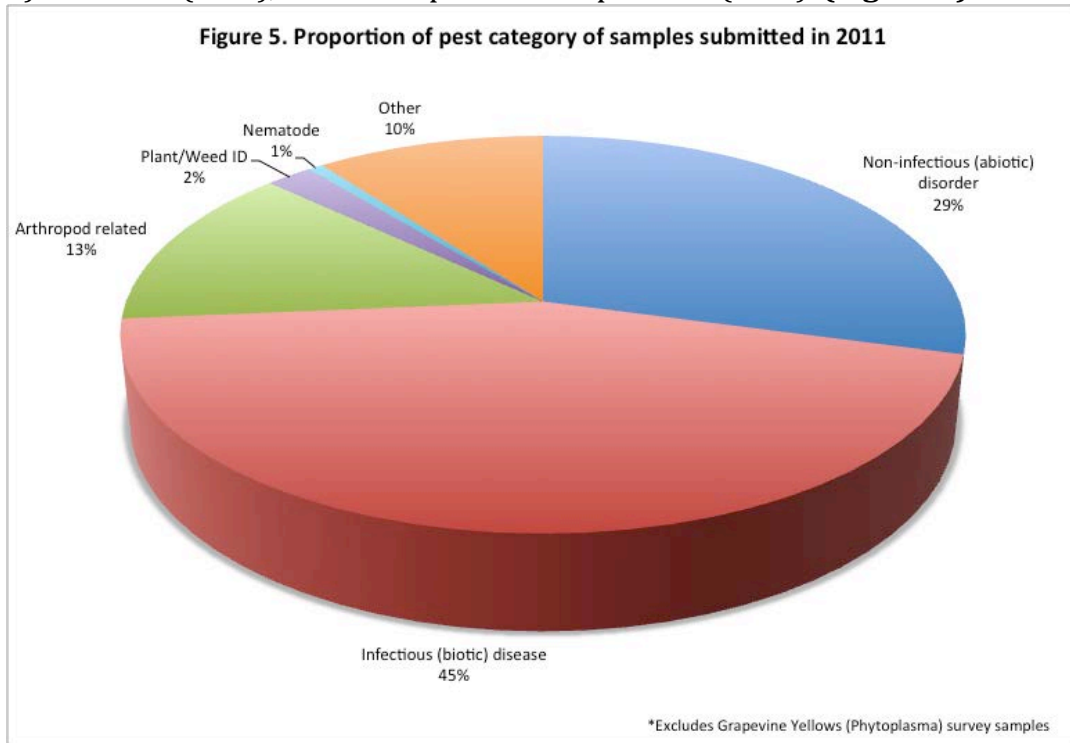


Table 3. Specimens sorted by sample category¹		
	2011	
Sample Category	Number of Specimens	%²
Agronomic	267	12
Field crops	196	9
Forage	3	0
Small grains	68	3
All Fruit	63	3
Large Fruit	26	1
Small Fruit	37	2
Ornamentals	1410	63
Annual	79	4
Biennial	1	*
Deciduous	381	17
Evergreen	760	34
Forested Area	2	*
Grnd Cvrs/Vines	11	*
Perennial	176	8
Turf	145	6
Vegetables	91	4
Miscellaneous	274	12
Aquatic	9	*
Insect ID	139	6
Nuts/Seeds	2	*
Multiple Hosts	96	4
Mushroom/Mold	9	*
Other	19	1
Total Specimens	2250	100
¹ Excludes 411 ornamental samples submitted for 2011 <i>P. ramorum</i> National Nursery Survey, 122 samples submitted for soybean Phytosanitary Testing, and 168 grape survey samples submitted for 2011 <i>Grape Phytoplasma Testing</i> ² Percent of total samples submitted during the year * Less than 1%		

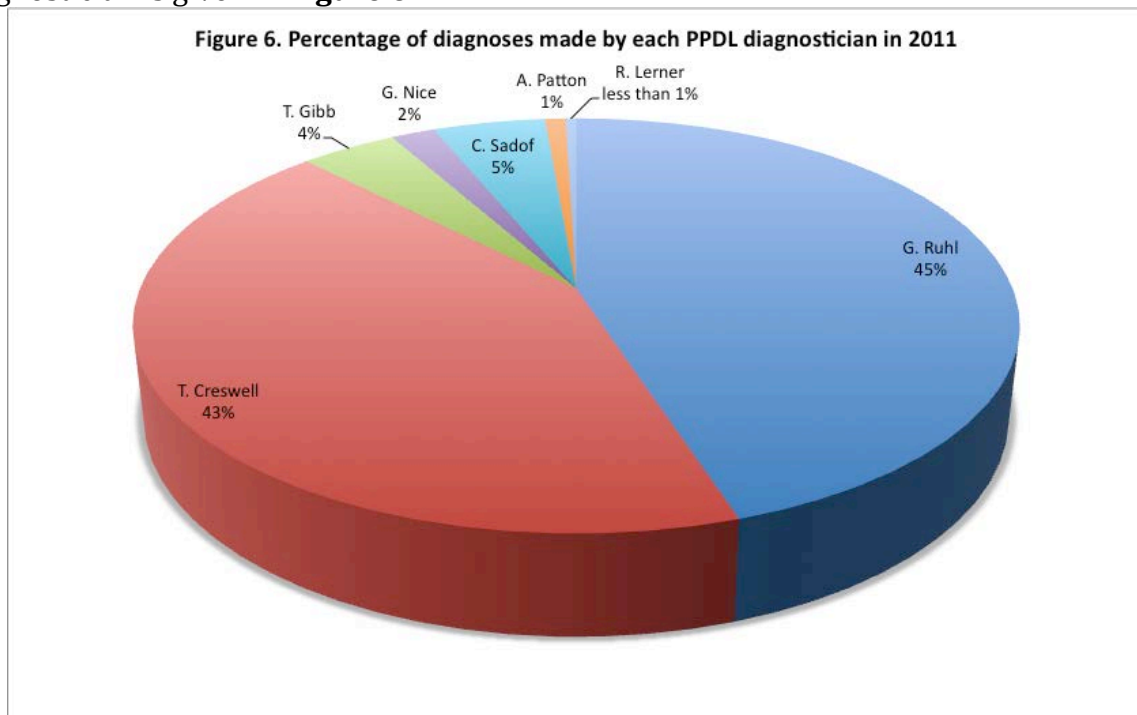
Type of Diagnosis

Many of the 2011 samples received multiple diagnoses due to the presence of more than one causal agent. The most frequently diagnosed group of causal agents, determined by the type of diagnoses made, were infectious diseases (45%), followed by noninfectious (abiotic) disorders (29%), and arthropod-related problem (13%). (Figure 5).



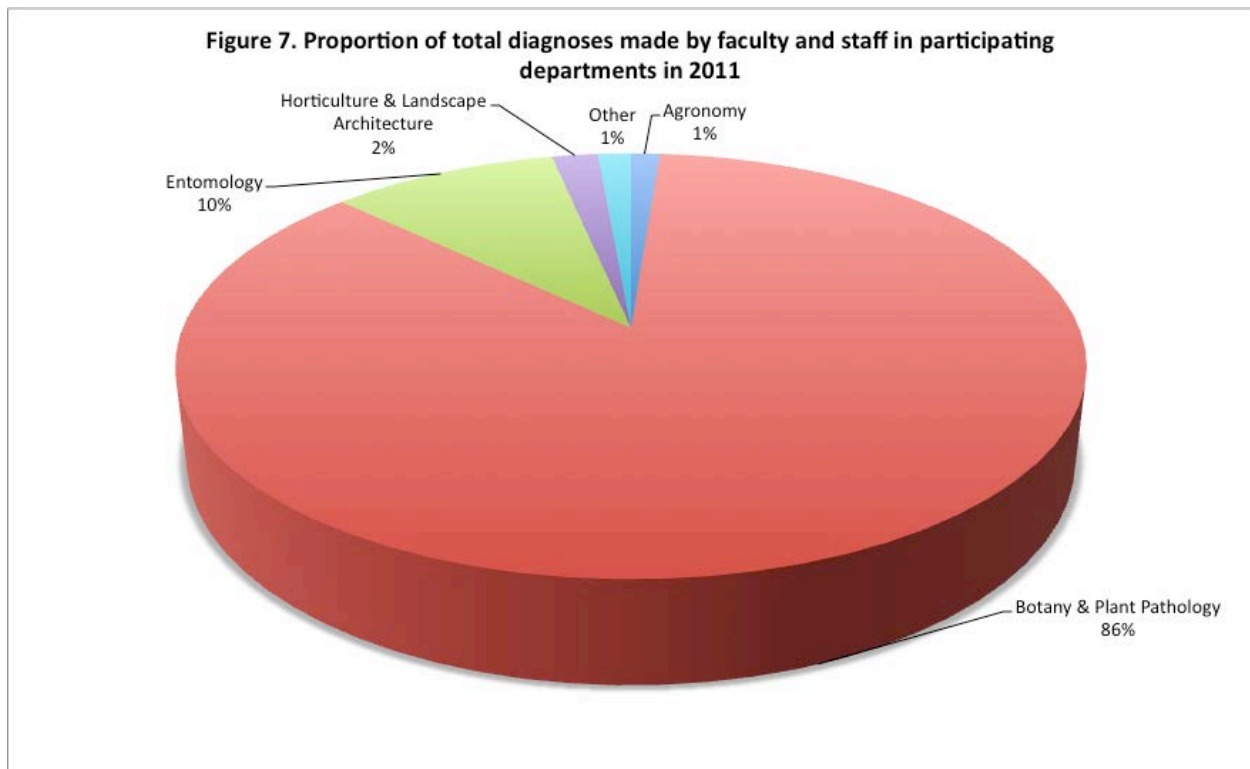
Diagnoses per Diagnostician

A comparison of the proportion of total 2011 diagnoses of samples made according to diagnostician is given in Figure 6.



Diagnoses per Department

A comparison of the proportion of total 2011 diagnoses made according to participating departments is shown in **Figure 7**. The faculty and staff in the Department of Botany & Plant Pathology diagnosed the majority (86%) of samples.



SAMPLE ORIGIN

Clientele Groups

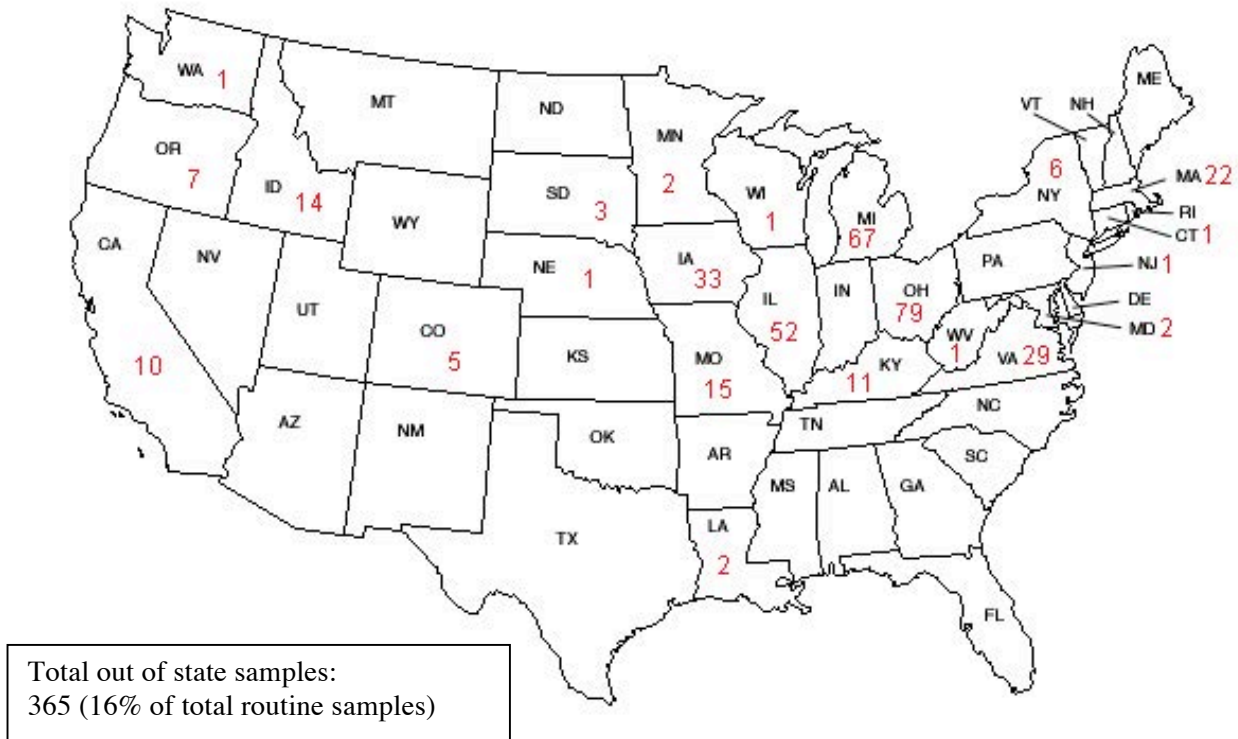
Samples are submitted to the PPDL by commercial and non-commercial clientele as well as by IDNR/USDA/APHIS personnel for regulatory and survey work (**Table 4**).

Table 4. Affiliation of persons submitting samples to the PPDL in 2011		
Affiliation	Number of samples	%
Commercial	1206	41
Agribusiness	82	3
Company/Firm	107	4
Consultant	119	4
Garden Center	3	*
Golf Course	43	1
Greenhouse	175	6
Grower/Farmer	49	2
Landscaper	110	4
Lawn Care/Landscaper	193	7
Lawn/Tree Care	210	7
Nursery	47	2
Park/School/Church Grounds Keeper	17	1
Pest Control	50	2
Veterinarian	1	*
Non-Commercial	560	19
Extension Educator	235	8
Homeowner	210	7
Other	8	*
Researcher/Specialist	107	4
Regulatory/Survey	1017	40
ICIA	122	4
IDNR	44	1
Annual SOD Survey	411	14
Indiana State Chemist	440	15
CAPS Survey: Grapevine Yellows	168	6
Totals	2951	100
* Less than 1%		

Out of State Submissions

The Plant and Pest Diagnostic Laboratory was initially established to serve residents of Indiana, however, due to the PPDL's national reputation, diagnostic services in 2011 were also provided for 365 samples (16% of total routine samples) submitted from 23 other states*.

Figure 8. Distribution of samples received from outside Indiana by the Plant and Pest Diagnostic Laboratory in 2011.



* The PPDL has a permit issued by USDA/APHIS/PPQ to receive out-of-state samples for diagnosis from the continental 48 states. No out-of-country physical samples are accepted.

AN INFORMATION SOURCE

The PPDL staff not only provide accurate and timely diagnosis of samples, 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 PPDL World Wide Web Home Page, (URL: <http://www.ppdل.purdue.edu>) was put "on-line" in June of 1995. The web server, now maintained by Bob Mitchell, IT manager for the Department of Botany and Plant Pathology and Amy Deitrich as webmaster, serves as an invaluable educational tool accessible not only to the citizens of Indiana, but people throughout the United States and the world. The PPDL web site provides information and links on species invasive to Indiana, up to date soybean rust information, a "Picture of the Week," information on "What's Hot" in the PPDL, and many featured links. There is a keyword searchable database, a digital library and a link for submitting digital samples to the PPDL. Web server statistics for the Plant and Pest Diagnostic Laboratory reported an average of 17,894 requests per day for PPDL web pages from January 1 through December 31, 2011 from a total of 189 countries worldwide.

As social media popularity continues to grow, the PPDL strives to stay on top of the trend and make communication easier for our clientele. We now have a presence on Facebook and Twitter and our number of followers continue to grow.

Extension Activities

PPDL staff members participate in a variety of Purdue University sponsored events and educational programs. Some of these programs in 2011 included:

- Master Gardener Training
- Turf and Ornamentals Workshops
- Southern Indiana Landscape School
- Indiana Green Expo
- Adobe connect updates to county extension educators
- IDNR Nursery Inspector Training for *P. ramorum* Nursery Survey
- Indiana Crop Improvement Association (ICIA) inspector training for Phytosanitary field inspection of corn and soybeans.
- Spring Fest (A University-wide 2 day public relations event)

Imprelis® Response

In spring of 2011, a new DuPont herbicide with the trade name Imprelis® was used on many turf areas (lawns, golf courses, sports fields, etc.) for weed control. This selective synthetic auxin herbicide is absorbed by leaves, stems and roots and provides residual weed control, as the product remains active in soil for some time. In June 2011 the PPDL began receiving samples of spruce, white pine and other conifers with symptoms of herbicide injury where Imprelis® had been applied. The Office of the Indiana State Chemist (OISC) began investigations into injury claims, which included submission of suspect injured plant material to the PPDL. By the end of August the lab had received more than 400 samples with suspected Imprelis® herbicide injury, effectively increasing our sample

load by 30-50% during that time period. As early as June 1, lawn care companies across the U.S. reported damage to an estimated 250,000 trees and ornamentals located adjacent to the treated turf areas.

Residue testing by the OISC in conjunction with PPDL diagnoses based on symptomatology and absence of other potential causal factors has allowed confirmation of herbicide injury in more than 13 plant species.

The PPDL, in collaboration with a team of Purdue University experts in the College of Agriculture, rapidly responded to this. We performed a thorough investigation and analysis of the cause of the problem, preparing written information (electronically distributed) on the problem and providing recommendations to Indiana homeowners and turf industry professionals. Faculty and staff from AGRY, BTNY, HLA, ENTM, AgComm and the PPDL worked with their respective industries and clientele and assisted the OISC in their investigation of the crisis and the role Imprelis herbicide played in causing injury to many different tree species in Indiana and the nation. Within 54 days of the first report of damage to trees (June 2011), the OISC issued to DuPont a stop sale, use or removal order (SSURO) of the herbicide in Indiana to halt the distribution and use of Imprelis in the state, preventing further damage to trees. Indiana was the only state to take this early action, followed by the U.S. Environmental Protection Agency, which relied on Indiana investigation findings and data to issue a federal SSURO 10 days later. This rapid response which accurately identified the problem while providing needed information to citizens of Indiana (and the nation) would not have been possible without the hard work and quick action of many faculty and staff at Purdue University in cooperation with the OISC.