



Annual Report 2010

Purdue University Cooperative Extension Service

PURDUE
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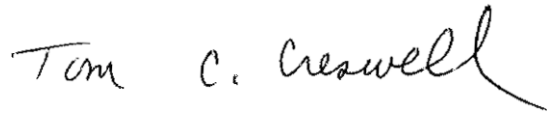
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ACKNOWLEDGMENTS

Purdue's Plant and Pest Diagnostic Lab (P&PDL) is recognized as a source of unbiased, quality, diagnostic information. This recognition is a result of the hard work and dedication of P&PDL 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 P&PDL secretary 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 P&PDL in addressing Indiana's plant and pest diagnostic needs.



Tom C. Creswell
Director, P&PDL



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 (P&PDL) 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 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); to University research faculty and staff; to the Office of the 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 P&PDL, 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 P&PDL 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 2010 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.

SURVEY WORK:

The P&PDL participated in Cooperative Agricultural Pest Survey (CAPS) efforts in 2010 in by conducting more than 500 laboratory tests on wine grape samples from 7 vineyards across the state. Tests for Grapevine yellows (Phytoplasma disease), Bacterial scorch (*Xylella fastidiosa*) and 5 virus diseases were conducted monthly from June through September. The information gathered was provided to the NPDP national data repository as well as uploaded through the CAPS data system. This data helps researchers and regulatory agencies guide research and monitoring efforts.

The P&PDL also supported Extension specialists involved in a soybean disease survey in 2010 by providing diagnostic expertise for 600 soybean samples taken from fields across the state.

P&PDL 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 P&PDL provided disease diagnosis on 118 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 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 below.

Botany and Plant Pathology

Director	Tom Creswell
Secretary and Receptionist	Janet Whaley
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
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Agronomy

Fertility, soil and environmentally related problems of corn	Robert Nielsen
Turfgrass management	Aaron Patton

Forestry & Natural Resources

General Forestry issues	Lenny Farlee
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The P&PDL is fortunate to have the support and assistance of numerous faculty and staff in the College of Agriculture. During 2010, 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 2010.¹

Faculty/Staff	Number of Diagnoses	Faculty/Staff	Number of Diagnoses
Agronomy	62 (2%)	Entomology	330 (8%)
C. Bigelow	9	G. Bennett	2
J. Camberato	27	L. Bledsoe	5
S. Casteel	1	B. Brown	1
K. Johnson	2	J. Faghihi	7
R. Nielsen	15	R. Foster	4
A. Patton	8	T. Gibb	171
		C. Krupke	1
Botany & Plant Pathology	3307 (86%)	J. Loven	1
		J. Obermeyer	6
J. Beckerman	6	C. Sadof	132
T. Creswell	865		
D. Egel	1	Horticulture & Landscape Architecture	99 (2%)
B. Johnson	5	B. Bordelon	3
T. Jordan	4	M. Dana	28
R. Latin	31	P. Hirst	1
C. Lembi	4	R. Lerner	17
D. Lubelski	1	R. Lopez	8
G. Nice	83	E. Maynard	2
G. Ruhl	2301 ^{3,4}	M. Mickelbart	6
I. Thompson	1	S. Weller	34
K. Wise	5		
Student Workers	21 (1%)	Other	45 (1%)
A. Leonberger	21	J. Byrne, Michigan State Univ.	28
		R. DeVries	1
		B. Lockhart, Univ. of Minnesota	1
		D. Mollov, Univ. of Minnesota	2
		L. Nees, OISC	9
		M. Palm	1
		M. Putnam	1
		S. Weeks, FNR	2
Total Diagnoses			3864

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 2010 P&PDL diagnosticians.

³ 400 additional sample diagnoses were provided for *P. ramorum* nursery survey samples.

⁴ Includes diagnoses for 600 soybean disease survey samples.

ADVISORY STEERING COMMITTEE

The inter-departmental nature of the P&PDL demands frequent and free-flowing exchange of information among P&PDL staff in participating departments. This communication takes place in an advisory capacity designated as the P&PDL 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 to the Department Head of Botany and Plant Pathology. The Committee is chaired by the Director of the P&PDL and is composed of diagnosticians, pertinent Extension Specialists and the Extension Administrative Professional.

LABORATORY OPERATIONS

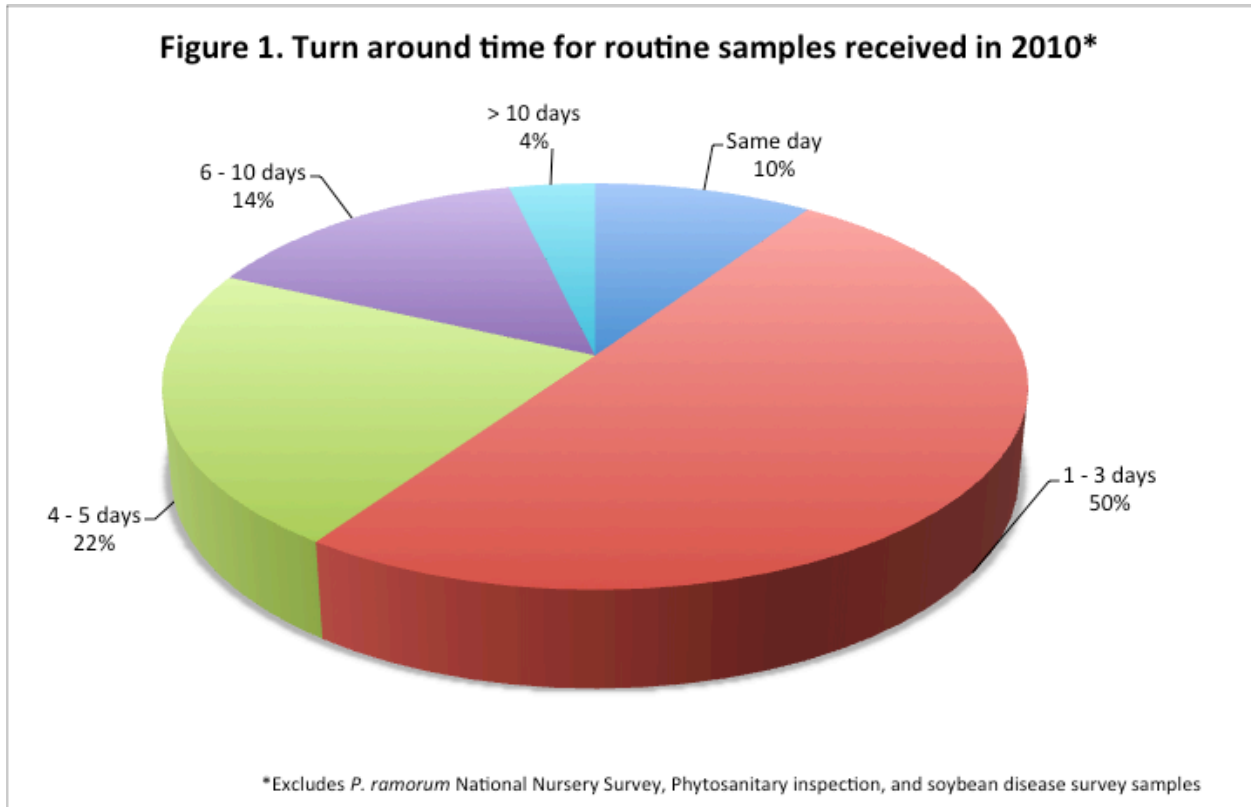
County offices of the Cooperative Extension Service (CES) are provided with a supply of sample submission forms, alcohol vials and mailing boxes to facilitate the submission of plant specimens and insects to the P&PDL. Submission forms are available online and may be downloaded from the P&PDL web page.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

Diagnosis Process

Information from the sample submission form is logged into the NP&PDL 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 10% of the samples received during 2010 and 60% of the samples were completed in three days or less. A total of 82% of the samples received during 2010 were diagnosed within five working days and 96% of all routine samples received were answered within 10 working days. An extended turn-around time of greater than 10 days (4% 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

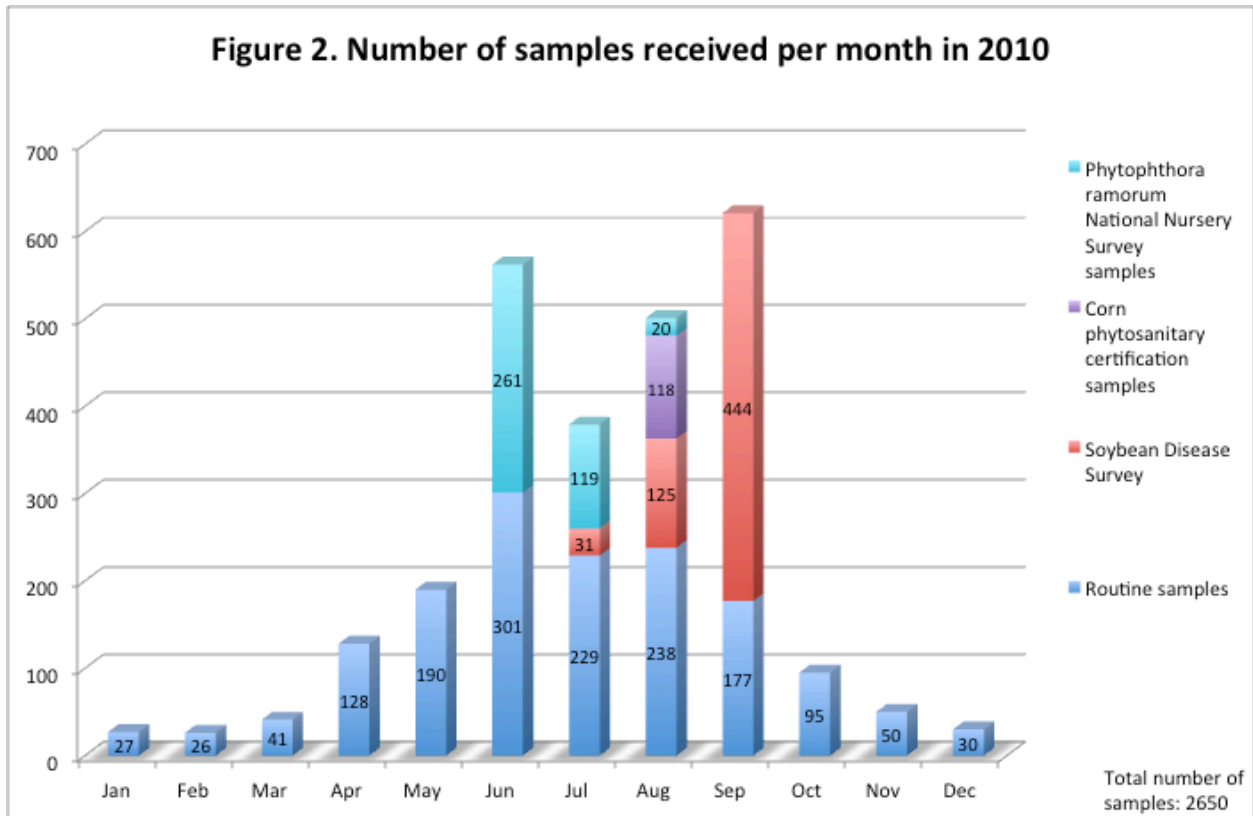
As per Table 2, approximately nine percent (134) of the total number of routine samples diagnosed by P&PDL diagnosticians in 2010 were submitted electronically, as digital samples. In addition to the 1532 routine samples diagnosed, 400 nursery samples were tested for the presence of *Phytophthora ramorum* as part of the Sudden Oak Death (Ramorum blight) National Survey. A total of 118 corn samples were submitted for disease diagnosis for phytosanitary certification (ICIA and IDNR).

Table 2. Breakdown of total samples for 2010	
Routine samples	1532
<i>Physical samples</i>	1344
<i>Digital samples</i>	134
<i>Digital samples with physical follow-up</i>	54
Regulatory/survey samples	1118
<i>Soybean disease survey samples</i>	600
<i>P. ramorum national survey samples</i>	400
<i>Phytosanitary certification samples (IDNR/ICIA)</i>	118
Total number of samples	2650

DIAGNOSES AND SAMPLES

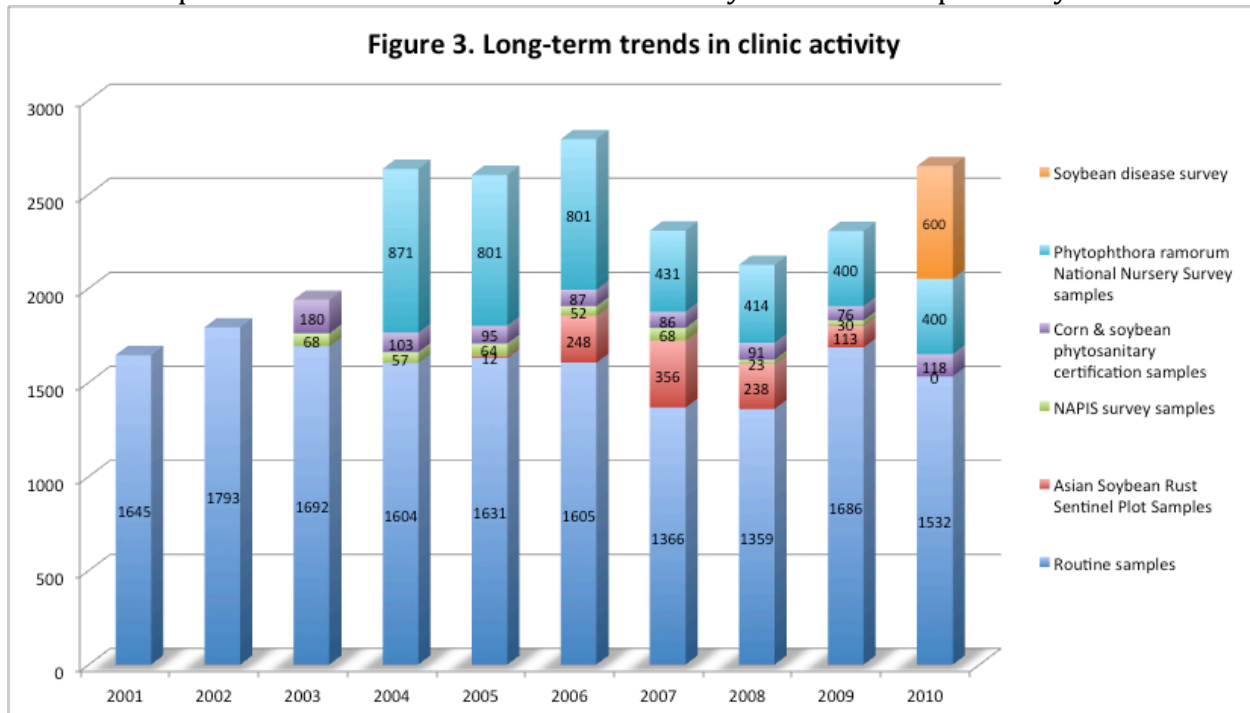
Monthly Activity

During 2010, the Laboratory diagnosed a total of 1532 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 2010 *Phytophthora ramorum* National Nursery Survey samples were submitted during June for diagnosis of the presence or absence of *P. ramorum*, the causal agent of Ramorum blight. During the month of August, ICIA and IDNR field inspectors submitted corn foliar samples to the P&PDL for disease diagnosis required for phytosanitary certification of seed. In July, August and September, we received a total of 600 soybean samples for the soybean disease survey.



Long-Term Trends

Routine sample submissions have remained relatively stable for the past ten years.



Commodities Diagnosed

Figure 4 and **Table 3** show the number of specimens submitted in each commodity group, for 2010. The majority of samples submitted for diagnosis (48%) were from the ornamentals commodity group. In descending order, agronomic crops (18%), insects infesting homes and other buildings (8%), and vegetables and turfgrass/yard (both 7%) 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**).

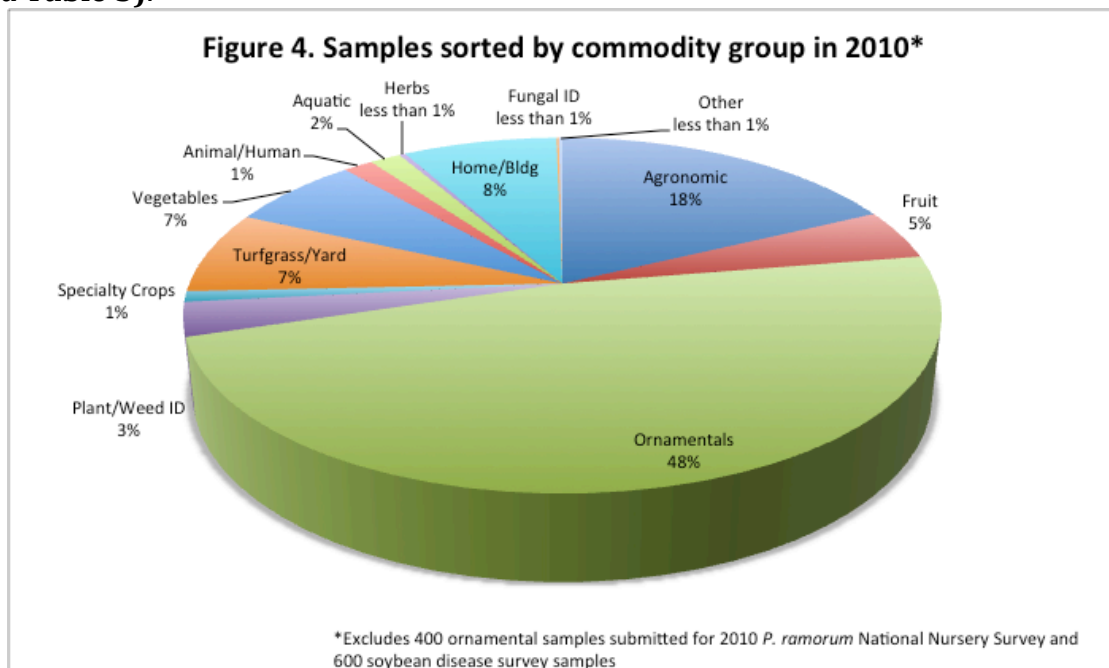


Table 3. Samples sorted by commodity group¹		
	2010	
Commodity	Number of Specimens	%²
Agronomic	294	18
Field crops	257	16
Forage	4	*
Small grains	33	2
Fruit	76	5
Small Fruit	24	2
Tree Fruit	52	3
Ornamentals	787	48
Flowers	177	11
Grnd Cvr/Vines	7	*
Deciduous	366	22
Evergreen	239	15
Plant/Weed ID	51	3
Specialty Crops	16	1
Field	1	*
Hort	15	1
Turfgrass/Yard	124	7
Vegetables	110	7
Miscellaneous	189	11
Animal/Human	25	1
Aquatic	26	2
Home/Bldg	129	8
Herbs	5	*
Fungal ID	2	*
Other	3	*
Total Specimens	1650	100

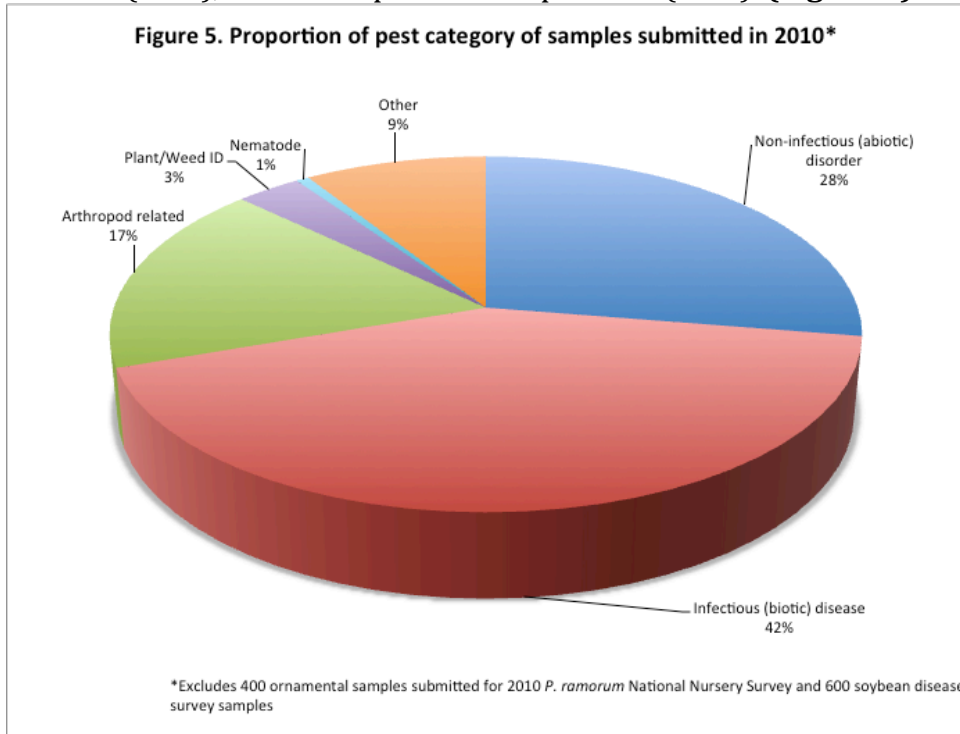
¹ Excludes 400 ornamental samples submitted for 2010 *P. ramorum* National Nursery Survey and 600 samples submitted for soybean disease survey

² Percent of total samples submitted during the year

* Less than 1%

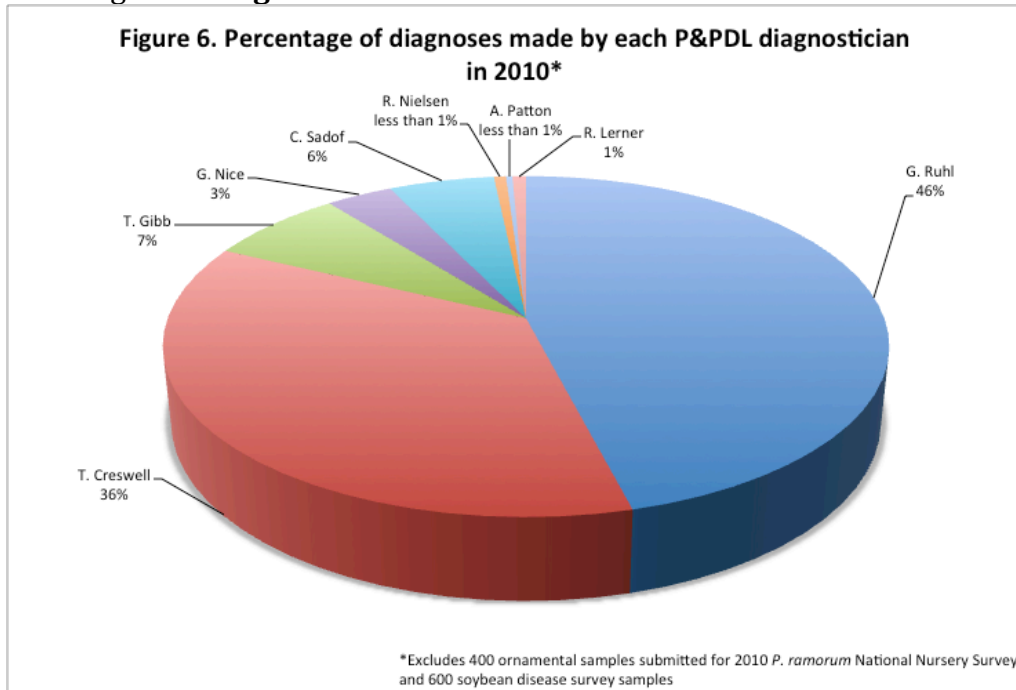
Type of Diagnosis

Many of the 2010 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 (42%), followed by noninfectious (abiotic) disorders (28%), and arthropod-related problem (17%). (Figure 5).



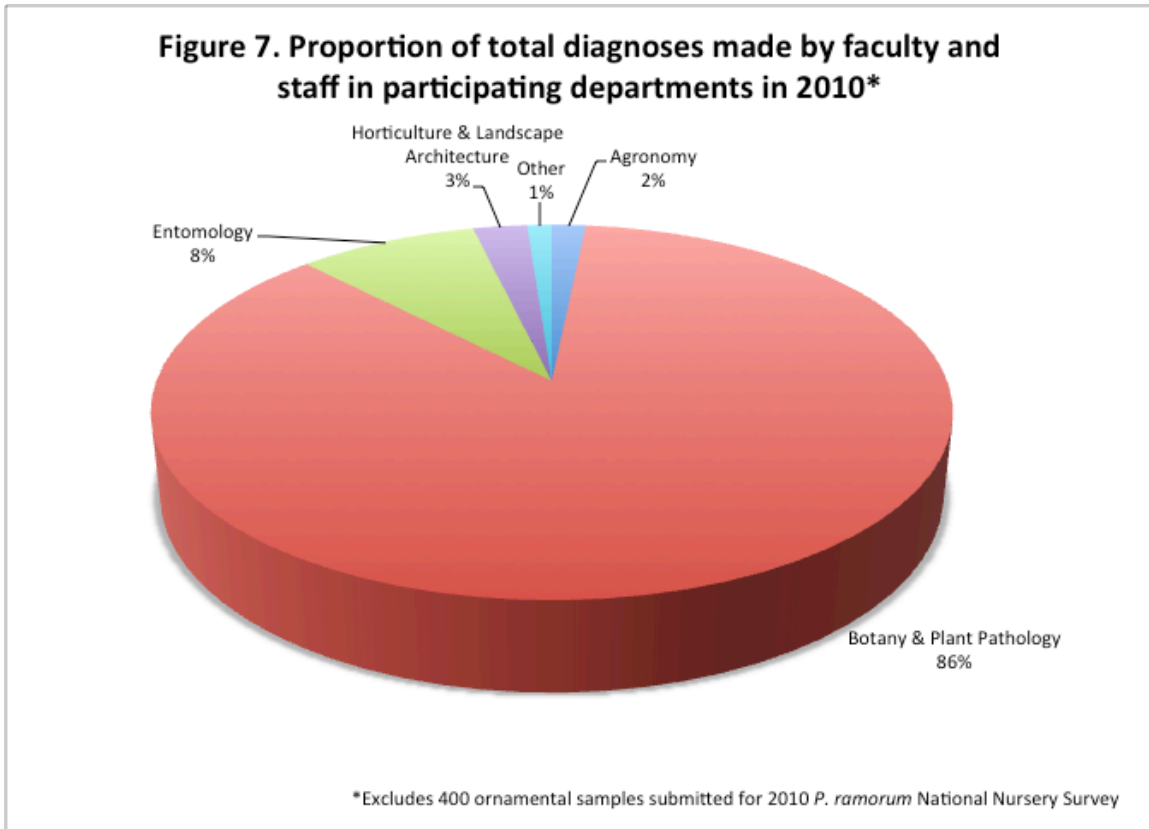
Diagnoses per Diagnostician

A comparison of the proportion of total 2010 diagnoses of samples made according to diagnostician is given in Figure 6.



Diagnoses per Department

A comparison of the proportion of total 2010 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

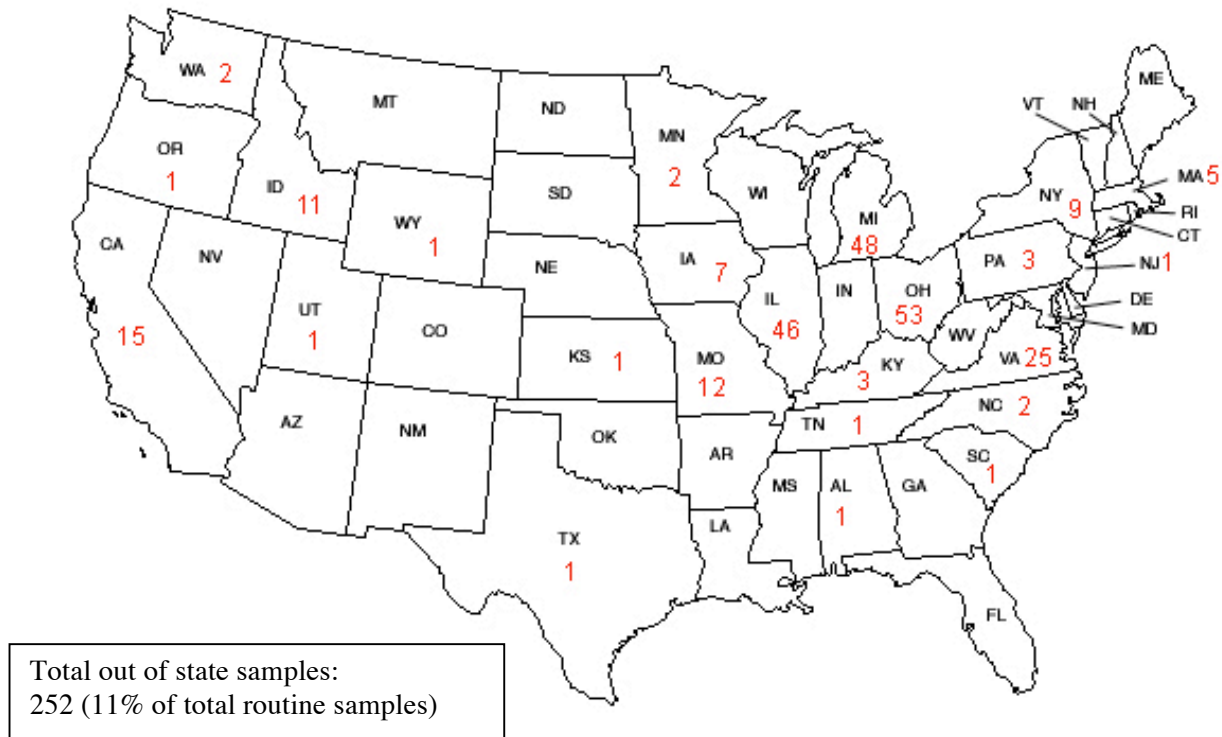
Samples are submitted to the P&PDL by commercial and non-commercial clientele as well as by IDNR/USDA/APHIS personnel for regulatory and survey work (**Table 4**).

Table 4. Affiliation of persons submitting samples to the P&PDL in 2010¹		
Affiliation	Number of samples	%
Commercial	801	48
Consultant	81	5
Dealer/Industry Rep	148	9
Garden Center	13	1
Golf Course	31	2
Greenhouse	98	6
Growers – Agronomic	19	1
Growers – Fruit/Vegetables	23	1
Growers – Ornamentals/Turf	8	*
Landscape	76	5
Lawn/Tree Care	199	12
Nursery	65	4
Pest Control	40	2
Non-Commercial	572	35
Extension Educator	275	17
Homeowner	180	11
Purdue – not Educator	71	4
Other	46	3
Regulatory/Survey	277	17
ICIA	127	8
IDNR	100	6
State Chemist	50	3
Totals	1650	100
¹ Excludes 400 ornamental samples submitted for 2010 <i>P. ramorum</i> National Nursery Survey and 600 samples submitted for soybean disease survey		
* Less than 1%		

Out of State Submissions

The Laboratory was established to serve residents of Indiana, however, due to the P&PDL's national reputation, diagnostic services were also provided for 252 samples (15% of total routine samples) submitted from 24 other states during 2010*.

Figure 8. Distribution of samples received from outside Indiana by the Plant and Pest Diagnostic Laboratory in 2010.



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

AN INFORMATION SOURCE

The P&PDL 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 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 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 P&PDL 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 P&PDL, and many featured links. There is a keyword searchable database, a digital library and a link for submitting digital samples to the P&PDL. Web server statistics for the Plant and Pest Diagnostic Laboratory reported an average of 17,632 requests per day for P&PDL web pages from January 1 through December 31, 2010 from a total of 156 countries worldwide.

As social media popularity continues to grow, the P&PDL 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

P&PDL staff members participate in a variety of Purdue University sponsored events and first detector educational programs. Some of these programs in 2010 included:

- Master Gardener Training
- Turf and Ornamentals Workshops
- IDNR Nursery Inspector: Training for *P. ramorum* Nursery Survey
- Indiana Crop Improvement Association (ICIA) inspectors: Training for Phytosanitary Field Inspection of corn and soybeans.