



2024 Summary Report

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2024 Plant & Pest Diagnostic Lab Annual Summary Report



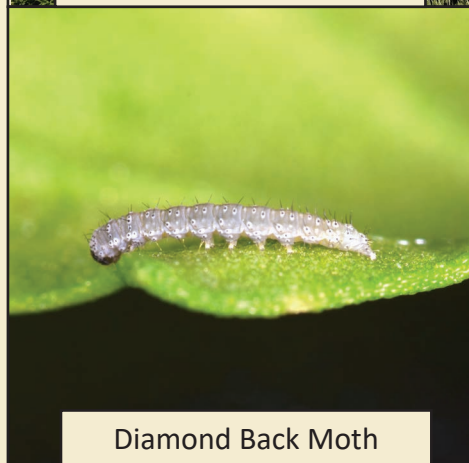
Spruce - Tordon uptake



Hosta - Hosta Virus X



Ophiostoma ulmi



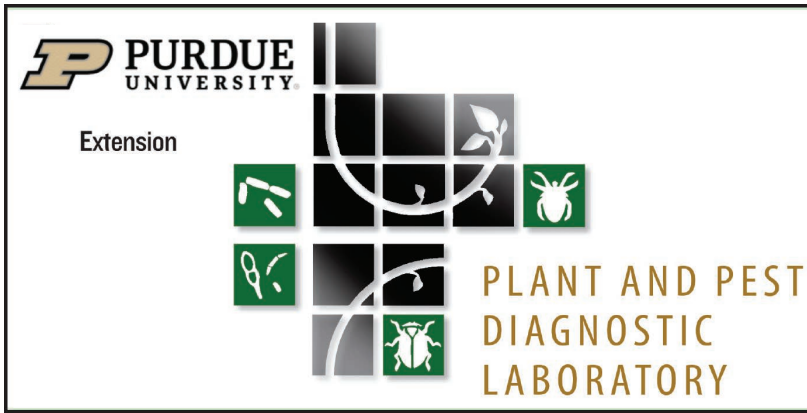
Diamond Back Moth



Lettuce - Slime Mold



Bentgrass - Dollar Spot



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Introduction

The Plant and Pest Diagnostic Laboratory (PPDL) remains dedicated to helping protect Indiana's agriculture, the green industry, and individual landscapes, by providing rapid and reliable diagnostic services for plant disease and pest problems. We also provide appropriate pest management strategies and diagnostics training. We are a participating member lab in the National Plant Diagnostic Network (NPDN), a consortium of Land Grant University diagnostic laboratories established to help protect our nation's plant biosecurity infrastructure.

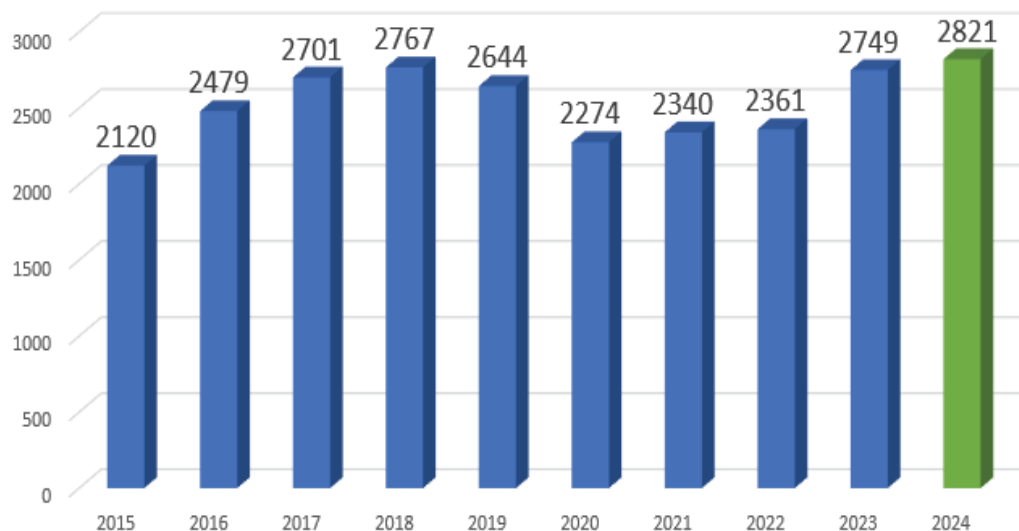
Plant Problem Diagnosis Saves Money and Pesticide Use

Diseases and pests of agronomic and horticultural crops negatively impact farms, greenhouse and nursery operations, orchards, turf, and landscapes. Growers need to know quickly what problems they face and how to mitigate and prevent them. Each year the PPDL surveys our clients to document the impact of our work and seek ways to improve our services.

PPDL clients reported they saved a total of \$886,770 in 2024 by using the PPDL to avoid crop loss or unnecessary pesticide use. As a result of applying PPDL recommended practices, clients avoided plant/crop loss (32%) and increased plant/crop quality (32%).

Clients also reported a better understanding of the problem (84%) and improved their ability to diagnose the problem (55%). PPDL reports allowed clients to choose the best pesticide (75%), avoid unnecessary pesticide use (51%), and understand how to apply a pesticide (24%). An important role of the PPDL is to make recommendations for treatment and prevention and 69% of clients reported seeking out resources (fact sheets, websites, etc.) or contacts recommended in PPDL reports. More than half (55%) reported changing

Figure 1 - Ten-Year Sample Trend



management practices because of the PDDL information. Most clients (89%) reported being satisfied or very satisfied with the PDDL quality of recommendations. PDDL clients across Indiana and the region learned and implemented practices to address plant and pest issues for improved plant health and crop production.



Figure 2 - Discoloration and decay on strawberry, later confirmed to be caused by *Erwinia pyrifoliae*.

New Disease Problem on Strawberry

Diagnosticians at the PDDL are always on alert for potential new disease problems in the samples received. During 2024 PDDL diagnosticians identified a new disease that had not been previously confirmed in the United States. A sample of greenhouse-grown strawberry fruit from Ohio had unusual symptoms of discoloration and decay (Fig. 2). Laboratory testing showed the fruit rot was caused by a bacterial pathogen that had not been previously documented on Strawberry in the US: *Erwinia pyrifoliae*, which is closely related to the more familiar *Erwinia amylovora*, the cause of fire blight on pear and apple. In collaboration with the USDA-PPQ Plant Pathogen Confirmatory Diagnostics Laboratory, the diagnosticians confirmed the identification, performed pathogenicity tests, and ultimately published a first report on the finding: <https://doi.org/10.1094/PDIS-06-24-1337-PDN> Other journal and newsletter publications co-authored by the diagnosticians are listed at the end of this report, including the first report of Soybean Red Crown rot in Indiana.

Sample Overview

Sample numbers in 2024 increased to 2821, the highest level in the last 10 years (Fig. 1), while total number of problems identified on the samples increased to 4410. More than 5360 total laboratory tests were conducted to allow accurate diagnosis of each sample. Ornamental plants are consistently the largest category of non-regulatory samples (61%), followed by agronomic crops (17%), highlighting the reliance of Indiana’s green industry on the expertise provided by the PDDL (Fig. 2). More detailed information on sample type, problem categories, and client groups are listed in tables in the appendix.

Figure 3 - Non-Regulatory Sample Categories

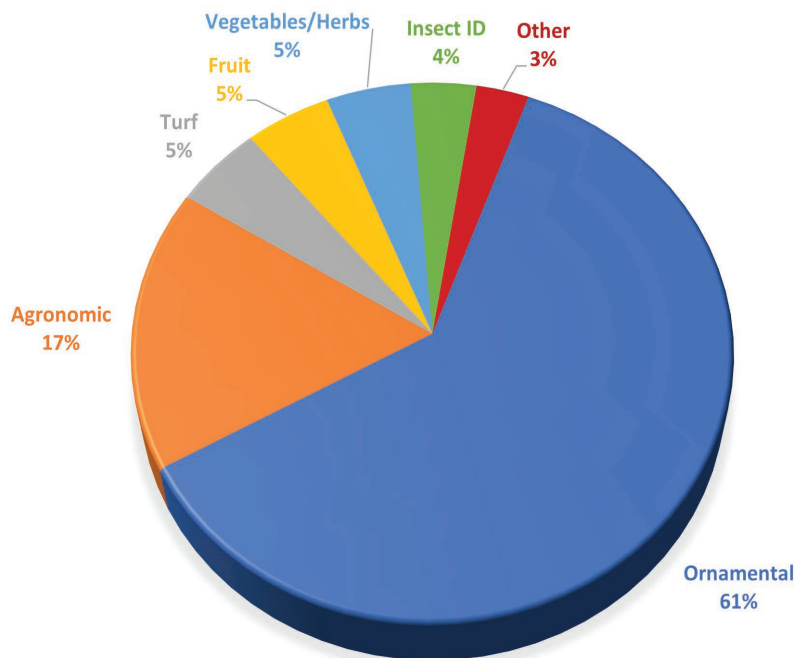
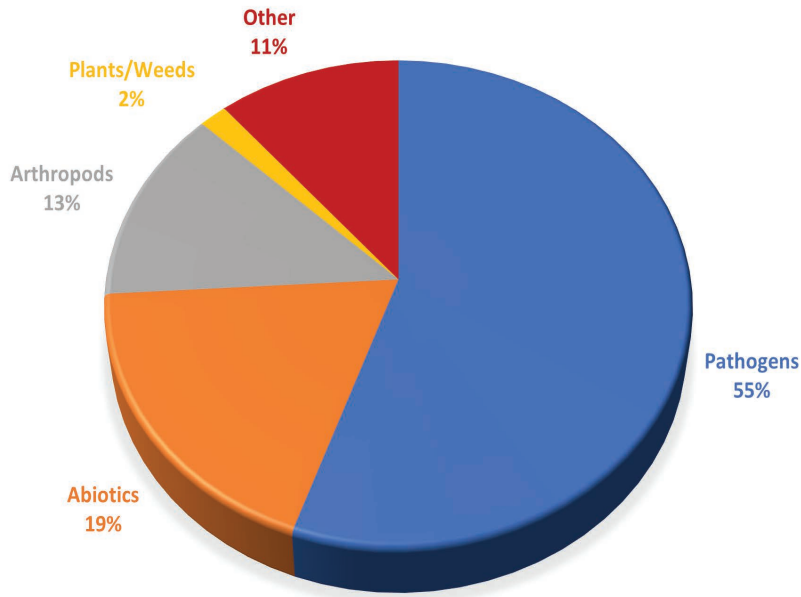


Figure 4 - Diagnosis by Problem Category



While diseases comprised 55.4% of our diagnoses last year, arthropod problems and damage due to non-living (abiotic) factors such as herbicide injury and weather extremes continue to be a significant segment of the problems diagnosed (Fig. 4).

Extension Specialist Collaboration

The PPDL remains committed to collaborative work with College of Agriculture Departments, including Botany & Plant Pathology, Agronomy, Entomology, Horticulture & Landscape Architecture, and Forestry & Natural Resources. The level of service provided by the PPDL would be impossible without generous help from Extension faculty and staff members providing problem diagnoses or recommendations on samples touching their specialty areas (Table 1). In 2024 we saw the retirements of Janna Beckerman, Extension Plant Pathology specialist for Fruit and Ornamental crops (Fig. 5), and Keith Johnson, Agronomy Extension Forage specialist (Fig. 6); both are long-time supporters of the PPDL and they will be missed. We are pleased to welcome two new faculty members; Andrew Johnston in the Entomology Department as a new Clinical Assistant Professor (Fig. 7), who has provided arthropod identification help to the PPDL for most of the year, and César Escalante (Fig. 8), who joined Botany and Plant Pathology with a focus on vegetable crop diseases. The PPDL provides an ongoing point of connection between county-based Extension educators, the public, and Extension specialists on campus, facilitating knowledge exchange and information about trends in lab samples to promote more informed recommendations for disease and pest management.



Figure 5. Janna Beckerman



Figure 6. Keith Johnson



Figure 7. Andrew Johnston



Figure 8. César Escalante

Table 1 - Department faculty and staff that assisted with sample diagnoses - 2024			
Faculty/Staff	# of Diagnoses	Faculty/Staff	# of Diagnoses
Agronomy	5	Entomology	188
Keith Johnson	5	Andrew Johnston	156
Botany	3650	Doug Richmond	13
John Bonkowski	2087	Elizabeth Long	10
Tom Creswell	1094	Laura Ingwell	5
Darcy Telenko	296	John Obermeyer	3
Lee Miller	81	Horticulture & Landscape Architecture	69
Marcelo Zimmer	48	Kyle Daniel	37
Janna Beckerman	38	Aaron Patton	11
César Escalante	6	Stephen Meyers	8
Forestry & Natural Resources	4	Karen Mitchell	5
Non-Purdue Specialist	12	Liz Maynard	2

Corn Tar Spot and Soybean Red Crown Rot Update:

Darcy Telenko’s field crop pathology team continues to scout for new and emerging diseases across the state with samples sent to the PPDL for diagnosis.

Tar spot of corn, caused by *Phyllachora maydis* (Fig. 9), continues to be a concern due to previous epidemics. In 2024, high levels of tar spot occurred in Indiana with major pockets of severe disease with reports of up to 100 bu/A losses. Environmental conditions are key in determining field risk year to year as temperature (64-73°F) for 30 days and leaf wetness play an important role in tar spot disease development. This year with the help of the PPDL and Purdue county ANR educators tar spot was confirmed in all 92 counties in Indiana. Over 380 samples were submitted to the PPDL for corn diseases with 66 being positive for tar spot. The distribution of corn tar spot in 2024 is shown in Figure 10. It is estimated that tar spot caused an estimated 5.4% loss to corn production in Indiana, making 2024 the worst season on record for the disease in Indiana.



Figure 9. Tarspot of Corn

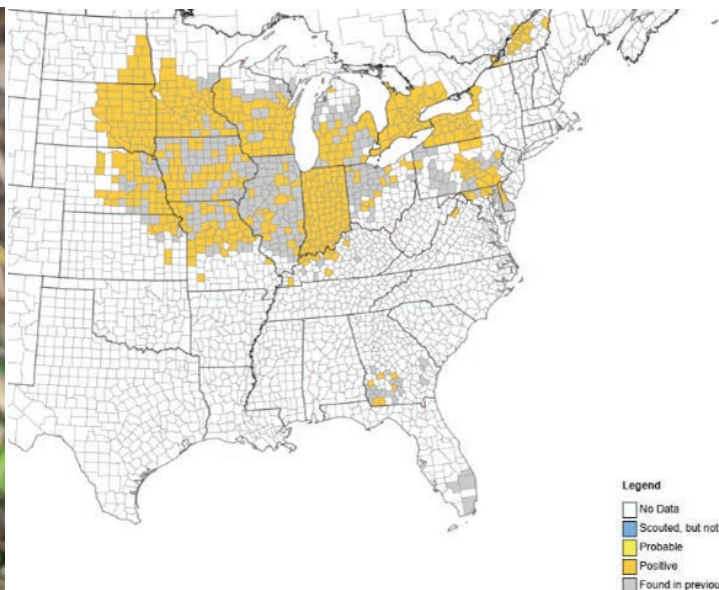


Figure 10. Distribution of Tarspot of Corn 2024

Red crown rot of soybean, caused by *Colonectria illicicola*, is a new disease in Indiana. Red crown rot symptoms in the field include red discoloration at the crown and red, spherical perithecia forming on the crown and stem (Fig. 11). It was first detected in Decatur and Spencer counties in 2022, Adams and Rush in 2023, and four new counties were confirmed in 2024: Allen, Bartholomew, DeKalb and Knox (Fig. 12).

With funding provided by the Indiana Corn Marketing Council and Indiana Soybean Alliance, Dr. Telenko's program paid sample handling fees for all suspected corn tar spot, corn southern rust, and soybean red crown rot samples submitted to the PPDL for diagnosis as part of ongoing surveys. Questions about disease management can be directed to Dr. Darcy Telenko at dtelenko@purdue.edu



Figure 11. Red crown rot symptoms

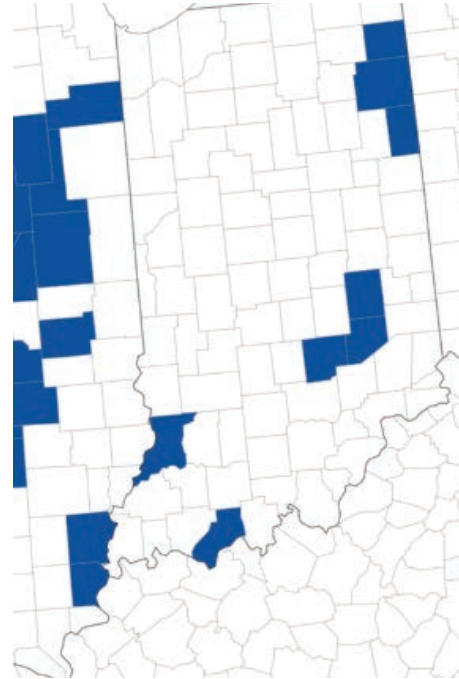


Figure 12. Red crown rot distribution 2024

Vascular Streak Dieback

A dieback and plant decline syndrome, known as vascular streak dieback (VSD) has emerged as a new problem threatening nursery production of redbud, maple, and other hardwood trees since 2019. Thin brown streaks found within vascular tissue in woody plants have been observed in frequent association with plants exhibiting dieback and decline symptoms (Fig. 13). A fungus, currently identified as a *Ceratobasidium* species, has been isolated or detected in all VSD cases in association with the vascular streak symptoms. To date, the IDNR has located and eradicated four occurrences of VSD in nursery stock in Indiana (redbud and tulip poplar). There have been no occurrences in Indiana landscapes or native stands to our knowledge. Our lab continues to work with specialists and multiple institutions in states where this issue has been found to learn more about the disease issue, including cultivar screenings, determining how the disease spreads, and improving ways to detect and isolate the associated fungus. For more information on VSD, please see the following link: <https://www.pubs.ext.vt.edu/SPES/spes-483/spes-483.html>



Figure 13. Vascular streak dieback symptoms on Redbud

Beech Leaf Disease Survey

First observed in Ohio in 2012, beech leaf disease (BLD) and the foliar nematode associated with symptomatic trees, *Litylenchus crenatae* subsp. *mccannii*, has been causing the decline of beech trees of all ages in the Northern US and parts of Canada. Affected trees show characteristic leaf striping and deformation, reduced vigor, and eventual death. The nematode has been detected in the following locations and is continuing to spread: CT, MA, ME, MI, NH, NJ, NY, OH, PA, RI, VA, and Canada. In collaboration with the Indiana IDNR and the Michigan, and Wisconsin Departments of Agriculture, we are participating in a survey to determine if BLD is present within the states and to measure the spread of BLD in Michigan. The survey runs from 2023 to 2026, with samples collected from October to March each year. Only 2 samples from Winter-Fall 2024 were determined to be positive for BLD. They were collected in Michigan in locations already known to be infested with *Litylenchus*.

Indiana Department of Natural Resources (IDNR) Collaboration:

The PPDL serves as the state laboratory charged with handling regulatory plant samples. Our work helps assure accuracy in disease diagnosis for phytosanitary certification for exports, administered by the IDNR. We also support the work of the IDNR by providing insect identification and disease diagnosis for nursery inspection samples and official state plant disease survey samples. Since 2004, the PPDL has partnered with the IDNR in annual Cooperative Agriculture Pest Survey (CAPS) efforts to ensure Indiana nurseries are free from *Phytophthora ramorum*, the causal agent of Ramorum Blight and Sudden Oak Death. The CAPS nursery survey assists in protecting Indiana landscapes, forests, and the timber industry from a potentially destructive pathogen while preventing impacts to trade that might occur if *P. ramorum* became established in our nurseries and forests. Fortunately, there were no *P. ramorum* detections in the 211 survey samples received this year.

Indiana Crop Improvement Association (ICIA) Collaboration:

In Indiana, ICIA field inspectors assist the IDNR by providing field inspections of crops grown for international export so that the IDNR may issue appropriate Phytosanitary export certificates. The PPDL provides phytosanitary corn and soybean disease diagnostics workshops to train Indiana Crop Improvement Association (ICIA) field inspectors annually to promote high standards of plant inspection work. This year, we processed 124 in-season samples from ICIA inspectors throughout Indiana.

Office of the Indiana State Chemist (OISC) Collaboration:

We also partner with the OISC on samples collected as part of official investigations of pesticide misapplication cases to evaluate potential herbicide damage and determine whether disease and insect problems may be contributing factors in those cases.

Extension and Teaching Activities

The PPDL staff participates in multiple in-person training events throughout the state each year. In 2024 our educational efforts included participation in Indiana Green Expo, Turf and Landscape Field Day, Indiana Arborists Association meeting, Indiana Professional Lawn and Landscape Association, Category 1A Pesticide Certification Training, Purdue Spring Fest, and the Purdue Extension Master Gardener Program. John Bonkowski and Tom Creswell presented a total of 13 talks, reaching more than 1250 participants. We also provided classroom lectures and/or lab experiences related to diagnostic work for students in six courses: BTNY 605, BTNY 208, BTNY 301, HORT 318, and FNR 444.

Journal Publications

1. First Report of *Xanthomonas dyei* Causing Bacterial Blight on Glossy Abelia. Enoch Noh, Tom Creswell, Janna L. Beckerman, John C. Bonkowski, and Hehe Wang. Plant Disease. 2024. <https://doi.org/10.1094/PDIS-08-24-1755-PDN>
2. First Report of Anthracnose Caused by *Colletotrichum sansevieriae* on *Dracaena trifasciata* (Snake Plant) in Tennessee. Marian Grskovich, Tom Creswell, and John Bonkowski. Plant Disease 2024. <https://doi.org/10.1094/PDIS-05-24-1049-PDN>
3. Phylodynamic Insights into Global Emergence and Diversification of the Tomato Pathogen *Xanthomonas hortorum* pv. *gardneri*. Jibrin, et. al. 2024. <https://apsjournals.apsnet.org/doi/pdf/10.1094/MPMI-04-24-0035-R>
4. First report of *Erwinia pyrifoliae* causing flower blight and fruit rot on greenhouse-grown *Fragaria × ananassa* in the United States. John Bonkowski, Jarred Yasuhara-Bell, and Tom Creswell. Plant Disease 2024. <https://doi.org/10.1094/PDIS-06-24-1337-PDN>
5. First Report of *Calonectria ilicicola* Causing Red Crown Rot of Soybean in Indiana. John Bonkowski, K. Morgan Goodnight, Marian R. Grskovich, Darcy Telenko. 2024 Plant Disease: <https://doi.org/10.1094/PDIS-10-23-2198-PDN>
6. Uncovering the Infection Strategy of *Phyllachora maydis* During Maize Colonization: A Comprehensive Analysis. Denise L. Caldwell, Camila Rocco da Silva, Austin G. McCoy, Harryson Avila, John C. Bonkowski, Martin I. Chilvers, Matthew Helm, Darcy E. P. Telenko, and Anjali S. Iyer-Pascuzzi. 2024 Phytopathology: <https://doi.org/10.1094/PHYTO-08-23-0298-KC>
7. Sensitivity of soybean (*Glycine max* L.) pathogens *Diaporthe aspalathi*, *D. caulivora*, and *D. longicolla* to Difenoconazole and Fluopyram fungicides. Karthika Mohan, Sarah Barnes, Dilorom Rasuleva, Taofeek Mukaila, Tom Allen, Gary C. Bergstrom, Kaitlyn Bissonnette, John Bonkowski, Carl A. Bradley, James Buck, Martin I. Chilvers, Anne E. Dorrance, Loren Giesler, Heather Marie Kelly, Nathan Kleczewski, Alyssa Betts, Horacio Lopez-Nicora, Dean Malvick, Dylan Mangel, Samuel Markell, Daren Shane Mueller, Madalyn K. Shires, Edward Sikora, Damon L. Smith, Darcy E. P. Telenko, Terry Spurlock, Dalitso Yabwalo, Kiersten Wise, and Febina Mathew. 2024 Plant Health Progress: <https://doi.org/10.1094/PHP-08-24-0078-RS>
8. Vascular streak dieback: A novel threat to redbud and other woody ornamental production in the United States. Prabha Liyanapathirana, Farhat A. Avin, John Bonkowski, Janna L. Beckerman, Michael Munster, Denita Hadziabdic, Robert N. Trigiano, and Fulya Baysal-Gurel, 2024 Abstract. <https://doi.org/10.1094/PDIS-04-24-0905-FE>

Purdue Landscape Report newsletter articles

Purdue Landscape Report newsletter:

Authored by John Bonkowski

- Black Spot of Elm: <https://purduelandscape.com/article/7528/>
- Septorioides Needle Blight of Pine: <https://purduelandscape.com/article/7299/>
- Leaf Curl and Leaf Blister Brought by Wet Weather: <https://purduelandscape.com/article/leaf-curl-and-leaf-blister-brought-by-wet-weather/>
- Webinar on Vascular Streak Dieback: <https://purduelandscape.com/article/webinar-on-vascular-streak-dieback/>
- Declining Pines of the White Variety: <https://purduelandscape.com/article/declining-pines-of-the-white-variety/>

Authored by Tom Creswell:

- Botryosphaeria Dieback and Canker: <https://purduelandscape.com/article/botryosphaeria-dieback-and-canker/>
- A Triple Threat to Rocky Mountain Juniper: Cytospora, Diplodia, and Botryosphaeria: <https://purduelandscape.com/article/a-triple-threat-to-rocky-mountain-juniper-cytospora-diplodia-and-botryosphaeria/>
- Oak Leaf Tatters – a spring ritual. Tom Creswell. May 23, 2023. <https://www.purduelandscape.com/article/oak-leaf-tatters-a-spring-ritual/>

Appendix: Additional Tables and Figures:

Category	# of Samples	% of Samples
Agronomic	318	16.9%
Corn	170	9.0%
Soy	122	6.5%
Small Grains - wheat,oats,barley	18	1.0%
Other	8	0.4%
Fruit	93	4.9%
Fruit tree/vine	64	3.4%
Small Fruit	29	1.5%
Ornamental	1156	61.4%
Woody ornamental - Deciduous	609	32.3%
Woody ornamental - Evergreen	301	16.0%
Perennial	161	8.6%
Annual	56	3.0%
Other	29	1.5%
Turf	96	5.1%
Vegetable/Herbs	92	4.9%
Insect ID	71	3.8%
Fungal ID	30	1.6%
Miscellaneous	27	1.4%
Total Samples:	1883	100.0%

Category	Number of Diagnoses	Percentage of Total
Pathogens	2441	55.4%
Fungi/Oomycetes	2089	47.4%
Viruses	220	5.0%
Bacteria	120	2.7%
Phytoplasma	12	0.3%
Abiotics	825	18.7%
Arthropods	577	13.1%
Insects	438	9.9%
Mites	109	2.5%
Nematodes	30	0.7%
Plants/Weed Identification	75	1.7%
Other	492	11.2%
Totals:	4410	100.0%

Appendix Table 3 - Affiliation of persons submitting samples to the PPDL - 2024		
Affiliation	Number of Samples	% of Total
Non-regulatory	1883	66.75%
Commercial	1354	48.00%
Garden Center/Greenhouse/Nursery	410	14.53%
Landscape/Lawn & Tree Care	209	7.41%
Crop Consultant	200	7.09%
Arborist	172	6.10%
Grower/Farmer	121	4.29%
Researcher/Specialist	62	4.29%
Extension-Purdue on the Farm	38	1.35%
Extension Educator	20	1.35%
Other	30	0.71%
Golf Course	30	0.96%
Agribusiness	27	1.06%
Pest Control	22	0.78%
Veterinarian/Medical Provider	12	0.43%
Non-Commercial	529	18.75%
Homeowner	340	12.05%
Researcher/Specialist	140	4.96%
Extension Agent	49	1.74%
Regulatory Samples	938	33.25%
Beech Leaf Disease Testing	348	12.34%
IDNR (SOD <i>P. ramorum</i> Nursery Survey)	211	7.48%
Office of the Indiana State Chemist	130	4.61%
IDNR (Nursery Inspection)	124	4.40%
ICIA (Phytosanitary certification field inspection)	124	4.40%
Total:	2821	100.00%



Extension
Plant and Pest Diagnostic Lab