

- Scouting 101
- Short YouTube Videos Help English and Spanish Speakers Improve Plant Health and Client Communication with the Purdue Plant Doctor Web Page.
- Cold Injury During a Very Mild Winter?

Scouting is the foundation of any IDM program. Scouting consists of systematically moving through the nursery, greenhouse or landscape looking for pathogens and pests, quantifying damage and evaluating thresholds. Scouting allows for the early identification of potential problems, providing more management options that can be implemented prior to a critical threshold, thereby reducing the control costs and crop losses. Since pest and pathogen populations vary, spraying without scouting (or spraying and praying) first may result in unnecessary or insufficient pesticide applications. A grower can use pesticides more effectively by knowing what pathogens are in a nursery, greenhouse or landscape, anticipating problems, and treating them before significant losses result.

A diagram of a triangular lattice with horizontal black lines. Red bonds connect vertices at (0,0) to (1,1), (1,0) to (2,1), (2,0) to (3,1), and (3,0) to (4,1). Blue bonds connect vertices at (0,0) to (1,0), (1,0) to (2,0), (2,0) to (3,0), (3,0) to (4,0), (0,1) to (1,1), (1,1) to (2,1), (2,1) to (3,1), (3,1) to (4,1), (0,2) to (1,2), (1,2) to (2,2), (2,2) to (3,2), (3,2) to (4,2), (0,3) to (1,3), (1,3) to (2,3), (2,3) to (3,3), and (3,3) to (4,3). Arrows indicate a spin configuration: (0,0) points down-left, (1,0) points up-left, (2,0) points down-left, (3,0) points up-left, (0,1) points down-right, (1,1) points up-right, (2,1) points down-right, (3,1) points up-right, (0,2) points down-left, (1,2) points up-left, (2,2) points down-left, (3,2) points up-left, (0,3) points down-right, (1,3) points up-right, (2,3) points down-right, and (3,3) points up-right.

When scouting for pathogens or pests, it is important to get a random sample. However, the scout also needs to observe and note any high population areas (foci) in the field. Scouts should walk through the field in a “V,” “X,” or “W” pattern to get a random sample of pest populations within the field (Fig. 1). Anywhere from 25-100 plants should be randomly selected for examination, depending on the size of the greenhouse/nursery/landscape.

Random selection of plants is the key to an accurate indication of a pest or pathogen population. This doesn't mean ignoring problems that you might see while scouting that don't conform to your pattern! Remember the goal is to identify any problems early, not walk in a pattern.

Stick to scouting patterns while noting any areas of unusual plants or problems [e.g., areas of high pathogen or pest population, called focus areas or foci (plural)]. Take care to prevent insect or pathogen foci from skewing the results—these areas may warrant separate treatment plans, eradication, or additional applications of pesticide.

Where to scout:



Figure 2. Comparing healthy (right) to stunted plant (left). Unpotting the plant revealed root rot. Photo by Janna Beckerman.

Scouting is different depending upon how plants are propagated. In the greenhouse, cuttings should be examined prior to being stuck, with any spotted, distorted or discolored cuttings discarded. For seed-propagated plants, begin scouting for all pests (insects and diseases) at germination. This is especially important if there is a history of problems with damping-off, cutting rots, botrytis, downy mildew, and root rots, particularly *Phytophthora* and *Pythium*. When examining individual plants, observe the top, middle, and bottom canopy, as well as the main stem and roots, if present. Pots should be tipped sideways for inspection of the underside of the leaves where downy mildew is often first visible (and insects often hide). Remove plants from pots for root examinations on crops that are highly susceptible root rot (e.g., lavender, hellebore, mum) by inverting and removing the pot (Fig. 2).

In the nursery, scouting begins when whips or liners are potted (or up-potted) and again at budbreak. When examining individual plants, observe the top, middle, and bottom of the main stem along with any roots or root ball. Plants should be assessed for any external signs of botrytis, powdery mildew, cankers or root rot, and discard any obviously infected plants. These plants are more likely to serve as the start of an epidemic rather than a saleable plant. Continue scouting paying extra attention at bud

break, not after the problem is identified. When examining individual plants, observe the top, middle, and bottom canopy, as well as the main stem and crown (root ball).

When scouting the wider nursery, consider the geography, including prevailing winds and rains, and field orientation (e.g., buildings or large trees that serve as windbreaks that increase humidity; farmer's fields that may drift herbicide or serve as sources of white mold (*Sclerotinia sclerotiorum*); alternate hosts for rust diseases, etc. Note any low spots that tend to accumulate water (depressions in fields or nurseries; areas adjacent to evaporative cooling pads in greenhouses; leaks) taking care to look for botrytis, or water molds (downy mildews, *Phytophthora*, *Pythium*) that can debilitate plants.

When to Scout:

Disease scouting should begin as soon as planting or budbreak and continue throughout the entire growing season.

Draw a nursery/greenhouse map to identify blocks and problems areas from year to year. This is particularly important as many diseases are best controlled early in the season before symptoms are visible (e.g., powdery mildew, botrytis, apple scab). Waiting for symptoms to appear to begin fungicide applications can result in severe damage to some ornamental crops (i.e., *Phytophthora* or downy mildews on perennials; fire blight on crabapples, hawthorns, etc.). By incorporating scouting, and using survey information to plan treatments, disease problems can be managed proactively and efficiently.

Should an unknown problem be found, samples can be sent to the Purdue Plant and Pest Diagnostic office (www.purdue.edu/PPDL) for identification and management suggestions.

Record Keeping

As an IDM tool, scouting is only one the first part of IDM. Without proper records, scouting will be ineffective. An example scouting template example can be seen on the last page (Fig. 3). The greatest value derived from scouting is the record of what plants have problems and when they occur so you can be proactive in future years and prevent these problems from happening. The best way to do this is to keep and regularly review detailed records. Records and maps (greenhouse, nursery, blocks, landscape) provide a history of past problems and provide a leg-up on future diagnoses, showing where, when and what crops have had problems. Information should be compiled weekly and then examined at the end of the season to prepare for next year's scouting and disease management. All of this is more easily said than done, but commitment to the process will provide dividends later, with improved yield, quality and plant health leading to happier clients in all of our industries.

When performed proactively, IPM saves growers money on chemical costs and reduces losses. It is the difference between planning and being proactive versus responding reactively to big losses. Developing a new IPM routine is hard and requires effort and intention. Begin by blocking a regular time to scout every week and allow time to record your efforts. Recognize that other demands in the greenhouse and/or nursery will compete with this

time, so prioritize it by setting an alarm in your phone or setting up a team approach so it isn't the responsibility of just one person. Keep in mind that this is process that will require repeated practice, but it is one that will pay dividends in better plant health and a better bottom line.

Basic Scouting Information			
Client:	Location:	SubLocation:	
Date:	Scout:		
Crop and Pest Information			
Host Crop and Stage	Pest, Disease, Disorder	How field was scouted	Notes (fertilizer, pesticides applied)
		Measurements: #Plants Sampled: #Samples/location: #Locations:	
		Measurements: #Plants Sampled: #Samples/location: #Locations:	
		Measurements: #Plants Sampled: #Samples/location: #Locations:	
		Measurements: #Plants Sampled: #Samples/location: #Locations:	
		Measurements: #Plants Sampled: #Samples/location: #Locations:	

Figure 3. Example scouting template. Start getting into the scouting habit by keeping it simple. As scouting becomes a habit, expand what you scout and when you scout it, improving your process as you gain experience.

Short YouTube Videos Help English and Spanish Speakers Improve Plant Health and Client Communication with the Purdue Plant Doctor Web Page.

(Cliff Sadof, csadof@purdue.edu)

Two short YouTube videos demonstrate how English and Spanish speakers can use this the Purdue Plant Doctor Website.

Diagnosing Plant Problems with the Purdue Plant Doctor Web Page (5 minutes -in English with closed captions)

<https://youtu.be/C4rGAP4Jerk>

Guia Rapida Diagnosticar y Manejar Problemas de las Plantas con Purdue Plant Doctor (9 minutes in Spanish with closed captions).

This video shows how to search for problems and switch between English and Spanish using Google Translate.

https://youtu.be/e_7bv_jV8NU

Please share this link with Spanish speaking employees and customers.

See Guides to using the Purdue Plant Doctor Web Page previous issues of the Purdue Landscape Report for more details on how to use the web page.

[English Guide to Purdue Plant Doctor.](#)

[Spanish Guide to Purdue Plant Doctor.](#)

Cold Injury During a Very Mild Winter?

(Kyle Daniel, daniel38@purdue.edu)

Remember the pre-Christmas freeze? What about the extremely long fall? The Midwest experienced above-average temperatures

through most of the winter, but those extremely cold temps in late December made for more than a few pipes to freeze in the southern part of the Midwest.

The dichotomy in weather patterns over the last several years has been mind-boggling. We've gone from flooding to drought in most recent growing seasons, to the extremes in temperatures this winter. Though it's an inconvenience for us, plants don't have the option of heated seats or umbrellas, thus stress or death can occur in these extremes.

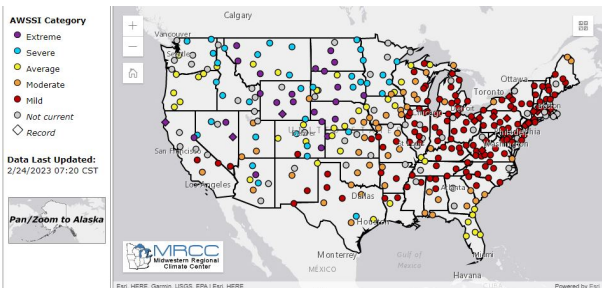


Figure 1. Accumulated Winter Season Severity Index for winter 2022-2023 in the United States from the Midwest Regional Climate Center.

<https://mrcc.purdue.edu/research/awssi/indexAwssi.jsp>

East of the Mississippi River, the 2022-2023 winter has been significantly milder than average, based on past climate models (Fig. 1). We don't typically have cold injury in late December, but drastic changes in temperatures can cause pernicious effects on plant health. The entire state of Indiana had the drastic changes in temperature December 22-27, 2022 (Table 1).

Location	December 22	December 23	December 24	December 25	December 26	December 27
Evansville	45/-1	5/-6	20/4	22/9	32/19	30/23
Indianapolis	41/-1	1/-9	15/0	16/4	23/15	29/21
Fort Wayne	39/9	9/-8	12/-2	13/5	21/10	29/16

Table 1. The high and low temperatures (F) in Evansville, Indianapolis, and Fort Wayne December 22-27, 2022. Data courtesy of the National Weather Service.

There's on-going evidence of damage across the Midwest from the late/long fall and extreme cold that was experienced in mid-late December. We've observed some perennial evergreens, i.e., American holly, Meserve holly (Fig. 2), and skip laurel (Fig. 3), damaged or killed during this winter, especially in the southern parts of the Midwest. In addition, some deciduous trees have significant bark cracking (Fig. 4). Though these plants are hardy well below the temperatures that were experienced, the maximum dormancy wasn't yet reached by plants due to the warm temperatures so late into the winter season.



Figure 2. A planting of Meserve hollies died during the winter of 2022-2023 due to cold injury. Photo via Gabriel Gluesenkamp.



Figure 3. Skip laurel death due to cold injury in 2022-2023. Photo via Tom Creswell.



Figure 4. Many trees, especially in the nursery, have experienced significant cracking in the winter of 2022-2023. Photo via Erick Brehob.

Plants survive through the winter by entering a phase of dormancy in which the plant is in a state of suspended animation. The dormancy process in plants is a complicated series of internal events caused by external events, that allow perennial plants to protect themselves during environmental changes, such as winter.

Endodormancy and ecodormancy are the stages of dormancy in which the plant has ceased growing. These processes use short days and environment to enter and exit dormancy. Endodormancy includes induction, maintenance, and release. Induction is the process that starts dormancy and is triggered from the reduction in daylight hours, followed by decreasingly cold temperatures to achieve maximum cold hardiness. Maintenance is the accumulation of chilling hours throughout the winter. Release occurs when the number of chilling hours has been fulfilled, thus entering ecodormancy. While endodormancy has internal requirements prior to exit dormancy, ecodormancy is mediated by environmental factors and can come out of dormancy once the environmental (i.e., temperatures) is suitable to resume growth.

An interesting phenomenon that I noticed in late fall/early winter was the length of time plants held onto leaves in the fall of 2022. Fall color came and went, but many species held onto the leaves long after leaves turned brown. Some species have a tendency to hold onto leaves throughout the winter, especially juvenile oaks (Fig. 5), but many other species exhibited similar attributes over the past winter season (Fig. 6).



Figure 5. A juvenile oak will typically retain leaves throughout the winter due to the incomplete leaf abscission.



Figure 6. Japanese maple leaf retention.

I suspect that the long fall delayed the abscission layer from fully forming until much later than normal. Leaf abscission and senescence are processes that occur in plants due to multiple factors, including response to dormancy, shade avoidance, and compartmentalizing injury/disease. Abscission and senescence rid a plant of individual leaves for the overall well-being of the entire organism. During this process, an abscission zone forms with a protective layer of suberized cells to seal off the separated portion of the senesced leaf and petiole (Figs. 7, 8, and 9). This process prevents winter injury from occurring.

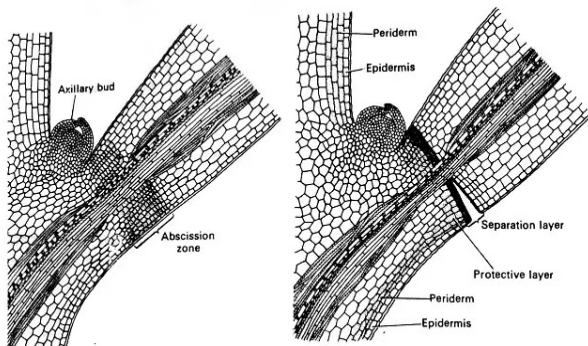


Figure 7. Leaf abscission formation and separation.

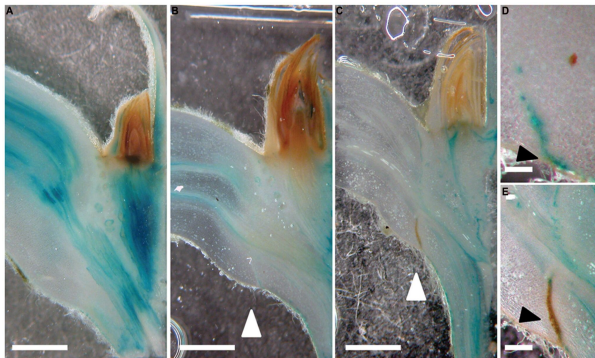


Figure 8. White arrow heads point to the abscission zones. (E) Mature abscission zone appears in brown; GUS precipitate in blue. Scale bars correspond to approximately 1 mm (A-C); 0.5 mm (D,E). Black arrowheads point to the forming (D) and mature abscission zone (E). Image via Jin, et.al. (2015).



Figure 9. Abscission layer with suberized cells on oak.

So, what should we expect?

In the coming few weeks:

- As weather warms, expect calls from homeowners regarding overwintering problems.
- As bud break begins, marginally cold hardy plants may have dead branches.
- If root damage has occurred, bud break may occur normally, but defoliation will follow due to a reduction in the ability to uptake water.
- If possible, wait to prune until after bud break so that dead branches can be removed.
- According to the National Phenology Network (<https://www.usanpn.org/usa-national-phenology-network>), spring is about three weeks early in the Southeast. If trends continue, bud break and flowering will be very early in the Midwest. This will increase the chances of late frost/freeze damage to plants. As of publication, magnolia are in bloom in the southern half of Indiana. Expected low temperatures will most likely freeze the blooms.
- Plants that have experienced damage from the winter will need to be watched carefully throughout this growing season to prevent other stresses, including drought.

Remember, if you have symptoms on plants you manage, the Purdue Plant and Pest Diagnostic Laboratory is a great resource to ensure the causes of plant problems. You can learn how to submit samples here:

<https://ag.purdue.edu/departments/btny/ppdl/>

Related articles:

Effects of Recent Cold Temperatures on Plants

<https://www.purduelandscapereport.org/article/effects-of-recent-cold-temperatures-on-plants/>

Effect of Cold Temperatures During Bud Break

<https://www.purduelandscapereport.org/article/4227/>

What do Trees Do in the Winter

<https://www.purduelandscapereport.org/article/what-do-trees-do-in-the-winter/>

Winter Injury Could Cause a Reduction of Flowering on Perennial Trees and Shrubs

<https://www.purduelandscapereport.org/article/winter-injury-could-cause-a-reduction-of-flowering-on-perennial-trees-and-shrubs/>

2020 Has Jumped the Shark!

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<https://www.purduelandscapereport.org/article/2020-has-jumped-the-shark/>

Winter Injury Update to Michigan Trees and Shrubs

<https://www.purduelandscapereport.org/article/winter-injury-update-to-michigan-trees-and-shrubs/>

References:

Jin, X., Zimmerman, J., Polle, A., and Fischer, U. 2015. Auxin is a long-range signal that acts independently of ethylene signaling on leaf abscission in Populus. Front. Plant Sci. Volume 6.

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