

THE PURDUE LANDSCAPE REPORT

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IPM&M: Integrated Pest Management and Mindfulness

(Janna Beckerman, jbeckerm@purdue.edu)

For many of us, pest management is never far from our mind. This may be because the pests we manage are always there, and even if we can't see them, we know that they haven't disappeared completely.

For this reason, it is important to take a time-out and think about how to improve your management, and begin with the crops that often cause regular problems. We'll use examples for the greenhouse, nursery and landscape (Table 1)

Table 1. Site impacts the management of different diseases and different crops.

What are you planning to spray?	Why are you planning to spray?
Greenhouse: Million bells (<i>Calibrachoa</i> spp.)	Powdery mildew and <i>Rhizoctonia</i>
Nursery: Roses (<i>Rosa</i> spp.)	Powdery and downy mildew
Landscape: Crabapple (<i>Malus</i> spp.)	Apple scab and rust

Replacement:

One of the most cost-effective ways to manage plant diseases is to use disease resistant varieties. Fortunately, we have two publications that list these at [Disease-resistant Annuals and Perennials in the Landscape](#) or [Disease-resistant Annual and Perennial Production](#).

Cultural Controls:

For greenhouse and nursery: Increase spacing between plants to reduce humidity in the canopy. Packing plants in tightly may not help your bottom line, or is off-set by the time spent on fungicides and spraying. If powdery mildew is a problem, start off by increasing space between plants and improving airflow with fans. For some crops and pathogens (like PM or Botrytis) spacing helps

considerably with disease management, and may even reduce or eliminate fungicide applications. When handling or moving plants, make sure that plants are dry to minimize the risk of injury and inoculation any bacterial pathogens that may be lurking.

For Landscape: Moving trees isn't an option for most landscapes. Unfortunately, many trees and shrubs are planted too close to houses or fences, reducing airflow and creating some of these problems. Pruning to open the canopy is essential to increase airflow, and improve any fungicide application. If the fungicide can't get to the intended target (in this case, a leaf or stem for rust or scab), it cannot protect the plant. Evaluate your target plant! Can you cover it successfully? A JD-9 handgun application works great for insects, but it does not provide the thorough coverage necessary for most fungicides.

Scouting:

All of the diseases listed are regular problems in their respective locations. To manage them successfully, make scouting a regular part of your management. Examine plants regularly and carefully, especially the lower, interior leaves where foliar diseases and crown rots get their start.

For greenhouse: For *Calibrachoa*, start as soon as the cutting are rooted. Fortunately, overhead watering inhibits powdery mildew, so PM is rarely a problem early in the production cycle. However, excessive watering can contribute to *Rhizoctonia* and other root rots like *Thielaviopsis* or *Phytophthora*. When trying to water to prevent powdery mildew, don't create new problems!

For nursery: With roses (and many other plants), the unfortunate reality is that the misting during propagation that suppresses powdery mildew and aids in rooting, also drives downy mildew. Downy mildew, and not black spot or powdery, is the primary problem affecting roses during propagation and production. This problem also gets into the landscape via asymptomatic plants, making downy mildew a much bigger problem than powdery mildew or even rose blackspot or rust. Managing water and scouting are essential to reduce the risk, incident and severity of downy mildew. To control downy mildew, maintaining the relative humidity below 85% will inhibit sporulation on any infected plants while preventing the germination of spores spread to healthy plants. This can be done by venting and heating the greenhouse with dry and warmer air.

In the landscape: Scouting is challenging because of changing clientele and the reality that these are pesticides and not silver

bullets. Most problems have progressed for many years before the client noticed them, and regular fungicide applications will take a few years to protect the new growth on a plant and restore it to its former 'glory'. A greenhouse or a nursery can clean house and sanitize, an option not available in the landscape.

Which, When, How: For all sites, it is critical to know three things:

1. Which plants routinely have problems? 2. When to apply fungicides to prevent those problems? and 3. Having the right equipment to treat problems. Regardless of the industry, only a few ornamental plants will have any need for fungicides. For these plants, scouting is performed to identify the stage to spray and effectively treat to prevent infection. Knowledge of the crop is essential as you need to apply fungicides to prevent infection. If you wait until you see symptoms, or really bad symptoms, you are starting from a losing position.

When you apply fungicides is just as important as where you apply them. Fungicides perform best when applied proactively, before symptoms are widespread throughout the plant. This is true wherever plants are grown, regardless of crop or system.

In the greenhouse, application via a boom sprayer may provide excellent protection early on, but as the crop density increases, fungicides will not penetrate into the canopy, and may not protect the crown or interior leaves, allowing powdery mildew or *Rhizoctonia* to get a foothold. Increase plant spacing or spot treat with a wand applicator, making sure that the fungicide gets to the interior of the plant, and doesn't just coat the outside.



Figure 1. Tight packing of roses and poor sanitation are a disaster waiting to happen in the inside cut flower operation, which was beset with issues of powdery mildew, botrytis and downy mildew.



Figure 2. Conifer nursery with well spaced plants.



Figure 3. These beautiful dense clusters of crabapple flowers indicate a tree in need of pruning!

In a nursery, fungicide applications need to compensate for any weather that can reduce efficacy. Heavy spring rains (more than 1") reduces fungicide residue by 50%, and may require re-application for protection, especially of highly susceptible roses (or lilacs, or ninebark). Spraying over a crop fails to get the fungicide where it needs to be, on the lower, interior leaves of individual plants. To do this successfully means having the right equipment—not just a boom, airblast or tower sprayer, but a backpack sprayer or fogger to spot treat and protect where pathogens get a foothold.

In the landscape, applying fungicides effectively requires that you are aware of where you are spraying. Are there restrictions because of nearby ponds, waterways, public spaces or neighbors? Are you able to actually cover the plant without drift to a protected area? Although there are fungicides to control a number of diseases, trying to cover mature trees may make using these fungicides impractical or even risky.

The application

When using systemic fungicides, be sure to tank-mix with a protectant and alternate with a fungicide with a different mode of action. For powdery mildew control on established, well-rooted plants, rotate a tank mix of chlorothalonil (Daconil; FRAC M5 protectant) with a FRAC 3 fungicide. Choices include Eagle (myclobutanil, GNL) , Terraguard (triflumizole GNL) or Tourney(NL) alternated with a FRAC 7-11 fungicide like Pageant (pyraclostrobin+boscalid), Okestra (pyraclostrobin+fluxapyroxad), Broadform (trifloxystrobin+fluopyram) or Mural (azoxystrobin+benzo...). This rotation will work well with crabapples, when timed just before bloom (pink), after bloom (remember we want to protect blooms and bees!), and then 7-14 days after, to protect against powdery mildew, scab, and rust!

If plants are still being rooted, take care in using FRAC 3, which often have a plant growth regulator effect and inhibit root formation. Other fungicides to consider in the greenhouse include FRAC 5 Piperon (piperalin), or Affirm (polyoxin D, FRAC 19).

As always, experiment with different products to identify what performs best for your situation, while keeping detailed records.

Downy mildew management has become a topic worthy of a full-treatise or three! Here is table to breakdown the different fungicides for downy mildew management.

Table 1. Fungicides labeled for downy mildew, along with Fungicide Resistance Action Committee (FRAC) codes. When developing a fungicide program, alternate between products with different codes to reduce the risk of fungicide resistance.

Fungicides (active ingredients)	FRAC Code	Sites*	REI	Spray or Drench	Comments
Adorn (fluopicolide)	43	G, L, N, S	12 h	S,D	Apply as a tank-mix with other fungicides.
Allette (fosetyl Al)	33	G, N	12 h	S	For downy mildew of roses only
Alude, Magellan, Vital, etc. (phosphorus acid salts)	33	G, N	4 h	S	
Broadform (trifloxystrobin+fluopyram)	7+11	G, I, L, N, S	12 h	S	
Compass	11	G, I, N, L, S	12 h	S,D	
Fenstop (fenamidone)	11	G	12 h	S	
Heritage (azoxystrobin)	11	G, L, N, S	4 h	S,D**	**Roses in commercial production may be drenched
Mancozeb (EBDC)	M	G, N	24 h	S	The addition of the surfactant Latron B-1956 will improve performance.
Micora (mandipropamid)	40	G, N, S	4 h	S,D	
Orvego (ametoctradin+dimethomorph)	40+45	G, I, N, S	12 h	S,D	Do not apply to dry media
Segovis (oxathiapiprolin)	U15	G, N, S	4 h	D	
Segway (cyazofamid)	21	G, N, L	12 h	S	
Stature DM (dimethomorph)	40	G,S,N	12 h	S	
Subdue Maxx (mefenoxam)*	4	G, L, N, S	0 h	D	

G= Greenhouse; N=Nursery, I= Interiorscape; L= Landscape; S= Shadehouse

All photos by Janna Beckerman.

Holiday decoration and firewood hitchhikers: How these bugs get in your house and what to do about them

(Elizabeth Barnes, barne175@purdue.edu)

You might think that cold weather brings an end to your battle with bugs, but insects can pop up unexpectedly indoors during the winter months too. Every year, a few people contact us concerned about some bugs that came into their home on their firewood, Christmas tree, or other holiday decorations. This is *very rare* but can be unnerving. Don't worry. The vast majority of these insects are harmless and there are a few simple steps you can take to keep them from bothering you.

It's important to understand why these bugs end up in your home. Insects can hitch a ride into your home on plant material like house plants, firewood, and Christmas trees. Many insects shelter in firewood or evergreen trees over winter to protect them from the elements. When they get into the warmth of your home they may get confused and think that it's spring. The insects then hatch or emerge from dormancy and look for something to eat. Unfortunately for them, your home lacks both the right food and the right climate for them to survive. They usually quickly die. This means that, in the vast majority of cases, if you either kill or catch and release the insects that you find and wait a week, your insect problem should clear up. Here are a few of the types of insects you might encounter:

Firewood

Firewood is often cut from dead or dying trees. Many of these trees are infested with insects even before you start chopping them. This is one of the reasons why we caution [not to move firewood long distances](#). You never know what you might be bringing along for the ride. Common insects that can emerge from firewood indoors include woodboring beetles, native bees, and ants. These insects feed on or nest in dead wood. Although it is highly unlikely that they will attack the wood in your house, they can still be a troublesome surprise. If they show up you can either

capture them and put them outside or kill them by vacuuming them up. You can also try to reduce the number of hitchhikers by changing when you chop your wood and how you store it. [Learn more here](#).

Holiday decorations

The needles and bows of evergreen trees offer excellent shelter from the harsh elements for animals of all sizes. Unfortunately, insects occasionally pick a tree destined for someone's living room. These insects are highly unlikely to cause any harm to you or your home and are easily dealt with.

The two most common stowaways are aphids and praying mantises. Aphids are small with round abdomens and long legs (image 1) and have both a winged and wingless form. They may be seen on the branches of your decorations or on nearby furniture. Praying mantises usually travel indoors as an egg mass (image 2). Each egg mass can contain hundreds of baby mantises (image 3). When they hatch they quickly disperse (probably to avoid being eaten by a sibling). Both types of insect generally don't survive more than a week in your home since they will not find the food they need. They can be easily disposed of by vacuuming them up. Or, if you have an enthusiastic entomologist in the house, the mantises can be captured and kept as pets.



IMAGE 1: Aphids sometimes feed on greenery that is harvested for holiday decorations. When the plants are brought indoors, the aphids may emerge. Image by S. Rae on flickr

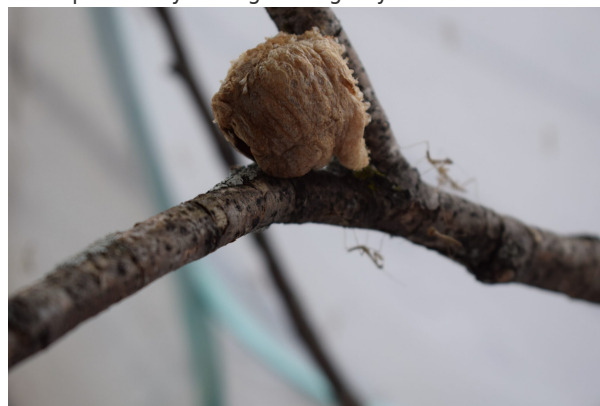


IMAGE 2: Praying mantis egg cases are loosely oval shaped, pale brown, and made of a Styrofoam-like material. They are often attached to small branches. Image by Elizabeth Barnes, Purdue University



IMAGE 3: When a praying mantis egg case hatches around a hundred baby mantises emerge and quickly spread into the surrounding area.

There is a new and invasive insect that has started showing up occasionally in holiday plants: [the spotted lanternfly](#). Although these insects are unlikely to be able to establish in the winter, it is vital that [you report them](#) if you encounter them. We need to understand how they are spreading if we are to keep them contained. You can print out and [make your own spotted lanternfly](#) to keep around as a reminder of what to look for.

A good way to avoid having these insects end up in your home is to inspect your decorations before you bring them into the house. Remove any insects that you find. If you come across mantis eggs, you can clip off the branch and tie it to a sheltered part of a

tree near your garden. You'll have a few more predators to keep down the pest insects come spring! If you find a spotted lanternfly or their egg masses, please put them in a plastic bag, save them, and [send in a report](#).

Finally, a caution. Don't spray your Christmas tree or any of your decorations with an insecticide*. Not only is it unnecessary post-harvest but some pesticides are flammable and carry other risks if used improperly. There are much simpler, more effective, and less risky ways to prevent or deal with insect hitchhikers in your home.

Bottom line: it's very rare to bring any insects into your home with your decorations and firewood. The ones that do hitch a ride are almost always harmless to you and your home. A quick cleanup and a little patience should take care of them. If that doesn't work, you can always contact your [local extension agent](#) for help!

Images by Elizabeth Barnes, Purdue University and S. Rae on flickr

*If you are a Christmas tree grower, you can find a thorough discussion of [Christmas tree IPM here](#) or by contacting [your local extension agent](#).

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Alleviating Landscape Soils with High Salt Concentrations

(Kyle Daniel, daniel38@purdue.edu)

It's that time of year that roadways and sidewalks begin to be treated with salt. To prevent accidents, both vehicular and slips, salt is an invaluable tool that keeps people safe. For all of the benefits for humans, plants aren't as appreciative. We have two great resources available that explains salt damage in great detail by Rosie Lerner and Janna Beckerman: [Deicing salts helpful for people but not landscape plants](#) and [Salt Damage in Landscape Plants](#)



Figure 1. Deicing Salts Helpful for People but not Landscape Plants.

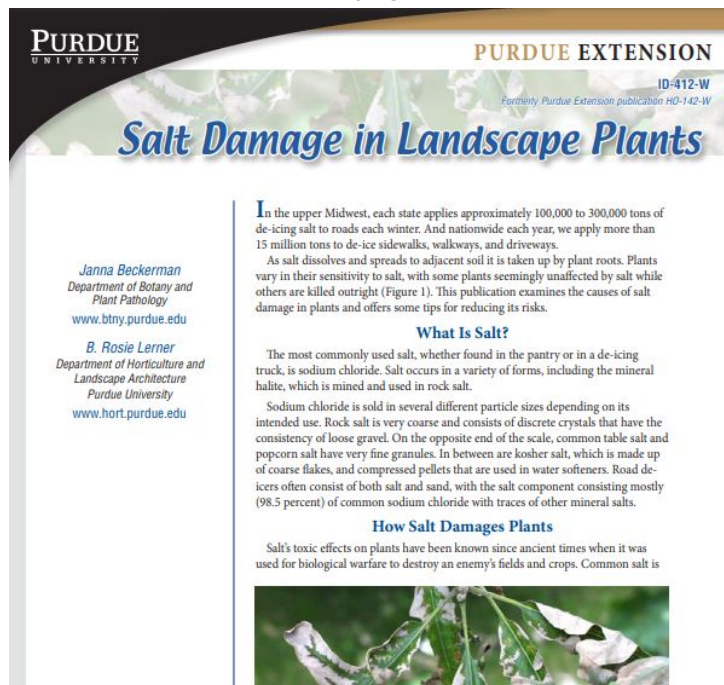


Figure 2. Salt Damage to Landscape Plants Bulletin.

Calcium chloride (CaCl_2) is sometimes used as the treatment for ice/snow, and is much safer to plants than sodium chloride (NaCl). The majority of the time NaCl is the primary de-icer due to the cost effectiveness compared to CaCl_2 , so the landscape can become sodic (high amounts of sodium). To remedy a salt (NaCl) buildup in the soil, there are few options available to improve conditions for plant growth.

One method to reduce the amount of sodium in soils is to irrigate

deeply. It's generally accepted that six inches of water will leach about 50% of salt accumulations in soil. This equates to approximately 372 gallons per 100 sq. ft. This method can take a significant amount of time and doesn't leach all of the salt to acceptable levels.

The other, and most effective method, is to add Gypsum (calcium sulfate (CaSO_4)) to the soil. Gypsum removes sodium by the interaction between the sulfate ions and sodium. The negatively charged sodium ions attract with the positively charged sodium ions, forming sodium sulfate, which is highly leachable from the soil. The calcium leftover from the reaction will bind to soil particles, which will provide aeration to the soil, thus increasing the leaching potential (Fig. 3). After gypsum is applied, irrigation is applied to leach out the sodium.

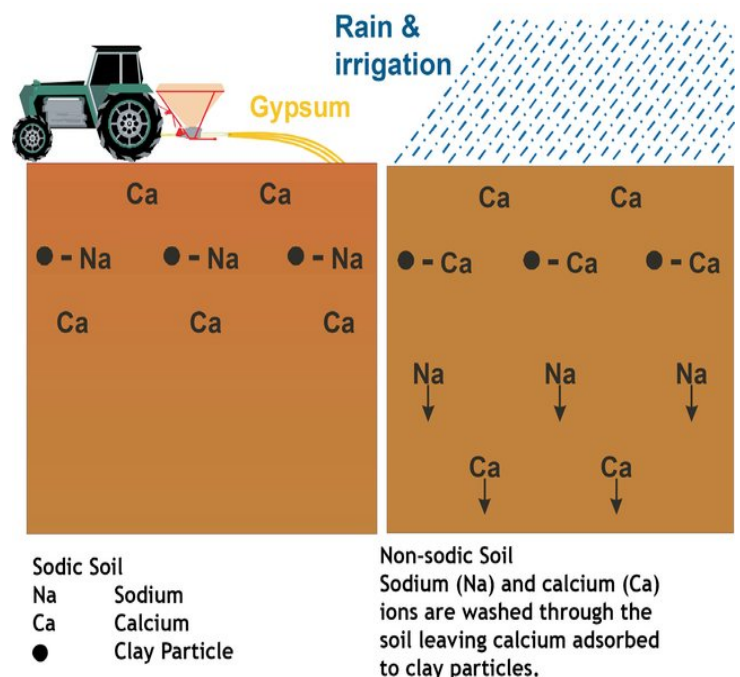


Figure 3. Gypsum and irrigation leach out most of the toxic levels of sodium ions in a sodic soil. Figure courtesy of Rengasamy et.al., 2009.

https://www.researchgate.net/publication/276417142_Diagnosis_and_management_of_sodicity_and_salinity_in_soil_and_water_in_the_Murray_Irrigation_region#fullTextFileContent

Dirr and Beiderman (1980) compared three separate gypsum products at two rates (20 and 40 pounds/100 sq. ft, respectively) and found that the two granular products improved plant appearance of cotoneaster and reduced electrical conductivity (amount of salts in the soil) compared to the control (Figs. 4 and 5).

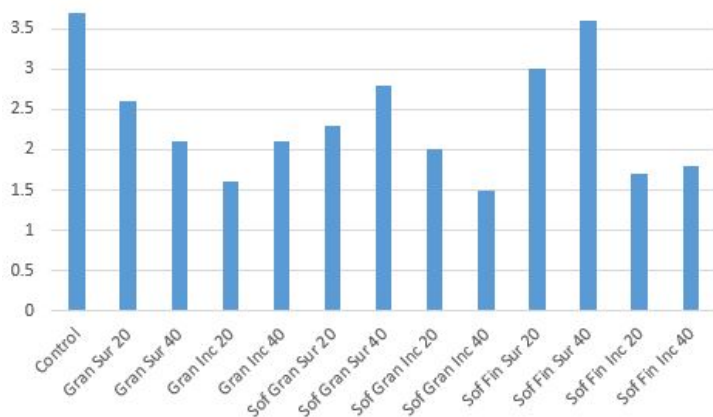


Figure 4. Visual ratings of cotoneaster after salt and gypsum treatments. 0=No damage, 5=Total death. Treatments: 20 and 40 pounds each of US Gypsum Granular, Sof'N'Soil Lawn and Garden Granular, and Sof-N'Soil Fine. Modified from Dirr and Biederman, 1980.

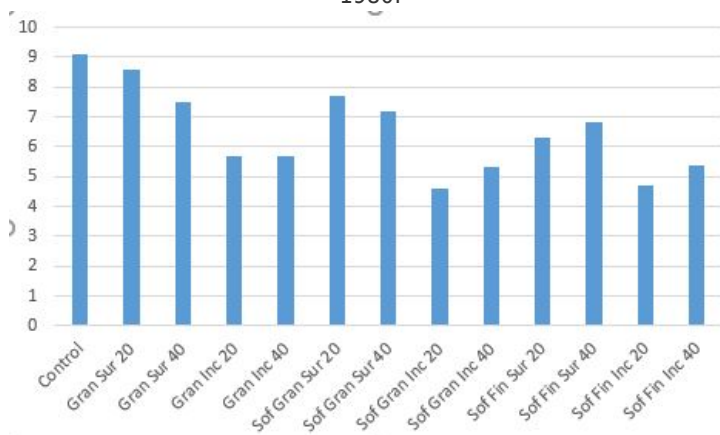


Figure 5. Electrical conductivity of cotoneaster after salt and gypsum treatments. 0=No damage, 5=Total death. Treatments: 20 and 40 pounds each of US Gypsum Granular, Sof'N'Soil Lawn and Garden Granular, and Sof-N'Soil Fine. Modified from Dirr and Biederman, 1980.

Prevention is always the best medicine, so limit the amount of salt around landscapes if possible, select salt-tolerant plants, and use calcium chloride instead of sodium chloride. When you are faced with sodic soils from salt buildup, a combination of gypsum and heavy irrigation should be used to reduce the amount of sodium around plants. It's best to perform this technique prior to bud break in the spring so that deciduous plants aren't yet up taking water, thus preventing plant damage.

Literature Cited:

Dirr, M. and Beiderman, J. 1980. Amerlioration of salt damage to cotoneaster by gypsum. *Journal of Arboriculture*. 6(4).

Rengasamy, P., North, S., and Smith, A. 2009. Diagnosis and management of sodicity and salinity in soil and water in the Murray Irrigation region. The University of Adelaide, SA. 98 pgs. https://www.researchgate.net/publication/276417142_Diagnosis_and_management_of_sodicity_and_salinity_in_soil_and_water_in_the_Murray_Irrigation_region#fullTextFileContent. Last accessed 12/9/2020.

Attend the Indiana Arborist Association Annual Conference Virtually

(Kyle Daniel, daniel38@purdue.edu)



Please join us for the

2021 Indiana Arborist Association Virtual Annual Conference

While we can't be together in person this year, we can continue to learn with each other and earn those continuing education units (CEU). Hear the most current research and information from internationally and nationally known experts about emerging trends and BMPs. Join us February 5th for a live Q and A session with our speakers.

Approximately 20 ISA Continuing Education Units Available

Approximately 6 CCHs Available

Watch during the conference any time between January 26- February 5, 2021

See internationally recognized pruning research expert University of Florida professor Emeritus Dr. Ed Gilman(left) and world-renowned UK researcher Dr. Duncan Slater(right) and among many others.

Visit <https://indiana-arborist.org/annual-conference/> for the program and to register!

Attend the Largest Green Industry Conference in Indiana Virtually

(Kyle Daniel, daniel38@purdue.edu)

For the most comprehensive Green Industry Education, attend the Indiana Green Expo! Though we are going virtual, the same, high quality education and CCH, CEU's will be available. Visit www.IndianaGreenExpo.com for the detailed schedule and to register!

Indiana Green Expo

Goes Virtual in 2021!

Given the uncertainty of the pandemic, the Indiana Green Expo 2021 will be held virtually. We have preliminary information to share that will give you an idea of the structure and content of the event.

This year IGE 2021 will have both an LIVE portion and a RECORDED portion.

Live Portion:
January 19-22, 2021

Recorded Portion:
January 18 – February 4, 2021

IGE 2021 PROGRAM

Live Portion (Zoom)

Session	TURF	LANDSCAPE	TRADE SHOW	NETWORKING SESSION
Date	January 19, 2021	January 20, 2021	January 21, 2021	January 22, 2021
Length	2 hours	2 hours	2 hours	2 hours
Time	10 am EST - noon	10 am EST - noon	10 am EST - noon	10 am EST - noon
Format	2-3 keynote presentations Purdue update MRTF update Q & A	2-3 keynote presentations Purdue update MRTF update Q & A	Opening kickoff Several 5-15 minute presentations from vendors (gold, silver, bronze levels) Q&A	3 speakers - Professional development - Tips on Networking - Network on Social Media Q&A

Recorded Portion The talks will be setup as a grid so participants can easily view all the talks and navigate to each. CCHs - Normal request based on content. Each 30-minute talk will have two associated quiz questions.

LAWN 6 recorded 30 minute presentations	GOLF 6 recorded 30 minute presentations	SPORTS 6 recorded 30 minute presentations	PLANT MATERIALS 6 recorded 30 minute presentations
LANDSCAPE MAINTENANCE/INSTALL 6 recorded 30 minute presentations	TREE CARE 3 recorded 30 minute presentations	BUSINESS 3 recorded 30 minute presentations	SPANISH 3 recorded 30 minute presentations
HARDSCAPE 3 recorded 30 minute presentations	PRODUCTION 3 recorded 30 minute presentations	INVASIVE SPECIES 3 recorded 30 minute presentations	VEGETATION MANAGEMENT 3 recorded 30 minute presentations

VENDOR OPPORTUNITIES

- Sponsorships at various levels with presentation time during Trade Show
- Networking events at your company facilities

More information to come

The complete schedule, sponsorship details, and registration will be available in the coming weeks at the Indiana Green Expo website — www.IndianaGreenExpo.com.

Visit www.IndianaGreenExpo.com