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THE PURDUE LANDSCAPE REPORT

In This Issue

Terrestrial Invasive Species Rule Signed by Indiana Governor

(Kyle Daniel, daniel38@purdue.edu)

The Invasive Terrestrial Plant Rule was signed by Governor Holcomb and published on March 18, 2019. The rule goes into effect 30 days after publishing, so it will be effective later in April.

The rule states with respect to the 44 plant species included on the rule:

"a person must not:

(1) Sell, offer or grow for sale, gift, barter, exchange, or distribute a species;

(2) Transport or transfer a species; or

(3) Introduce a species.

(4) Subdivisions (1) and (2) of this subsection are effective one year after the effective date of this rule."

Note that section (3) "Introduce a species" is effective immediately (around April 16, 2019).

Selling, offering, distributing and transport doesn't go into effect until April of 2020, so nurseries will have some time to sell down their stock. This is an important component of the rule to minimize economic loss to nurseries that grow and/or sell the few commercially available species that are on the list. Currently there is no mandate to eradicate existing plantings in nurseries, landscapes, or forested areas.

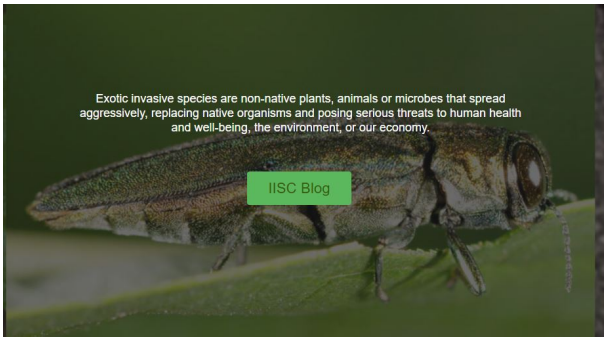
What is an Invasive Species?
An Invasive Species is defined in Executive Order 13112 as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." These species often change their habitats by outcompeting native species for the resources needed to survive. The result is loss of diversity and degradation of natural habitats.

What damage do invasive species do?
Invasive species often displace native species, reducing diversity and degrading the habitats in which they have been introduced. These invaders have negative effects on property values, agricultural yields, public utilities, recreation, and tourism. In addition, Indiana landowners and managers spent over $5 million controlling invasive plants in 2012 according to a survey by the Indiana Invasive Species Council's Invasive Plant Advisory Committee. The economic impact of invasive species globally has been estimated at 5% of GDP which in Indiana approaches $15 billion.

What is Indiana doing?
The Terrestrial Plant Rule (312 IAC 18-3-25) designates 44 species of plants as invasive pests. This rule makes it illegal to sell, gift, barter, exchange, distribute, transport or introduce these plants in the State of Indiana.

What is Purdue Extension doing?
Purdue Extension has a long history of addressing invasive species including invasive plants with established programs and expertise, and a reach into every county with dedicated Educators. Information about these efforts are being updated in the Report Invasive website, hosted by Purdue College of Agriculture and the Indiana Invasive Species Council.

What does the Terrestrial Plant Rule restrict?
These plants are not to be sold, gifted, bartered, exchanged, distributed, transported or introduced in Indiana.



The following are prohibited invasive terrestrial plants and are declared pests or pathogens regulated under this section:

(1) *Achyranthes japonica* (Japanese chaff flower).
(2) *Ailanthus altissima* (tree of heaven)
(3) *Alliaria petiolata* (garlic mustard)
(4) *Alnus glutinosa* (black alder)
(5) *Artemisia vulgaris* (mugwort)
(6) *Arthraxon hispidus* (small carpgrass)
(7) *Berberis thunbergii* (Japanese barberry)
(8) *Carduus acanthoides* (spiny plumeless thistle)
(9) *Carduus nutans* (musk thistle)
(10) *Celastrus orbiculatus* (Asian bittersweet)
(11) *Centaurea stoebe* (spotted knapweed)
(12) *Cirsium vulgare* (bull thistle)
(13) *Conium maculatum* (poison hemlock)
(14) *Convolvulus arvensis* (field bindweed)
(15) *Coronilla varia* (crown vetch)
(16) *Dioscorea polystachya (oppositifolia*) (Chinese yam)
(17) *Dipsacus fullonum* (common teasel)
(18) *Dipsacus laciniatus* (cut-leaved teasel)
(19) *Elaeagnus umbellata* (autumn olive)
(20) *Euonymus fortunei* (wintercreeper)
(21) *Euphorbia esula* (leafy spurge)
(22*) Frangula alnus* (glossy buckthorn)
(23) *Hesperis matronali*s (dame's rocket)
(24) Humulus japo*nicus* (Japanese hops)
(25) *Lepidium latifolium* (pepperweed)
(26) *Lespedeza cuneata* (sericea lespedeza)
(27) *Ligustrum obtusifolium* (blunt-leaved privet)
(28) *Lonicera japonica* (Japanese honeysuckle)
(29) *Lonicera maacki* (Amur honeysuckle)
(30) Lonicera mo*rrowii* (Morrow's honeysuckle)
(31) *Lonicera tatarica* (Tatarian honeysuckle)
(32) *Lonicera x bella* (Bell's honeysuckle)
(33) *Microstegium vimineum* (Japanese stiltgrass)
(34*) Morus alba* (white mulberry)
(35) *Phalaris arundinacea* (reed canarygrass)
(36) *Phellodendron amurense* (Amur cork tree)
(37) *Phragmites australis subspecies australis* (common reed)
(38) *Polygonum perfoliatum* (mile-a-minute vine)
(39) *Reynoutria japonica* (Japanese knotweed)
(40) *Reynoutria sachalinensis* (giant knotweed)
(41) *Reynoutria x bohemica* (Bohemian knotweed)
(42) *Rhamnus cathartica* (common buckthorn)
(43) *Vincetoxicum nigrum* (black swallow-wort)
(44) *Vincetoxicum rossicum* (pale swallow-wort

Alternatives for invasives:
https://www.extension.purdue.edu/extmedia/ID/ID-464-W.pdf

For more information on the rule and invasive species:
https://www.in.gov/dnr/naturepreserve/4736.htm
https://www.entm.purdue.edu/iisc/

Gray leaf spot/blight of Hakone Grass

(Tom Creswell, creswell@purdue.edu)

Hakone grass (*Hakonechloa macra*), also known as Japanese forest grass, is often used for massing in beds in where a low maintenance ground cover is needed in semi-shaded areas. The graceful arching stems along with the availability of gold or white striped variegated cultivars make it an attractive option. There are few reports of disease problems on Hakone grass but one problem seems to show up with some regularity in both nurseries and landscape beds: gray leaf spot and blight, caused by the fungus Magnaporthe (= Pyricularia).

Figure 1

Figure 2

Fig 1 and 2: Hakone grass in a landscape bed with gray leaf spot.

Figure 3

Reports of this problem from studies done in Ohio indicate that blight found on hakone grass is caused by the same fungus that causes gray leaf spot on perennial ryegrass and fescue. Gray leaf spot on perennial ryegrass is a widespread problem in the Midwest, especially on golf course fairways and athletic fields during periods of warm humid weather with frequent rainfall or irrigation. The fungus survives the winter as dormant mycelium on infested plant debris.

Fig 3: Perennial ryegrass fairway heavily damaged during an outbreak of gray leaf spot.

Figure 4

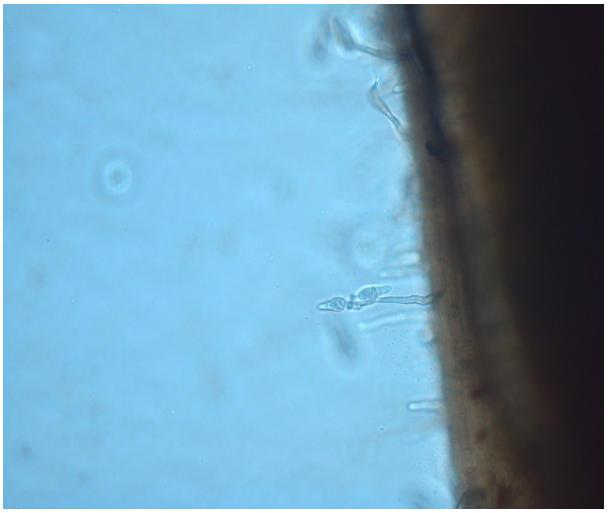


Figure 5

Figs 4 and 5: Spores of the gray leaf spot pathogen on a blade of perennial ryegrass

In nurseries using overhead irrigation the disease can quickly become established and, although plants are not killed, they may become unsuitable for sale. Plants that are grown with high nitrogen fertilizers and spaced close together are more likely to be damaged. Spores from infected ryegrass in the landscape can easily spread to landscape beds, leading to spots and blighting when conditions conducive to infection. Preventive fungicide applications of the following fungicides may be needed: Compass®, Disarm®, Heritage®, Pageant®, Broadform®, Mural® and thiophanate-methyl (Cleary 3336® and other generic fungicides with the same active ingredient). In landscape beds you can reduce impact from this disease by starting with healthy plants and by making sure plants are properly spaced, mulched and are not drought stressed. Also, avoid sprinkler irrigation and high nitrogen fertilizers.

Figure 6

Figure 7

Figure 8

Figs 6, 7, 8: Hakone grass, cultivar 'All Gold' showing leaf spots and blighting of lower leaves caused by gray leaf spot.

Equipment Damage To Trees

(Lindsey Purcell, lapurcel@purdue.edu)

One of the most dangerous pests to trees is a human, especially with equipment. Injuries to trees caused by a lawn mower or weed trimmer can seriously threaten a tree's health.

Additionally, damage to the bark layer of trees causes a long-term liability by creating a wound which leads to a defect, becoming an unsafe tree.

The site of injury is usually the root flare area, where the tree meets the turf and gets in the path of the mower or trimmer. The bark on a tree acts to protect a very important transport system called the cambium layer. This is where specialized tubes are located which move nutrients and water between the roots and the leaves. Bark layers can vary in thickness on different tree species. It can be more than an inch in thickness or less than 1/16 of an inch on young, smooth-barked trees such as maples and birch trees. This isn't much protection against string trimmers and mowing equipment, especially the young trees.

Any type of damage or removal of the bark and the transport system can result in long-term damage. Damage, which extends completely around the base of the tree called girdling, will result in ultimate death in a short time.

Tree wounds are serious when it comes to tree health. The wounded area is an opportunity for other insects and diseases to enter the tree that causes further damage. Trees can be completely killed from an attack following injuries. Fungi becomes active on the wound surface, causing structural defects from the decay. This weakens the tree or it eventually dies, creating a risk tree to people around it.

Newly planted, young trees need all the help we can provide to become established in the landscape and these trees are often the most commonly and seriously affected by maintenance equipment. However, injury can be avoided easily and at very low cost with these suggestions.

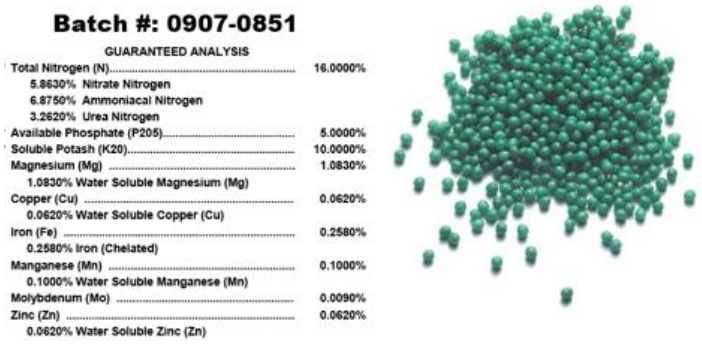
1. 
The removal of turf or prevention of grass and weeds from growing at the base of the tree are low-tech solutions to eliminate a serious problem. Spraying herbicides to eliminate vegetation around the base of the tree can decrease mowing maintenance costs. Be sure to use care when applying herbicides around trees.
2. A 2-3" layer of mulch on the root zone of the tree provides an attractive and healthy environment for the tree to grow. Additionally, it provides a visual cue to keep equipment away from the tree.
3. Also, trunk guards and similar devices can add an additional measure of protection for the tree. Using white, expanding tree guards can help improve the trees ability to withstand equipment contact, but also help to reduce winter injury.

Trees are a major asset to your property and important to our environment. Protect our trees and preserve these valuable assets by staying away from tree trunks with any mowing or weed trimming equipment. The damage lasts and it cannot be repaired and often results in losing your tree.

Changing pH and Fertilizing at the Same Time? How nitrogen sources can change soil pH

(Kyle Daniel, daniel38@purdue.edu)

We all know that plants take up nitrogen in significant quantities, compared to some of the other essential nutrients. What most don't know is that elemental nitrogen (N) is not what is taken up by plants. In fact, nitrogen can be taken up in only two forms, ammonium (NH_4) and nitrate (NO_3). Fertilizer labels will list the elements contained within, including the various types of nitrogen (Fig.1).



Batch #: 0907-0851

GUARANTEED ANALYSIS

Total Nitrogen (N)	16.0000%
5.8630% Nitrate Nitrogen	
6.8750% Ammoniacal Nitrogen	
3.2620% Urea Nitrogen	
Available Phosphate (P205)	5.0000%
Soluble Potash (K20)	10.0000%
Magnesium (Mg)	1.0830%
1.0830% Water Soluble Magnesium (Mg)	
Copper (Cu)	0.0620%
0.0620% Water Soluble Copper (Cu)	
Iron (Fe)	0.2580%
0.2580% Iron (Chelated)	
Manganese (Mn)	0.1000%
0.1000% Water Soluble Manganese (Mn)	
Molybdenum (Mo)	0.0090%
Zinc (Zn)	0.0620%
0.0620% Water Soluble Zinc (Zn)	

Figure 1. Fertilizer labels will include the forms of nutrients included in the formulation.

What you should know about pH…..

The definition of pH is the negative logarithmic of the hydrogen-ion concentration. What does this even mean? More simply put, the more H^+ (hydrogen) ions, the more acidic, while the more OH^- (hydroxide) the more basic. Always remember that the pH scale is logarithmic, which means each number on the scale is 10 times more acidic or basic than the next number on the scale. A pH of 6 is 10 times more acidic than a pH of 7. This is one reason changing pH dramatically is very difficult. Ammonium has a positive charge and nitrate has a negative charge. When a plant

takes in a positive or negative charged ion, the roots will release the inversely charged ion. For example, when a root takes up ammonium, an H^+ is released, while nitrate uptake releases OH^-(Fig. 2). Ammonium nitrate is a common type of fertilizer due to the net neutral charge on soil pH. When looking to alter soil pH with a nitrogen source, there are options to pursue.

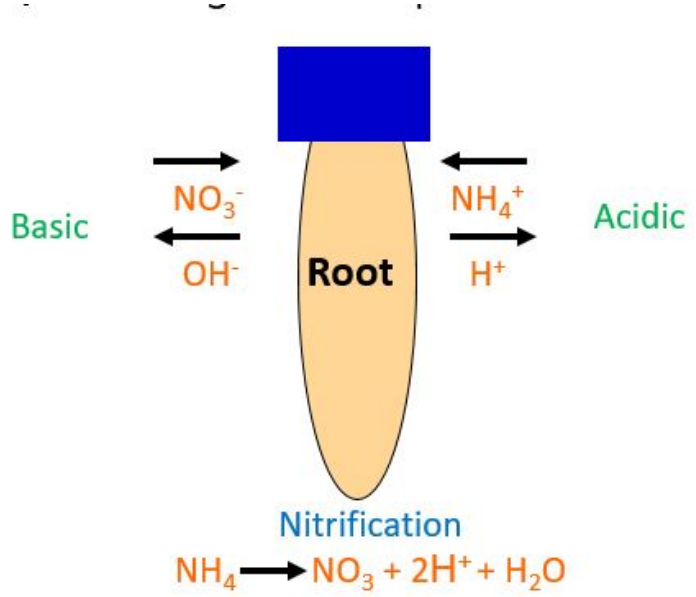


Figure 2. Plant uptake of ammonium and nitrate, and the release of hydrogen and hydroxide. Illustration by Mike Mickelbart.

Impacts of soil pH….

Other than small pockets, the majority of the Midwest's soils are alkaline (basic), with pH approaching the 7.5 to 8.0 range. Limestone bedrock dominates the region, which is the primary contributor to the elevated pH levels. Unfortunately many of our ornamental plants prefer a pH below 7, thus making some species susceptible to nutrient deficiencies. The two most common deficiency symptoms found in many ornamental plants involve iron (Fe) and manganese (Mn). The two essential nutrients are very sensitive to changes in pH, whereas these nutrients are not available for root uptake in alkaline soils.

How to develop a plan to lower pH….

There are a couple of methods to correcting the pH of the soil, which includes adding organic matter, sulfur containing products, and fertilizing using an acidifying nitrogen source (Fig. 3). As previously mentioned, if a lower pH is required, ammonium or urea-based fertilizers can aide in the reduction of pH.

Fertilizer Material	Acidity Index
Anhydrous ammonia	140
Ammonium sulfate	110
Ammonium-phosphate-sulfate	88
Urea	71
Ammonium nitrate	62
Monoammonium phosphate	58

Figure 3. Acidity index of nitrogen sources.

More Information on Soil pH:
https://www.purduelandscapereport.org/article/1658/

Fertilizing Woody Plants:
https://www.extension.purdue.edu/extmedia/HO/HO-140-W.pdf

Collecting Soil Samples for Testing:
https://www.extension.purdue.edu/extmedia/HO/HO-71-W.pdf

Soil pH and Organic Matter:
http://landresources.montana.edu/nm/documents/NM8.pdf

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