Incorporating Noxious Weeds and Invasive Species Lessons into Pesticide Trainings

Gary Wyatt and Angela Gupta - Extension Educators
How do we teach farmers and commercial applicators about Invasive Species, Pollinators, etc.?
Required Pesticide License Certification Trainings:

• Private Pesticide applicators (farmers)
• Commercial Turf/Ornamental
• Commercial Ag
Lessons to Pesticide Applicators

2015 – 2016: 4 to 5 Invasive Species (Buckthorn, EAB, OB, BMSB and SWD)
   Evaluations: 78% Increase in knowledge

2017 – 2018: MN Noxious Weeds and Invasive Species
   Evaluations: 40 to 60% of participants did not know the difference. Knowledge about topic: Before 27%, After 72% = Much to Very Much
Invasive Species in MN
(Farmers should be aware of Invasive Species)

- Buckthorn
- Oriental Bittersweet
- Emerald Ash Borer
- Brown Marmorated Stink Bug
- Spotted Wing Drosophila
Buckthorn: (Winter Host of Soybean Aphid)

*Rhamnus cathartica,* An exotic invasive tree

Eggs

Soybean Aphids and eggs on bud
# Distinguishing Bittersweets

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<thead>
<tr>
<th>Fruit capsule color</th>
<th>American</th>
<th>Oriental</th>
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<tbody>
<tr>
<td>Orange</td>
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<td>Yellow</td>
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<table>
<thead>
<tr>
<th>Fruit position</th>
<th>American</th>
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<tr>
<td>Orange</td>
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Emerald Ash Borer

• From Asia
• Michigan in 2002
• Only infests Ash trees (Green, White, Yellow)
• Found in MN in 2009
• Diversify tree species
Brown Marmorated Stink Bug

- Native to Asia
- In Minnesota (Twin Cities, Winona)
- Found in MN Soybeans
- Native “Brown” stink bug – OK
- Dark antennae with light bands
- Fall home invader, many host plants
Spotted Wing Drosophila

- Found in MN in 2012
- Attracted to ripe/healthy fruit
- Males have a dark spot on wings
- Eggs laid on fruit, larva eats fruit
- Over winters as adult
- Active in summer (June - September)
Palmer Amaranth

70 seed on a dime, up to 250,000/plant (Annual)
An invasive specie =

- Non-Native
- Causes **harm** to environment, economy or to human health
- Out-competes and displaces other species in natural ecosystems, agricultural fields and pastures, roadsides, and recreational areas

- Creeping charlie
- Purple loosestrife
- Common buckthorn
An aggressive plant …

A native or non-native plant that spreads quickly into areas where it is not wanted through:

– producing large numbers of easily germinated **seed**
– vigorously **spreading root systems** and suckering

Prickly ash  Gooseneck loosestrife  Dandelion
Noxious Weeds

• Per MN law, noxious weeds are the invasive plants that must be managed or eradicated because they cause significant harm - economic, environmental, or human health.
• 29 noxious weeds in MN
  – 28 non-native spp.
  – 1 native sp.

MS 18.77:
“Noxious weed means an annual, biennial, or perennial plant that the Commissioner of Agriculture designates to be injurious to public health, the environment, public roads, crops, livestock, or other property in Minnesota.”
### MINNESOTA

#### Noxious Weeds and Terrestrial Invasive Species

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>MDA Noxious Weeds</th>
<th>MN DNR Web Page</th>
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<tbody>
<tr>
<td>Palmer Amaranth</td>
<td>Amaranthus palmeri S. Watson</td>
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<tr>
<td>Oriental Bittersweet</td>
<td>Celastrus arbutifolius Thunb.</td>
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<tr>
<td>Brown Knaweed</td>
<td>Centaurea jacea L.</td>
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<tr>
<td>Yellow Starthistle</td>
<td>Centaurea solstitialis L.</td>
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<tr>
<td>Meadow Knaweed</td>
<td>Centaurea x mon挈nch C.E. Britton</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Black Swallow-wort</td>
<td>Cynanchum louiseae Kartesz &amp; Gandhi</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Creeping Charlie</td>
<td>Digitalis lanata Ehrh.</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Common Teasel</td>
<td>Dipsacus fullonum L.</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Cutleaf Teasel</td>
<td>Dipsacus locustanus L.</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Giant Hogweed</td>
<td>Heracleum mantegazzianum Sommier &amp; Levr</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Japanese Knotweed</td>
<td>Polygonum cuspidatum Cav. &amp; Zucc.</td>
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<td>X</td>
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<tr>
<td>Giant Knotweed</td>
<td>Polygonum sachalinense F. Schmidt ex Maxim</td>
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<tr>
<td>Amur Maple</td>
<td>Acer ginnala</td>
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</table>

#### Prohibited Noxious Weeds Eradicate (must be eradicated by the above and below ground parts of the plant):  
1. Poison Ivy | Toxicodendron radicans (L.) Kurz & T. Rydbergii | X | X |
3. Giant Knotweed | Polygonum sachalinense F. Schmidt ex Maxim | X | X |
4. Amur Maple | Acer ginnala | X | X |

Failure to comply with the Minnesota Noxious Weed Law may result in enforcement action by a county or local municipality.

**County Noxious Weeds** — Contact your local County Agricultural Inspector or Designated Employee for more information: [www. dnr.state.mn.us/plants/pestmanagement/equipment/eradicationlist.html](http://www.dnr.state.mn.us/plants/pestmanagement/equipment/eradicationlist.html)

**Additional Minnesota Department of Natural Resources Terrestrial Invasive Plants Web Pages**  
[www.dnr.state.mn.us/invasive/terrestrialplants/index.html](http://www.dnr.state.mn.us/invasive/terrestrialplants/index.html)

<table>
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<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>MDA Noxious Weeds</th>
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</thead>
<tbody>
<tr>
<td>Annual Hawkweed</td>
<td>Hieracium aurantiacum</td>
<td>X</td>
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<tr>
<td>Gyffil</td>
<td>Chrysanthemum leucanthemum</td>
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<td>X</td>
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<tr>
<td>Perennial Saw Toothy</td>
<td>Senecio radula</td>
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<td>X</td>
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<tr>
<td>Reed Canary Grass</td>
<td>Phalaris canariensis</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Russian Olive</td>
<td>Elaeagnus angustifolia</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Siberian Elm</td>
<td>Ulmus pumila</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Siberian Pea Shrub</td>
<td>Caragana arborescens</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Smooth Brome Grass</td>
<td>Bromus inermis</td>
<td>X</td>
<td>X</td>
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<tr>
<td>White Sweetclover</td>
<td>Melilotus albus</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Yellow Iris</td>
<td>Iris pseudacorus</td>
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</table>

#### Restricted Noxious Weeds (may not be sold, transported without a permit, or intentionally planted in Minnesota):  
1. Tree of Heaven | Ailanthus altissima | X | X |
2. Garlic Mustard | Alliaria petiolata (M. Bieb.) Covara & Grande | X | X |
3. Porcelain Berry | Amelopsis brevipedunculata (Maxim.) Trautv. | X | X |
5. Wild Carrot/Illinois Lace | Daucus carota L. | X | X |
6. Glassy Buckhorn (and all cultivars) | Frangula ulmis Mill | X | X |
7. Amur Honeysuckle | Lonicera maackii (Rupr.) Herder | X | X |
8. Morrow's Honeysuckle | Lonicera morrowii A. Gray | X | X |
9. Bell's Honeysuckle | Lonicera x bella Zabel | X | X |
10. Common Reed (non-native subspecies-rameojunis) | Phragmites australis (Cav.) Trin. ex Steud. Ssp. Australis | X | X |
11. Common or European Buckthorn | Rhamus cathartica L. | X | X |
12. Black Locust | Robinia pseudacacia L. | X | X |
13. Multiflora Rose | Rosa multiflora Thunb. | X | X |
14. Tartarian Honeysuckle | Lonicera tatarica L. | X | X |
15. Japanese Barberry | Berberis thunbergii DC. | X | X |

Additional resources for regulated noxious weeds and non-regulated invasive plants in Minnesota:  
**MDA Website**: [www.mda.state.mn.us/pestmanagement](http://www.mda.state.mn.us/pestmanagement)  
**MN Department of Transportation Website**: [www.dot.state.mn.us/roadsides/pestmanagement/noxiousweeds.pdf](http://www.dot.state.mn.us/roadsides/pestmanagement/noxiousweeds.pdf)  
**MN Board of Water and Soil Resources Cooperative Weed Management Areas**: [www.bwsr.state.mn.us/standing/contig/CWMAs.html](http://www.bwsr.state.mn.us/standing/contig/CWMAs.html)

**ARREST THE PEST!** Please report “Eradicate” list species to MDA - arrest breakup@state.mn.us — 888-545-6694.

**OLEIN: App**: OLEIN is an invasive species early detection and warning system for the Great Lakes region. Citizen reports on this app are directly reported to the MDA invasive species staff: http://apps.burnwood.org/apps/olein/
Reporting obligation

• Farmers and Ag professionals are **not** required by law to report Noxious Weeds.

• Reporting a noxious weed is a **voluntary** action for anyone in Minnesota.
  
  – However, the MDA would appreciate reports of *Prohibited - Eradicate* & *Prohibited - Control* species.
Reporting: Invasive Species

**Arrest the Pest**

*SLOW THE SPREAD*

*Arrest the Pest* relies on Minnesota residents acting as volunteers to report potential threats to Minnesota's forests and crops. To report a pest there are **three important steps:**

1. **Take pictures** of the pest or disease.
2. **Take notes** of the exact location of the pest, including the address or GPS coordinates, as well as a description of the surroundings.
3. **Insects** Take pictures and notes of the plants on which the insect was found. Note any unique markings on the insect. If possible, place a coin or other easily recognizable object next to the insect to compare the size.
Tools for Invasive Species:

- MDA ID Cards
- 3D printing
- Mounts
INVASIVE SPECIES
Managing buckthorn: a soybean aphid host

Buckthorn is an over-winter host plant for soybean aphid eggs and the crown rust fungus. This fact sheet describes methods to control buckthorn that may be found in rural windbreaks, river bottoms and woodlands.

Common or European buckthorn (Rhamnus cathartica L.) is an invasive plant which was brought to North America in the 1850s for landscaping and windbreaks. It tolerates a wide range of conditions, quickly outcompetes native plants, degrades wildlife habitat and threatens the future of forests, wetlands, and prairies.

Buckthorn leaves can be identified by their indented mid-vein, oval shape, and slightly serrated edges. It is very easy to spot buckthorn in the fall, because its leaves remain green. Female plants will produce purple or black berries in the fall. (Image courtesy Leslie J. Mehrhoff, University of Connecticut, Bugwood.org.)

Buckthorn is an understory shrub or small tree growing to 25’ high with a spreading, loosely branched crown, and often has multiple stems at the base. Female plants produce purple or black berries in the fall, and seeds are widely dispersed by birds and other wildlife. Female, berry producing plants should be targeted for control first.

NON-CHEMICAL CONTROL METHODS

PULLING:
Small to medium sized trees can be pulled. Monitor area to watch for regrowth from seed and re-sprouting. Buckthorn has a fibrous root system and can be pulled up by hand or tools when small.

GRAZING:
Goats and other livestock have been used to graze buckthorn. Repeat grazing periods when regrowth occurs is required. Monitor site; chemical applications may be needed.

MOWING:
Repeat mowing required. Monitor regrowth; chemical applications may be needed.
# Invasive Species Volunteer Programs at UMN Extension

<table>
<thead>
<tr>
<th>Year</th>
<th>Programs</th>
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<tbody>
<tr>
<td>2008</td>
<td>Forest Pest First Detector (FPFD)</td>
</tr>
<tr>
<td>2009</td>
<td>EAB + insects + Oriental Bittersweet (OB)</td>
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<tr>
<td>2010</td>
<td>Ash survey</td>
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<tr>
<td>2011</td>
<td>EAB &amp; OB survey</td>
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<tr>
<td>2012</td>
<td>FPFD &amp; AIS Detector</td>
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<td>2013</td>
<td>Invasive Blitz</td>
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<tr>
<td>2014</td>
<td>Buckthorn &amp; Soybean Aphid</td>
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<tr>
<td>2015</td>
<td>Wasp Watchers</td>
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<td>2016</td>
<td>ISMTrack</td>
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<tr>
<td>2017</td>
<td>UAV, 3D, AR</td>
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<tr>
<td>2018</td>
<td>New infestations</td>
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<thead>
<tr>
<th>Levels of invasive species</th>
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</thead>
<tbody>
<tr>
<td>Established populations</td>
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</tbody>
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Plant Overview (2018 2019 Pesticide Lesson)

1. Oriental Bittersweet/American Bittersweet
2. Wild Parsnip and other Carrot Family Plants
3. Amaranth Family
4. Woodbine/Virginia Creeper
5. Barberry Cultivars
6. Honeysuckle Cultivars
7. Crabgrass/Quackgrass
8. Canada Thistle and Other Thistles
9. Creeping Charlie/Henbit
Summary

- Pesticide Applicator Training workshops can be another opportunity to teach Invasive Species.
- Farmers, landowners and Ag professionals should know about Invasive Species in Ag Landscapes.
- Report Invasive Species to state lead agency or GLEDN.
- Ag professionals and landowners are encouraged to access agencies and resources for identifying, reporting and managing Noxious Weeds and Invasive Species.
Questions?

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Angela Gupta
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Oriental bittersweet: *Celastrus orbiculatus* Thunb.

**Identification:** Compare to native *American bittersweet* (*Celastrus scandens*). See page 49.

**Plant:** Woody, twining, perennial vines up to 60 feet long, reaches tree tops and covers fences. Stem diameters of 4 inches documented in Minnesota.

**Leaves:** Alternate, fine rounded teeth on the leaf edge, dark green and shiny turning yellow in autumn. Typically, elliptical with a blunt leaf tip and nearly as wide as long as 2-5 inches.

**Flower:** Female flowers are small, inconspicuous, greenish clumped (3-7) in leaf axils along stems. Dioecious species, male and female flowers on separate plants. Male flowers are also axil but may be terminal. Compare white pollen on male flowers to yellowish pollen on American bittersweet flowers. Also, American bittersweet flowers are similar in size and color but are found only terminal on vine branches (on the ends).

**Fruit and Seed:** Along the vine in leaf axils are potentially 3-7 yellowish, 3-parted capsules enclosing reddish-colored, 3-parted, berry-like arils. Each part contains 1-2 seeds; therefore, potential total of 3-6 seeds per fruit. Dioecious, separate fruiting (female) and non-fruiting (male) plants. American bittersweet’s 3-parted fruit is more red, the 3-parted capsules more orange and fruits are terminal on the vine branches (on the ends).

**Life History:** Vegetative reproduction occurs from below-ground rhizomes, above-ground stolons and suckering of roots. Birds will eat the fruits (arils) during the winter and disperse the seeds. Seeds germinate late spring.

**Habitat:** Readily invades disturbed, open, sunny sites, yet Oriental bittersweet is moderately tolerant of shade allowing it to grow in open woodlands.

**Management:**

**Prescribed fire** research has shown that basal sprouting is stimulated and stand density increases dramatically.

**Cutting** of stems can be used to kill above ground portions of plants especially if the infestation is covering large areas or is climbing high into forest canopy. Preferably, propagating plant parts should be disposed of onsite or when necessary contained (e.g., bagged) and removed to an approved facility. For more information on these options, please read MDA’s guide on removal and disposal. Combine with herbicide applications for best results.

**Herbicides** that act systematically such as formulations of triclopyr or glyphosate can be applied as foliar, basal bark or cut stem applications. Foliar applications are reserved for easy to reach foliage, re-sprouting or along fence lines. Once foliage is out of reach, application to cut stems or basal bark will yield the best results.

**Technical note:** Fruit may appear to be a terminal cluster—it is axillary.

**Left above:** greenish, female flower. **Left below:** greenish male flower, note white pollen grains on anthers of the upper flower.

**Right:** Light brown seeds. Each structure is 3 parted and each part contains 1-2 seeds. Image shows 5 seeds from a single fruit.

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<td>Herbicide</td>
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Burning is not recommended.

Mowing is not recommended.
Native vs. Non-Native plants

• **Native species** - species naturally present and reproducing in MN or a species that naturally expands from its historic range into MN.

• **Non-native species** - species that have been introduced or moved (intentionally or accidentally), by human activities to a location (MN) where they do not naturally occur.
Why are invasive species and their management important?

“Over the past 200 years or so, more than 50,000 foreign plant and animal species have become established in the United States. About one in seven has become invasive, with damage and control costs estimated at more than $138 billion each year.”

- USDA Animal and Plant Health Inspection Service (APHIS), 2001