Advisory Council

This calendar was produced and distributed by the Minnesota Invasive Species Advisory Council (MISAC). MISAC is a statewide entity that:

- Promotes communication and cooperation among organizations involved in invasive species issues.
- Coordinates outreach on invasive species.
- Supports statewide and multi-state conferences related to invasive species issues.
- Supports trainings and field visits related to invasive species.
- Recognizes outstanding and noteworthy work related to invasive species and encourages such work through the Carol Mortensen Award.
- Advocates for research and management for the species and pathways deemed greatest risk.


MISAC Mission Statement

To provide leadership to prevent the spread and reduce the harmful impacts of aquatic and terrestrial invasive species to MN landscapes, economies, and the citizens of the State of MN by promoting invasive species awareness, prevention, and management through research, education, and regulation in cooperation with local, state, tribal, and federal partners.

Invasive Species Threats

Invasive species are nonnative plants, animals and pathogens that cause environmental damage, economic loss or harm to human health. These pests can displace native species, harm habitats, and degrade natural, managed, and agricultural landscapes.

In addition to harming our natural resources, invasive pests can pose serious economic threats to major Minnesota industries such as agriculture, tourism and forestry. Some estimates peg the economic damage of invasive pests in the U.S. at more than $130 billion a year.

Public awareness and action are the keys to preventing the spread of invasive species. Please use the information in this calendar to help inform Minnesotans about the invasive species problem and how they can take action in the challenge to reduce invasive species spread and harm.

Authors

1854 Treaty Authority
Jeffrey Flory
Tyler Kaspar
Leech Lake Band of Ojibwe
Kate Hagsten
Fond du Lac Band of Lake Superior Chippewa
Kelsey Wenner
Minnesota Department of Agriculture
Angie Ambourn
Christina Basch
Jennifer Burington
Michael Merriman
Marissa Streifel
Minnesota Department of Natural Resources
Nick Frohnauer
Allison Gamble
Laura Van Riper
Tina Wolbers
University of Minnesota Duluth
Donn Branstrator
Natural Resources Research Institute, University of Minnesota Duluth
Valerie Brady
Josh Dumke
University of Minnesota Sea Grant Program
Doug Jensen
University of Minnesota Twin Cities
Michael Schuster
Megan Weber
Peter Wragg

Editors

MN Department of Natural Resources
Claire Gahler
Laura Van Riper
Three Rivers Park District
Missy Anderson
University of Minnesota
Megan Weber

©2019 State of Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155-4040
888-646-6367
651-296-6157
www.mndnr.gov

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Information Sources

The Minnesota Invasive Species Advisory Council (MISAC) website provides additional information about invasive species in Minnesota. This website is a gateway to invasive species information including species profiles, contact information for experts in Minnesota, and links to other related websites.

MISAC
www.mninvasives.org

The following websites of MISAC members also have information about invasive species:

Minnesota Department of Agriculture
www.mda.state.mn.us

Minnesota Department of Natural Resources
www.mndnr.gov/invasives

University of Minnesota Sea Grant Program
www.seagrant.umn.edu/ais

U.S. Department of Agriculture
APHIS
www.aphis.usda.gov

U.S. Department of Agriculture
Forest Service
www.fs.fed.us/invasivespecies

U.S. Department of Agriculture
National Invasive Species Information Center
www.invasivespeciesinfo.gov

U.S. Fish and Wildlife Service
www.fws.gov/invasives

Find contact information for four agencies with invasive species responsibilities in Minnesota on the back of this calendar. These agencies, as well as other MISAC members, can provide informational products such as brochures, species identification cards, and videos about invasive species.

Report Invasive Species

One of the keys for a rapid response to invasive species is the early identification of new occurrences. Please report occurrences of invasive species in MN to the following:

• “Arrest the Pest” at: 888-545-6684. Please call to report suspicious pest species arriving on plants or articles from foreign countries or other states. Get the latest updates on invasive species such as gypsy moth, soybean rust, sudden oak death, Asian longhorned beetle, emerald ash borer, bark beetles, and other destructive insect, plant and disease pest species at: www.mda.state.mn.us/plants-insects/arrest-pest

• DNR Invasive Species Program at: 651-259-5100 or 888-646-6367 to report invasive aquatic plants or wild animals such as Eurasian watermilfoil, zebra mussels, invasive carp, round goby, nonnative deer and mute swans.

• EDDMapS Midwest website or Great Lakes Early Detection Network app at: www.eddmaps.org/midwest

• Or, as specified for individual species in this calendar.

MISAC Members

[Logos of various MISAC members]
COLD MORTALITY OF EMERALD ASH BORER

*Agrilus planipennis*

Photos: Minnesota Department of Agriculture

Peeling logs to look for EAB larvae.

EAB larva killed over the winter.

Woodpeckers have pecked at these trees to eat EAB larvae.
Species: A wood boring insect that infests and kills ash (Fraxinus) trees.

Origin: Native to north-east Asia.

Impacts
During the summer emerald ash borer (EAB) larvae are busy under the bark of ash trees, disrupting the tree’s ability to obtain important nutrients and water. As winter approaches larvae move deeper into the wood or into thicker bark to mature into adults.

EAB larvae are able to survive at temperatures below freezing by accumulating antifreeze agents in their body. About 50 percent of EAB larvae die when the temperature inside the tree is below -20°F and about 90 percent will die at -30°F. Wind chill does not affect EAB larvae. Temperatures underneath the bark are often warmer than the air.

In years with extremely cold temperatures, it is possible that EAB populations will be reduced. A few EAB are likely to survive and populations will be able to rebound. EAB cold tolerance varies from year to year and from place to place. Extreme cold will not solve the problems associated with EAB.

Where To Look
EAB larvae are found under the bark of ash trees. Larvae that have died due to cold exposure typically have a darkened and sometimes shriveled appearance.

Regulatory Classification
U.S. Department of Agriculture and Minnesota Department of Agriculture regulations slow the spread of EAB by restricting the movement of items that can introduce EAB to new areas.

Further Information
www.mda.state.mn.us/eab
COMMUNITY BASED SOCIAL MARKETING

Photos: Minnesota Department of Natural Resources
What is it?
Community-Based Social Marketing (CBSM) is a five-step social science approach to foster sustainable behaviors over the long term. The CBSM approach goes beyond traditional informational campaigns to target individual behaviors to help bridge the gap between awareness and action. CBSM is one tool being used in the Minnesota Department of Natural Resources aquatic invasive species (AIS) prevention programs.

What’s Being Done?
The first two CBSM steps being implemented are: (1) identifying and prioritizing AIS prevention behaviors and (2) identifying the barriers to and benefits of practicing these behaviors today.

What are Some Elements of CBSM Strategies?
• Target simple and easy behaviors first.
• Use behavior change tools like commitments, prompts, and incentives.
• Use direct and personal appeals.
• Encourage people in the community to model invasive species prevention actions so those actions become the new community norm.

What’s Next?
This project will identify pathways and people who could have a big influence on reducing the spread of AIS. Priority outcomes include:

• Anglers know how to properly use and dispose of live bait.
• Shoreland property owners dry used docks and lifts for 21 days before installing them in another water body.
• Aquatic plant retailers sell only low-risk species.
• Aquarium and water garden owners do not release plants and animals into public waters.

The results will be shared with partners, used to refine AIS communications, and inform subsequent CBSM steps. The ultimate goals are to promote desirable behaviors and create an environment where people see AIS prevention as the popular thing to do.

Further Information
mndnr.gov/invasives/ais/prevention
A seed analyst sorts a seed sample.

Photo: Minnesota Department of Agriculture
Seed Contamination
Seed sold for planting in the United States can be produced anywhere in the world. How do you know that the seed you are purchasing doesn’t contain invasive plants?

Seed Production and Testing
The seed industry takes precautions to help protect the consumer from purchasing seed that contains weeds. Seed producers minimize weeds in production fields, clean and condition seed after harvest, and test seed lots to determine the identity of contaminants in seed.

Seed Labeling
The Minnesota Department of Agriculture (MDA) Seed Regulatory Program regulations include:

- Weed seed (seeds that are identified as weeds in agricultural, natural, or other settings) must be included as a weed seed percentage on the seed bag’s label.
- Prohibited noxious weed seeds are prohibited from being in a seed bag.
- Restricted noxious weed seeds are restricted to 25 seeds per pound. The label must list them by name and state the number of seeds per pound.

Noxious Weed Seeds vs. Noxious Weeds
Minnesota has a separate process for regulating noxious weed plants and whether landowners are required to control them on their property. Noxious weed seed species and noxious weed species are not always the same species. The MDA is working to harmonize these lists to prevent the spread of noxious weeds in seed.

How Can People Help?
- Check your seed package label to see if weed seeds are listed so you can avoid planting species you don’t want.
- If your seed package isn’t properly labeled, report this seedy situation to the MDA.

Further Information
www.mda.state.mn.us/plants-insects/buying-and-selling-seed-minnesota
TRIBAL MANAGEMENT OF INVASIVE SPECIES

A Fond du Lac employee learns to identify emerald ash borer damaged trees.

Agimaag (snow shoes) are made from ash wood.

Tribal Management
Cultural and natural resources important to tribes in Minnesota are threatened by invasive species on and off reservation and in the ceded territories. Below are three examples of how Tribal Nations and tribal organizations are managing invasive species to protect these resources.

1854 Treaty Authority
The 1854 Treaty Authority is governed by the Bois Forte and Grand Portage Bands of Chippewa and co-manages resources within the 1854 Ceded Territory. They have partnered with the U.S. Forest Service and Minnesota Department of Natural Resources (DNR) to detect and remove buckthorn species from federal and state lands to help ensure availability of cultural resources in forests for band members in off-Reservation ceded territory.

Fond du Lac Band of Lake Superior Chippewa
Emerald ash borer is an invasive insect that kills ash trees. Fond du Lac Band members utilize black ash for cultural practices including basket weaving and making snow shoes. Ash stands also help to regulate the water levels for the wild rice lakes located on Reservation. Fond du Lac is working on implementing management strategies in preparation for emerald ash borer arrival.

Leech Lake Band of Ojibwe
The Leech Lake Reservation shares 90% of its boundaries with the Chippewa National Forest. The Band’s Division of Resource Management works closely with the U.S. Forest Service, DNR and surrounding counties for invasive species management across the 865,000 acre Reservation. Eurasian watermilfoil is an aquatic invasive plant that is only found in one lake on the Reservation. In the summer of 2019, as part of a youth civic governance project, native weevils were introduced as a biological control to keep dense mats from taking over the lake.
SPINY WATERFLEA
*Bythotrephes longimanus*

**Keys to ID**
- Grow to 1/4 to 5/8 of an inch
- Long tail spine can be seen with the naked eye, particularly on angling lines
- Spiny tails have 1–4 pairs of barbs
- Distinctive black eyespot
- Females may have large brood chamber on back

Photos — Above: Donn Branstrator, University of Minnesota Duluth | Main: Robert Hell, Natural Resources Research Institute, UMD

Spiny waterfleas on a fishing line.
**Species:** A zooplankton up to 5/8 inch long, most of which is a rigid tail spine.

**Origin:** Spiny waterflea is native to Eurasia and likely travelled to North America in ship ballast water.

**Impacts**
It is a carnivore that eats native zooplankton. Zooplankton are important for fish nutrition and as grazers that maintain clear water by removing algae. Lakes with spiny waterflea may experience food web changes.

**Status**
Confirmed in over 35 Minnesota lakes including Basswood, Devil Track, Kabetogama, Lake of the Woods, Mille Lacs, Rainy, Saganaga, and Vermilion.

**Where to Look**
It thrives between June and October, primarily in deeper waters away from shore. Populations commonly move vertically from deep waters to surface waters at night to feed.

**Regulatory Classification**
It is a regulated invasive species (DNR), which means that it is illegal to release it into public waters.

**Means of Spread**
Spiny waterflea can be spread in water in boats and attached to angling gear and other equipment. Trolled angling lines can collect large numbers of spiny waterfleas.

**How Can People Help?**
- Physically remove spiny waterflea from angling lines, anchors and other water recreation equipment.
- Drain all water.
- Thoroughly dry all fishing, angling, and boating gear before using in a new waterbody.
- Notify the Minnesota Department of Natural Resources of any zooplankton with a long tail spine found in a lake not known to be infested.

**Further Information**
www.dnr.state.mn.us/invasives/aquaticanimals/spinywaterflea
**WILD PARSNIP**
*Pastinaca sativa*

**Keys to ID**
- Forms a rosette of leaves in its first year, before bolting.
- 4-6 foot tall mature plant with yellow flowers.
- Alternate leaves consisting of 5-15 egg-shaped, toothed leaflets arranged in pairs.
- Stalk is hairless, hollow and grooved.
- Flowering umbels are 2-6 inches wide and contain many small, 5-petal yellow flowers.
- Plants bloom from June through late August.

Photos — Above: Laura Van Riper, Minnesota Department of Natural Resources | Main: Monika Chandler, Minnesota Department of Agriculture
Species: An herbaceous plant that dies after seed maturation (a monocarpic perennial).

Origin: Native to Europe and Asia. It was brought to North America as a root vegetable crop but seeds spread from cultivated areas to other areas.

Impacts
Wild parsnip outcompetes native vegetation in disturbed areas, reducing suitable habitat. The plant contains toxic chemicals that are activated by sunlight. **WARNING:** the sap can cause serious burns and blisters to human and other mammalian skin after contact. Livestock can be harmed by ingesting plants and infestations reduce the quality of forage crops.

Status
Present throughout Minnesota, with extensive infestations in southeast and central Minnesota.

Where to Look
Wild parsnip is commonly found along disturbed areas such as roadside ditches, stream banks, and old fields.

Regulatory Classification
Wild parsnip is a Prohibited Noxious Weed on the Control List (MDA). Efforts must be made to prevent seed maturation and dispersal of plants into new areas. Sale and transportation (except for disposal at an approved facility) are prohibited.

Means of Spread
Wild parsnip spreads readily through seed distribution. Seeds can spread by mowing, wind, water, and wildlife.

How Can People Help?
- Control small infestations before they spread, especially in high traffic areas. ALWAYS wear protective clothing and gloves to protect skin from the plant’s sap.
- Time mowing and other management activities to prevent spreading wild parsnip seed.
- Clean boots and equipment to prevent spreading seeds.

Further Information
www.mda.state.mn.us/weedcontrol
BAITFISH PATHWAY

Photos — Above: Eric Morken, Echo Press | Main: Courtesy of the U.S. Coast Guard
Species: People can introduce aquatic invasive species, unwanted parasites, viruses, fish, or crayfish by improperly handling baitfish. The baitfish themselves may be nonnative species or other species may be spread with the baitfish. Contamination can occur where baitfish are raised or harvested.

Impacts
Impacts vary depending on the organism introduced. Viruses such as VHS can directly impact important game fish species. Introduced invasive fish can impact native aquatic communities.

Regulatory Status
- If keeping baitfish when done fishing, bait bucket water must be exchanged with tap or bottled water prior to leaving the waterbody.
- You cannot dispose of unwanted bait in Minnesota waters. Place unwanted bait in the trash.
- It is illegal to import bait from out of state.
- Individuals cannot transport more than 12 dozen minnows or leeches without a commercial minnow license. Tap or bottled water is required for transportation.
- With few exceptions, bait cannot be harvested from lakes and rivers listed as infested waters.
- Minnow dealers and private hatcheries with a minnow dealer endorsement are required to complete annual aquatic invasive species training prior to taking, selling, or transporting minnows within the state.

Means of Spread
Improper disposal of unwanted bait and/or bait bucket water.

How Can People Help?
- Place unwanted bait – including minnows, crayfish, and worms - in the trash.
- If you want to keep leftover baitfish, transport baitfish in tap or bottled water.

Further Information
www.dnr.state.mn.us/invasives/preventspread_watercraft.html
“Conference was the best I have ever attended. The amount of presentations, vendors and knowledge shared was almost overwhelming! I will continue to attend every year ahead and advise others in my area to do the same! THANK YOU!!!!”

- 2018 conference attendee

Photos: Elizabeth Nida Photography
What Is It?
In 2018 this conference became the largest gathering in the world focused on managing the spread of invasive species. The 2018 conference was the first time that UMISC joined with the North American Invasive Species Management Association to hold a joint conference. Attendees praised the conference for improving awareness, deepening knowledge, and providing networking opportunities. Many planned to improve invasive species management in their areas based on the information they gathered.

The 2020 Upper Midwest Invasive Species Conference will introduce innovative technology and successes in management, prevention, and outreach for over 100 terrestrial and aquatic invasive species. It is the sixth biennial conference stemming from a partnership among the Minnesota Invasive Species Advisory Council, the Invasive Plant Association of Wisconsin and the Midwest Invasive Plant Network. Expect hundreds of presentations and a variety of workshops and field trips showcasing improvements in management of invasive species.

Why?
This conference offers potential solutions to the harmful socio-economic and ecological impacts of invasive species. The Upper Midwest is addressing many invasive pests including zebra mussels, starry stonewort, emerald ash borer, and Palmer amaranth. Emerging species in the region such as spotted lanternfly and hydrilla could cause more damage.

Who?
Natural resource managers, researchers, educators, students, and lake association members attend these conferences as do staff from state agencies, non-governmental organizations, businesses, and news outlets. Over 700 people came to the 2018 conference representing 32 U.S. states, five Canadian provinces, Belarus, Russia and Switzerland.

When and Where?
October 12-14, 2020 in Duluth, Minnesota.

Further Information:
www.umisc.net
WATER SOLDIER

*Stratiotes aloides*

**Keys to ID**

- Forms a rosette of long, sword-shaped leaves with serrated margins.
- If present, flowers are white with three petals.
- Roots may be attached to the bottom sediment, but do not always attach.
- Resembles the top of a pineapple, aloe plants, or spider plants.

Photos — Above: Public domain | Main: Jorg Hempel, Creative Commons
**Species:** A loosely-rooted, flowering aquatic plant with both submerged and emergent growth forms.

**Origin:** Native to Europe and northwest Asia.

**Impacts**
Water soldier is buoyant and can form dense floating stands that can crowd out native plants and hinder aquatic recreation. The sharp, serrated leaf margins can cut the skin of swimmers and others who come into contact with the plant. Water soldier can also alter the water chemistry, becoming harmful to phytoplankton and other aquatic organisms.

**Status**
Not present in Minnesota. North American distribution is limited to southeastern Ontario in Canada.

**Where to Look**
Water soldier is usually found in stagnant, nutrient-rich waters with muddy or mucky sediment. Watch for it in bays, backwater ponds, ditches, and canals.

**Regulatory Classification**
Water soldier is a federally listed noxious weed, and a prohibited invasive species (DNR). It is illegal to possess, import, purchase, transport, or introduce water soldier without a permit.

**Means of Spread**
Water soldier may spread from ornamental water gardens or on boats, trailers, and other recreational water equipment.

**How Can People Help?**
- Do not plant water soldier in water gardens.
- Properly dispose of water garden and aquarium plants.
- Remove all aquatic vegetation before transporting aquatic equipment.
- Notify the Minnesota Department of Natural Resources with the exact location if you suspect you’ve found water soldier.

**Further Information**
dnr.wi.gov/topic/Invasives/fact/WaterSoldiers.html

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**SEPTEMBER**

**Labor Day**

**Fall Equinox**
COVER IT UP!

Using plants to control buckthorn

Keys to ID

- Leaves are dark, egg-shaped and pointed at the tip with finely toothed edges.
- Leaves stay green late into fall.
- Stems have gray bark with orange heartwood.
- Twig ends have a pair of terminal buds with a small thorn between them.

Workers establish Cover It Up! plots by planting native species.
Species: Common Buckthorn (Rhamnus cathartica) is an understory tree that forms dense stands and shades out native species. The Cover It Up! research project is examining if other plants can be used to reduce buckthorn.

The Challenge
Buckthorn can be removed using mechanical and chemical treatments, but these treatments often provide only temporary control. Long-term control is made more challenging by the rapid re-establishment of buckthorn from seed and re-sprout, as well as the loss of competitive native plants. By densely planting native species, can we shade out buckthorn seedlings and make forests more resistant?

Current Research Efforts
- Determine the level of shading needed to kill buckthorn or slow its growth.
- Identify native herbaceous and woody species that can provide suppressive shading.
- Develop methods for revegetating selected species in diverse environments.
- Evaluate how to combine revegetation with fire management, deer management, and herbicide use to suppress buckthorn regeneration.

The Goal
Buckthorn control is the start of a long-term restoration process. The project goal is that the revegetation treatments designed and tested by Cover It Up! will serve as a template for woodland and forest managers. Curating forest communities to increase shading and resist buckthorn can potentially offer managers significant cost and labor savings. It could also benefit woodland ecosystems by inhibiting the establishment of buckthorn and other invaders, reducing herbicide applications, increasing forest understory plant diversity, and improving wildlife habitat.

Further Information
z.umn.edu/coveritup

Funding for this project is provided by the Minnesota Invasive Terrestrial Plant & Pests Center through the Minnesota Environment and Natural Resources Trust Fund.
MARBLED CRAYFISH

*Procambarus virginalis*

**Keys to ID**

- Medium sized crayfish (5-15 cm long).
- Dark body (brown, red, or blue) with a white marbled pattern on their back.

Photos — Above: C. Chucholl, Creative Commons | Main: Andre Karwath, Creative Commons
Species: Marbled crayfish (also called marmokrebs) are ornamental freshwater crayfish.

Origin: Marbled crayfish are a parthenogenetic (female only) lineage descended from Procambarus fallax, which is native to the southeastern United States. Marbled crayfish reproduce by cloning.

Impacts
Marbled crayfish are a fast growing species that mature early and reproduce extensively. Since they reproduce by cloning, one individual is capable of starting a new population. The limited research indicates that they can negatively impact native crayfish and fish habitat. They are carriers of a highly contagious disease that can cause mass mortality in non-North American crayfish populations.

Status
Marbled crayfish are the most popular crayfish sold via the online aquarium trade. No known wild populations exist in the United States. Marbled crayfish are established in Madagascar and Europe.

Where to Look
Freshwater habitats, such as streams and marshes.

Regulatory Classification
Marbled crayfish are classified as an unlisted nonnative species (DNR). It is illegal to release unlisted species into a free living state.

Means of Spread
Release of aquarium specimens by humans.

How Can People Help?
• Keep all aquarium pets in captivity. Do not release any aquarium pet, including marbled crayfish, outside.
• Contact local aquarium suppliers or Minnesota Sea Grant for information on how to re-home or humanely dispose of unwanted pets.
• Report any sightings of marbled crayfish to the DNR.

Further Information
www.sciencemag.org/news/2018/02/aquarium-accident-may-have-given-crayfish-dna-take-over-world
GENETIC BIOCONTROL OF INVASIVE SPECIES

Diamondback moth caterpillar eating a leaf.

Diamondback moth.
What is genetic biocontrol?
Scientists are studying the potential of genetic technologies to reduce populations of invasive species. “Genetic biocontrol” is a general term that may refer to the use of many different approaches to modify the genes or gene expression of an organism for the purpose of managing populations of invasive species.

Status of genetic biocontrol in Minnesota
Genetic biocontrol for invasive species is still in the research stage in Minnesota. Researchers are working with federal and state agencies to develop approaches that are effective, safe, and can be implemented with confidence.

Genetic biocontrol research outside Minnesota
Diamondback moths are nonnative agricultural pests of cabbage, broccoli, and other mustard family crops. Aedes aegypti mosquitoes are nonnative insects that transmit dangerous diseases that affect humans including Zika, dengue, chikungunya, and yellow fever.

Scientists have engineered diamondback moths (shelton.entomology.cornell.edu/diamondbackmoth) and A. aegypti (oxitec.com/friendly-mosquitoes) to have a self-limiting gene so that when males mate with wild-type females, their female offspring will die before they can reproduce. Repeated releases of engineered males are required for control. Over time releases should reduce the population of the pest species in an area. Both of these projects are in the field trial stages outside of Minnesota.

Further information
Researchers in the Midwest are testing new methods in the laboratory that may provide genetic biocontrol for:
- Spotted wing drosophila flies: mitppc.umn.edu/project/genetic-control-invasive-insect-species-phase-i
- Common carp: maisrc.umn.edu/genetic-carp
- Zebra mussels: usgs.gov/centers/umesc/science/developing-rna-interference-control-zebra-mussels
For more information about invasive species in Minnesota

Aquatic Plants and Animals
Minnesota Department of Natural Resources
Invasive Species Program
651-259-5100

U.S. Fish and Wildlife Service
612-713-5114

University of Minnesota Sea Grant Program
218-726-8712

Terrestrial Plants and Insects
Minnesota Department of Agriculture
Invasive Species Program
1-888-545-6684