



INVASIVE SPECIES

2020 CALENDAR

Minnesota Invasive Species Advisory Council

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.

The Council includes these members: 1854 Treaty Authority, Carver County Water Management Organization, Fond du Lac Band of Lake Superior Chippewa, Hennepin County, Lake County Soil and Water Conservation District, Leech Lake Band of Ojibwe, Meeker County, Minneapolis Park and Recreation Board, MN Association of County Agricultural Inspectors, MN Board of Water and Soil Resources, MN Department of Agriculture, MN Department of Natural Resources, MN Department of Transportation, MN Nursery and Landscape Association, National Park Service, St. Croix River Association, The Nature Conservancy, Three Rivers Park District, USDA-Animal and Plant Health Inspection Service, USDA-Natural Resources Conservation Service, U.S. Fish and Wildlife Service, U.S. Forest Service, University of MN, University of MN Sea Grant Program and Wildlife Forever.

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.

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FSC Logo

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.mninvases.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.seagrants.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





Peeling logs to look for EAB larvae.



EAB larva killed over the winter.

COLD MORTALITY OF EMERALD ASH BORER

Agrilus planipennis



Woodpeckers have pecked at these trees to eat EAB larvae.

JANUARY

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

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	31	1 New Year's Day	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20 Martin Luther King Jr. Day	21	22	23	24	25
26	27	28	29	30	31	1



Inspecting a dock for invasive species.



Removing invasive species from a boat.

COMMUNITY BASED SOCIAL MARKETING



State fair visitors learn how to prevent the spread of invasive species.

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

FEBRUARY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14 Valentine's Day	15
16	17 Presidents' Day	18	19	20	21	22
23	24	25	26	27	28	29



SEED LABELING

A seed analyst sorts a seed sample.

MARCH

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

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
Daylight Savings Time Begins						
15	16	17	18	19	20	21
		St. Patrick's Day		Spring Equinox		
22	23	24	25	26	27	28
29	30	31	1	2	3	4



Agimaag (snow shoes) are made from ash wood.

TRIBAL MANAGEMENT OF INVASIVE SPECIES



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

APRIL

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.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
Easter			Tax Day			
19	20	21	22	23	24	25
					Arbor Day	
26	27	28	29	30	1	2



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



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

MAY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
26	27	28	29	30	1 Arbor Month in MN Begins	2
3	4	5 Cinco de Mayo	6	7	8	9
10 Mother's Day	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
	31 Memorial Day					



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.



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

JUNE

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20 Summer Solstice
21	22	23	24	25	26	27
Father's Day						
28	29	30	1	2	2	4



Baitfish.

BAITFISH PATHWAY

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

JULY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
28	29	30	1	2	3	4 Independence Day
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1



UPPER MIDWEST INVASIVE SPECIES CONFERENCE (UMISC)

“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



UMISC attendees on a field trip.

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

AUGUST

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					



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.



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

SEPTEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	31	1	2	3	4	5
6	7 Labor Day	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22 Fall Equinox	23	24	25	26
27	28	29	30	1	2	3



Cover It Up! experimental plots.

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.



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.



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

NOVEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Daylight Savings Time Ends	2	3 Election Day	4	5	6	7
8	9	10	11 Veterans Day	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26 Thanksgiving	27 Day After Thanksgiving	28
29	30	1	2	3	4	5



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 PROTECT OUR ENVIRONMENT
 DO NOT RELEASE FISH AND AQUATIC PLANTS



www.Habitattitude.net



Diamondback moth caterpillar eating a leaf.

Diamondback moth.

GENETIC BIOCONTROL OF INVASIVE SPECIES

DECEMBER

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* mosquitos 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

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
	Winter Solstice			Christmas Eve	Christmas	
27	28	29	30	31	1	2
				New Year's Eve		



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

