

2.13 INVASIVE SPECIES

According to the ODNR, Division of Wildlife, of the approximately 3,000 species of plants known to occur in Ohio, about 75 percent are native or have occurred in Ohio before the time of substantial European settlement, which was about 1750. The other 25 percent is not native to Ohio, having been introduced from other states or countries.

Most of these species never stray far from where they are introduced (gardens, urban areas, agricultural fields), yet some become very invasive and displace native plants in woodlands, wetlands, prairies, and other natural areas. Non-native plants have been introduced for erosion control, horticulture, forage crops, medicinal use, and wildlife foods as well as by accident. The top 10 species invading Ohio are:

1. Bush Honeysuckle
2. Autumn Olive
3. Buckthorn
4. Common Reed
5. Garlic Mustard
6. Japanese Honeysuckle
7. Japanese Knotweed
8. Multiflora Rose
9. Purple Loosestrife
10. Reed Canary Grass

Without natural predators or controls, invasive, non-native plants are able to spread quickly and force out native plants. In Ohio, several non-native plants are invading woodlands and displacing native spring wildflowers. Other non-native plants are impacting our wetlands by creating monocultures. Native plant diversity is important for wildlife habitat, as many animals depend on a variety of native plants for food and cover.

According to the Aquatic Nuisance Species Task Force, which is a nationwide cooperative effort between many federal departments, the species listed below are a few of the many aquatic nuisance species that are potentially harmful to North American environments in which they are not native. (* not currently in Ohio)

1. Zebra Mussel
2. Ruffe
3. Chinese Mitten Crab
4. European Green Crab
5. Brown Tree Snake*
6. Eurasian Water Milfoil
7. New Zealand Mudsnail
8. Asian Swamp Eel*
9. Lionfish*
10. Round Goby
11. Sea Lamprey
12. Snakehead
13. Nutria*
14. Hydrilla
15. Applesnail
16. Water Hyacinth
17. Rusty Crayfish
18. Giant Salvinia

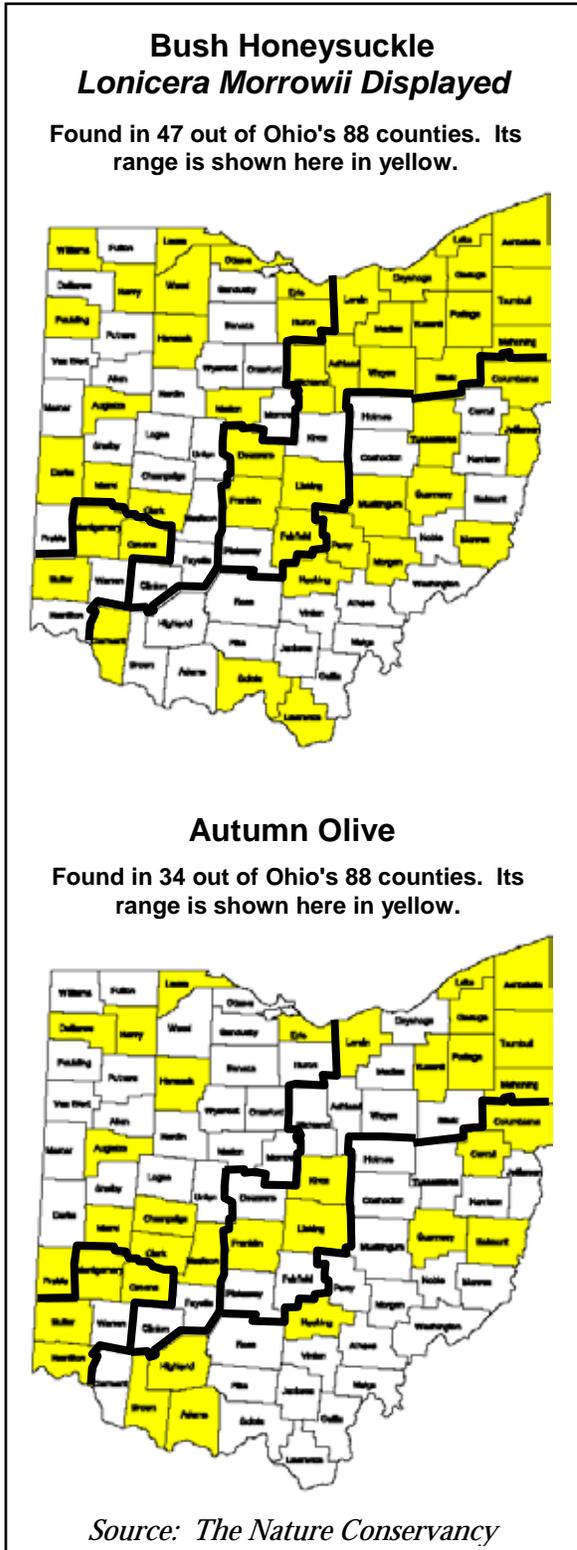
Lastly, according to the ODNR, Division of Forestry one of the most invasive insect species in Ohio is the Emerald Ash Borer. This Asian pest is part of a group of insects known as metallic wood-boring beetles. Emerald Ash Borer affects all species of native ash found in Ohio. Because North American ash trees did not coexist in association with this pest, they have little or no resistance to its attack. This ash tree-killing insect from Asia was unintentionally introduced to southeastern Michigan several years ago. In February of 2003, it was first found feeding on ash trees in northwest Ohio.

Emerald Ash Borer larvae feed on the living portion of the tree, directly beneath the bark. This eating habit restricts the tree's ability to move essential water and nutrients throughout the plant. In three to five years, even the healthiest tree is unable to survive an attack.

RISK ASSESSMENT

Location

The area invaded by each plant species varies based on its preferred environment. Those with the fewest limitations have spread to nearly every county in Ohio. Following is a description of each plant from the ODNR, Division of Natural Areas and Preserves along with a map of known impacted counties from The Nature Conservancy.



Bush Honeysuckles consist of a number of upright shrubs which can grow 6-15 feet in height. Each has dark green, egg-shaped leaves. The tubular flowers are white on the Amur and the Morrow (changing to yellow with age), and pink on the Tatarian. Berries range from red to orange, occasionally yellow, and are eaten and dispersed by birds.

Habitat: The bush honeysuckles inhabit abandoned fields, roadsides, woodlands, and edges of marshes. Morrow is currently a problem in northern Ohio; Amur is found mostly in southwestern Ohio; and Tatarian is widespread in Ohio.

Management: The best control method is to cut and treat stumps with systemic herbicide. Sprouts from cut stems may be treated with a foliar application of systemic herbicide. Young shrubs are easy to pull or dig up. Be aware there is a native bush honeysuckle in Ohio (*Diervilla lonicera*).

Autumn-Olive is a fast-growing shrub or small tree reaching up to 20 feet tall. Its leaves are small and oval, dark green on the upper surface and silvery below. Small coppery dots occur on stems and leaves. This shrub has light yellow, aromatic flowers and produces large quantities of small, round red fruits that are readily eaten and spread by birds.

Habitat: Autumn-olive can survive in very poor soils because of its nitrogen-fixing root nodules. It grows in disturbed areas, roadsides, pastures, and fields throughout Ohio.

Management: Stems may be cut and treated with systemic herbicide. Resprouting will occur, so follow-up control is necessary. A combination of hand-pulling, digging and herbicide treatments is usually necessary.

Buckthorn
Rhamnus Frangula Displayed

Found in 30 out of Ohio's 88 counties. Its range is shown here in yellow.



Common Reed

Found in 43 out of Ohio's 88 counties. Its range is shown here in yellow.



Source: The Nature Conservancy

Buckthorns are tall shrubs or small trees that grow up to 20 feet tall. The smooth, gray to brown bark is distinctively spotted. Glossy buckthorn has shiny leaves with smooth edges. It has solitary red to purple berry-like fruits. Common buckthorn has black fruits and dull green smooth leaves. Both species are abundant seed producers.

Habitat: Glossy buckthorn usually occurs in wetlands, such as fens or bogs, but it is also found in forests, fencerows, edges, prairies, and old fields. Common buckthorn occurs in a range of upland habitats, such as forests, woodland edges, fencerows, prairies, and old fields. Both species are most prevalent in central and northern Ohio.

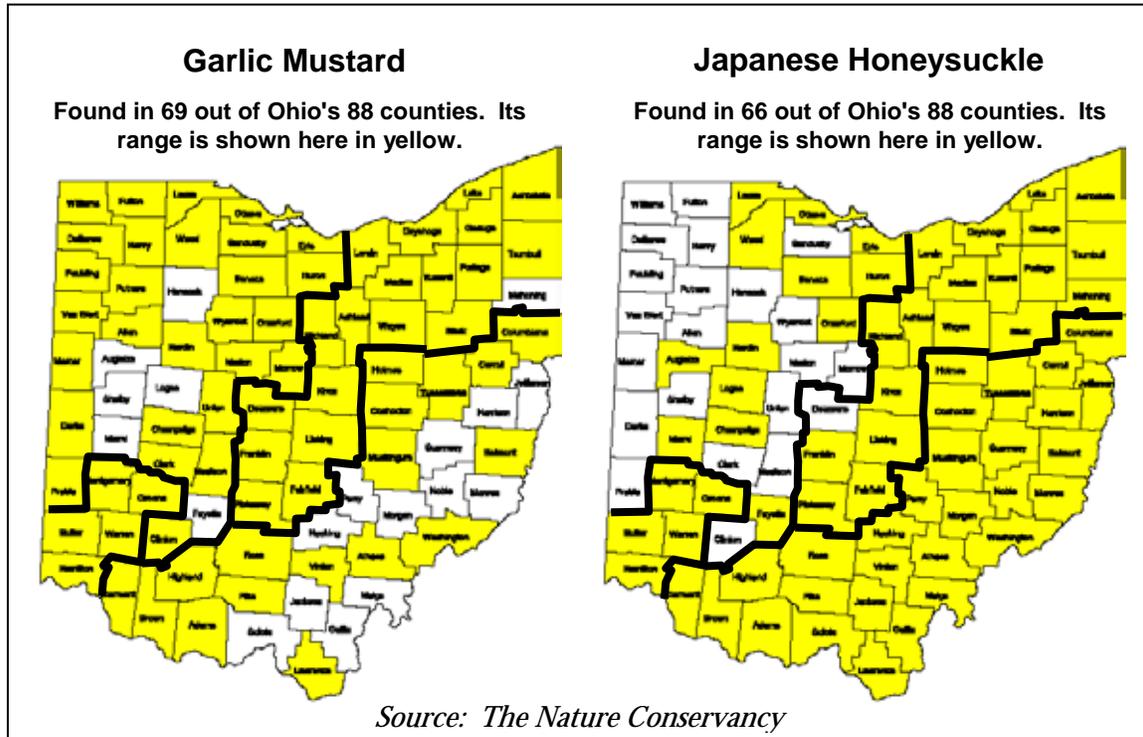
Management: Cutting and treating stumps with systemic herbicide is the best method of control. Buckthorns are very difficult to control due to vigorous resprouting and a large seedbank.

The Common Reed, or Phragmites, is a grass that reaches up to 15 feet in height. The leaves are smooth, stiff and wide with coarse hollow stems. The big, plume-like flower head is grayish-purple when in fruit. Common reed spreads mostly vegetatively forming huge colonies by sprouting new shoots through underground stems (rhizomes).

Habitat: Common reed grows in open wetland habitats and ditches primarily in northern Ohio. It occurs in still water areas of marshes, lake shores, riverbanks, and disturbed or polluted soils, often creating pure stands.

Some populations are not invasive and may be native, however there is no reliable method to tell the two apart.

Management: Long-term management is necessary for control of this persistent plant. Cutting and/or treating stems with systemic herbicides is generally the most effective, grass-specific herbicides are recommended in areas where native plants occur.



Garlic Mustard is a biennial herb. It begins as a rosette of leaves in the first year, overwinters as a green rosette of leaves, flowers and fruits in the second year, and then dies. First-year rosettes consist of kidney-shaped, garlic-smelling leaves; the second-year plant grows a stem up to four feet tall with triangular, sharply-toothed leaves. The small, four-petaled flowers are white and grow in clusters at the top of the stem. Garlic mustard produces large quantities of seeds which can remain viable for seven years or more.

Habitat: This woodland plant prefers some shade but is occasionally found in full sun. It invades upland and floodplain forests, savannas, yards, streams, trails, and roadsides throughout Ohio.

Management: Repeated prescribed burns in oak forests may be effective. Light infestations of garlic mustard can be hand pulled before or at flowering time. Plants should be removed from the site after pulling, as the seeds may continue to mature. Systemic herbicides can be applied to the rosettes in early spring or late fall.

Japanese Honeysuckle is a woody semi-evergreen vine with opposite, oval leaves. The flowers grow in pairs, are white to yellow, and very fragrant. Fruits, also in pairs, are purple to black berries. This vine climbs and drapes over native vegetation, forming dense patches.

Habitat: Japanese Honeysuckle thrives in disturbed habitats, such as roadsides, trails, fencerows, abandoned fields, and forest edges primarily in southern Ohio. Disturbances such as logging, road building, floods, and windstorms create an opportunity for this vine to invade native plant communities.

Management: Burning in combination with systemic herbicide application may be an effective control method. Herbicides can be applied to the leaves when native plants are dormant. Be aware there are native climbing honeysuckles in Ohio, such as *Lonicera Dioica*.

Japanese Knotweed is a shrub-like herb that grows up to 10 feet tall. Stems are smooth and the pointed leaves vary from broadly oval to almost triangular. Flowers are greenish-white and very small. The seeds are dispersed by wind. Once established, the plants spread by a system of underground stems reaching 60 feet.

Habitat: Japanese Knotweed can grow in a wide variety of habitats. It is found in open areas, such as roadsides, streambanks, and woodland edges, primarily in eastern Ohio. It spreads quickly and forms dense thickets.

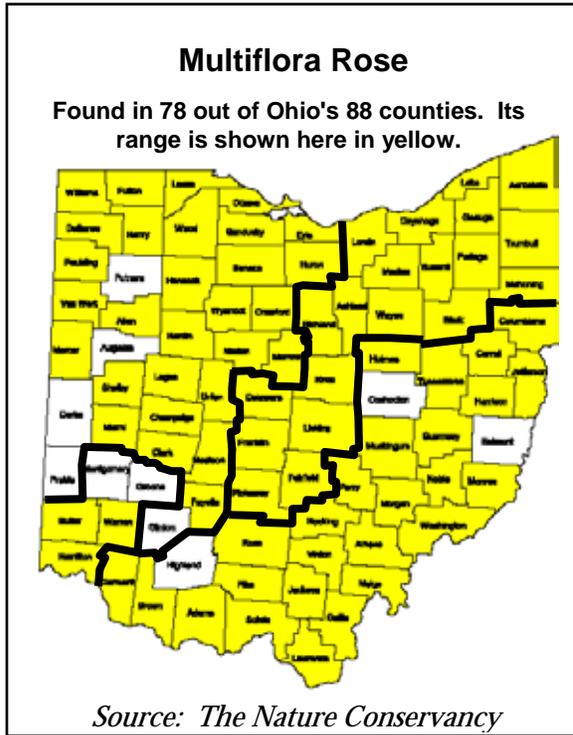
Management: Knotweed is very difficult to control. Leaves may be sprayed or stems cut and treated with systemic herbicide.

Reed Canary Grass reaches 2-5 feet tall. The hairless stems gradually taper to flat and rough leaf blades 3-10 inches long. The flowers occur in dense clusters and are green to purple, changing to beige and becoming more open over time. The plant spreads aggressively both by seed and by forming a thick system of underground stems (rhizomes).

Habitat: This grass occurs in wetlands, such as marshes, wet prairies, meadows, fens, stream banks, and seasonally wet areas throughout Ohio. Reed Canary Grass has been planted widely for forage and erosion control. Native strains possibly occur, however introduced strains are thought to be more invasive. There is no reliable method to tell the two strains apart.

Management: A combination of burning or mowing with systemic herbicides is the best method of control; grass-specific herbicides applied with wick applicators are recommended in areas where native plants occur.

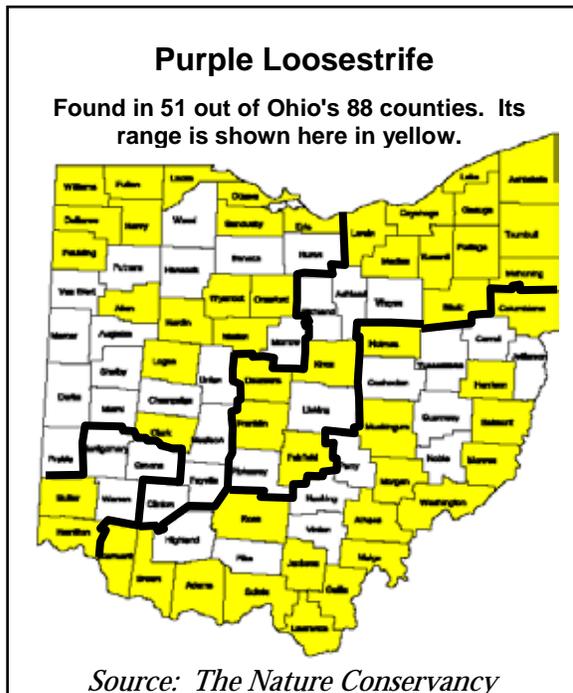
Multiflora Rose is a dense spreading shrub with widely arching canes and stiff, curved thorns. This shrub grows up to 15 feet tall with alternate, compound leaves of seven to nine oval leaflets. Multiflora Rose has numerous white flowers that produce clusters of small, red fruits. The fruits (called hips) are eaten by birds and mammals which help disperse the seeds. An individual plant can produce up to 500,000 seeds per year!



Habitat: Multiflora rose was formerly planted as a "living fence" to control livestock, stabilize soil and create barriers for roadways. It has also been planted as a wildlife cover and food source. This rose occurs in a wide range of habitats throughout Ohio but prefers sunny areas with well-drained soils.

Management: A long-term management program of mowing or cutting and treating stems with systemic herbicide several times during the growing season is recommended. Digging or hand-pulling small shrubs may also be effective.

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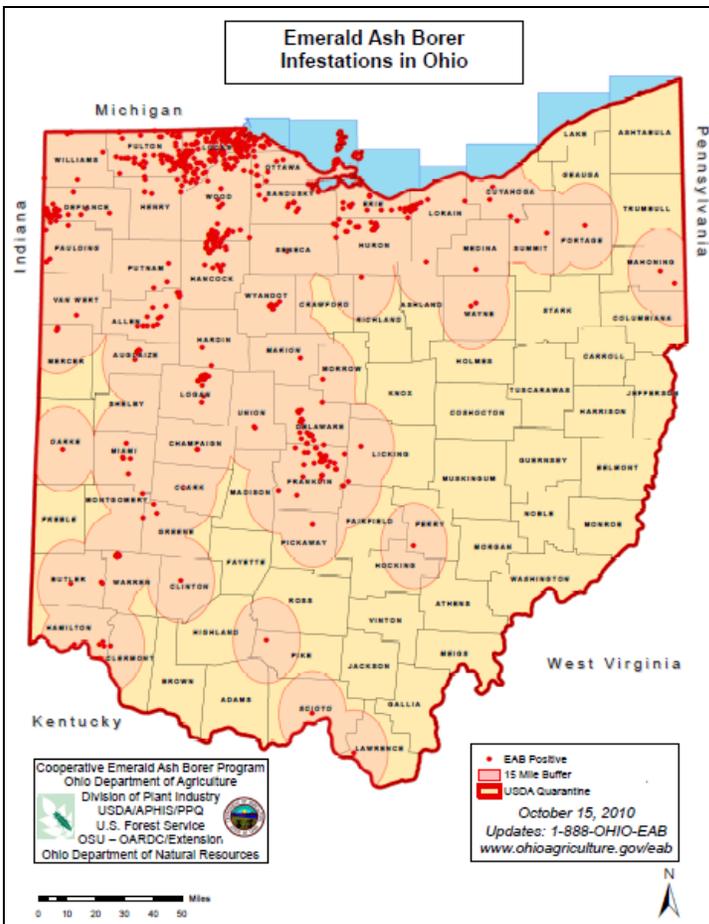
Purple Loosestrife grows 3-7 feet tall and has a dense bushy growth of 1-50 stems. Long spikes of flowers are purple to magenta; linear-shaped leaves grow opposite along the square stems. Purple Loosestrife spreads aggressively by underground stems (rhizomes) and can produce as many as a million seeds per plant. Supposedly sterile strains of *L. virgatum* will outcross with this plant and produce seeds.

Habitat: Purple Loosestrife grows in a variety of wetland habitats including marshes, river banks, ditches, wet meadows, and edges of water bodies, primarily in northern Ohio. Loosestrife can invade both natural and disturbed wetlands, replacing native vegetation

with nearly pure stands of Loosestrife.

Management: Small stands of Purple Loosestrife can be controlled by hand-pulling, digging, or applying systemic herbicides to the foliage. Herbicides may be used to control large populations. Biological controls using insects are being researched in Ohio and other states and may be helpful in reducing infestations.

Of the 18 aquatic invasive species noted at the national level there are three the Ohio Department of Natural Resources specifically notes: the Round Goby, Eurasian Ruffe and Zebra Mussel. The Round Goby and Eurasian Ruffe are species of fish which have proven in all Great Lakes region to rapidly increase in numbers and some have seen a decrease in native fish populations. Exact counts and range of impacted waters are difficult to determine. Often sport fishermen are the first to confirm their presence. The Zebra Mussel is a mollusk found throughout Lake Erie and in a few inland lakes that will attach to any unprotected surface which may include native clams. All three species pose the greatest threat to Lake Erie with the potential of moving inland. The counties immediately impacted are Lucas, Ottawa, Sandusky, Erie, Lorain, Cuyahoga, Lake and Ashtabula.



The Emerald Ash Borer is currently found in 50 of Ohio's 88 counties, six neighboring states and the province of Ontario. From its initial detecting in Northwest Ohio the insect has spread south to the Ohio River in the south and Pennsylvania in the East. One of the greatest problems increasing the spread of the insects is the transport of infected firewood. Quarantine areas have been established making the transport of firewood across county lines illegal. As of September 8, 2010, all 88 counties in the state comprise Ohio's quarantine area.

LHMP Data

SHARPP. Hazard identification data were

queried from SHARPP to evaluate each hazard and its frequency. Invasive species ranked 13th for frequency when compared to all 15 hazards evaluated in

this plan (Chart 2.2.a), and it ranked last for onset. However, this hazard scored high for response duration, with several respondents indicated response would take more than one month. For the remaining factors, this hazard scored in the bottom four hazards, and had a final ranking of 12th out of the 15 hazards evaluated. These and additional HIRA data queried from SHARPP can be found in Appendix J.

Past Occurrences

Invasive species of plants, fish and insects have been arriving in Ohio since the establishment of European settlers in the 1750s. With each improvement in the scale and speed of human transportation, the potential for unintended introduction of invasive species has increased. Organisms which could not survive the month-long journey from Europe or Africa to America can make the journey in a matter of hours today. Several examples of species introduction pathways follow:

The Round Goby species was introduced from Eurasia into the St. Clair River and vicinity on the Michigan-Ontario border where several collections were made in 1990 on both the U.S. and the Canadian side. Speculation exists the Goby was transported from its native Caspian Sea by way of ballast tanks on ocean going vessels. Today the Goby is found in all the Great Lakes and is making inroads in all contiguous state watersheds.

The Multiflora Rose was introduced to the U.S. from Japan in 1886 as an understock for ornamental roses. Birds are responsible for spreading the seeds, which remain viable for a number of years. In the 1930s, the Soil Conservation Services advocated the use of Multiflora Rose for erosion projects and as a way to confine livestock. Hedges of Multiflora Rose have also been used as a crash barrier and to reduce headlight glare in highway medians.

The Emerald Ash Borer was introduced into North America sometime in the 1990's. The insect is believed to have been introduced into the U.S. in wood packing material from China. It was first reported killing ash trees in the Detroit and Windsor areas in 2002. Only species of ash are hosts for the beetle, which usually kill infested trees within a couple of years. Since then, infestations have been found throughout Lower Michigan, Ohio, northern Indiana, the Chicago area, Maryland and recently in Pennsylvania.

Considering the thousands of plant, dozens of aquatic and unknown number of insect species introduced into Ohio over the past 250 years samples of the most often cited transfer media are provided here. Exotic species can arrive by a nearly endless number of vectors making a complete listing impossible.

Probability of Future Events

Since the beginning of European colonization non-native species have been arriving in Ohio. With the increase in global trade and travel the probability of new and unexpected species arriving in Ohio will continue to grow. Legislation is in place around the world in an attempt to control the migration of unwanted

species between ecosystems. The ODNR is currently battling the entrance of wild boars from Kentucky and West Virginia. In addition, there are several species of carp currently migrating up the Mississippi watershed from the Gulf Coast. Although not currently reported in any Ohio waterways, the probability of future infestations is near certain.

It is certain that new wanted and unwanted species will arrive in Ohio. The importance of controlling the integrity of existing ecosystems will require ongoing state, national and international efforts to avoid unwanted infestations.

VULNERABILITY ANALYSIS & LOSS ESTIMATION

Methodology

Impacts of invasive species tend to have commercial operational impacts, as opposed to many built environment impacts of the other hazards covered. Due to this unique situation, rather than a matrix listing county losses, the loss estimates will be presented using historical response costs to predict future losses in unadjusted dollars.

Results

From the perspective of invasive plant species the Multiflora Rose is one of most expensive to combat in Ohio. Each individual plant's ability to produce 500,000 seeds a year allows this invasive species to spread over large area with incredible speed. Agricultural groups are facing the highest exposure and expense in the form of infiltration of crop lands and eradication programs. According to agricultural experts associated with The Ohio State University, Ohioans are estimated to spend millions of dollars combating the Multiflora Rose. Precise dollar figures are not available due to the majority of response activities being performed by non-governmental entities.

Four known methods of responding to the species exist. First, the removal of the plant as a whole, including the roots, can be cost effective in small applications. Second, repeated defoliation or mowing down the plants will eventually kill almost any plant. Third, the use of herbicides can be effective if applied at specific stages of the plant's growth. All of the above management techniques can be expensive and labor intensive. The last method is the use of Rose Rosette Disease, a mite-vectored virus, which is giving rise to a hope for a lower cost control agent.

Turning to invasive aquatic species, the Zebra Mussel is one of the most expensive to control. The mussels naturally collect on any solid surface and create significant problems for drinking water processing facilities and utilities. All in-water structures are impacted including, but not limited to, piers, breakwalls, vessel hulls and vessel engines cooled with external water. Estimates for controlling infestations run between \$2 and \$10 million per year depending on how many sources are aggregated. Should the Zebra Mussel

effectively invade the river systems of Ohio, it is suggested the annual control costs could rise 10-fold.

Invasive insect species are both the direct source of damage to trees and a vector for other parasites. In the last century the North American population of Elm trees was decimated by a fungus which arrived on infected trees shipped to an Ohio furniture company. One of the primary transport methods is through beetles which the fungus uses as a host to move from tree to tree. The beetle's ability to fly exponentially increased the number of trees impacted. Trees located in non-urban areas posed financial impact only to loggers; however, the Elm was a popular urban tree and the cost to remove them ran into the millions over the years.

The Emerald Ash Borer, which is currently impacting the North American Ash tree, has already cost millions of dollars in attempts to identify and isolate infected trees. In Ohio alone there are an estimated 5 billion Ash trees at risk. Although many research centers are searching for an effective means of combating the insect, the only method currently available is the use of insecticides which have to be applied annually. The un-captured cost to treat Ash trees in Ohio will likely reach into the millions, as urban areas combat the insect.

STATE-OWNED AND STATE-LEASED CRITICAL FACILITIES VULNERABILITY ANALYSIS & LOSS ESTIMATION

Similar to drought in Section 2.11, invasive species have very limited impact on state-owned or state-leased facilities. The most prominent impact to state facilities relates to the maintenance of marinas in Zebra Mussel impacted areas. These mussels can clog inlets that could affect facilities, but not in the same manner as many of the other hazards. Also, Emerald Ash Borer could result in significant increases in fuel for wildfires in Region 3, which could adversely affect state facilities.