

1854 Treaty Authority Invasive Species Management Plan

Introduction

Invasive species are defined as species nonnative to an ecosystem that cause or may cause economic or environmental harm or harm to human health. This definition includes any potential threat to the use of natural resources. To limit the effects of invasive species on natural resources within the 1854 Ceded Territory (Figure 1), the 1854 Treaty Authority will implement an Invasive Species Management Plan to prevent the spread of terrestrial and aquatic invasive species, to detect new invasive species, new infestation locations, and to control current infestations. This plan will assist the 1854 Treaty Authority in protecting the natural resources within the 1854 Ceded Territory from invasive species, as well as native nuisance species impacting their use, for the Bois Forte and Grand Portage Bands of Chippewa.

General approaches to address invasive species problems are often similar across the range of species and pathways of introduction and spread. Because there are currently many federal, state, local, tribal, and private entities involved in addressing IS, using a framework established by the 1854 ISMP for all types of IS can aid in addressing the issue cooperatively, and using approaches consistent with other agencies.

While the approaches are often common among species, the ability to treat all invasive species and invasion pathways equally is not always feasible due to limited resources and knowledge. For many species, there are no tools to manage them once introduced and for others, and better management tools are needed. There is a need to prioritize control efforts for management actions regarding invasive species and their pathways for invasion, which is addressed in this plan.

Species of concern: (see Appendix A for a list of aquatic invasive species and infested waters in the 1854 Ceded Territory, see Appendix B for a list of terrestrial invasive species and their distributions in the 1854 Ceded Territory, and see Appendix C for pictures and identification characteristics for species of concern)

Aquatic species currently in 1854 Ceded Territory

Eurasian watermilfoil (*Myriophyllum spicatum*) and **hybrid watermilfoil** (*Myriophyllum spicatum* x *M. sibiricum*) are feathery submerged aquatic plants that can quickly form thick mats in shallow areas of lakes and rivers in North America. Matted milfoil can displace native aquatic plants, impacting fish and wildlife. These mats can interfere with swimming and entangle propellers, which hinders boating, fishing, and waterfowl hunting. Heavy infestations may reduce property values along shorelines. It was first introduced in the 1940's and can easily spread through fragmentation. Eradicating established infestations is nearly impossible. However, infestations can be controlled with mechanical cutting and/or chemical treatments.

Curly leaf pondweed (*Potamogeton crispus*) is a submerged aquatic plant that grows quickly in early spring and late fall, which allows it to displace native plants and reduce habitat for native fish populations. It also undergoes large die offs in the mid- summer which can potentially cause oxygen depletion leading to large fish kills, algal blooms, and other harmful impacts to aquatic life. Curly leaf pondweed can form in large, dense mats which interfere with recreational water use including boating, fishing, and swimming. These mats also disrupt habitat for wildlife, waterfowl, and fish populations.

Curly leaf pondweed was first introduced in the mid 1880's and has currently infested over 700 waterbodies in MN due to its vast ability to reproduce, spreading by seed, rhizomes, turions (overwintering bud), and by plant fragmentation. Once present it is extremely difficult to eradicate, however, populations can be controlled mechanically if given continual treatment.

Purple loosestrife (*Lythrum salicaria*) is a wetland plant that invades marshes and lakeshores, replacing cattails, culturally significant wild rice, and other native wetland plants. It can form dense, impenetrable stands which are unsuitable as cover, food, or nesting sites for a wide range of native wetland animals including ducks, geese, rails, bitterns, muskrats, frogs, toads, and turtles. Many rare and endangered species survive only in wetland habitat, and therefore are at a high risk. Purple loosestrife was both unintentionally and intentionally spread as an ornamental plant starting in the 1800s. New areas are most likely infested from escaped seed sources originating from gardens and nurseries. Once in aquatic systems, seeds are easily spread by moving water and wetland animals.

Non-native Phragmites (*Phragmites australis subsp. australis*) is a non-native subspecies of common reed. It is very similar to the native subspecies; *Phragmites australis subsp. americanus*. Both are perennial wetland grasses and present in Minnesota. Non-native Phragmites is known to invade lake shores, wetlands, rivers, and roadsides. Mixed wetland communities can be replaced by near monocultures of non-native Phragmites causing changes in ecosystem processes (hydrology, nutrient cycles) and negative impacts on native plants and wildlife, including one of 1854's priority species, wild rice. Importation, transportation, and sale of the non-native subspecies is prohibited. Once established it spreads easily, however, it can be controlled via mechanical and chemical treatments with continued monitoring.

Pickerelweed (*Pontederia cordata*) is a perennial *native* plant native to Minnesota and ranges throughout most of Eastern North America. It is an emergent plant and can tolerate fluctuating water levels (ankle deep to six feet). This plant is found in freshwater along shorelines of lakes and streams, and in wetlands. It can grow in a variety of sediments and will form spreading colonies in protected bays. Due to pickerelweeds adaptability, it can negatively impact native wild rice (*Zizania palustris*). Pickerelweed often occupies similar habitats as wild rice and has been seen in the same water body. Under certain conditions pickerelweed can get very dense and can out-compete wild rice within an area. Pickerelweed can choke out inlets/outlets causing fluctuations in water levels, which may damage wild rice populations which are sensitive to these types of changes.

Round goby (*Apollonia melanostomus*) and **tubenose goby** (*Proterorhinus semilunaris*) pose a serious threat to North American aquatic ecosystems, with potential impacts on sport and commercial fishing. Since their discovery in the St. Clair River in 1990, these bottom-dwelling fish have rapidly spread to many areas of the Great Lakes. Once established, populations typically increase quickly. Both types of gobies can displace native fish, eat their eggs and young, take over optimal habitat, spawn multiple times a season, and survive in poor quality water -- giving them a competitive advantage. Round gobies have been shown to spread more aggressively than tubenose gobies, however, once established both species are difficult to eradicate and control.

Eurasian ruffe (*Gymnocephalus cernuus*) are small fish that can threaten aquatic ecosystems when they invade a new area. This aggressive perch species may compete with native fish for food and habitat. They also threaten the industries of sport and commercial fishing. The ruffe population rapidly increased in the St. Louis River Estuary in the Duluth-Superior Harbor after it was first reported in the U.S. in 1986,

presumably coming from ballast water of ocean going vessels. The population in the harbor may have spread to other rivers and bays along the south shore of western Lake Superior and to coastal habitats in Lakes Michigan and Huron. They can also be unintentionally transported by boaters through bait buckets, live wells, and bilge water.

White perch (*Morone americana*) came from the Atlantic coastal region in brackish water and first appeared in the Great Lakes in the 1940s. They are predacious and opportunistic feeders, often feeding on the eggs of walleye and other fish species. They compete with other native populations for zooplankton which may lead to algal blooms and other negative effects such as population declines. Unauthorized stocking has been a source of spread to inland waters in other states.

White bass (*Morone chrysops*) are a fish species that has been found intermittently in the St. Louis River Estuary and the Duluth-Superior Harbor since the 1980's. Although this species has not been found to be well established in the St. Louis River, individuals have been caught in recent bottom trawl surveys. This may be due to an increasing population or more accurate identification since they can easily be mistaken for white perch. White bass pose similar problems as white perch and are predacious fish, often feeding on the young of other fish species. The main diet of white bass consists of minnows in their adult life and insects, insect larva, and small fish in their early development, similar to many other predacious fish species in this region. They also have the potential to grow rapidly in the right conditions, often outcompeting other fish species for food and space.

*This area considers the white bass invasive, some other areas in Minnesota do not.

Rainbow smelt (*Osmerus mordax*) are a small fish species that has been both intentionally and unintentionally introduced in many waterbodies in the Great Lake Region, including Lake Superior. Smelt fishing has been a popular pastime in MN so rainbow smelt have been stocked in Lake Superior in the past. However, they have been shown to negatively impact a variety of culturally significant and keystone fish species in Lake Superior including cisco, lake trout, lake whitefish and walleye. They also predate on larval fish species, have potential to change zooplankton structure, and are competing with other fish populations for food sources. They spread through connecting waterways, migrating upstream to spawn, and through human transference. They can be controlled using chemical treatments, intentional overfishing, or an increase in predatory fish species.

Spiny (*Bythotrephes longimanus*) and **fishhook** (*Cercopagis pengoi*) **water fleas** are small predacious crustaceans that threaten aquatic ecosystems by competing with native fish (including fingerlings) for food. Both arrived in ships' ballast water from Eurasia in the 1980's and 1990's. Currently, spiny water flea has been found in Lake Superior and some inland lakes in northeastern MN, while only a single specimen of fishhook water flea was found in Lake Superior and is not believed to be established there. Water fleas are a hazard to fisherman as they collect in masses on fishing lines and downrigger cables. These masses can cause damage to equipment and prevent fish from being landed. They can spread to inland waters through contaminated boats and equipment, with the eggs resisting drying and remaining viable out of water in certain conditions. Currently, there is no method of controlling water fleas. Surveying for new infestations and preventing new introductions is key in reducing the spread.

Bloody red shrimp (*Hemimysis anomala*) is an invertebrate species that has similar impacts on ecosystems as waterfleas and zebra mussels. They are present in all five Great Lakes, most recently Lake Superior. One individual bloody red shrimp was detected near Allouez Bay in the St. Louis River for the first time in 2017. In 2018, 13 more were detected in St. Louis and Superior bays while two more were

detected in the Superior Entry. They are omnivores feeding on algae, phyto and zoo plankton, insect larvae, detritus (plant and animal remains), and waterfleas. They compete with fingerling fish and native invertebrate populations for food and space. They may be associated with diatom blooms and increases in phytoplankton since they typically prefer zooplankton as a food source. Bloody red shrimp reproduce four times a year, a much higher rate than native species, making the risk for native displacement high.

Viral hemorrhagic septicemia (VHS) is a deadly viral disease of fresh and saltwater fish and has been present in the Great Lakes since at least 2003, the source of introduction is unknown. VHS can cause both individual and large-scale fish kills through extreme hemorrhaging that occurs internally and externally. It is transmitted to juvenile and adult fish most often via urine and sex gametes that enter a fish through their gills or wounds. Fish with a low level of infection may not display any symptoms. VHS can spread by moving infected fish (gamefish and baitfish) and infected water/equipment from one body of water to another.

New Zealand mud snails (*Potamopyrgus antipodarum*) are tiny invasive snails that threaten the food webs of trout streams and other waters. They were first found in Lake Superior in 2005 and quickly spread to other western rivers, sometimes reaching densities over 500,000 per square meter. This mass population can potentially displace native species and introduces new competition for food sources and space. New Zealand mud snails can be transported on waders and gear and have a unique “door” feature on their shells allowing them to survive out of water for days. One snail can reproduce and start a new infestation. Eradicating established infestations is nearly impossible, so preventing the spread of this species is crucial in control efforts.

Zebra mussels (*Dreissena polymorpha*) and **quagga mussels (*Dreissena rostriformis*)** are prolific invaders that cost the U.S. billions of dollars each year. These small mussels from Eurasia can clog water intakes and damage equipment by attaching to boat motors and hard surfaces. They can damage ecosystems by harming fisheries, smothering native mussels and crayfish, and littering beaches with their sharp shells. In the late 1980's zebra mussels were found in the Great Lakes, thought to be spread by ballast water. In the 1854 ceded territory, both zebra and quagga mussels have been found in the St. Louis River and are limited in Lake Superior. Currently, only zebra mussels have been found in inland lakes. Zebra and quagga mussels spread primarily by attaching to boat hulls, aquatic plants, nets, fishing equipment, or drifting in water. Adult mussels can survive out of water for days under certain conditions. Larval zebra mussels (veligers), are very small, free swimming/drifted and can be present in high densities throughout the water column. Both adults and veligers are most likely transported by boaters. Adults will attach to vessels and veligers are easily transported through undrained water including live wells/baitwells, bait buckets, and bilge water.

Rusty crayfish (*Orconectes rusticus*) are invasive crustaceans spreading to lakes, rivers, and streams in several areas of North America. They are more aggressive than native crayfish, better able to avoid fish predation, graze on aquatic vegetation, and can harm native fish populations by eating their eggs and young. They can displace native crayfish by outcompeting them for resources. Rusty Crayfish are native to the southern United States and have likely spread from aquarium release or bait bucket release by anglers. Females can carry fertilized eggs or a male's sperm so even the release of a single female could establish a new population. Eradicating established infestations is nearly impossible. However, reduction and control of rusty crayfish populations is currently being tested using continual trapping and restoration of large predatory fish species.

Chinese and Banded mystery snails (*Cipangopaludina chinensis*, *Viviparus georgianus*) are invertebrates that can reproduce and take over areas very quickly. They can survive up to 12 weeks out of water, and once in a new waterbody can quickly displace native snails, outcompeting them for resources such as food and habitat. They also are intermediate hosts for many parasites and trematodes that can kill or cause harm to waterfowl and smallmouth bass. They have also been found to be a potential pathway for human flukes. Mystery snails often have large die offs in mid-summer and their shells can litter beaches, becoming a nuisance to recreational users. They originally spread here from Asia in the late 1800's, most likely due to aquarium release. Once established, they are very difficult to eradicate from any area.

Faucet snail (*Bithynia tentaculata*) is a very small invasive snail that can spread and take over areas very quickly. They are part of the life cycle for certain types of flukes that can carry diseases linked to killing waterfowl and coots. Similar to zebra mussels, faucet snails have been problematic in clogging intake valves and other submerged equipment. They often will spread rapidly, outcompeting native snails for space and resources. The small size of faucet snails allows them to attach to aquatic vegetation and recreational equipment undetected, allowing them to be transported easily to inland waters through unsuspecting boaters. Once a population is established in an area, eradication is extremely difficult. Controlling the pathways of spread is a crucial component in managing faucet snails.

Hybrid cattail (*Typha angustifolia* x *latifolia*) is a cattail that is a hybrid between the invasive **narrow-leaved cattail** (*T. angustifolia* var *calumetensis*) and the native broadleaf cattail. The invasive **narrow-leaved** cattail is most easily identified by the gap between the male and female fruits at the top of the stem ranging between 0.5-4". It can occupy freshwater marshes, wet meadows, fens, roadsides, ditches, shallow ponds, streams, and lake shores. The **hybrid** cattail can occupy both territories of its parent plants, making it capable of taking over many habitats at a fast pace. It can be found in roadsides, ditches, streams, ponds, lakeshores, etc. It often grows in wetland environments and can displace rare native species and other plants that native species may depend on for food and shelter. The hybrid cattail also spreads vegetatively making it extremely difficult to eradicate once it is in an area.

Aquatic Species Threatening to Invade 1854 Territory

**This is not a comprehensive list of all invasive species that could potentially invade, instead it is meant to highlight some species that have a high risk of spreading into the ceded territory in the near future.*

Bighead, silver, grass, and black carp (*Hypophthalmichthys nobilis*, *Mylopharyngodon piceus*, *Ctenopharyngodon idella*, and *Hypophthalmichthys molitrix*) (Asian carp) are invasive carp species native to Asia. Bighead and silver carp are large, planktivorous, filter feeding fish weighing up to 110 pounds and 60 pounds. They filter large amounts of plankton and compete for food with native fish (larval and adult) and mussels, leading to decreased survival and size of larval fish and sport fish. Silver carp can also cause harm to boaters by jumping up to 10 feet out of the water when disturbed by sounds and vibrations from watercraft. Grass and black carp are also large (70 and 90 pounds or more) but are not planktivores and can cause other impacts. Grass carp feed primarily on aquatic plants and can impact/clear weed beds while black carp primarily feed on snails and mussels and can impact native communities. Juvenile Asian carp can be difficult to distinguish and could be spread through use or release of live bait. Asian carp were originally imported in the 1970's, escaped from aquaculture ponds in the 1980's, and have since spread rapidly being found in the Mississippi river and some southern MN lakes (exception: black carp have not been documented in MN). Currently, the MNDNR considers Asian carp prohibited invasive species, which means import, possession, transport, and introduction into the

wild is prohibited. Currently, studies are being done on piscicides to try to target carp species, and audio studies are being done to see if a frequency transmitter can prevent carp movement into new areas.

Rudd (*Scardinius erythrophthalmus*) is an invasive fish species known to predate heavily on aquatic vegetation. They have a unique and incomplete digestive process which releases nutrients into the water and reduces water quality. The feeding habits put native plant communities at risk as well as compete for resources with other fish species. They are an adaptable omnivorous fish and can occupy a variety of habitats with a variety of food resources, allowing them to outcompete other native fish species. They also can hybridize with the golden shiner, a native fish species, the future impacts of which are unclear. In areas with current rudd infestations, native fish reproduction seems to be less successful. It is believed to have been transported to the United States in the early 1900's as a game fish, and is commonly produced and used for bait purposes, adding to the spread. It is believed that most introductions are accidental from the emptying of bait buckets. It is currently illegal to transport, trade, or possess rudd in most states surrounding the great lakes region.

Red swamp crayfish (*Procambarus clarkii*) are a crustacean species that are similar to rusty crayfish. They are aggressive and predate heavily on aquatic vegetation, larval fish, snails, and amphibians. Once in an area they establish very quickly, leading to heavy competition with native crayfish species for resources and can cause declines in native crayfish populations. They are native to the southern united states and most likely were introduced via aquarium releases. They are capable of crossing over land in wet conditions and usually travel to nearby or connected waterways from infested areas. Due to a deep burrowing behavior, once they are in an area, they are extremely difficult to eradicate.

Flowering rush (*Butomus umbellatus*) is a plant species that can grow in shoreline, lake, and river habitats both as a submerged and emergent aquatic plant. It is a pioneer species, allowing it to grow in disturbed areas or areas that are currently unoccupied by other species. It can grow in dense patches, like purple loosestrife, which can cause issues for recreational users. The dense growth can also displace native species and alter habitat for many wildlife and fish species. There are currently two infestations reported on the western edge of Itasca County, and it is still sold as an ornamental plant in nearby states such as Wisconsin. Early detection of this species is key. Control of new infestations is possible through mechanical control.

Starry stonewort (*Nitellopsis obtusa*) is a new species of algae discovered in MN in 2015, with new infestations found in Beltrami, Cass, and Itasca counties in 2016. This alga can produce extremely thick mats of vegetation that can spread extremely fast. This alga is an extreme nuisance to recreational users, essentially rendering the infested area unusable. It can displace many native aquatic plant and alga species and can alter the habitat for fish species, inhibiting both movement and spawning. Starry Stonewort reproduces by fragmentation, making it very easy to transport by boats and equipment and very difficult to control once it is in an area. Controlling infested areas by removing individual plants by hand is possible but needs to be consistently monitored and maintained.

Harmful algal blooms (blue-green algae) (*Anabaena*, *Aphanizomenon*, etc.) are blooms of algae that can occur rapidly and release harmful toxins into the environment posing risks to fish, plant, waterfowl, mammal, and human health. Harmful algal blooms usually occur in areas where a lot of nutrient runoff is present, or where the water clarity is such that algae can grow abundantly. A high density of decaying algal blooms can cause oxygen depletion in the water leading to large fish kills and other negative ecological impacts. The large blooms can also make waterways unusable to recreational boaters and

swimmers and can displace native aquatic plant and algal communities. Treatment of small algal blooms is possible with the use of an algicide. Reporting and monitoring unusual algae activity is key in reducing the health hazards associated with toxic blooms.

Terrestrial species

Common buckthorn (*Rhamnus cathartica*) is large perennial wood shrub species from Eurasia that was used in North America to create hedges on properties since the mid-1800's. It is an allopathic, dioecious species that can grow up to 20 – 25 ft., sprouts vigorously when damaged, forming multi-stemmed individuals, and is a heavy berry producer. Common buckthorn's high fecundity rate produces dense, monoculture thickets underneath the parent female tree, while rodents will spread it locally and birds will eat the berries and transport the seeds further distances. Without natural biocontrols, this species physically crowds out native plants, shrubs and trees, increased by the chemical inhibitors it secretes, removing food and shelter for native animals. Studies have also found that the chemicals buckthorn releases can be washed into nearby riparian, lake and wetland habitats, killing amphibian species. It also serves as a host to other pests, such as crown rust fungus and soybean aphid, both affecting farm crops. Once a population is established, this species is difficult to eradicate, let alone control. Therefore, early detection, rapid removal, and continued monitoring is vital to protecting native species and habitats.

Glossy buckthorn (*Frangula alnus*) is also a large perennial woody shrub from Eurasia that was once sold in nurseries in Minnesota and are still sold in other states. It is very similar to common buckthorn except that it is monoecious (all individuals produce fruit) and tends to prefer wetland habitats, such as acidic bogs, fens, and sedge meadows. After establishing in a wetland, this species will expand upland into dryer habitats. The same threats and concerns of common buckthorn, minus the pests, apply to glossy buckthorn as well.

Oriental bittersweet (*Celastrus orbiculatus*) is a twining, dioecious woody vine from east Asia, brought to the United States in the mid-1860's as an ornamental, that now poses a threat to forest habitats. It grows vigorously, rapping tightly around tree trunks towards the forest canopy to reach sunlight, girdling trees. Once Oriental bittersweet reaches the canopy, it forms a thick blanket over the tree tops, shading and killing them and the forest floor habitat due to lack of sunlight. Either the added weight of the vines, snow and ice accumulation, or the dead trees eventually break or fall, opening the canopy. This invasive vine then blankets the ground, choking out all native plants and trees that try to grow there. This species spreads vegetatively by suckering roots or stolons. Birds also spread this invasive by eating the berries and spreading the seeds far distances. Humans spread this species by planting it or making and selling the twining vines as wreaths with their bright reddish-orange berries as decorative aesthetics, resulting in birds eating and spreading the seeds from new locations. Oriental bittersweet seeds are only viable for a few years but have a high germination rate. It is difficult to identify from our native species, American bittersweet (*Celastrus scandens*), which poses the possibility of nurseries accidentally selling the invasive species. The closeness of their genetics also allows for hybridization, creating even more vigorous individuals, and threatens the extinction of our native species.

Canada thistle (*Cirsium arvense*) is a perennial forb native to Eurasia. It invades natural areas such as prairies, savannas, and glades, that have been disturbed, as well as dunes. It also invades wet areas with fluctuating water levels such as streambanks, sedge meadows and wet prairies. Canada thistle can also move into forest/woodland edges, being able to tolerate moderate shade. It grows in circular patches spreading/reproducing vegetatively through horizontal roots which can spread 10 -12' in one season.

Root fragments less than one inch can regenerate a plant. It also produces seeds for reproduction that are wind dispersed. Most of the seeds germinate within a year, but some may remain viable in the soil for up to twenty years or more. Once it has established itself, it spreads quickly replacing native plants and diminishing diversity.

Bull thistle (*Cirsium vulgare*) is from Eurasia and was introduced to the U.S. in the early 1800's. It is a biennial forb, growing between 3 – 6 feet tall with one erect, branched stem. The seeds are dispersed by the wind and can remain viable in the soil for over 10 years. This species colonizes primarily in disturbed areas, such as pastures, roadsides, and ditch banks, but also in hayfields, disturbed prairies, and recent timber harvests in forests. Most grazing animals don't prefer bull thistle, giving it a competitive edge.

Spiny plumeless thistle (*Carduus acanthoides*) is also from Eurasia and is very similar to bull thistle in its characteristics and threats to wildlife.

Common St. Johnswort (*Hypericum perforatum*) is a perennial forb native to Europe, North Africa, and Asia. It prefers poor, sandy, dry soils and full sun, and can be found primarily in waste areas, railroad right-of-ways, sidewalk cracks, roadsides, meadows, dry pastures, rangelands, fields, open woods, dunes, and disturbed ground. However, it has the capability to invade healthy rangelands. It spreads both by underground rhizomes, above-ground creeping stems, and by seeds that are dispersed by wind and animals. Common St. Johnswort is considered an invasive plant because it crowds out native species and is toxic to livestock. It contains hypericin, a phototoxin (activated by ultraviolet rays) that travels to the skin after ingestion. This makes some livestock sensitive to sunlight and causes them to develop skin blisters and lose hair. Documents do not mention if this toxicity also affects wildlife that might ingest this invasive plant.

Spotted knapweed (*Centaurea stoebe* subsp. *micranthos*) is an allopathic short-lived perennial (1 – 4 years) forb native to Europe that was unintentionally introduced in the 1890's in alfalfa or hay imports. It is most common in sunny, dry habitats with well-drained or gravelly soils. It grows on heavily disturbed sites, roadsides, agricultural field margins, undisturbed dry prairies, oak and pine barrens, rangeland, lake dunes, and sandy ridges. It releases a toxin into the soil that hinders or prevents the growth of neighboring species. This promotes its domination, reduces plant diversity and limits forage and crop production. As spotted knapweed populations rise and other plant species are excluded, surface runoff and sedimentation often increases. Water holding capacity of soil decreases as taproots replace the network of native plant root systems.

Brown knapweed (*Centaurea jacea*) is a perennial forb native to Europe. It can be found invading woodland clearings, yards, ditches, disturbed areas, pastures, and other grasslands, thriving in sunny, cool, and moist locations, but is shade tolerant. Brown knapweed is capable of outcompeting our native species, creating large monocultures that reduce species diversity, wildlife habitat, and forage availability.

Meadow knapweed (*Centaurea x moncktonii*) is an herbaceous perennial that is a fertile hybrid between brown knapweed (*Centaurea jacea*) and black knapweed (*Centaurea nigra*) from Europe. It invades sunny and wet habitats such as wet meadows, hayfields, pastures, riparian areas, roadsides, and forest openings. Meadow knapweed has the same threats to wildlife as brown knapweed, but to different habitat types.

Diffuse knapweed (*Centaurea diffusa*) is an allopathic, monocarpic perennial (plant dies after bearing fruit) forb from Eurasia. It prefers open habitats over shaded ones and has been typically found on light, dry, porous soils. Diffuse knapweed is a pioneer species that threatens to quickly invade disturbed and undisturbed grassland (plains and rangelands), shrubland, riparian communities, and forested benchlands. This invasive species is known to outcompete and reduce native plant and animal species, lowering diversity and their dense stands that can reach 500 plants/m², will increase soil erosion. It only spreads by seed dispersal, which a single individual can produce up to 18,000 seeds. Containing this species is difficult due its tendencies for the involucre of the seed capsule to remain closed until the plant dries up, typically during late fall and early winter, the stem breaks off at ground level and becomes a tumbleweed, propagating the seeds over long distances. These tumbleweeds have also been observed to become lodged under vehicles, greatly expanding their dispersal range. Some seed capsules do open early and are dispersed near the mother plant from being shaken by wind or other disturbance mechanisms, increasing the infestation's seedbank and population density. Their seeds can remain dormant in the soil for several years.

Knapweed complex – knapweeds are notorious for hybridizing with each other, posing great threats to wildlife in North America. The first three knapweeds are at risk of creating a more vigorous hybrid if any of them grow next to each other. Diffuse knapweed is also at risk of hybridizing with spotted knapweed (*C. x psammogena*). These hybrids can invade more habitat types and become more difficult to kill and manage. Spotted knapweed is widespread throughout Minnesota, thus, too late to eradicate. Brown and meadow knapweeds are recent introductions and are more feasible to eradicate, which is imperative to prevent hybridization from occurring.

Common tansy (*Tanacetum vulgare*) is a perennial forb native to Eurasia, introduced for medicinal and horticultural purposes. It grows in sandy and loamy soils of open disturbed areas, roadsides, pastures, fields, prairies, hedgerows, gardens, naturally disturbed environments, such as flood-scoured river shores, and can invade 5 – 10 feet into forest edge habitats. Tansy invades disturbed areas by forming very dense patches that crowd out native plants. It can clog drainage ditches restricting the flow of water. It may threaten the ecological health of areas through reduction of wildlife habitat and species diversity. It is also mildly toxic. Some people have reported reactions to the oil from this plant.

Leafy spurge (*Euphorbia esula*) is a perennial forb native to Eurasia. It rapidly invades primarily non-cropland disturbed environments, such as roadsides and is a threat mainly to moist and dry prairies and savannas. It is tolerant to a wide range of habitats, from dry to moist, and sunny to semi-shade; although it is most aggressive in dry soil conditions where there is less competition from native plants. The fruits capsule uses an explosive mechanism to disperse seeds up to 15 feet away, have a high germination rate, and remain viable in the soil for 7 years. Leafy Spurge has an extensive deep root system and reproduces vegetatively from the crown and along rhizomes. The World Conservation Union has listed Leafy spurge as one of the world's worst invasive species.

Wild parsnip (*Pastinaca sativa*) is an herbaceous, monocarpic perennial (plant dies after bearing fruit) from Eurasia that was brought to North America as a root vegetable. This invasive plant escaped cultivation and naturalized, invading roadsides, fields, and abandoned lots. During its early introduction, it invades slowly, but its rate of spread increases exponentially as its population builds, displacing native species. Wild parsnip also poses a health risk to animals and to humans. The sap from its stems and

leaves will cause phytophotodermatitis, meaning the sap on skin will cause blistering rashes from sunlight exposure, taking 2 – 4 weeks to heal, and typically leaves permanent scarring.

Garlic mustard (*Alliaria petiolata*) is a biennial forb from Eurasia that escaped cultivation and now threatens the forest understory. It prefers shaded, moist habitats, but can also invade oak savannas and disturbed areas in full sunlight. One individual can produce between 350 – 8,000 seeds, allowing it to take over an area and spread easily. Reports have shown that garlic mustard inhibits beneficial fungi that are associated with native plants, suggesting that this could be the cause of native species diversity declines within 10 years of garlic mustards introduction to an area. Water, animal, and human activity are main vectors of spreading this noxious weed.

Garden lupine (*Lupinus polyphyllus*), also called big-leaf lupine, is an herbaceous perennial from the West coast of North America and cultivated for gardens. It has been planted around the world and is now considered invasive in New Zealand, Sweden, Norway, Switzerland, Czech Republic, Finland, and Lithuania, but not within the non-native range of North America. Garden lupine forms dense, monoculture patches along roadsides and in fields of 1854 Ceded Territory and has been observed expanding into the forest at Moose Mountain SNA. The USFS considers this species invasive and is actively treating it in SNF.

Exotic honeysuckles (*Lonicera tartarica*, *L. morrowii*, *L. x bella*) are woody shrubs that were introduced to North America as an ornamental and for wildlife. Exotic honeysuckle replaces native forest shrubs and herbaceous plants by spreading vegetatively from rooting along its arching branches that contacts soil, forming dense monoculture stands. They shade out herbaceous ground cover and deplete soil moisture. Seeds are easily dispersed by birds.

Japanese barberry (*Berberis thunbergii*) is a woody shrub from Japan and eastern Asia that has naturalized and spread into woodlands and forests. It easily expands vegetatively by horizontal lower branches that root when in contact with soil, forming dense monocultures that outcompete native plants and do not provide food to animals that browse (such as deer). The original cultivar typically produced over 600 seeds per plant (the high numbers of bright red berries in the winter was a preferred trait) which can spread by birds feeding on them. Japanese barberry can also raise the soil pH and nitrogen levels, affecting the native plant community. Research in Connecticut has also shown correlation of Japanese barberry monoculture stands and the rate of ticks infected with Lyme disease.

Siberian peashrub (*Caragana arborescens*) is a woody shrub native to Siberia and Manchuria. It invades savanna and woodland edge environments where it competes with native shrubs and it also invades disturbed grasslands, preferring full sunlight but able to tolerate shade. It is still sold as an ornamental and for shelterbelt, wildlife plantings, and erosion control. Siberian peashrub fruit pods use explosive dehiscence to propagate their seeds short distances and can spread vegetatively from exposed roots that sucker new stems. Rodents are possibly another vector that can spread their seeds a greater distance. It is a nitrogen fixer, altering the soil's chemistry and affect the native plant community.

European highbush cranberry (*Viburnum opulus* subsp. *opulus*) is from Eurasia and brought here by the nursery industry as an ornamental landscaping plant. It looks almost identical to our native American highbush cranberry (*Viburnum opulus* subsp. *trilobum*) and possibly at risk of hybridizing. This non-native species is widely planted and has been mistaken as the native species by sellers. European highbush cranberry has spread into natural habitats from birds eating the berries and distributing the

seeds. In 2016, European highbush cranberry was observed spreading vegetatively from low arching branches that touch the soil at Hawk Ridge in Duluth, MN, similarly to how exotic honeysuckles spread. Documentation of spread is likely under reported due to difficulty distinguishing from the native species and people not knowing to look for it.

Japanese knotweed (*Polygonum cuspidatum*) is a large dioecious shrub-like perennial forb with arching canes from East Asia that was brought here as an ornamental and was used for erosion control. So far, only female plants have been sold at nurseries within North America, which is important because then it can't reproduce. This invasive plant forms large root balls and shoots out long rhizomes that expands the patch vegetatively, forming dense, monoculture stands that choke out native species. Even though this plant was thought to prevent erosion, they do not have filament root structures that help hold soil, which promotes erosion. On streams, they can spread when root fragments break off during heavy rains and wash downstream. This plant is also spread by land owners who mow or cut the stalks and illegally dump the clippings along roadsides and in ditches because the stems can re-root where its nodes contact the soil. Japanese knotweed has a low chance of spreading by seed, requiring Giant knotweed to be present nearby for pollination. The World Conservation Union has listed Japanese knotweed as one of the world's worst invasive species.

Giant knotweed (*Polygonum sachalinense*) is a large monocious shrub-like perennial forb with arching canes from NE Asia. It poses the same issues, dispersal vectors, and threats as Japanese knotweed with the addition that it sexually reproduces (each flower has male and female parts) and can spread by seeds. They can also pollinate Japanese knotweed when nearby, creating hybrids.

Bohemian knotweed (*Polygonum x bohemicum*) is a hybrid between Japanese (*Polygonum cuspidatum*) and Giant (*Polygonum sachalinense*) knotweeds. Because it is a hybrid, it can either be monocious or dioecious. This hybrid poses the same issues and threats as both Japanese and Giant knotweeds, is less likely spread by seed than Giant knotweed. MDA is currently conducting surveys in Duluth to determine its presence in our area and if they are producing viable seeds.

Solidstem burnet-saxifrage (*Pimpinella saxifraga*) is a perennial forb from Eurasia. It looks similar to many other white umbelled species in the carrot family, such as Queen Anne's lace, and has been under reported. Because of this, there is not much information on it. This non-native species forms dense, monoculture patches that chokes out native plants, invading grass and open habitats. According to the WI DNR (listing it as restricted), it can also invade woodlands. It spreads by seed, especially from human activities such as mowing, ATV/snowmobile, and construction.

Garden valerian (*Valeriana officinalis*) is a perennial forb from Eurasia that was brought here as an herb. This is a relatively new non-native species that has escaped cultivation and invades forests, wetlands, marshes, woodland swamps, grasslands, and stream edges. Not much information is available online due to how new it is. Garden valerian is able to compete well against common tansy and reed canary grass. It spreads by seed, especially from human activities such as mowing, ATV/snowmobile, and construction.

Dalmatian toadflax (*Linaria dalmatica*) is a perennial forb from the Mediterranean region that was introduced to North America in the late 1800's. This species spreads both by seed and vegetatively from rhizomes. It does not invade areas easily, native vegetation being able to outcompete their seedlings, but once it becomes established, it will take over large areas with dense monocultures that displace

native plants. Dalmatian toadflax is also very difficult to control, in that only highly toxic herbicides are effective against it. There are biocontrols that work for this noxious weed, but due to its early spread into MN, they are not feasible to use on the small, isolated populations.

Cutleaf teasel (*Dipsacus laciniatus*) is a monocarpic perennial forb that was brought to North America for the fabric industry and ornamental purposes. This noxious weed invades open, sunny habitats, such as along roads and in pastures, preferring disturbed areas, but can also invade high quality habitats such as prairies, savannas, seeps, and sedge meadows. It only spreads by seed, but each flowerhead can produce up to 1,500 seeds, with each plant containing multiple flowerheads. Most of the seeds stay local, forming large, dense monoculture patches that choke out native plants. Their seeds are also easily spread by water flow along riparian corridors, across snow, and by human activities, such as mowing, ATV/snowmobile, construction equipment, and people collecting the seed heads for floral arrangements. Birds are known to consume and spread the seeds as well.

Bristly bellflower (*Campanula cervicaria*) is a monocarpic perennial forb from Scandinavia and Central Europe, listed as endangered in its native range, and is only known to have naturalized and spread in 1854 Ceded Territory. It is prolific in spreading by seed, each plant producing between 20 – 30,000 seeds, and can be dispersed by human activities, such as mowing, ATV/snowmobile, and construction. Very little is known about this new introduced species. Dense patches have been observed along roads, in the forest at Moose Mountain, and in the Superior National Forest.

Crown vetch (*Securigera varia*) is a perennial forb from Eurasia that was introduced in the 1950's as ground cover and for erosion control. MNDOT frequently used this species and birdsfoot trefoil (*Lotus corniculatus*) after road construction for erosion control but stopped due to their invasive nature. Crownvetch spreads both vegetatively by rhizomes and by seeds dispersed easily by human activities such as mowing, ATV/snowmobile, and construction. It forms large dense, thick bushy monoculture patches that chokes out native species.

Tufted (*Vicia cracca*) and **hairy** (*V. villosa*) **vetches** are both monocarpic perennial forbs from Eurasia that were brought to North America as a forage crop and to control erosion. They use tendrils to climb high for support and form thick, dense mats that choke out native plant species. These invasive plants are easily spread by human activities such as mowing and construction as well as spread by birds and horses, invading disturbed fields, thickets, along roadsides, and restored prairies.

Queen Anne's lace (*Daucus carota*) is a biennial forb from Eurasia that invades roadsides, fields, disturbed dry prairies, and recovering/restored grasslands. It spreads easily by seeds, naturally by seeds sticking onto animal fur and clothing with hooked spines (ectozoochory) or when the umbel breaks off and acts as a tumble weed, being blown across the snow by the wind, or from human activities, such as mowing, ATV/snowmobile, and construction. Queen Anne's lace will form dense patches that outcompete native vegetation.

Emerald ash borer (*Agrilus planipennis*) (EAB) is an invasive, wood boring beetle native to East Asia that may have been accidentally introduced to the United States in the pallets made from untreated ash wood used for transporting goods from China. Since their introduction to the North America, EAB has killed millions of ash trees (*Fraxinus spp*). The EAB spends its' immature (larval) stage inside an ash tree. It feeds on the cambium tissues (green layer under the bark) for 1-2 years leaving an S-shaped tunneling pattern. This feeding disrupts the trees' ability to move water and nutrients back and forth from the

roots to the rest of the tree. The ash tree starves and eventually dies within 2-4 years. Once the EAB transitions to an adult it will exit the ash tree through the bark (leaving a D-shaped exit hole), fly to the tree's canopy, mate, and lay eggs on the bark starting their life cycle over again. In 2013, EAB was confirmed in the City of Superior in Douglas County, Wisconsin, which borders the 1854 Ceded Territory, and was placed under EAB quarantine. EAB was detected within the Ceded Territory in 2015 at Park Point in Duluth, MN with a special quarantine placed on that peninsula. In 2016, EAB was detected near Hartley Park in Duluth, extending the special quarantine to encompass the SE corner of St. Louis County. An EAB quarantine restricts the movement of ash logs, ash byproducts and hardwood firewood out of the county, which are the primary pathways for their spread.

Gypsy moth (*Lymantria dispar*) is an invasive moth species native to Europe and was intentionally introduced to the eastern United States from France in 1869 to make a better breed of silkworm. This effort was unsuccessful and gypsy moths have since expanded their range to Minnesota. Much of their spread has been due to human activity, such as motorized vehicles and tourism, when gypsy moths attach their egg masses to equipment and other personal objects that get transported to another location. Since their introduction, gypsy moths have caused significant defoliation of forests. Aspen and oaks are two of the 500 preferred host species, but they can feed on almost any tree species. Gypsy moths defoliate trees during their larval (caterpillar) life stage in early to mid-summer. This defoliation does not kill trees directly, but it makes them more susceptible to diseases and other stressors that do kill the trees. Multiple years of defoliation caused by gypsy moth feeding will continue to weaken trees until another stressor kills them. Since 2014, a quarantine has been placed on Lake and Cook counties.

Pathways for introduction and spread

There are many pathways that introduce and spread invasive species. The most common pathway has been through human activity. Some introductions, such as common carp, European buckthorn, and purple loosestrife, were intentional and caused unexpected harm. Other introductions are unintentional, such as spotted knapweed, emerald ash borer, and spiny water flea. Invasive species are often unknowingly carried in or on animals, vehicles, equipment, ships, commercial goods, produce, wood, water, clothing, etc. Ballast water discharge from ships was once a significant pathway for introducing aquatic species, such as zebra mussels, Eurasian ruffe, and round gobies, into the Duluth harbor and other Minnesota ports on Lake Superior. Current ballast water regulations have prevented the introduction of new AIS into the United States since its implementation in 2006. For inland waters, transporting recreational boats, as well as docks and other equipment, between water bodies has been the main pathway for introducing new aquatic species. Transporting firewood can be a pathway to introduce and spread invasive insects such as emerald ash borer into the 1854 Ceded Territory. People camping and/or visiting an area infested with gypsy moths and then leaving without cleaning their egg masses from their vehicles, tents, equipment, bags, clothing, etc. will spread gypsy moths to new areas.

Prioritization/control of pathways

Since there are many pathways that introduce and spread invasive species, it is not feasible to control all pathways with equal effort due to limited resources. Because of this, it is important to assess the risk of each pathway spreading invasive species and prioritize efforts for control. Our prioritization for control of a pathway is based on its probability of introducing and spreading invasive species (risk) to/within the 1854 Ceded Territory and the resources available for control.

Ballast water is still a potential pathway for spreading aquatic invasive species into Lake Superior. Control of ballast water discharge and treatment is managed and monitored by state and federal agencies that have the resources to do so. Our role will be to continue monitoring the St. Louis River Estuary for any new invasive species introduced and to review and provide comment in support of the Bois Forte and Grand Portage Bands of Chippewa when there are opportunities. Transporting recreational boats between water bodies is still a high-risk pathway to spread aquatic invasive species. This pathway will actively be controlled by the 1854 Treaty Authority by inspecting boats entering and leaving public water accesses for aquatic invasive species, checking boat owners for compliance with regulations, and educating the public about the damages AIS cause to our waters and how to reduce their spread. Accesses to waters with invasive species and/or high use will be given priority.

Pathways for terrestrial invasive species are not feasible to control due to no definitive point source to monitor and limited regulations that are not easily enforced. 1854's efforts to reduce pathways of TIS will be through educating the public about the damages TIS cause to our forest, wetland, and open habitats and what habits they can form to help reduce the rate of their spread.

Cooperative efforts

To better protect natural resources within the 1854 Ceded Territory from invasive species, the 1854 Treaty Authority has coordinated efforts with other agencies. Recent cooperating partners and efforts have included: Minnesota Sea Grant (public outreach), Minnesota Department of Natural Resources (MDNR) (coordination of decontamination units at public boat landings, public outreach), Soil and Water Conservation Districts (coordination of decontamination units, surveillance and outreach events), US Fish and Wildlife Service (early detection of aquatic invasive species in the St. Louis River), Fortune Bay Marina, Vermillion Lake Association (coordination of decontamination units and AIS surveillance), US Forest Service (control of invasive plants), St. Louis River Alliance (management of non-native Phragmites), MN Department of Agriculture (detection and response of new terrestrial invasive species), the City of Duluth (coordination of volunteers and terrestrial invasive species management), and the Stewardship Network (invasive species efforts in the Greater Duluth Area). These partnerships and efforts will be continued and opportunities for new partnerships will be explored.

Invasive Species Management Plan framework: goal, objectives, strategies, and actions

Main goal: Implement multi-faceted management approach for terrestrial and aquatic invasive species to prevent new introductions, stop/slow spread of existing invasions, and control/eliminate invasive species where feasible.

Objective 1: staffing

Strategy: hire additional staff

Actions

- Hire invasive species technicians to perform actions consistent with the 1854 Treaty Authority's Invasive Species Management Plan.
- Seek additional funding to support hiring of invasive species technicians and other program needs.

Objective 2: education**Strategy (a): educate 1854 Treaty Authority staff****Actions**

- Train staff on invasive species education, identification, control, and use of equipment.
- Attend conferences and trainings to stay current on new potential control methods and surveillance techniques
- Implement and update Best Management Practices (BMP's) for working in areas infested with invasive species.
- Conduct appropriate background research when undertaking new projects or expanding current projects to have the most current, pertinent knowledge available.
- Maintain and update a list of aquatic invasive species found in the 1854 Ceded Territory and the lakes/rivers they are found in.

Strategy (b): educate band members**Actions**

- Provide outreach at powwows, community gatherings, tribal accesses and other events.
- Develop and distribute public information items such as displays, brochures, posters, and promotional items with the 1854 Treaty Authority, Stop Aquatic Hitchhikers, Habitattitude, and PlayCleanGo logos.
- Provide current information and updates regarding invasive species in the 1854 Treaty Authority newsletter.
- Provide current information and updates on the 1854 Treaty Authority website and enhance the website to include links to other resources.
- Develop classroom lessons and educational activities to teach students of all ages.

Strategy (c): educate the general public**Actions**

- Coordinate with the MDNR to perform boat inspections at public accesses within the 1854 Ceded Territory and inform the public about aquatic invasive species through verbal communication and outreach materials.
- Attend public outreach events with MN Sea Grant, MDNR, Duluth CISMA, and other agency staff to talk with the public and pass out education materials. These events include fairs, community events, fishing tournaments, and other gatherings.
- Develop classroom lessons and educational activities to teach students of all ages.

Objective 3: Surveillance**Strategy: identify new invasions of terrestrial and aquatic species**

Actions

- Survey high risk and culturally important areas within the 1854 Ceded Territory for new terrestrial and aquatic invasive species.
- Survey these areas for new infestations of invasive plant species with emphasis on species included in this plan.
- Survey high risk areas for emerald ash borer and gypsy moths spread to aide in cooperative efforts in locating new infestations for rapid response.
- Survey high risk and culturally important areas within the 1854 Ceded Territory for new aquatic invasive species as well as excessive spreading of the native pickerelweed in wild rice lakes.
- Survey high risk and culturally important inland lakes for new infestations with emphasis on species included in this plan.
- Survey the St. Louis River for new aquatic invasive species through bottom trawl surveys and assist the US Fish and Wildlife Service with their early detection efforts.

Objective 4: Monitoring**Strategy: monitor terrestrial and aquatic invaders****Actions**

- Monitor areas currently invaded by terrestrial species for abundance and distribution.
- Monitor distribution and abundance of the native pickerelweed in wild rice lakes and its effect on wild rice distribution and abundance.
- Monitor abundance and distribution of AIS in known infestations of lakes/ivers.
- Continue long-term monitoring of abundance and distribution of native and non-native fish species in the St. Louis River Estuary. Survey also serves as surveillance tool for new invasive species.

Objective 5: Control**Strategy (a): control pathways for introducing terrestrial and aquatic invasive species****Actions**

- Prioritize control efforts based on pathway risk and resources available for control.
- Review and provide input on regulations that protect resources of interest to the bands.
- Operate decontamination unit to decontaminate boats entering/leaving public water accesses on waters with invasive species, has high use and/or is a high priority (e.g. walleye assessment lake, wild rice water). Work with the MDNR to increase frequency of use and number of public accesses to use the decontamination unit.
- Enforce laws put in place to control invasive species.

Strategy (b): manage new and current infestations of terrestrial and aquatic invasive species**Actions**

- Plan and implement rapid response strategies for any new or limited infestation (terrestrial or aquatic) in coordination with the bands and the proper federal and/or state agencies to increase the feasibility of eradicating the species.
- Coordinate with the USFS to utilize control techniques to manage invasive terrestrial plant species off-reservation.
- Investigate techniques used to manage native pickerelweed to limit its impact on wild rice (e.g. cutting, winter plowing, and/or winter drawdown).

Strategy (c): monitor success of control efforts**Actions**

- Annually monitor terrestrial/aquatic plant infestations treated by various techniques to evaluate effectiveness of each method and locate areas where additional control is warranted.
- Monitor pickerelweed sites where control efforts were used semi-annually (early and late season) to estimate effectiveness and determine where additional effort is needed.
- Monitor waters where rusty crayfish control efforts were used (during the summer) to estimate effectiveness and determine where additional effort is needed.
- Keep track of number of hours invasive species technicians spend at each landing, the number of people/boaters they interacted with and the number of boats inspected and/or decontaminated to determine when and where our efforts are best applied in future efforts.
- Record how many waterbodies were surveyed, what species were surveyed for, and if new infestations were found.

1854 Ceded Territory

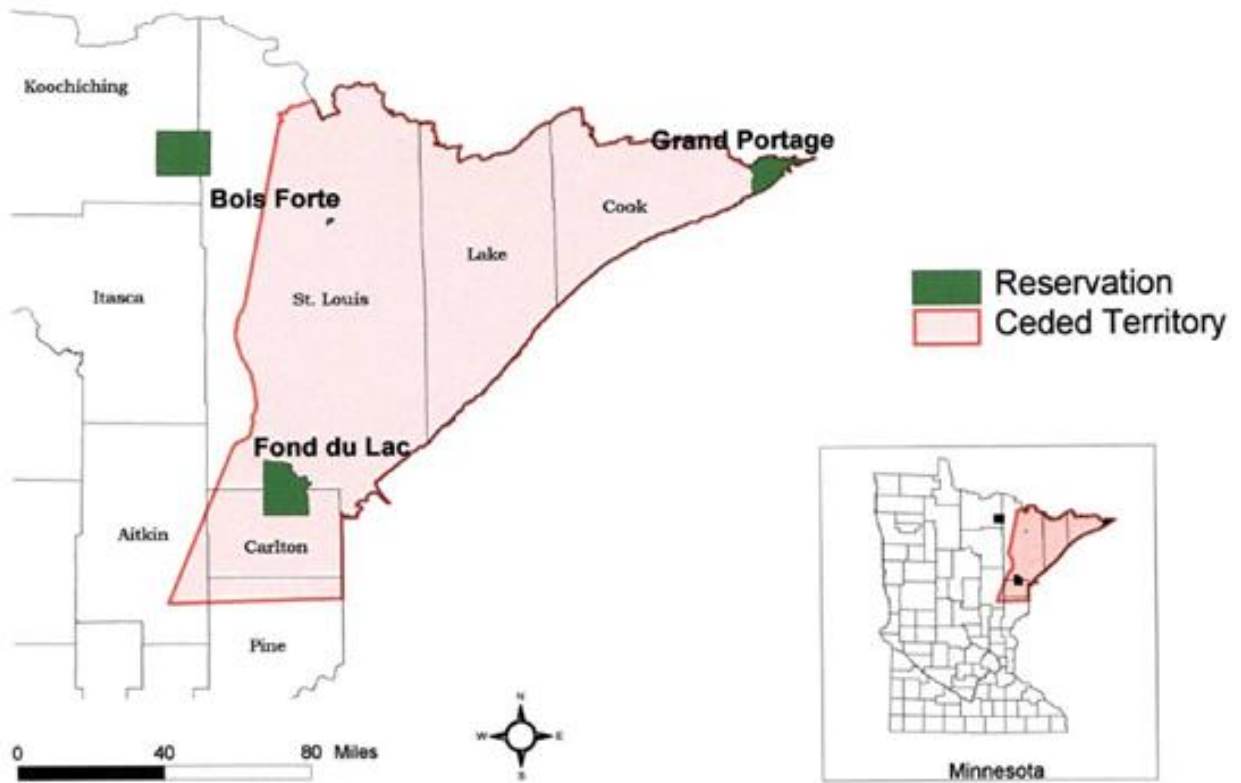


Figure 1. Map of 1854 Ceded Territory and Reservation boundaries.

Appendix A: List of Aquatic Invasive Species and Infested Waters in the 1854 Ceded Territory

Bloody Red Shrimp:

- Multiple Counties: St. Louis River, Lake Superior

Eurasian Milfoil:

- Carlton County: Bear Lake, Chub Lake, Little Hanging Horn Lake
- Pine County: Sand Lake, Sturgeon Lake
- St. Louis County: Gilbert Pit Lake, Horseshoe Lake
- Multiple Counties: Lake Superior

Faucet Snail:

- Multiple Counties: St. Louis River, downstream of the Fond du Lac Dam, Lake Superior and tributaries to Lake Superior

Eurasian Ruffe:

- Multiple Counties: St. Louis River, downstream of the Fond du Lac Dam, Lake Superior

New Zealand Mud Snail:

- Multiple Counties: St. Louis River, downstream of the Fond du Lac Dam, Lake Superior

Round Goby:

- Multiple Counties: St. Louis River, downstream of the Fond du Lac Dam, Lake Superior and tributaries to Lake Superior

Spiny Water Flea:

- Cook County: Caribou Lake, Devil Track Lake, Devilfish Lake, Flour Lake, Greenwood Lake, Gunflint Lake, Little John Lake, McFarland Lake, North Fowl Lake, Pine Lake, Pigeon River downstream of South Fowl Lake, Royal Lake, Royal River between Little John and North Fowl Lakes, Lake Saganaga, South Fowl Lake, Trout Lake (near Grand Marais)
- Lake County: Basswood Lake, Basswood River between Basswood Lake and Crooked Lake, Crooked Lake, Fall Lake, Newton Lake
- St. Louis County: Ash River downstream of section line of Section 8, Township 68 North, Range 18 West, Burntside Lake, Burntside River between Burntside Lake and Shagawa Lake, Shagawa Lake, Crane Lake, Dead River, East Twin Lake, Fish Lake, Iron Lake, Island Lake, Kabetogama Lake, Bottle Lake, Bottle River between Bottle lake and Lac La Croix Lake, Lac La Croix Lake, Pike River from Pike River Dam at CSAH 77 near Peyla to Lake Vermilion, Lake Vermilion, Vermilion River from Lake Vermilion to Crane Lake, Little Vermilion Lake, Loon Lake, Namakan Lake, Rainy Lake, Sand Point Lake, West Twin Lake
- Multiple Counties: Lake Superior, Cloquet River from Island Lake to the St. Louis River, St. Louis River downstream of the Cloquet River

Viral Hemorrhagic Septicemia (VHS):

- Multiple Counties: St. Louis River downstream of Fond du Lac dam, Lake Superior and tributaries to Lake Superior

White Perch:

- Multiple Counties: St. Louis River, downstream of the Fond du Lac Dam, Lake Superior and tributaries to Lake Superior

Zebra Mussels:

- St. Louis County: Pike Lake, Mud Lake, White Pine River, Gilbert Pit (Lake Ore-Be-Gone)
- Lake County: Crooked Lake, Unnamed creek between Crooked lake and Houghtaling Creek, Artlip Lake, Houghtaling Creek downstream of the mouth of the unnamed creek draining Artlip Lake.
- Multiple Counties: St. Louis River, downstream of White Pine River, Lake Superior and tributaries to Lake Superior

Appendix B: List of Terrestrial Invasive Species and Infested Areas in the 1854 Ceded Territory

Common Buckthorn: Noxious weed – Restricted list

- St. Louis County: large, dense areas, widespread
 - all of the greater Duluth area, Moose Mountain SNA, Ruffed Grouse WMA, MN Point Pine Forest SNA, Quad Cities area, Buhl, Aurora, Cook, Lake Vermilion-Soudan Underground Mine State Park, Bear Head Lake State Park, Ely area, Cloquet Valley State Forest (tax forfeited lands), Laurentian Divide of Superior National Forest
- Carlton County: less dense, smaller distribution than SLC
 - Jay Cooke State Forest, Fond du Lac State Forest (Red River area), Blackhoof WMA
- Lake County: low distribution in a few dense patches
 - Two Harbors area, Beaver Bay area, Hwy 7 east of Finland
- Cook County: rare
 - Grand Marais (1 known male? planted in a yard)

Glossy Buckthorn: Noxious weed – Restricted list

- St. Louis County: large, dense areas, widespread (less than common buckthorn)
 - all of the greater Duluth area, Moose Mountain SNA, MN Point Pine Forest SNA, south of Eveleth (between Mud Lake and Saint Marys Lake), Lake Vermilion-Soudan Underground Mine State Park, Cloquet Valley State Forest (tax forfeited lands)
- Carlton County: less dense, smaller distribution than St. Louis County
 - Hemlock Ravine SNA, Fond du Lac State Forest (Red River area), Blackhoof WMA, Moose Lake

Exotic Honeysuckle: Noxious weed – Restricted list

- St. Louis County: large, dense areas, widespread (less than Common Buckthorn)
 - all of the greater Duluth area, Moose Mountain SNA, Ruffed Grouse WMA, MN Point Pine Forest SNA
- rest of the counties: widespread, less dense, smaller distribution than SLC

Oriental Bittersweet: Noxious weed – Prohibited Eradicate list

- St. Louis County: pioneer population, rare
 - in Duluth (along I-35 around exit/entrance ramps 253A) and on private property in the East Hillside neighborhood, Fortune Bay

Canada Thistle: Noxious weed – Prohibited Control list

- All counties: widespread, multiple dense patches
 - Superior National Forest, Moose Mountain SNA, MN Point Pine Forest SNA

Spiny Plumeless Thistle: Noxious weed – Prohibited Control list

- St. Louis County: rare, wide distribution
 - Superior National Forest
- Lake County: rare, wide distribution
 - Superior National Forest and Tettegouche State Park

Bull Thistle: MN DNR – lists as invasive

- All counties: common, low density, few dense patches
 - Superior National Forest, Moose Mountain SNA

Common St. Johnswort: Non-native

- All counties: common, multiple dense patches
 - Superior National Forest, Moose Mountain SNA

Spotted Knapweed: Noxious weed – Prohibited Control list

- All counties: widespread, multiple dense patches
 - Superior National Forest, Moose Mountain SNA, MN Point Pine Forest SNA

Brown Knapweed: Noxious weed – Prohibited Eradicate list

- St. Louis County: pioneer population, rare

Meadow Knapweed: Noxious weed – Prohibited Eradicate list

- St. Louis County: two pioneer populations, rare
 - Cook, MN along Hwy 53, near intersection of State Hwy 73 and Hwy 53, just outside (north) of the Laurentian Divide of Superior National Forest
- Lake County: pioneer population, rare
 - Silver Bay, MN along Hwy 61
- Pine County: pioneer population, rare
 - Audubon Center of the North Woods (not within the Ceded Territory)

Diffuse Knapweed: Noxious weed – Prohibited Eradicate list

- St. Louis County: pioneer population, rare
 - found on one Army Corps of Engineer property in Duluth, MN

Common Tansy: Noxious weed – Prohibited Control list

- All counties: widespread, multiple dense patches
 - Superior National Forest, Moose Mountain SNA, MN Point Pine Forest SNA

Leafy Spurge: Noxious weed – Prohibited Control list

- All counties: uncommon, few dense patches
 - Superior National Forest, City of Duluth, MN Point Pine Forest SNA

Wild Parsnip: Noxious weed – Prohibited Control list

- St. Louis County: uncommon, few dense patches
 - Superior National Forest, City of Duluth, along Hwy 23 between Boy Scout Landing and Perch Lake, along I-35, along Co. Hwy 4 in Rice Lake Township, along Hwy 53 in Hermantown, along Hwy 169 between Tower and Sudan, NE of Ely, MN

- In Bois Forte Reservation along Nett Lake Road (outside of the Ceded Territory)

Garlic Mustard: Noxious weed – Prohibited Control list

- St. Louis County: uncommon, multiple dense patches
 - Superior National Forest, the greater Duluth area, around Ely, MN
- Lake County
 - NE of Two Harbors, NW of Beaver Bay along Beaver River, in the Boundary Waters Canoe Wilderness Area between Gabimichigami Lake and Peter Lake

Crown Vetch: Noxious weed – Restricted list

- St. Louis County: rare, dense patches
 - in Duluth – along Hwy 53, at Abbot Landing of Island Lake Reservoir, in SNF along Co. Hwy 16, in SNF at Whiteface Reservoir, in SNF at McNair Site, at the SNF LaCroix Office

Queen Anne's Lace: Noxious weed – Restricted list

- St. Louis County: rare, isolated pockets
 - High density at the Lake Superior Zoo, escaped patches NE of the zoo on S 71 Ave. W
- Lake County: rare, isolated pockets
 - High density on private industry property in Silver Bay, MN, small patches in Finland, MN
- Cook County: rare, isolated pockets
 - USFS treatment efforts in the Gunflint area

Garden Lupine: Non-native

- St. Louis County: uncommon, few dense patches
 - National Forest, Moose Mountain SNA
- Lake County: uncommon, few dense patches
 - Superior National Forest
- Cook County: uncommon, few dense patches
 - Superior National Forest

Japanese Barberry: Noxious weed – Specially regulated

- St. Louis County: widespread, uncommon in the wild, commonly used in landscapes on private property (less than Exotic Honeysuckle)
 - all of the greater Duluth area, MN Point Pine Forest SNA, Hawk Ridge
- Carlton County: widespread, less dense, smaller distribution than SLC
 - Cloquet area, Fond du Lac State Forest (Red River area)
- Lake County: isolated known infestation of extreme high density (monoculture)
 - Two Harbor's area
- Cook County: rare, one known planting on private property
 - Grand Marais, MN

Siberian Peashrub: MN DNR – listed as invasive

- All counties: common, widespread, multiple dense patches

- Superior National Forest, Ely area

European Highbush Cranberry: Non-native

- St. Louis County: rare, wide distribution in pockets, likely under reported
 - Moose Mountain SNA, Hawk Ridge, MN Point Pine Forest SNA, Chester Park
- Carlton County: rare, under reported
 - Chub Lake

Japanese Knotweed: Noxious weed – Specially regulated

- All counties: dense in the greater Duluth area, rare for the rest of the territory

Giant Knotweed: Noxious weed – Specially regulated

- St. Louis County: listed as being present in this county on the USDA's website

Bohemian Knotweed: Non-native

- All counties: dense in the greater Duluth area, rare for the rest of the territory

Solidstem Burnet-Saxifrage: Non-native

- St. Louis County: pioneer populations, rare, MDA considers this species under reported
 - north of Virginia, MN multiple patches along Pelton Road going towards Big Rice Lake, west of Fortune Bay on private properties along Hwy 169
- Pine County: rare, very high density, established population, under reported
 - Audubon Center of the North Woods (15 miles south of the Ceded Territory border)

Garden Valerian: Non-native

- St. Louis County: widespread, high density in southern area of county
 - high density in the greater Duluth area, spreading north along Hwy 61, Hwy 53, Co. Hwy 4, and Co. Hwy 44 (within southern area of SNF), and south along I-35 and Hwy 23. At Moose Mountain SNA, Hawk Ridge, MN Point Pine Forest SNA, Cloquet Valley State Park, along Co. Hwy 16, in Ely, MN
- Carlton County: widespread, less dense than in SLC
 - along I-35, Hwy 23, Co. Hwy 3, Fond du Lac State Forest (Red River area)
- Lake County: rare, spotty distribution
 - along Hwy 61, in SNF off of Co. Hwy 11, in Finland, MN
- Cook County: rare, spotty distribution
 - Along Hwy 61, in SNF along Co. Hwy 4

Dalmatian Toadflax: Noxious weed – Prohibited Eradicate list

- Cook County: pioneer population, rare
 - Lutsen, MN along Hwy 61

Cut-leaf Teasel: Noxious weed – Prohibited Eradicate list

- St. Louis County: pioneer population, rare
 - in Duluth, MDA is dealing with it, location not known to 1854

Bristly Bellflower: Non-native

- St. Louis County: uncommon, widespread, under reported
 - Moose Mountain SNA, Lincoln Park, along Hwy 61, along Co. Hwy 4, Boulder Lake Reservoir,
- Lake County: less dense, smaller distribution than SLC
 - Along Hwy 61, in middle of SNF east of Scott Junction
- Cook County: less dense, smaller distribution than Lake County
 - along Hwy 61 around Grand Marais

Tufted Vetch: MN DNR – listed as invasive

- St. Louis County: rare, few patches
 - along Hwy 53 in Cook, MN
- Lake County: rare, few patches
 - in SNF at McDougal Lake boat launch

Hairy Vetch: MN DNR – listed as invasive

- St. Louis County: rare, few patches
 - at the Fish Lake Reservoir's boat launch, along Fish Lake Dam Road
- Lake County: rare, few patches
 - in SNF along the NSSMT south of Co. Hwy 11

Amur Maple: Noxious weed – Specially regulated

- All counties: used in landscapes in private yards and as hedges. Has been seen spreading along road sides. Has yet to be seen spreading into forests within the Ceded Territory

Black Locust: Noxious weed – Restricted list

- St. Louis County: rare, wide distribution in small, monoculture pockets
 - Cloquet, Proctor, throughout Duluth (extensive within Central Park), Ely along a section of the Trezona Trail

Emerald Ash Borer: Quarantines

- Carlton County: early detection, pioneer population
 - City of Duluth: Park Point, the Woodland Park, Lincoln Park, Congdon Park, and Lake Side-Lester Park Neighborhoods, City of Rice Lake
 - Special quarantine in place over the SE corner of county, containing the area west of Hwy 53 and Hwy 33 and south of Co. Hwy 49, through the area without roads along this line to Lake Superior

Gypsy Moth: Quarantines

- St. Louis County: uncommon, multiple low count detections
 - Most of this county is under STS Action Area

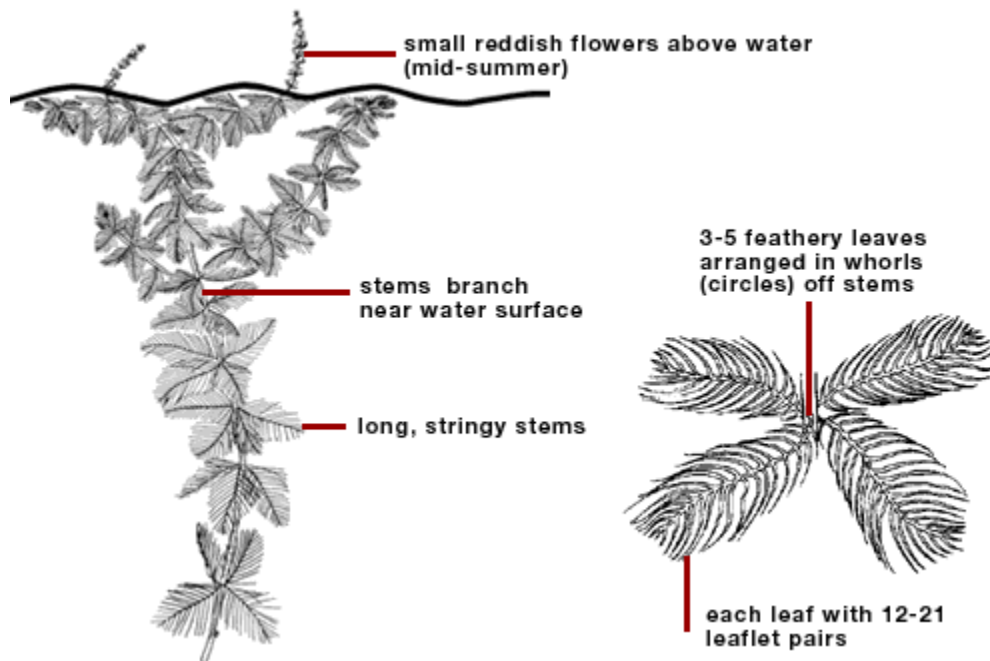
- Lake County: quarantine in place
- Cook County: quarantine in place

Appendix C: Pictures of and Identification Characteristics for Species of Concern

Aquatic invasive species currently in the Ceded Territory

Eurasian watermilfoil (*Myriophyllum spicatum*) and hybrid watermilfoil (*Myriophyllum spicatum* x *M. sibiricum*)

(Pictures and identifying characteristics from <http://www.seagrant.umn.edu/ais/watermilfoil>)

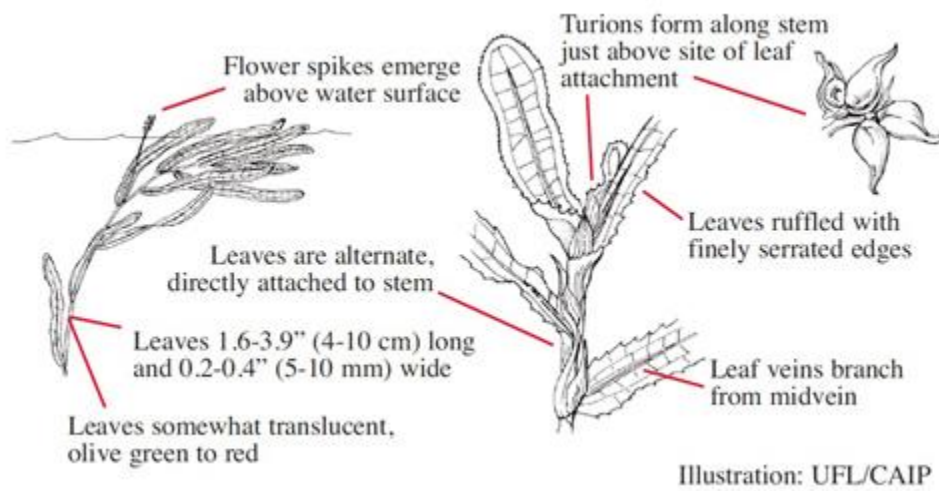


Identifying characteristics:

- Found in water less than 20 feet (6 meters) deep.
- May form mats in waters less than 15 feet (4.5 meters) deep.
- A native look-alike, northern watermilfoil, has fewer (5-10) leaflet pairs.
- Hybrid milfoil will look similar with usually fewer leaflet pairs than Eurasian watermilfoil.

Curly leaf pondweed (*Potamogeton crispus*)

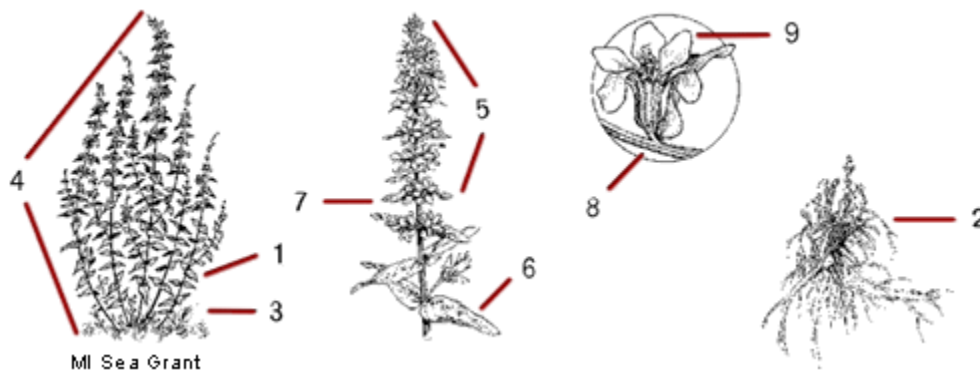
(Pictures and Identifying characteristics from <http://www.seagrant.umn.edu/ais/curlyleaf>)

**Identifying characteristics:**

- Tolerant of low light, it grows throughout the winter
- Forms floating mats in littoral areas in lakes, ponds, and moderately flowing rivers
- May be confused with largeleaf pondweed or claspingleaf pondweed

Purple loosestrife (*Lythrum salicaria*)

(Pictures and identifying characteristics from <http://www.seagrant.umn.edu/ais/purpleloosestrife>)

**Identifying characteristics** (numbers match diagram above):

1. Mature plants have many stems that grow from a...
2. Root crown
3. Dead stems stand until spring
4. Height 3 to 7 feet (1 to 2 meters)
5. Spike covered with many flowers
6. Downy, smooth-edged leaves
7. Leaves usually paired, opposite
8. Stem has ridges
9. Flower has several pink-purple petals

Non-native Phragmites (*Phragmites australis* subsp. *australis*)

(Pictures and Identifying characteristics from <https://mnfi.anr.msu.edu/phragmites/>)

Non-native



Native



Non-native



Native



Non-native



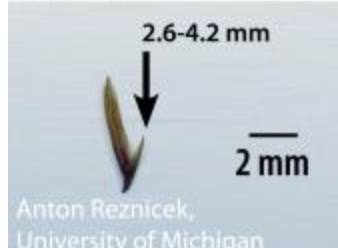
Native



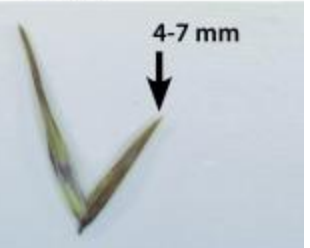
Anton Reznicek,
University of Michigan

The ligule is much wider on native Phragmites.

Non-native



Native



Anton Reznicek,
University of Michigan

The glume is much larger on native Phragmites.

Identifying characteristics:

- Leaf sheaths of non-native Phragmites will cling tightly to the stems
- Typically, non-native Phragmites will grow much taller and be in much denser stands
- Non-native Phragmites has a longer growing season and will remain green into the fall after native Phragmites has turned brown and dispersed its seed
- Non-native Phragmites typically will have a fuller seed head, this is especially apparent in the early spring and late fall.
- The ligule is much wider on native Phragmites (pictured above)
- The glume is much longer on native Phragmites than invasive Phragmites.

Pickereelweed (*Pontederia cordata*)

(Pictures are from https://webapps8.dnr.state.mn.us/restoreyourshore/plants/plant_detail/277)

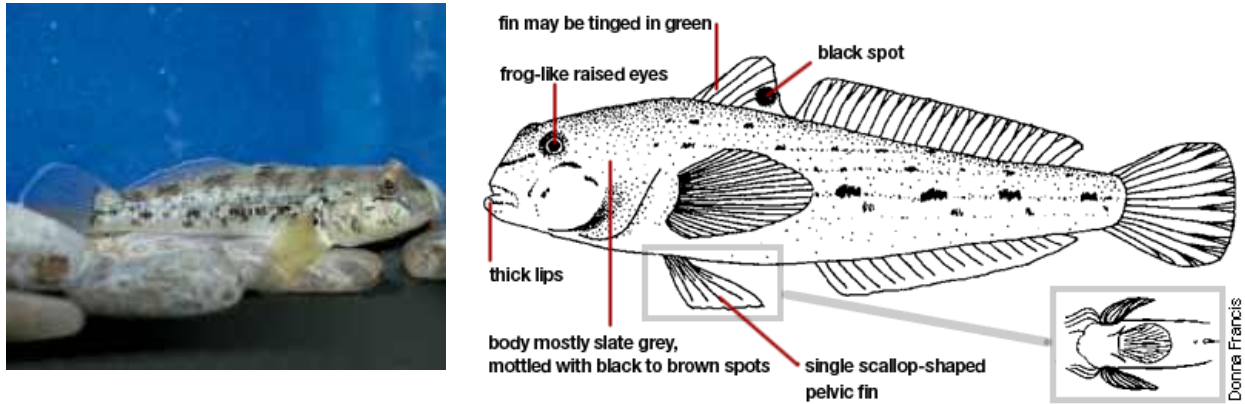


Identifying characteristics (refer to pictures above):

- Purple to blue flower spike 2-3 inches long.
- Grows in water, 1-3 feet tall (from lakebed to the top of the flower).
- Heart shaped leaves with parallel veins.

Round gobies (*Apollonia melanostomus*)

(Pictures and identifying characteristics from <http://www.seagrant.umn.edu/ais/roundgoby/>)



Identifying characteristics:

- No other native fish in the Great Lakes has the single pelvic fin.
- Young are solid slate gray.
- Usually 3-6 inches (7-15 cm) long, may be up to 10 inches (25 cm).

Tubenose gobies (*Proterorhinus marmoratus*)

(Pictures and Identifying characteristics from <http://www.invadingspecies.com/invaders/fish/tubenose-goby/>)

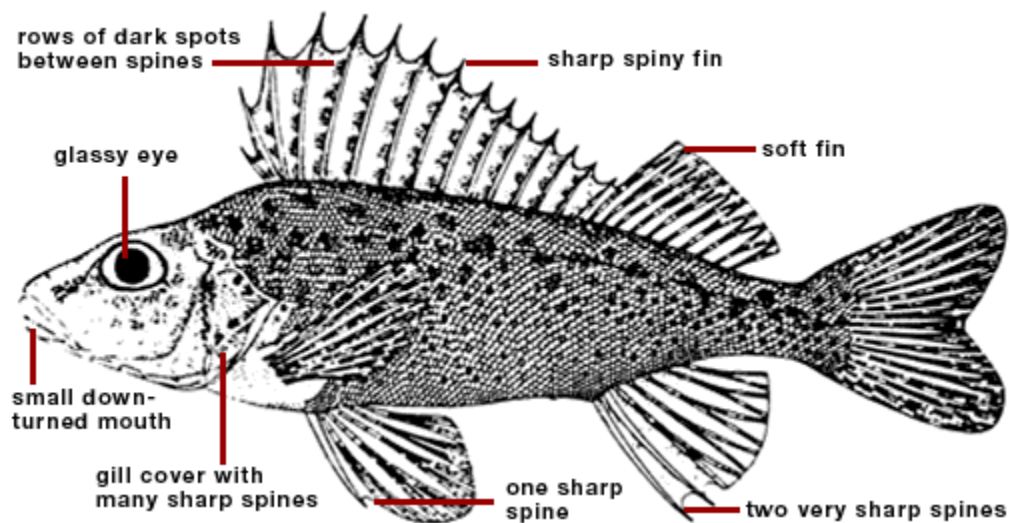


Identifying characteristics:

- Fused, scallop-shaped pelvic fin
- Small, nostril tubes extend over upper lip
- Unlike the **round goby**, the tubenose goby has no black spot on its dorsal fin

Eurasian ruffe (*Gymnocephalus cernuus*)

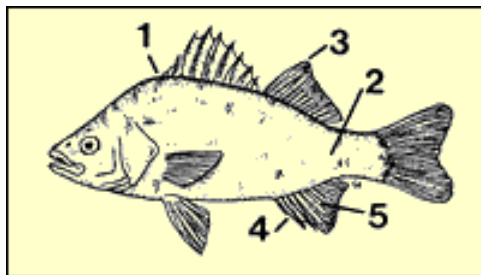
(Pictures and identifying characteristics from <http://www.seagrant.umn.edu/ais/ruffe>)

**Identifying characteristics:**

- Small fish resembling a yellow perch with walleye markings (member of the perch family)
- Adult ruffe are about five to six inches long and rarely exceeds 10 inches in length.
- Characters that make ruffe differ from other perch species are:
 1. A very large dorsal fin, joined together, front and back. The front part of this large dorsal fin has 11-16 spines.
 2. A slightly downturned mouth.
 3. Absence of scales on its head.

White perch (*Morone americana*)

(Picture is from <http://www.seagrant.wisc.edu/Home/Topics/InvasiveSpecies/Details.aspx?PostID=657>)

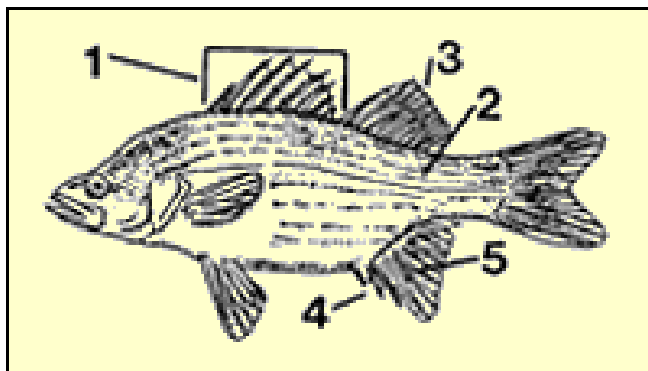
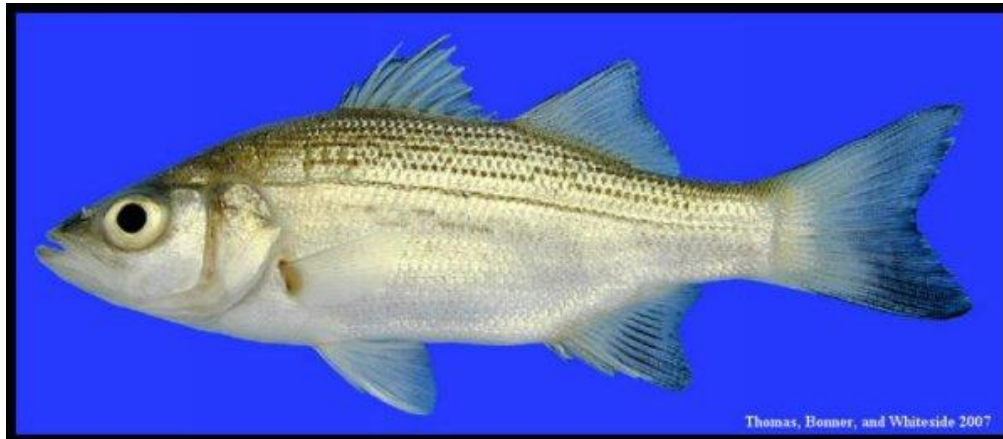


Identifying characteristics (labeled picture above and corresponding characteristics below are from <http://www.seagrant.umn.edu/exotics/wperch.html>):

1. The body is deepest just ahead of, or at the beginning of, the dorsal fin.
2. There are no lines or stripes on the back or sides.
3. When the spiny dorsal fin is pulled erect, the soft dorsal fin also becomes erect.
4. The second and third bony anal spines are almost exactly the same length.
5. The anal fin usually has 8 or 9 soft rays behind the 3 bony spines.

White bass (*Morone chrysops*)

(Picture is from <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=779>)



Identifying characteristics (labeled picture above and corresponding characteristics below are from <http://www.seagrant.umn.edu/exotics/wperch.html>):

- The body is deepest below the dorsal fin and the depth remains fairly uniform below the entire spin dorsal fin.
- From 6 to 10 dark lines run horizontally down the back and sides.
- When the spiny dorsal fin is pulled erect, the soft dorsal fin remains relaxed
- Each of 3 bony anal fin spines are of different lengths and are arranged in ascending order.
- The anal fin usually has 11 or 12 soft rays behind the 3 bony spines.

Rainbow smelt (*Osmerus mordax*)

(Identifying Characteristics and Images from <http://www.seagrant.umn.edu/ais/smelt> and <http://www.bentzenlab.ca/research-interests/84-2/>)



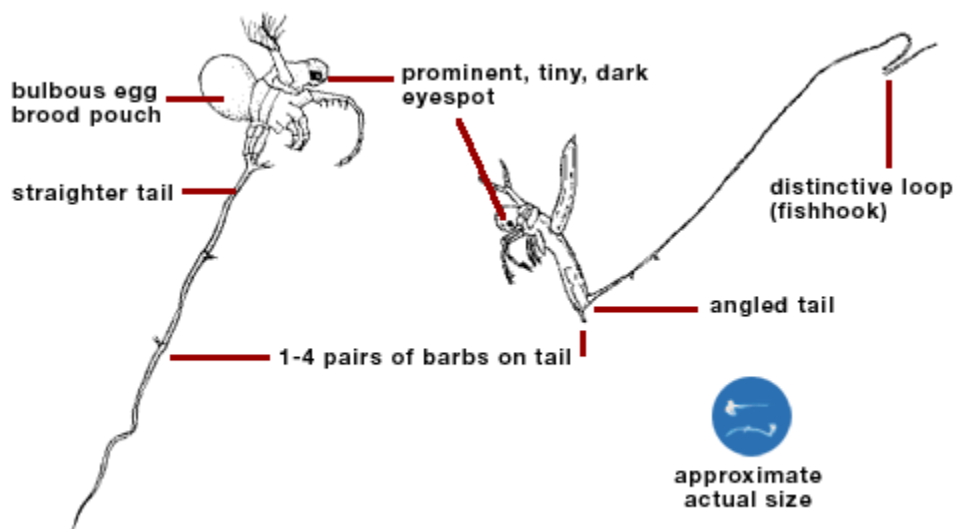
Identifying characteristics:

- The body is cylindrical, slender, and long
- The back is a silvery pale green with stripes of iridescent pink, purple, and blue
- The underside is white
- There are 26-35 gill rakers
- It has a pointed snout and large black and silver eyes

Spiny (*Bythotrephes longimanus*) and **fishhook** (*Cercopagis pengoi*) water fleas
 (Pictures and identifying characteristics from <http://www.seagrant.umn.edu/ais/waterflea>)



(Spiny water fleas clumped on fishing line)



MI Sea Grant, Ontario Federation of Anglers and Hunters

Identifying characteristics:

- Difficult to distinguish without magnification, 1/4-5/8 inches (5-15 mm) total length.
- Clumps look and feel like gelatin or cotton matting with tiny black spots (see picture above).
- Prefer deep lakes, but can establish in shallow waterbodies and rivers.
- Abundant during summer (June-September) depending upon water temperatures.

Bloody red shrimp (*Hemimysis anomala*)

(Images and identifying characteristics from

<http://www.seagrant.wisc.edu/Home/Topics/InvasiveSpecies/Details.aspx?PostID=664>)



Identifying characteristics:

- The biggest difference between bloody red shrimp and the native shrimp is that the bloody red shrimp has a flat end to the tail and then two anal spines. The native look alike shrimp will just have a deeply forked tail.
- They will appear in reddish swarms. In July, the swarms will appear in shady areas during the day.
- The shrimp will be about a ¼" to ½" long

Viral hemorrhagic septicemia (VHS)

(Pictures and identifying characteristics of infection from http://www.dnr.state.mn.us/fish_diseases/vhs.html)



Photo courtesy of Dr. Mohamed Faisal



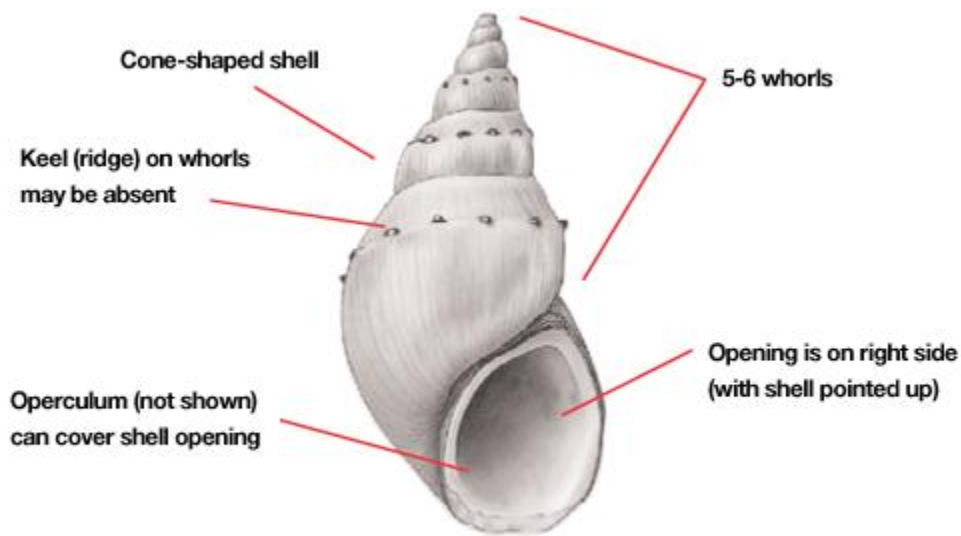
Photo courtesy of Dr. Mohamed Faisal

Identifying characteristics of infected fish:

- At low levels of infection, fish may not display any symptoms.
- Fish will display widespread bleeding (see pictures above) throughout the body surface (eyes, skin and fins).
- Fish will display widespread bleeding within the internal organs (swim bladder, intestine, kidney, etc.).
- Fish will often swim in circles and stay at or near the surface.
- Confirmation of VHS requires laboratory testing.

New Zealand mud snails (*Potamopyrgus antipodarum*)

(Pictures and identifying characteristics from http://www.seagrant.umn.edu/ais/newzealand_mudsnail)



Credit: U.S. Geological Survey

Identifying characteristics:

- Small, up to 1/5-inch (5 mm) long.
- Difficult to distinguish from native snails; shell more elongated.
- Usually horn-colored, but ranges from light to dark brown.

Zebra mussels (*Dreissena polymorpha*)

(Pictures and identifying characteristics from <http://www.seagrant.umn.edu/ais/zebramusel>)

**Identifying characteristics:**

- Look like small clams with a yellowish or brownish “D”-shaped shell, usually with dark and light-colored stripes.
- Can be up to two inches long, but most are under one inch. Zebra mussels usually grow in clusters containing numerous individuals and are generally found in shallow (6-30 feet), algae-rich water.
- Only freshwater mollusk that can firmly attach itself to solid objects – submerged rocks, dock pilings, boat hulls, water intake pipes, etc. To do this, they use bisset threads (see drawing above).
- On smooth surfaces, young zebra mussels feel like fine sandpaper.
- Juveniles are about the size of peppercorns.

Quagga Mussels (*Dreissena rostriformis*)

Images and identifying characteristics from

<https://nas.er.usgs.gov/taxgroup/mollusks/images/zebra&quagga2.gif> and

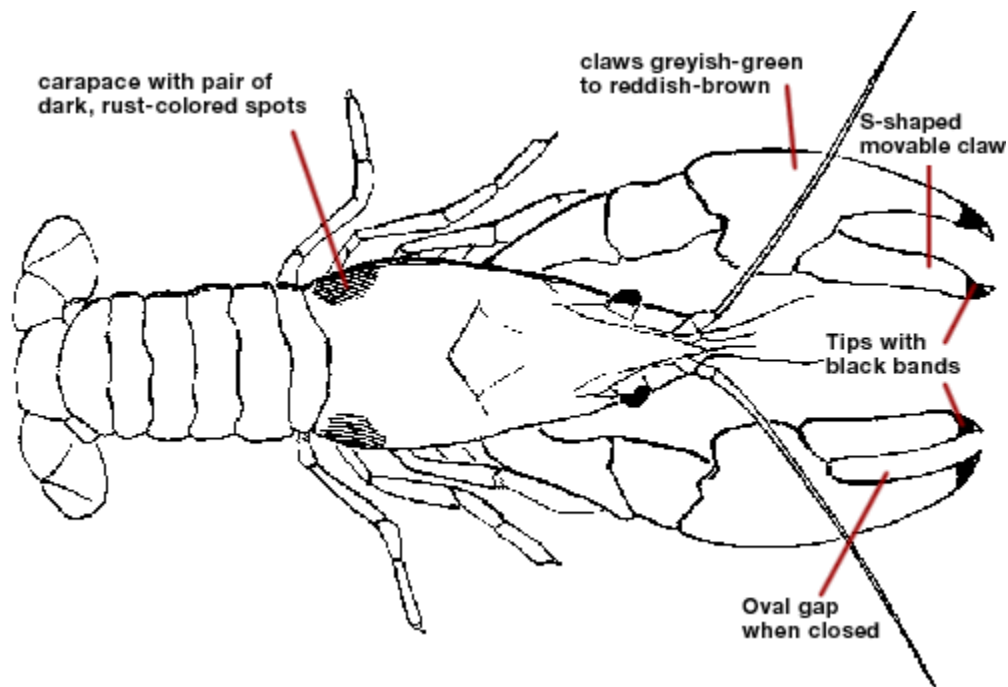
<https://www.invasivespeciesinfo.gov/aquatics/quagga.shtml>

**Identifying Characteristics:**

- Does not sit flat on ventral side
- Rounder (less triangular) in shape than zebra mussel
- Dark concentric rings on shell
- Pale in color near hinge of shell

Rusty crayfish (*Orconectes rusticus*)

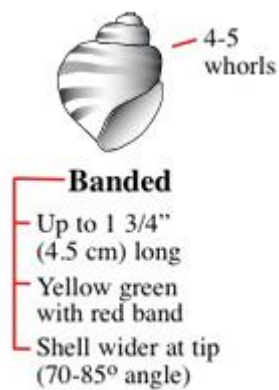
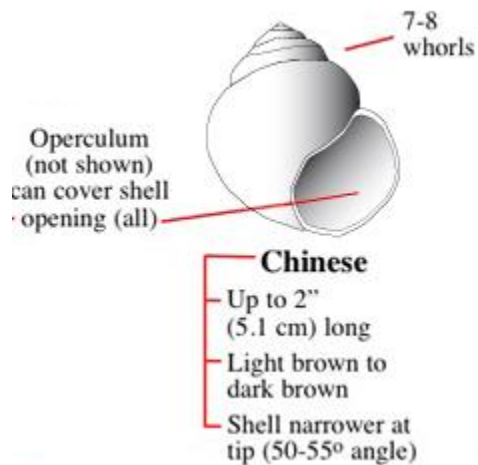
(Pictures and identifying characteristics from <http://www.seagrant.umn.edu/ais/rustycrayfish>)



Identifying characteristics

- Adults generally are 3-5 inches (7-13 cm) long.
- Claws larger and smoother than many other crayfish; usually without wart-like white bumps.
- Claws with oval gap when closed; no distinct thin slit or notch present.

Chinese and banded mystery snails (*Cipangopaludina chinensis*, *Viviparus georgianus*)
 (Images and Identifying characteristics from <http://www.seagrant.umn.edu/ais/mysterysnail>,
<https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=1045> and
<https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=1047>)



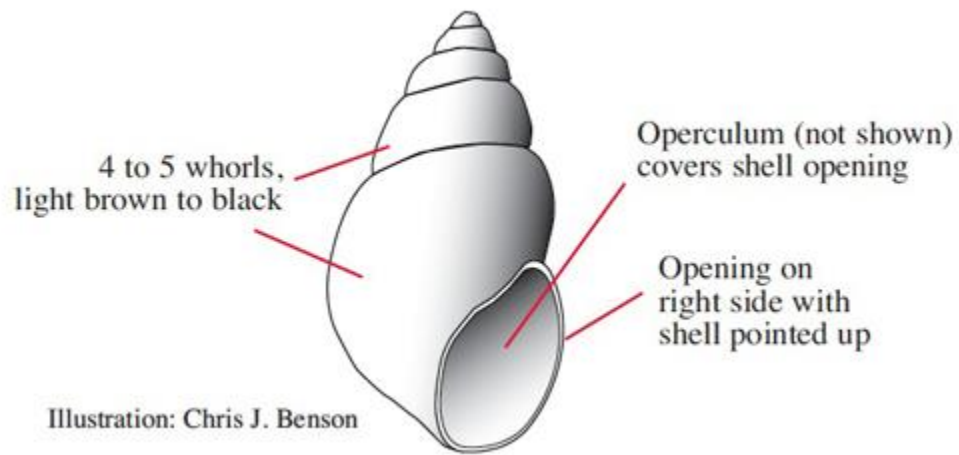
Illustrations: Chris J. Benson

Identifying characteristics:

- Golf ball size snails with a trap door, allowing them to seal in moisture when out of the water
- Found in lakes and slow moving rivers
- Chinese mystery snails have 7-8 whorls on their shell
- Banded mystery snails have 4-5 whorls on their shell
- The inner coloration of the mystery snail is white to light blue

Faucet snail (*Bithynia tentaculata*)

(Images and characteristics from <http://www.seagrant.umn.edu/ais/faucetsnail> and http://www.dnr.state.mn.us/invasives/aquaticanimals/faucet_snail/index.html)



Identifying characteristics:

- Up to ½" long
- Found on rocky shorelines, river and lake bottoms, aquatic vegetation, and docks
- Difficult to distinguish from native snails or immature invasive mystery snails

Cattail comparisons: hybrid, narrow-leaved, and broadleaf cattails



Narrow-leaved cattail – invasive
Typha angustifolia

Spreads: by seed and vegetatively

ID: largest gap between female (bottom) and male (top) flowers



Hybrid cattail – invasive
Typha angustifolia x *latifolia*

Spreads: vegetatively and possibly by seed

ID: gap between female flowers and male flowers varied



Broadleaf cattail – native
Typha latifolia

Spreads: by seed and vegetatively

ID: no gap between female and male flowers

I.D. characteristics are circled in red

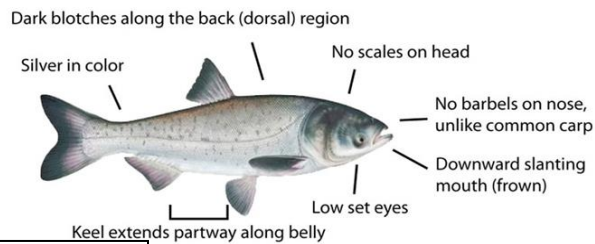
Aquatic species threatening to invade the 1854 Ceded Territory

Bighead, black, grass, and silver carp (*Hypophthalmichthys nobilis*, *Mylopharyngodon piceus*, *Ctenopharyngodon idella*, and *Hypophthalmichthys molitrix*)

(Pictures and identifying characteristics from

www.watershedcouncil.org/learn/aquatic%20invasive%20species/asian-carp/how-to-identify-bighead-and-silver-carp/ and <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=514>)

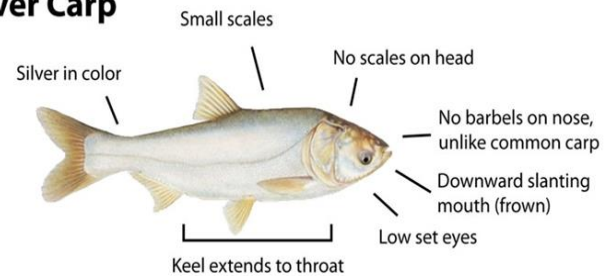
Bighead Carp



Black Carp



Silver Carp



Grass Carp



Identifying characteristics of bighead carp:

- Has large scaleless head with upturned mouth, no barbells.
- Eyes are forward, sit below the mouth and project downward.
- Keel is scaleless and extends only from anal fin to pelvic fin.
- Scales are very small (troutlike), 91–120 in lateral line.
- Gill rakers are long and comb-like.
- Body is dark gray on the top (dorsal) side and transitions to silver white on sides.
- Has many dark irregularly shaped blotches scattered over body.

Identifying characteristics of silver carp:

- Has scaleless head with large upturned mouth, no barbells.
- Eyes are forward, sit below the mouth, and project downward.
- Keel is scaleless and extends all the way from anal fin to base of gills.

- Scales are very small (troutlike), 91–124 in lateral line.
- Gill rakers are fused and appear spongy.
- Body is olive green on the top and transitions to silver (sometimes bronze to red) on the sides.

Identifying characteristics of black carp:

- Similar to grass carp, however, appears darker (not black) in color
- Has pharyngeal teeth (throat teeth) which are similar to human molars
- More pointed snout than other carp species

Identifying characteristics of grass carp:

- Smaller dorsal fin than any other type of Asian carp
- Scales are fewer, but larger and have a dark edging around the outside
- Fewer anal rays are present
- White Belly
- No barbels present

Rudd (*Scardinius erythrophthalmus*)

(Images and identifying characteristics from <http://www.invadingspecies.com/invaders/fish/rudd/> and <http://www.great-lakes.net/envt/flora-fauna/invasive/rudd.html>)



Identifying characteristics:

- The Rudd is in the minnow family and has been consistently used for aquaculture, adding to its spread in the United States
- The fins of the Rudd are bright red and they have a fully scaled belly and usually have red eyes or a red spot around the eye area
- They are usually four to 10 inches' long
- They are adaptable to several types of environments, including poor water quality, and are omnivores or opportunistic feeders

Red swamp crayfish (*Procambarus clarkii*)

(Images and identifying characteristics from <http://www.seagrants.umn.edu/ais/redswampcrayfish>)

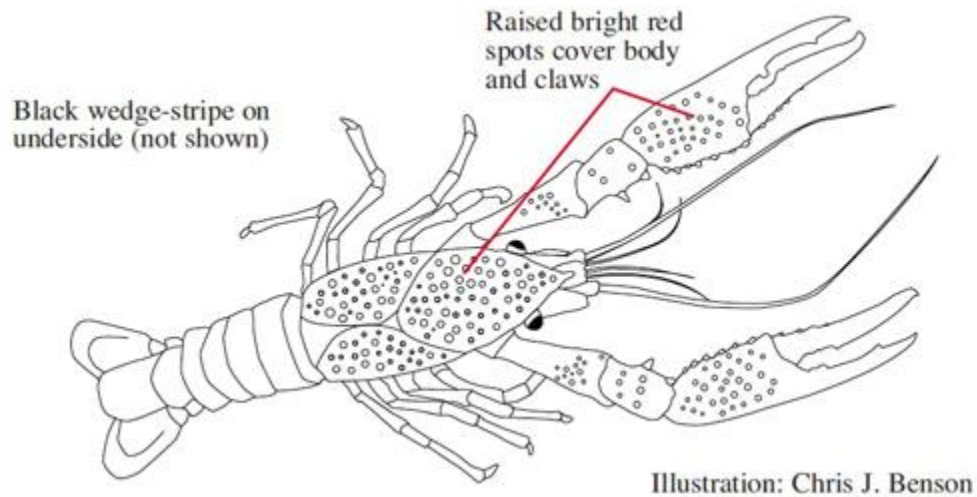


Illustration: Chris J. Benson

Identifying characteristics:

- Found in all types of freshwater ecosystems, native to the southern United States
- Digs burrows deep into the bottoms of lakes, ponds, and rivers
- They have a dark red body and are up to 5 inches' long
- One easily identifiable characteristic is they have raised bright spots all over there body and claws

Flowering rush (*Butomus umbellatus*)

(Images and identifying characteristics from <http://www.seagrass.umn.edu/ais/floweringrush>)



Identifying characteristics:

- Easiest to identify when flowering. Flowers grow in umbrella shaped clusters and each individual flower has 3 whitish pink petals. Plants only produce flowers in very shallow water or on dry sites.
- Green stems that resemble bulrushes but are triangular in cross section.
- Along shore, erect leaves and grows to about 3 feet in height. The leaf tips may be spirally twisted. Under water, the leaves are limp.
- Has an extensive root system that can break into new plants if disturbed.

Starry stonewort

(Images and identifying characteristics from <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=1688> and <http://www.dnr.state.mn.us/invasives/aquaticplants/starrystonewort/index.html>)



Identifying characteristics:

- Starry stonewort is identified by its star-shaped bulbils, other than that it looks similar to many other types of native musk-grasses and algae
- It forms dense mats and easily outcompetes native algae and vegetation
- Native musk-grasses and stoneworts will usually have a garlic odor, starry stonewort does not
- Branches are whorled around the stem and tend to be in variable lengths

Harmful algal blooms (blue-green algae) (*Anabaena* sp., *Aphanizomenon* sp., etc.)

(Images and identifying characteristics from <https://www.pca.state.mn.us/water/blue-green-algae-and-harmful-algal-blooms>)

**Identifying characteristics:**

- Harmful algal blooms can appear in a variety of ways, pictured above is just one example. Typically, the water will appear to have a green tint, or large algal mats can be seen on the surface of the water described as looking like “pea soup”
- Harmful algal blooms are associated with places with lots of runoff or areas with good water clarity
- Harmful algal blooms can result in fish kills or poisoning of species that drink from affected areas
- Blooms can also have indirect effects causing respiratory problems for skin irritations for humans near affected areas

Terrestrial invasive species currently in the 1854 Ceded Territory

Common (*Rhamnus cathartica*) & glossy (*Fangula alnus*) buckthorn

(Pictures and identifying characteristics from

<http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/id.html>)

Common buckthorn



1.



2.



3.



4.

Identifying characteristics (see above corresponding pictures):

- Leaves:** Egg-shaped, pointed at the tip, smooth, dark, glossy and finely-toothed. 3-5 pair of curved leaf veins. Leaves stay green late into fall.
- Branch:** Buds and leaves are sub-opposite, opposite, or alternate. Twigs often end in small (<1/4") sharp, stout thorns.
- Wood:** Brown bark with elongate silvery corky projections (caution: native plums or cherries have a similar bark). Cut branch exposes yellow sapwood and orange heartwood.
- Fruit:** Large, round, berry-like clusters of black 1/4" fruit. Ripens in August and September.

Glossy buckthorn



1.



2.



3.



4.

Identifying Characteristics (see above corresponding pictures):

- Leaves:** Oval, smooth, dark, glossy, and toothless edges. 8-9 pair of leaf veins. Leaves stay green late into fall.
- Branch:** Buds and leaves are alternate. No thorn at tip of twig.
- Wood:** Brown bark with elongate silvery corky projections (caution: native plums or cherries have a similar bark). Cut branch exposes yellow sapwood and orange heartwood.
- Fruit:** Small clusters of berry-like, 1/4" fruit. Ripens progressively from a distinctive red-brown to a dark purple in August and September. Each berry has 2 to 3 seeds.

Oriental bittersweet (*Celastrus orbiculatus*)

(Pictures and identifying characteristics from

http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/oriental_bittersweet.html)

**Identifying characteristics:**

Appearance: Deciduous vine that grows up to 66 ft. long. Vines climb by winding around a tree or other support structure.

Leaves: Alternate, simple, vary in shape from oblong to almost round. Leaf size is also variable from 2-5" long to 1.4-2" wide. Leaf margins have rounded teeth.

Flowers: There are separate male and female plants. Flowering occurs in the spring and flowers are arranged in clusters of 2-7 at the leaf axils. Each flower has 5 petals and 5 sepals. Flowers are small and greenish-yellow.

Fruit: Fruits are round and change in color from green to bright red with a yellow capsule as they mature. Typical female plants can produce up to 370 fruits which ripen in the fall.

Roots: Underground rhizomes spread and can send up new plants.

To distinguish from the native vine, American bittersweet (*Celastrus scandens*):

- American bittersweet has orange capsules around red fruits, Oriental bittersweet has yellow capsules around red fruits.
- American bittersweet flowers and fruits are only found at the terminal ends of stems, Oriental bittersweet flowers and fruits are found all along the stem at leaf axils.
- Leaf shape is highly variable and not a good characteristic for distinguishing American vs. Oriental bittersweet.

Canada thistle (*Cirsium arvense*)

(Pictures from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/canadathistle.aspx>)



Identifying characteristics:

(from <http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/canadathistle.html>)

- Perennial herbaceous plant, 2 - 5' tall with slender grooved stems that branch only at the top. It has male and female plants.
- Leaves are alternating, smooth, oblong, tapering, and directly attached to the stem, deeply divided, with prickly margins.
- Many small purple flowers appear on top of the upper branched stems between June and September.
- Seeds are small, light brown and tufted for dispersal by the wind. Seeds remain viable in the soil for over 20 years.
- Each plant has a fibrous taproot with wide spreading horizontal roots. Each small section of root can form a new plant enabling the plant to spread vegetatively.

Bull thistle (*Cirsium vulgare*)

(Pictures and identifying characteristics from

<http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/bullthistle.html>)

**Identifying characteristics:**

- **Appearance:** Biennial herbaceous plant, between 3 - 6' tall with one erect branched stem. It grows a rosette in its first year and blooms in its second year.
- **Leaves:** Alternate, coarsely lobed, each lobe with a spine at its tip. Spines extend downward from the leaves along prominent ridges of the stem. Upper leaf surface is rough.
- **Flowers:** Disk-shaped flowerheads contain hundreds of tiny individual purple flowers which bloom from July through August.
- **Seeds:** Numerous straw-colored seeds with plume-like bristles are dispersed by wind. They remain viable in the soil for over 10 years.
- **Roots:** Each plant has a fleshy taproot.

Spiny plumeless thistle (*Carduus acanthoides*)

(Pictures and identifying characteristics from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/plumelessthistle.aspx>)**Identifying characteristics:**

- It is a biennial species that reproduces by seed.
- It grows 3- 5 feet tall.
- The stems are branched and covered with numerous spiny leaves.
- The rosettes have deeply lobed, narrow, and spiny leaves.
- In the second year, the plant bolts, forming branched stems with alternate spiny-lobed leaves that are narrower and wavier than the closely related musk thistle and extend onto and around the stem, giving it the appearance of having clusters of leafy spines throughout.
- Flowers are small, purple to pink, singular or in clusters, and subtended by numerous needle-like bracts. The plant blooms on the end of stems mid-June to August and can be bulbous in shape.

Common St. Johnswort (*Hypericum perforatum*)

(Pictures and identifying characteristics from <http://www.ag.ndsu.edu/pubs/plantsci/weeds/w1411.pdf>)

**Identifying characteristics:**

- Taproot perennial herb usually growing 1-5 feet tall.
- Stems are multi-branched, smooth, reddish and woody at the base.
- Leaves are opposite, entire, linear to oblong with in-rolled edges and 3/8 to 1 inch long. They are dark green above and light green below and dotted with tiny, translucent glands. The spotted leaf appearance (see above picture) is a key characteristic for identification.
- Flowers are yellow, star-like with five petals and 0.5 to 1 inch in diameter, with tiny black dots on the margins. Petals are twice as long as the sepals and numerous stamens are arranged in three groups.
- Seeds are egg-shaped and are held within a three-valved capsule that bursts at maturity. They are tiny, dark brown, 3/64-inch-long, somewhat cylindrical, slightly pointed at the ends and coarsely pitted.

Spotted knapweed (*Centaurea maculosa*)

(Pictures from

http://wrc.umn.edu/prod/groups/cfans/@pub/@cfans/@wrc/documents/asset/cfans_asset_114216.pdf)



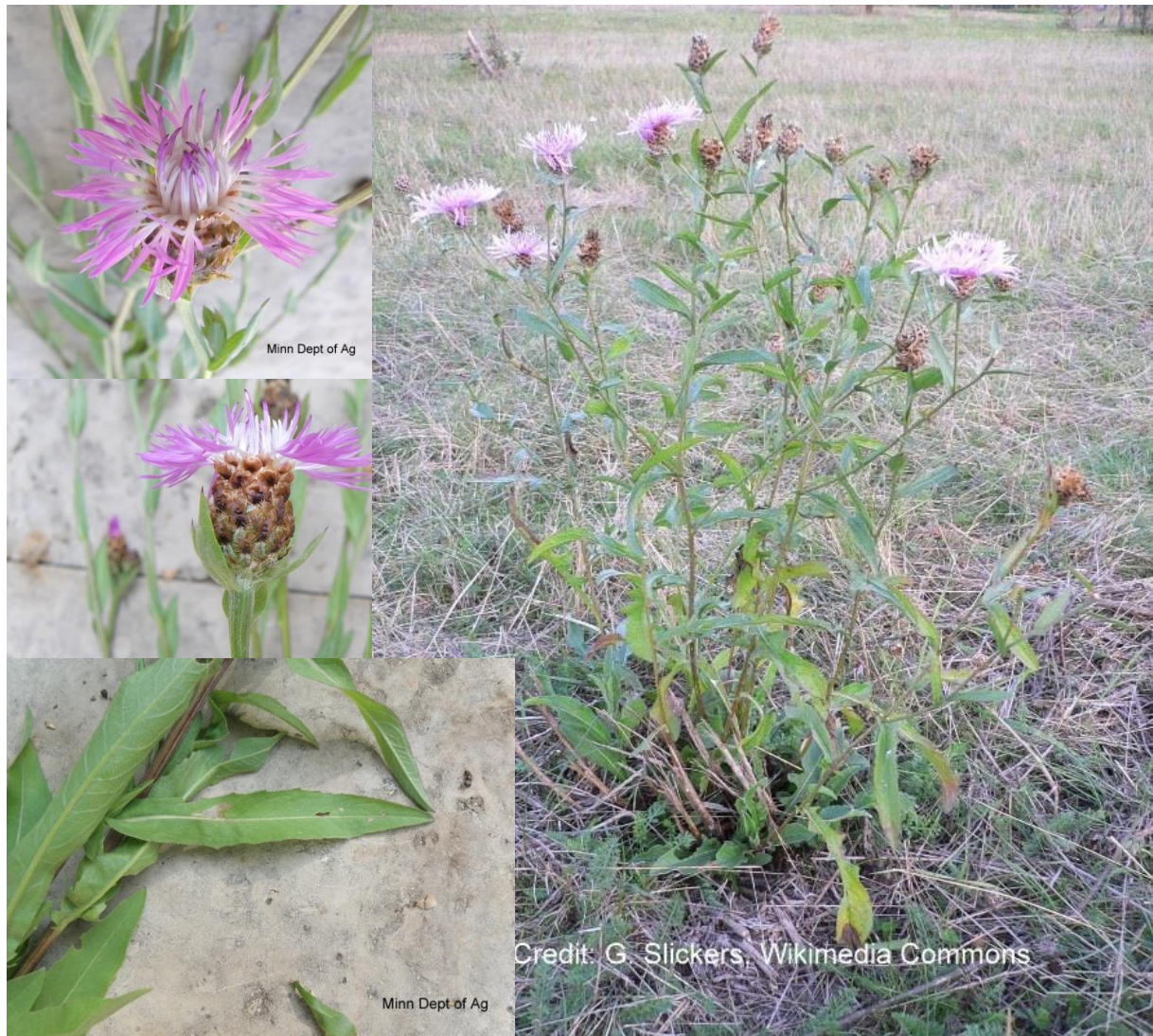
Identifying characteristics:

(from <http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/spottedknapweed.html>)

- Biennial or short-lived perennial herbaceous plant, 2 - 3' high. Basal leaves form a rosette the first year from which grow 1- 20 wiry, hoary, branched stems during the second year.
- Leaves are alternating, grayish, hoary, and divided into lance-shaped lobes decreasing in size at the top.
- Thistle-like pink to purple flowers sit at the tips of terminal and axillary stems, bloom from July through September.
- Seeds are brownish, 1/4" long with small tuft of bristles, dispersed by rodents, livestock and commercial hay. Seed viable in the soil for 7 years.
- Root system consists of a stout taproot and lateral shoots forming new rosettes near the parent plant.

Brown knapweed (*Centaurea jacea*)

(Pictures and identifying characteristics from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/brownsknapweed.aspx>)**Identifying characteristics:**

- It is a perennial plant that has multiple upright, reddish stems that are 1 to 4 feet tall.
- Small, single flowers are clustered together to form composite flower heads. Flowers are mostly pink/purple, sometimes having white centers. They are borne at the ends of branches and are approximately 1 inch in diameter. Flowering occurs mid-summer until fall followed by the production of white to light brown seeds with short plumes.
- The bracts below the flowers are rounded and wide at the tip and often have brown tips.
- Leaves are alternate, lance shaped and pubescent (hairy), occasionally with wavy margins or lobed. Basal leaves grow up to 4 inches long. Seedlings are tap-rooted and mature plants develop a cluster of roots below the crown.

Meadow knapweed (*Centaurea x moncktonii*)

(Pictures and identifying characteristics from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/meadowkw.aspx>)**Identifying characteristics:**

- It is a perennial plant that has multiple upright, reddish stems that are 20-40" tall.
- Single flowers, mostly pink/purple but occasionally white, are at the ends of branches and are approximately $\frac{3}{4}$ " in diameter. Flowering occurs mid-summer until fall, followed by the production of white to light brown seeds with short plumes.
- Leaves are lance-shaped and pubescent, occasionally with wavy margins or lobed. Basal leaves grow up to 4" long. Seedlings are tap-rooted and mature plants develop a cluster of roots below the crown.

Diffuse knapweed (*Centaurea diffusa*)

(Pictures and identifying characteristics from <http://www.cwma.org/DiffuseKnapweed.html>)

**Identifying characteristics:**

- **Lifecycle:** Biennial or short-lived perennial
- **Growth form:** Forb
- **Flower:** Flowerheads are broadly urn-shaped, 0.6-0.8 in tall, solitary or in clusters of 2-3 at the ends of the branches. Floral bracts are yellowish with a brownish margin, sometimes spotted, fringed on the sides, and terminating in a slender bristle or spine. The heads contain two types of flowers, ray flowers around the edges surrounding tubular disk flowers. The ray flowers are white, rose-purple, to lavender. June-Aug.
 - The bracts surrounding each flower bear 4 to 5 pairs of lateral spines and one, long terminal spine. Diffuse knapweed can resemble spotted knapweed with the black tipped bracts. The difference is the sharp spine at the end of the bract that is characteristic of diffuse knapweed.
- **Seeds/Fruit:** Seeds are light brown to black.
- **Leaves:** Basal leaves are stalked and divided into narrow, hairy segments. Stem leaves are smaller, alternate, less divided, stalkless, and become bract-like near the flower clusters.
 - When leaves are young, they are covered by fine hairs.
- **Stems:** Stems are upright, 4-24 in tall, highly branched, angled, with short, stiff hairs on the angles.
- **Roots:** Taproot.
- **Seedling:** Seedlings have finely divided leaves that are covered with short hair.

Note: Diffuse knapweed may be distinguished from other knapweeds by the terminal spine on the floral bract.

Common tansy (*Tanacetum vulgare*)

(Pictures from <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>)



Identifying Characteristics:

(from <http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/commontansy.html>)

- Perennial herbaceous plant, 3' tall, up to 5' in shaded areas, and erect. A single stem branches extensively toward the top into short stems forming a flat-topped cluster of numerous button-like flower heads; plants have medicinal properties.
- Alternating leaves, pinnately compound (leaflets arranged on both sides of a common stalk), irregularly lobed. Leaves become smaller towards the top of the stalk, and are strongly aromatic when crushed (strong, distinctive scent).
- Bright yellow flowers, daisy-like discs up to 0.5" wide, lacking rays, blooming from July through October.
- Numerous tufted seeds dispersed by wind and water.
- Roots spread vegetatively forming new plants from even small root fragments.

Leafy spurge (*Euphorbia esula*)

(Pictures from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/leafyspurge.aspx>)**Identifying characteristics:**(from <http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/leafyspurge.html>)

- **Appearance:** Perennial herbaceous plant, 2- 3 1/2' tall, erect branching, smooth stems growing from a deep vertical root. Stems, flowers, and leaves emit a white milky sap when broken.
- **Leaves:** Alternate, small, oblong to lance-shaped, on the upper part of stem; scale-like on the lower part of the stem.
- **Flowers:** Small, borne by showy yellow-green bracts which open in late May; flowers bloom from June into fall. Umbrella-shaped flower cluster, 7-10, at the top of each stem, single, stemmed flowers grow from leaf axils below.
- **Seeds:** Explosive dispersal from a seed capsule up to 15'; high germination rate; seeds remain viable in the soil for 7 years.
- **Roots:** Extensive deep root system, vegetative reproduction from crown and root buds.

Wild parsnip (*Pastinaca sativa*)

(Pictures from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/wildparsnip.aspx>)**Identifying characteristics:**(from <http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/wildparsnip.html>)

- **Appearance:** Monocarpic perennial herbaceous plant (plant spends one or more years in rosette stage, blooms under favorable conditions, and then dies), 6" high in the rosette stage and 4' high on stout, grooved stems in the flowering stage.
- **Leaves:** Alternate, leaf is made up of 5 -15 egg shaped leaflets along both sides of a common stalk; leaflets sharply-toothed or lobed at the margins; upper leaves smaller.
- **Flowers:** Flat-topped broad flower cluster 2 - 6" wide, numerous five-petaled yellow flowers; bloom from June to late summer.
- **Seeds:** Small, flat, round, slightly ribbed, straw-colored, abundant, takes 3 weeks to ripen before they can reseed; viable in the soil for 4 years.
- **Roots:** Long, thick, edible taproot.

Warning - Avoid skin contact with the toxic sap of the plant tissue by wearing gloves, long sleeves and long pants. The sap of wild parsnip in contact with skin in the presence of sunlight can cause a rash and blistering and discoloration of the skin (phytophotodermatitis) (bottom, center picture).

(Picture of rash is from <http://www.thisinsider.com/poisonous-wild-parsnip-plant-causes-severe-rashes-2016-7>)

Garlic mustard (*Alliaria petiolata*)

(Pictures from <https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist.aspx>)

**Identifying characteristics:**

(from <http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/garlicmustard.html>)

- **Appearance:** Biennial herbaceous plant, second year it bolts, forming weak single stems 12 - 36" high when it flowers. Only plant of this height blooming white in wooded environments in May.
- **Leaves:** Round, scallop-edged, dark green; first year, rosettes of 3 or 4 leaves; second year plants have alternate stem leaves. Leaves and stems smell like onion or garlic when crushed.
- **Flowers:** White, small and numerous, with four separate petals. Each plant has one or two flowering stems on second year plants.
- **Seeds:** Slender capsules 1-2 1/2" long, containing a single row of oblong black seeds. Seeds are viable in the soil for 5 years.
- **Roots:** White, slender taproot, "S"-shaped at the top.

Garden lupine (*Lupinus polyphyllus*)

(Pictures and identification characteristics from <https://www.minnesotawildflowers.info/flower/large-leaved-lupine>)

**Identification characteristics:**

- **Flowers:** A spike-like raceme 6 to 18 inches long of ½-inch pea-shaped flowers on stalks about ½ inch long. Flowers are typically blue to violet, but may be pink, white, or 2-tone. The upper petal (standard) curls or folds back on the sides and is a bit smaller than the lateral wings below it. The raceme may be tightly packed or looser, the flowers spiraling or nearly whorled around the stem.
- **Leaves and stem:** Leaves are palmately compound in groups of 9 to 17. Leaflets are 2 to 5 inches long, to 1 inch wide, toothless, hairless on the upper surface, silky/hairy on the underside, pointed at the tip, tapering at the base, on a long stalk. Stems are smooth and green.

Exotic honeysuckles (*Lonicera tatarica*, *L. morrowii*, *L. x bella*)

(Pictures and identification characteristics from

<http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/exotichoneysuckles.html>)



Identification characteristics:

- **Appearance:** Upright deciduous shrubs, 5 -12' high. *Lonicera x bella* is a horticultural hybrid. Older stems have shaggy bark and are often hollow.
- **Leaves:** Opposite, simple, oval, and untoothed. *L. tatarica* has smooth, hairless leaves, *L. morrowii* has downy (fuzzy feeling from short, soft, dense hairs) leaves.
- **Flowers:** Fragrant, tubular, bloom in May and June, white, red, but most often pink.
- **Fruit:** Fruits are red or yellow, situated in pairs in the leaf axils.
- **Roots:** Roots are fibrous and shallow.

Japanese barberry (*Berberis thunbergii*)

(Pictures and some identification characteristics from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/japanesebarberry.aspx>)



Identification characteristics:

(most from <http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/japanesebarberry.html>)

- **Appearance:** Small, compact, spiny shrub, 3-6' tall with slightly curving branches.
- **Leaves:** small, rounded, and arranged in clusters above the spines. Japanese barberry cultivars can range in color from chartreuse, gold, maroon, and green. Most naturalized Japanese barberry plants found to date have green leaves in the summer followed by vibrant orange and red fall foliage.
- **Flowers:** Yellow, single or in clusters of 2-4 blossoms; blooming in May.
- **Fruit:** Bright red, egg-shaped small berries, in clusters or single, mature in August and stay on the shrub through winter.
- **Seeds:** Dispersed by birds.

Siberian peashrub (*Caragana arborescens*)

(Pictures and identification characteristics from

<http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/siberianpeashrub.html>)

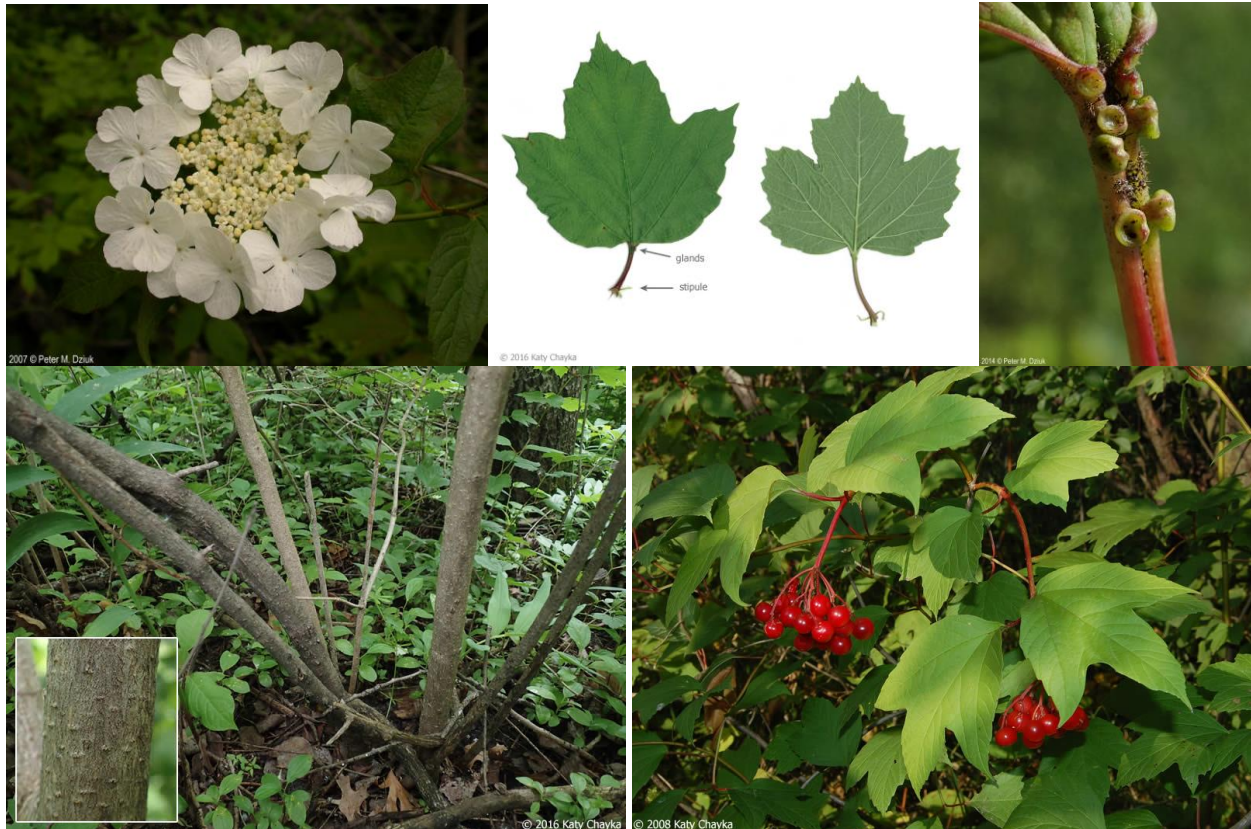


Identification characteristics:

- **Appearance:** Upright shrub or small tree, up to 18' high. Narrow branching, gray bark and branches; young twigs, yellowish-green.
- **Leaves:** Alternate, compound, 2- 4" long consisting of 8 -12 pairs of leaflets; leaflets elliptic.
- **Flowers:** Yellow, single, tubular, at the end of a stalk that grows from the leaf axil; blooms in May - June.
- **Fruit:** Pods 1- 2" long, sharply pointed, brown and smooth.

European highbush cranberry (*Viburnum opulus* var. *opulus*)

(Pictures from <https://www.minnesotawildflowers.info/shrub/guelder-rose>)



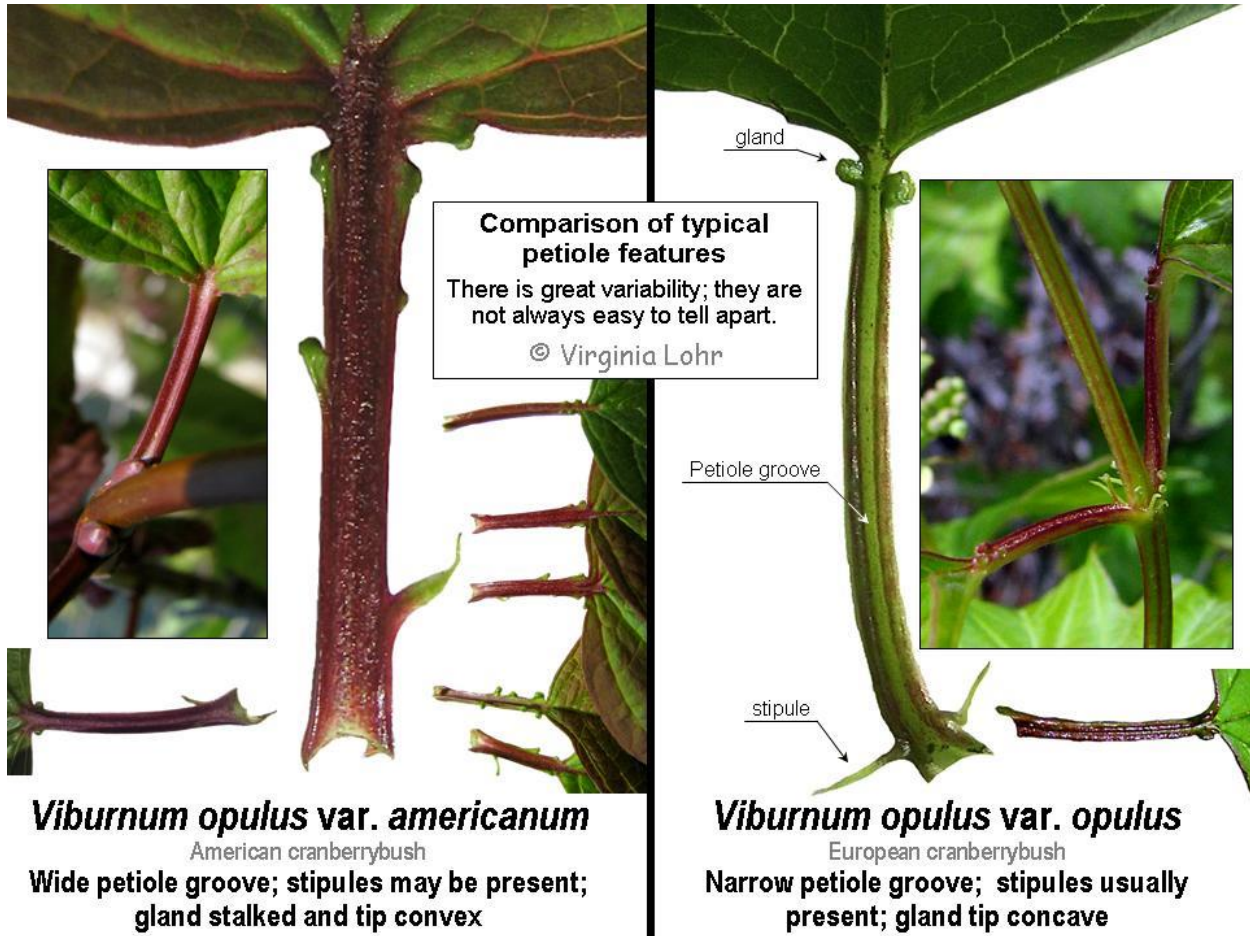
Identification characteristics:

(from <http://dendro.cnre.vt.edu/dendrology/syllabus/factsheet.cfm?ID=402>)

- **Leaf:** Opposite, simple, 3 lobed and coarsely serrated, orbicular, 2 to 4 inches long, concave glands on petiole, dark green above, velvety below.
- **Flower:** White, very showy, 1/2 inch across, occurring in large clusters, outer ring of flowers sterile and larger, many cultivators have only sterile flowers, appearing in mid-spring.
- **Fruit:** Red, 1/4-inch drupe in clusters, ripening in late summer and persisting through the winter.
- **Twig:** Moderate, tan to gray-brown, distinctly ridged, with numerous lenticels; green to reddish brown buds are plump and have 2 visible scales.
- **Bark:** Light brown and stays largely smooth.
- **Form:** Multiple, arching stemmed shrub to 10 feet tall.

Comparison between our native and the non-native:

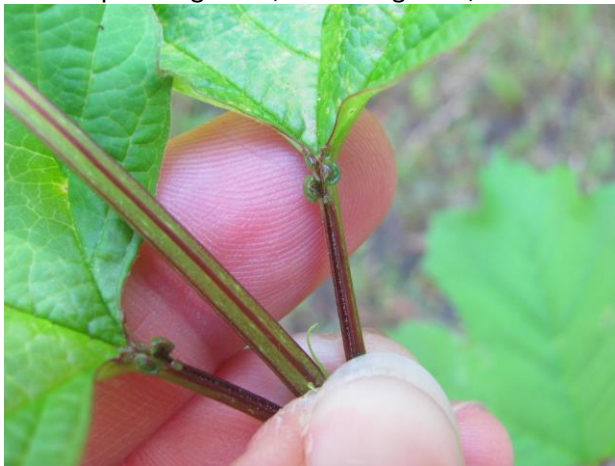
(from <http://classes.hortla.wsu.edu/hort231/List02/VibOpVarCompare.html>)



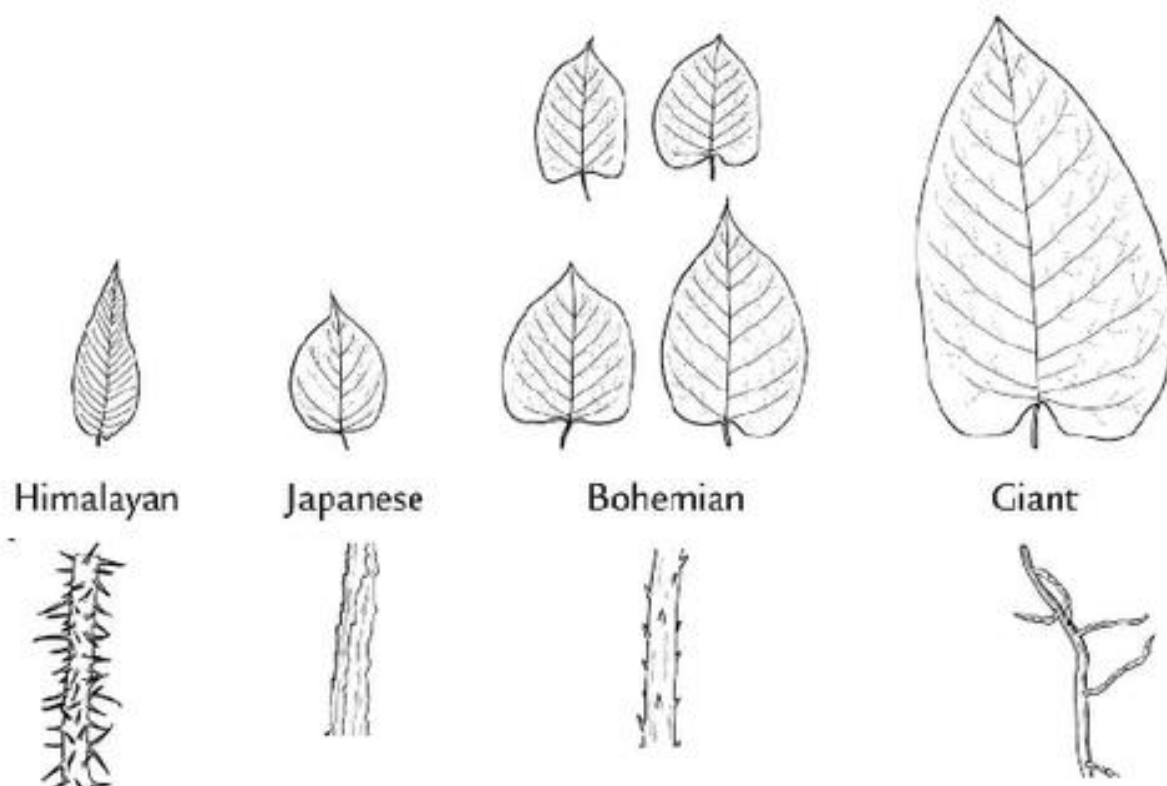
European highbush cranberry:

Narrow petiole groove; concave glands, wider than long

Dense infestation of invasive



both photos by Jeffrey Flory, at Moose Mountain in Duluth, MN, taken on 06/07/2016

The Knotweed Complex:**Japanese knotweed** (*Polygonum cuspidatum*)**Bohemian knotweed** (*Polygonum x bohemicum*)**Giant knotweed** (*Polygonum sachalinense*)(Pictures from <http://techlinenews.com/articles/2013/identification-and-management-of-invasive-knotweeds>)**Identification characteristics:**(from https://www.for.gov.bc.ca/hra/publications/invasive_plants/Knotweed_key_BC_2007.pdf)

	Japanese knotweed	Bohemian knotweed	Giant knotweed
Stems:	1.5 to 2.5 m, multiple branches, stems mottled purple-brown	2 to 5 m, few to several branches, stems mottled purple-brown	3 to 6 m, few or no branches, stems mottled purple-brown
Leaf Size and Shape:	Ovate, 3-10 cm, about 2/3 as wide, base straight, not curved, leaf tip abruptly pointed, leaf texture thick and leathery	Ovate, 5-30 cm, about 2/3 as wide, base variable in shape, from ± straight to moderately curved, leaf tip gradually to sharply tapered, leaf texture intermediate	Ovate, 20-40 cm, about 2/3 as wide, deeply indented at the base (cordate), leaf tip pointed, leaf texture thin and flexible
Leaf Hairs:	No stiff hairs on leaf margin, veins on leaf underside have blunt knobs (scabers), giving them a slightly rough, ridged appearance	Few or no hairs on leaf margin, veins on leaf underside have small, stout hairs	Tiny, stiff hairs on leaf margin, veins on leaf underside have long, multicellular hairs
Flower Gender:	Female	Either female or perfect	Perfect and fertile
Flower Arrangement:	Loose, drooping panicle	Erect or loose, drooping panicle	Compact, drooping panicle
Flower Color:	Greenish-white to creamy white	Greenish-white to creamy white	Greenish-white to creamy white
Seeds:	Occasionally produced	Occasionally produced	Usually produced

Solidstem burnet-saxifrage (*Pimpinella saxifraga*)

(Pictures and identification characteristics from <https://www.minnesotawildflowers.info/flower/burnet-saxifrage>)



Identification characteristics:

- **Flower:** Flat clusters (umbels) made up of 7 to 20 groups (umbellets) of 10 to 20 flowers each. Flowers are white, sometimes tinged pink, about 1/6 inch across with 5 petals, a creamy colored center and a pair of styles at the top. The base of both the umbel and umbellets typically have no bracts, occasionally one. Umbellet stalks are 1 to 1½ inches long. Umbels are 2 to 3 inches across.
- **Leaves:** Leaves are few and widely spaced, alternate, pinnately compound and variously covered in short hairs. The lowest leaves are up to 12 inches long, its leaflets oval to nearly round with large, coarse teeth. Leaves become progressively smaller as they ascend the stem, becoming deeply lobed in the upper plant.
- **Stem:** At the base of the leaf is a sheath that wraps around the stem. In the upper stem a leaf may be absent leaving only the sheath. Stems are densely covered in very short hairs and have faint ribbing. Plants are few branched.
- **Fruit:** Fruit is a flattened oval pod with faint ribs, less than 1/8-inch-long, and splits into 2 seeds.

Garden valerian (*Valeriana officinalis*)

(Pictures and identification characteristics from <https://www.minnesotawildflowers.info/flower/garden-heliotrope>)

**Identification characteristics:**

- **Flower:** Flat to round clusters up to 4 inches across of tiny trumpet shaped flowers. Flowers are pinkish to white, up to ¼ inch long with five round lobes; 3 creamy white stamens poke out of the tube. A plant may have multiple clusters on branching stems in the upper part.
- **Leaves and Stems:** The opposite, compound leaves are up to 8 inches long, each with 7-12 pairs of narrow lance-shaped, toothed leaflets with scattered hairs on lower surface. Leaves become smaller and leaflets become narrower as they ascend the stem. Stems are finely hairy, especially at nodes.
- **Fruit:** Fruit is a brown seed, about 1/8-inch-long, with an array of feathery hairs radiating at the top.

Dalmatian toadflax (*Linaria dalmatica*)

(Pictures and identification characteristics from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/toadflax.aspx>)**Identification characteristics:**

- Dalmatian toadflax looks like a large, yellow snapdragon.
- It is a short-lived perennial that grows up to 4 feet tall. Both leaves and stems are a waxy, bluish-green.
- Leaves are heart-shaped, 1 to 3 inches long and clasp the stem.
- Multiple flowers are arranged in spikes on the stems. They are bright yellow and sometimes have an orange center. The flowers are 1 to 1½ inches long and have spurs. Flowering occurs from early summer to early fall.
- Seed pods are ½ inch long and contain 140 to 250 small dark brown to black seeds with wings. Most of the upper stems die back in winter and new stems emerge in the spring.
- Yellow toadflax is common in Minnesota and looks similar. To distinguish the two species, compare the small, narrow, linear yellow toadflax leaves **(A)** to the thick, waxy, clasping, heart-shaped Dalmatian toadflax leaves **(B)**.



Cutleaf teasel (*Dipsacus laciniatus*)

(Pictures and identification characteristics from

<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/teasel.aspx>)



Identification characteristics:

- Teasels are monocarpic perennials (produce seed only once in a lifetime) that form basal rosettes for at least one year until enough resources are acquired to send up flower stalks. Rosettes develop oblong, hairy leaves and large tap roots.
- The small, dense white flowers occur on oval-shaped, terminal heads enclosed by stiff, spiny bracts. Flower stalks may grow to over 7 feet in height. Blooming occurs from July through September. After flowering and seed production, the plants die.
- Leaves on the flowering stalks are large, deeply-lobed, opposite, and wrap around the stem forming cups that can hold water. Both the leaves and stems are very prickly.
- Teasels also exhibit a characteristic shared by many weedy species – elasticity – that enables it to quickly produce abundant seeds on very short stalks after mowing.

Bristly bellflower (*Campanula cervicaria*)

(Pictures and identification characteristics from <https://www.minnesotawildflowers.info/flower/bristly-bellflower>)

**Identification characteristics:**

- **Flowers:** Tight clusters at the top of the stem and in upper leaf axils. Flowers are $\frac{1}{2}$ to $\frac{3}{4}$ inch long, blue to violet, bell-shaped with 5 fused lobes that are oblong with pointed tips. Short erect hairs are scattered along the outside lobe edges and the midvein. The calyx is about $\frac{1}{4}$ the length of flower tube, fused with 5 blunt lobes and bristly hairs on the outer surface. 5 stamens are retained in the tube with a style, 3-parted at the tip, extending beyond the lobes. Short, broad, leafy bracts with bristly outer surfaces wrap the base of clusters.
- **Leaves and Stem:** Leaves are 6 to 8 inches long, basal leaves with winged stalks, the blade narrow lance to spatula shaped, withering away at flowering. Stem leaves are few, alternate, becoming smaller, stalkless and more lance-linear as they ascend the stem. Leaf edges are irregular with rounded teeth and are often wavy. The lower leaf surface has short, bristly hairs, especially along the edges and midvein; the upper surface hairs are more scattered. Stems are unbranched, with sharp vertical ridges and densely covered in bristly hairs.

Crown vetch (*Coronilla varia*)

(Pictures and identification characteristics from

<http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/crownvetch.html>)

**Identification characteristics:**

- **Appearance:** Perennial herbaceous plant, growing 2 - 6' long stems with a reclining and trailing growth pattern. In winter and early spring crown vetch can be easily recognized as brown unsightly patches.
- **Leaves:** Pinnately (feather-like) compound, (leaflets on both sides of a common stalk) with 15 - 25 pairs of oblong leaflets.
- **Flowers:** Clustered in flat-topped umbels ranging from pink, lavender to white on extended stalks which grow from the leaf axils; blooming from May through August.
- **Seeds:** Slender seeds are contained in finger-like pods; they remain viable in the soil for 15 years.
- **Roots:** Spread vegetatively with horizontal stems growing below the soil surface, called rhizomes, forming roots and producing new plants. They can grow up to 10' long, contributing to extensive vegetative spread.

Tufted (*Vicia cracca*) and hairy (*V. villosa*) vetches(Pictures and identification characteristics from <https://www.minnesotawildflowers.info/>)**Tufted vetch**

Flower: Dense, 1-sided raceme of 10 to 50 elongated pea-shaped flowers. Flowers are about ½ inch long, the upper petal (standard) flaring upward, lateral wings below it oval, extending outward, as long as the standard is high. The standard is typically pink to blue-violet with lighter colored lateral wings though flowers in a cluster may all be the same color.



The calyx holding the flower is hairless to minutely hairy, with 5 prong-like lobes, the upper lobes broadly triangular and shorter than the lower, and all shorter than the calyx tube. Flower stalks are minutely hairy.

Leaves and Stems: Leaves are compound with 5 to 12 pairs of leaflets, and a branched tendrill at the end that entwines surrounding vegetation for support. Leaves can be up to 10 inches long and 2 inches wide but 6 inches or less is typical. Leaflets are about ¾ inch long and 1/8 inch wide, linear to oblong, toothless, with a tiny, abrupt point at the tip (mucronate). Both surfaces are covered in short appressed hairs.



At the base of the leaf stalk is a pair of narrow, sharply pointed, leafy appendages (stipules) that are ¼ to 1/3 inch long and short hairy, particularly around the edges. Stems are vining, multi-branched and sprawling, 4-sided with

distinct ridges and variously covered in very short hairs.

Fruit: Fruit is a flattened pea pod up to 1 inch long, containing 2 to 8 round to oval seeds.



Notes: Tufted vetch is most easily distinguished by the minute hairs rather than the longer, spreading hairs of hairy vetch on its stems and stalks, plus tuft vetch has lightly smaller flowers. Tufted vetch is a perennial whereas hairy vetch is mostly an annual.

Hairy vetch

Flower: One-sided raceme of 5 to 20 pairs of drooping, elongated pea-shaped flowers. Flowers are ½ to ¾ inch long, the upper petal (standard) flaring upward, lateral wings below it oval, extending outward, as long as the standard is high. The standard is typically pink to deep purple with lighter colored lateral wings though sometimes all flowers in a cluster are all white.



The calyx holding the flower is swollen at the base and covered in spreading hairs, with 5 prong-like lobes, the upper lobes narrowly triangular and shorter than the calyx tube, the lower

lobes longer than the upper and often longer than the tube. Flower stalks are covered in spreading hairs.

Leaves and Stems:

Leaves are compound with 8 to 12 pairs of leaflets, and a branched tendrill at the end that entwines surrounding vegetation for support. Leaves can be up to 10 inches long and 2 inches wide but 6 inches or less is typical. Leaflets are about 1 inch long and ¼ inch wide, toothless, hairy, generally elliptical.



At the base of the leaf stalk is a pair of narrow, leafy appendages (stipules) that are ¼ to 1/3 inch long and densely hairy. Stems are vining, multi-branched and sprawling, with distinct ridges and covered in spreading hairs.

Fruit: Fruit is a flattened pea pod up to 2 inches long, containing several round seeds.

Queen Anne's lace (*Daucus carota*)

(Pictures and identification characteristics from

<http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/queenannslace.html>)



Identification characteristics:

- **Appearance:** Biennial herbaceous plant, 3 - 4' tall, consists of one or several hairy hollow stems, growing from one central stem, each with an umbrella-shaped flower cluster at the top. Plant smells like a carrot, it is the ancestor of the garden carrot. Appears as rosette in its first year.
- **Leaves:** Alternate, start immediately below the flower, increasing in size down the stem. They are pinnately divided (leaflets are arranged on both sides of a common stalk).
- **Flowers:** Compound, flat-topped umbels (small umbels within a large umbel) umbels becoming concave when mature; bloom May through October.
- **Seeds:** Barbed small seeds, promotes dispersal by animals and wind, seeds stay viable in the soil for 1- 2 years.
- **Roots:** Slender, woody taproot, carrot-like in smell and taste.

Emerald ash borer (*Agrilus planipennis*) (EAB)

(Pictures and identifying characteristics from www.abs.russell.wisc.edu/eab/)



1



2

Identification characteristics of adults (1):

- Metallic green, 3/8" to 1/2" long, 1/8" wide.
- Emerge in June and are active through summer.
- Mate and lay eggs on ash tree bark during summer.

Identification characteristics of larvae (2):

- Cream colored with bell-shaped body segments.
- Can be over 1" long.
- Emerge from eggs and tunnel into cambial layer (just beneath the bark) and feeds on tree tissues.



1



2



3

Symptoms of infestation:

1. Sparse leaves and dying branches in upper canopy and green shoots (suckering) on the lower trunk.
2. S-shaped tunneling pattern under the bark from larvae.
3. D-shaped exit holes through bark from adult emergence.

Gypsy moth (*Lymantria dispar*)

(Pictures and identifying characteristics from

<http://www.dnr.state.mn.us/invasives/terrestrialanimals/gypsymoth/index.html>)



1



2



3

Identification characteristics of adults (1):

- Emerge in July in the south and August in the north.
- Males are brown to gray with dark markings in a scalloped pattern along the wing edge. They have large featherlike antennae used to pick up the female pheromone (sex attractant).
- Females are white with small brown markings, are much larger than the males and do not fly.
- Adults mate and die within one to two weeks of emergence without ever feeding.
- Females deposit egg masses in crevices, under loose bark, or in protected places on objects in infested areas near host trees.

Identification characteristics of larvae (caterpillars) (2 and 3):

- Five pairs of blue dots and six pairs of red dots down the back.
- Hatch between late April and early June
- Climbs to top of a tree after hatching, spins a silken thread and catches the wind to the nearest preferred host tree.
- Feed on leaves of host tree (2).
- Pupates late June through July.