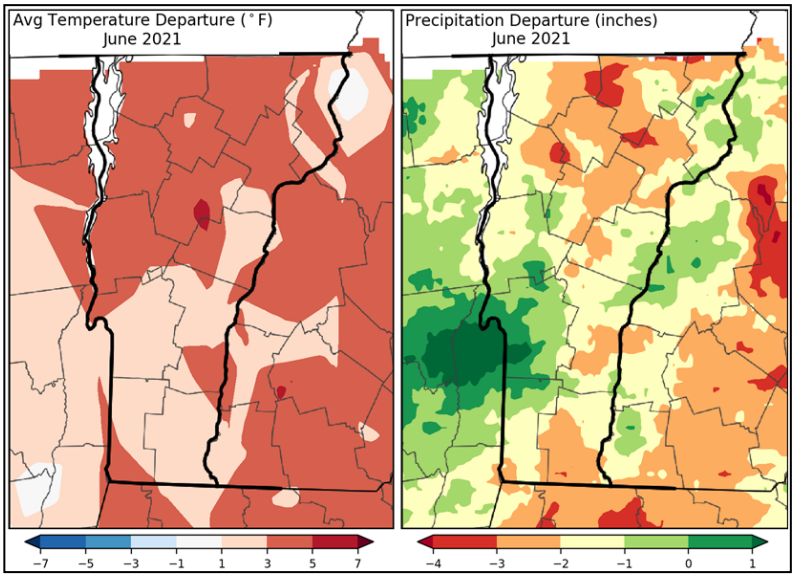
Vermont Forest Health

Insect and Disease Observations — June 2021

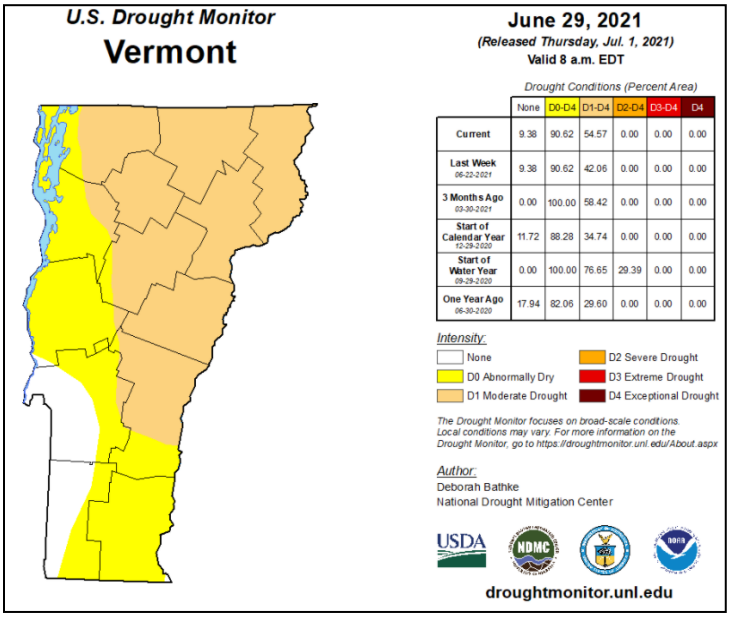
Department of Forests, Parks & Recreation
June 2021 vtforest.com

Weather Recap

Seasonally warm weather this month helps kick off the official start to summer. On average, this month was warmer and wetter than in June of 2020. State-wide temperatures averaged 64.5°F, which was 1.7 degrees warmer than June of last year. Statewide precipitation averaged 2.64 inches, which was 0.24 inches more than June of last year. Starting June 1st, the U.S. Drought Monitor listed 28.35% of the state in moderate drought, 55.14% as abnormally dry, and 16.51% as no drought. By the end of the month, drought severity increased with listings being updated to 54.57% of the state in moderate drought, 36.05% as abnormally dry, and 9.38% as no drought.



Temperature and precipitation departure from normal. Maps and data: Northeast Regional Climate Center.



Fire Update

With most of Vermont still experiencing abnormally dry or drought conditions, risk of potential wildland fires, especially escaped campfires, persists. To stay current on fire danger visit our Monitoring Fire Danger page. Fire danger rating is updated daily, spring through fall. Also visit our Prevent Forest Fire page for tips on safe burning practices and how to extinguish a fire safely.

Vermont drought conditions at the end of June. Map and data: U.S. Drought Monitor.

Invasive Insect Update

An ongoing outbreak of LDD caterpillars (gypsy moth, *Lymantria dispar dispar*) continue to be reported in the Champlain valley. Additional reports indicate that this outbreak extends from Highgate down to Rutland, although damage may be underreported in rural areas. This invasive insect is a significant defoliator (leaf eater) of trees and shrubs, and although they prefer oak trees, high populations will cause them to eat many types of leaves, including maple and pine.

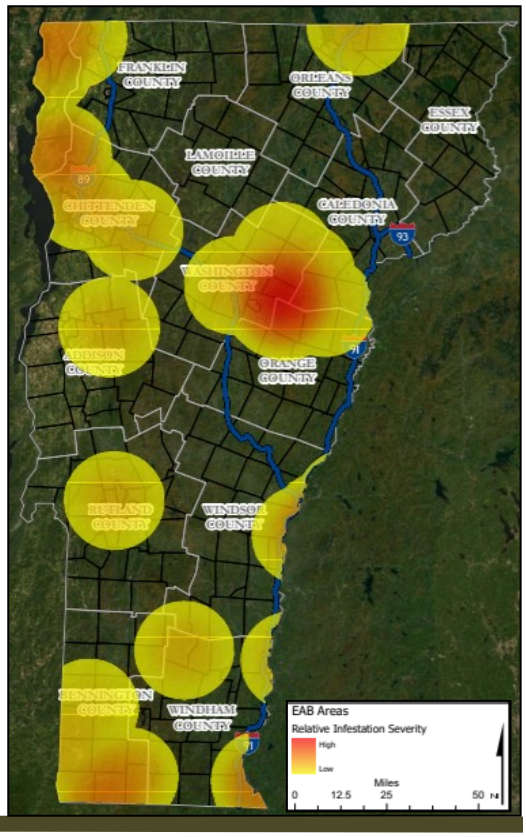
LDD defoliation. Photo credit: FPR Staff.

This invasive insect is managed by both viral and fungal biocontrols, that are most prevalent and effective after wet springs and during high outbreaks of LDD. The viral biocontrol, LdMNPV *(Lymantria dispar* multicapsid nuclear polyhedrosis virus) has been reported killing LDD caterpillars in Highgate this month. This virus causes caterpillars to climb to elevated positions during the day, before liquefying and dying. Caterpillars infected with this virus will arch when dying, allowing the liquid contents to rain onto leaves, and then be consumed and reinfect other LDD caterpillars.

LDD killed by LdMNPV. Photo credit: R. Kelley.

A new detection of emerald ash borer (EAB, *Agrilus planipennis)*, was found in Colchester, VT. This new find has expanded the infested area within Chittenden County to either include and/or increase the already infested areas in Colchester, Milton, Shelburne, Burlington, South Burlington, Westford, Winooski, and Essex.

If you are a forest landowner, homeowner, forester, logging contractor, municipality, and/or utility professional in an infested area, you should evaluate the options available to protect ash trees and immediately implement Vermont's "Slow the Spread" recommendations. For additional resources including managing ash in your woodlot or around your home, or Use Value Appraisal guidance, check out the resources available at VTInvasives.



EAB Infested Area in Vermont showing EAB relative infestation severity. Map and data: ANR's Natural Resources Atlas.

Other Observations

White satin moth caterpillars (*Leucoma salicis*) were observed early this month. These defoliators were introduced to the U.S. in the early 1900s and are now widely distributed in North America. They prefer ornamental poplar species, however, they can feed on all species of poplar and willow. Although a non-native insect, these caterpillars are often present at low levels and have several natural predators including species of vertebrates, viruses, and fungi.

White satin moth caterpillars. Photo credit: Bev Radaker.

Oat crown rust caused by the fungal pathogen *Puccinia coronata* was observed causing aceia (fruiting body) lesions on common buckthorn leaves this month. This rust pathogen requires two obligate (living) hosts, buckthorn (*Rhamnus* spp.) and oat (*Avena* spp.), to complete its lifecycle. This pathogen causes minimal damage to buckthorn hosts but can cause mortality and large-scale crop loss in oats.

Oat crown rust on buckthorn. Photo credit: Andrej Kunca, National Forest Centre, Bugwood.

Peach leaf curl, caused by the fungus *Taphrina deformans*, was observed on ornamental peach trees early this month. This fungal pathogen causes leaf deformation including puckered, thickened, and curled leaves, which can lead to premature leaf drop. This pathogen is not commonly responsible for severe dieback or defoliation and can be managed using a commercial fungicide before bud break.

Peach leaf curl symptoms on leaf. Photo credit: FPR Staff.

Woolly apple aphid (*Eriosoma lanigerum*) was observed feeding on American elm. This native pest uses American elm as an alternate host, and feeding causes newly emerging shoots to form in rosette-like structures. These rosettes contain deformed and stunted leaves that create a protective habitat for the aphids. These insects cause minimal damage to elms but can cause root galls and severe dieback on the primary hosts including apple and mountain-ash.

Rosette-like structure caused by the woolly apple aphid. Photo credit: anonymous.

Bacterial wetwood has been reported in isolated areas across the state. Wetwood typically happens to damaged trees that have had prolonged exposure to being water-soaked. Although aesthetically alarming, this causes minimal (if any) damage to overall tree health and vigor. Promoting overall tree health and vigor helps reduce tree stress, which could decrease the severity of wetwood. This could include but is not limited to, proper pruning and proper mulching.

Bacterial wetwood. Photo credit: FPR Staff.

Hackberry leaf miner (*Agromyza* sp.) tunnels were observed in Wilgus State Park early this month. Larvae in this genus live inside of the leaf tissue, and consume the leaf from the inside. This insect is protected not only from predators inside the leaf tissue, but also from many plant defenses. These larvae zig and zag while they selectively eat layers of tissue with low amounts of cellulose and other plant defense chemicals.

Leaf miner tunnels. Photo credit: FPR Staff.

Ash gall midge (*Dasineura tumidosae*) was observed on white ash in Montpelier. This gall midge feeds on leaf tissue, which creates leaf galls on the main vein of ash leaves. Although infested leaves have abnormal growth and potentially fewer photosynthetic capabilities, this insect does not contribute to large-scale dieback or decline.

Ash gall midge galls. Photo credit: FPR Staff.

Maple anthracnose (*Aureobasidium apocryptum*, *Discula campestris* and *Colletotrichum gleosporoides*) continues to be reported throughout the state. Although this foliar disease is more prevalent after wet springs, it can also appear following short periods of heavy rain. In large and dense canopies, this pathogen can spread to other parts of the crown, causing leaf necrosis, deformation and premature leaf drop. To reduce presence and damage, canopies can be thinned to decrease humidity and moisture retention. Although not aesthetically pleasing, this pathogen does not contribute to severe dieback or defoliation.

Maple anthracnose. Photo credit: FPR Staff.

Oak apple gall wasp (*Biorrhiza pallida*) damage was observed on red oak this month. In spring, wasp eggs are laid in the young buds of oak trees. In addition to eggs, the female wasp injects the buds with venom that causes the emerging leaf tissue to deform and swell. Upon hatching, the larvae feed on leaf tissue and in the process, secrete enzymes that cause a round gall to form. This gall provides a protective habitat for the larvae to mature in.

Oak apple gall. Photo credit: Joe Boggs, OSU Extension.

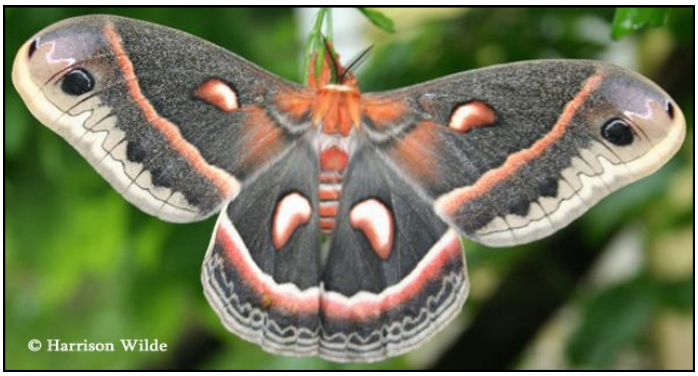
Fir– fern rust, caused by the fungal pathogens *Uredinopsis* spp. and/or *Milesina* spp., was observed causing yellowing needles of fir trees in the northeast kingdom. This rust pathogen can be identified by whiteish-pale aecia (fruiting bodies) erupting from the bottom of an infected needle. Infected needles will be "cast" or dropped from the branches as the tree tries to compartmentalize the pathogen.

Aecia on bottom of needle infected with fir– fern rust. Photo credit: R. Kelley.

Beech erineum mite (*Aceria ferruginea*), a type of eriophyid mite, damage has been reported across the state following leaf-out. This mite only feeds on American beech trees, and their feeding causes pale yellow to pinkish-red patches to form on the leaf. These mites only feed on unfurling leaves, and once the leaf is fully expanded it no longer feeds. This feeding causes minimal damage to the overall health and vigor of infested trees.

Beech erineum mite patches. Photo credit: Preston Chappell, Bugguide.

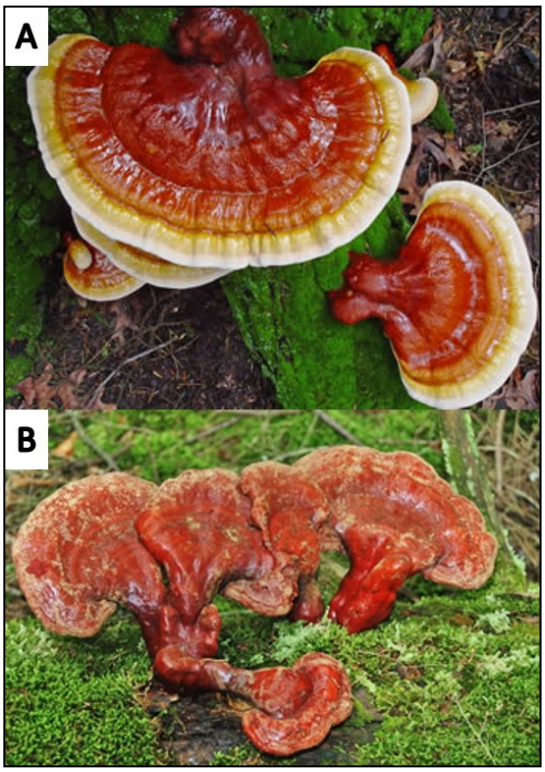
Cecropia moths (*Hyalophora cecropia*) can be found hanging off the sides of buildings and under outdoor lights during the early summer months. Cecropia moths are North America's largest native moth and can have a wingspan that exceeds seven inches! As larvae, these caterpillars prefer maple trees, however, they will also feed on other hardwoods including cherry and birch trees. The defoliation caused by larval feeding is minimal and does not contribute to large scale defoliation or dieback.



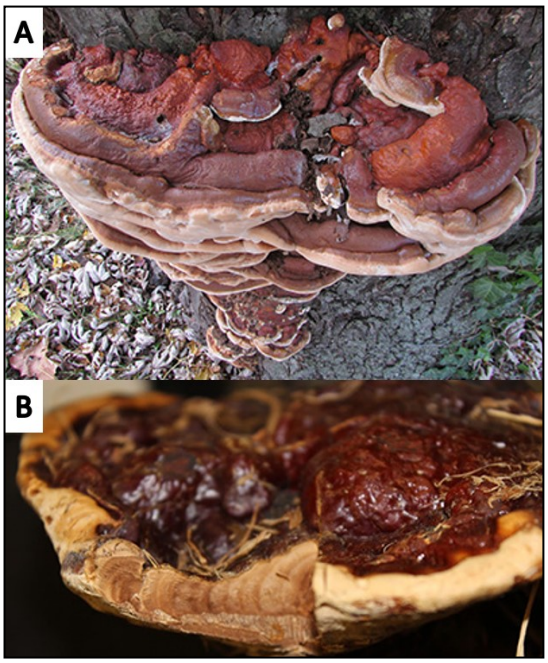
Adult cecropia moth. Photo credit: Harrison Wilde, Butterflies and Moths of North America.

Foraging For Fungi

The hemlock varnish shelf, (*Ganoderma tsugae*) is a commonly foraged polypore that is harvested between May and July. This polypore is parasitic and saprotrophic and is commonly found growing out of hemlock trees. As a parasite, this fungus causes white rot in hemlocks. Its cap is kidney-shaped with a red, shiny, varnished surface. When immature, this mushroom has whiteish-yellow stripes towards the margin of the cap. This cap can grow between 4 -16 cm in width and is secured from a reddish-brown stem that is 3-14 cm long and 3 cm thick. The underside of its cap has a whiteish to reddish-brown pore surface that bruises when damaged and turns black with KOH. These pores give off a brown spore print, and under a microscope, the spores are double walled.



A: Young hemlock varnish shelf. Photo credit: David Work, Messiah College. **B:** Mature hemlock varnish shelf. Photo credit: Glenn Brynes, Messiah College.



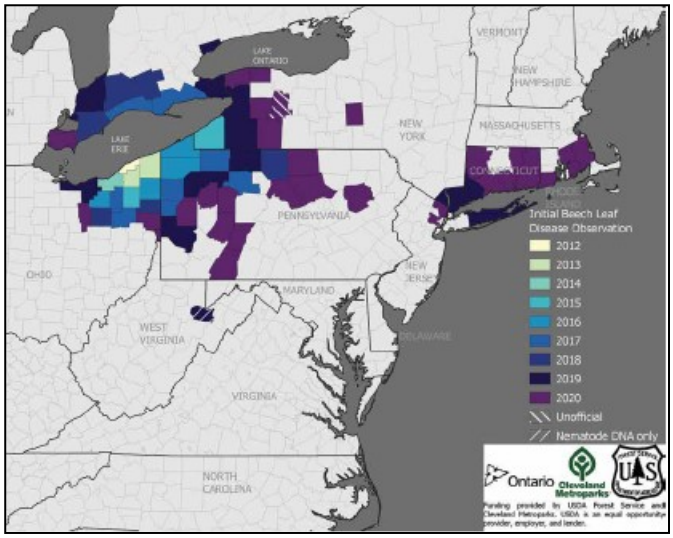
A: Clusters of *G. sessile*. Photo credit: Maricel Patino, Messiah College. **B:** *G. sessile* showing concentric rings.

A similar species, *Ganoderma sessile*, is another forgeable look-a-like that can be found in our eastern forests. Like the *G. tsugae*, this species also has a pore surface that bruises brown when damaged, and under a microscope, has spores with double walls. This mushroom is mostly saprotrophic, but can sometimes be parasitic, and is found growing out of dead and damaged hardwood trees. Its cap is irregularly kidney-shaped with a red-brown lacquered surface. This cap can grow between 8-16 cm wide and 4-8 cm deep and turns black with KOH. When immature, this mushroom is pale brown but matures into a medium-dark brown. As the mushroom ages, there are melanoid bands (concentric growth rings) in the flesh of the cap. This mushroom usually (but not always) has an absent stem, but when present, is also lacquered, brownish-red, and 5 cm long, and 2 cm thick. The underside of its cap has a whiteish to pale-brown pore surface that bruises when damaged. These pores give off a reddish-brown spore print. Although not commonly foraged as an edible, in traditional Chinese medicine, both of these mushrooms are foraged for their use in extracts and tinctures due to their similarities with Reishi mushrooms (*Ganoderma lucidum,* not established in Vermont). As with all wild mushrooms, there are risks to eating and misidentifying them which can be both dangerous and fatal. Always ensure you have the correct identification before consuming any wild edible. ***The State of Vermont accepts no liability or responsibility for the consumption and/or misidentification of any mushrooms mentioned in this publication.***

Pests in the Spotlight: Beech Leaf Disease

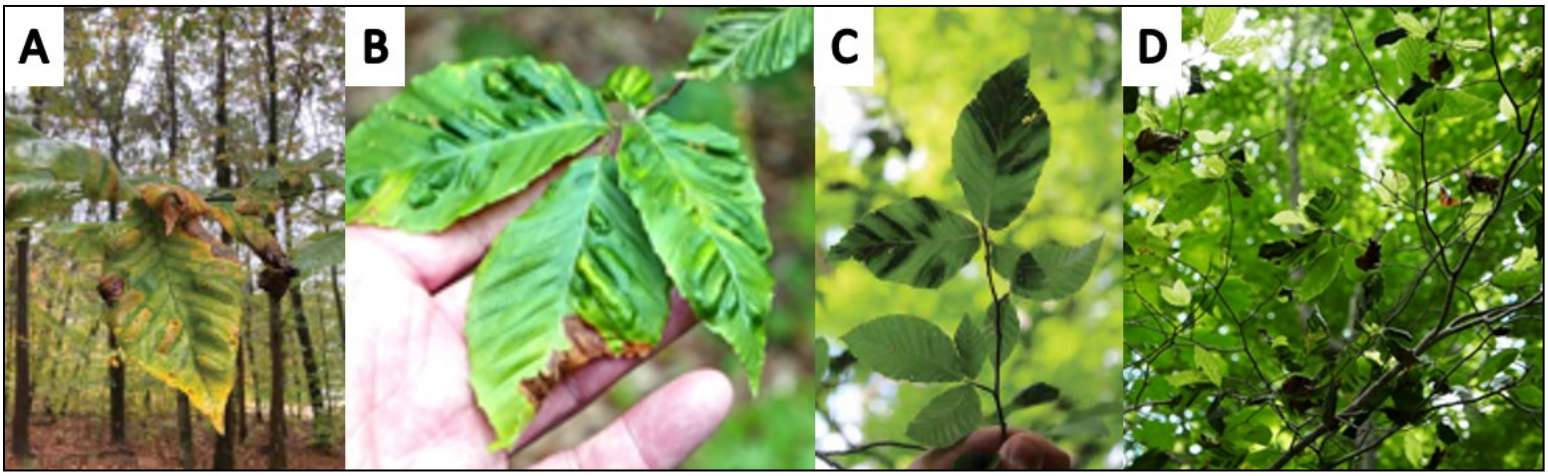
Beech leaf disease (BLD) affects both American and European beech trees, and causes leaf deformation, dieback, and mortality of infested hosts. The causal agent of BLD is an introduced nematode from Japan, *Litylenchus crenatae mccannii*. This pest was first documented in Ohio in 2012 and has currently not been observed in Vermont. This pest can affect all ages and sizes of beech, being most deadly to saplings and understory beech.

This pest has currently been reported in 7 states, and Ontario Canada. The most recent reports are in Maine (2021, data not shown), Massachusetts (2020) and Rhode Island (2020).



Current known range of BLD. Map and data: Cleveland Metroparks.

In early stages of infection, beech leaves begin to develop a thick striping pattern between leaf veins, which can sometimes coincide with chlorosis (yellowing). In severe infections, the striping area has been observed as slightly raised and thicker than normal tissue, which will lead to leaf deformation. Heavily symptomatic leaves may drop mid-growing season, however less symptomatic leaves typically do not drop. Overtime, dieback will occur which starts at the lower branches on a canopy and progresses upwards. In younger trees, disease progression can be rapid which leads to high mortality of saplings and understory beech. Studies have shown that symptoms do not progress throughout the growing season, which provides support for nematodes overwintering inside of buds and affecting leaves before budbreak in the spring. Due to this, symptoms can include aborted buds which present as crispy empty buds on an affected branch. For more information or to report a sighting, visit VTinvasives.



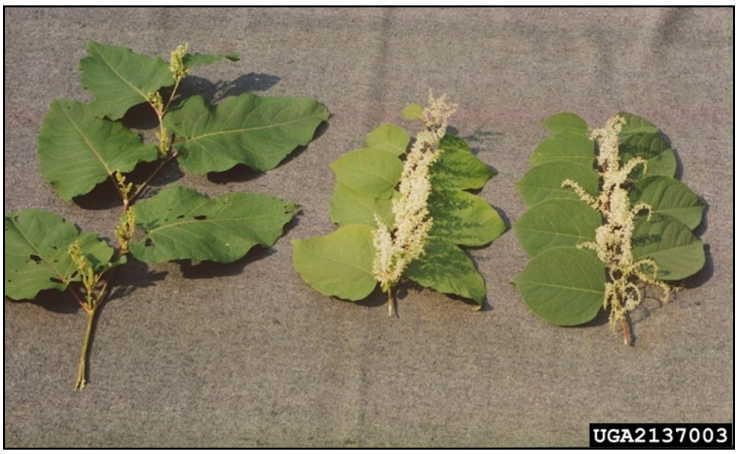
A: Advanced symptoms of BLD. Photo credit: Cameron McIntire, USDA FS. **B:** Moderate symptoms of BLD. Photo credit: Jim Chatfield, Ohio State University. **C:** Banding symptom associated with BLD. Photo credit: Tom Macy, Ohio DNR. **D:** Leaf drop and dieback. Photo credit: Jim Chatfield, Ohio State University.

Early Detection Species: Invasive Knotweeds

Towering green stalks of knotweed have sprung up along rivers, roadsides, backyards, and other disturbed areas. "Knotweed," a term used to refer to several related plants is comprised of **Japanese knotweed** (*Fallopia japonica*, syn. *Reynoutria japonica*, *Polygonum cupsidatum*), **giant knotweed** (*Fallopia sachalinensis*, syn. *Reynoutria sachalinensis*, *Polygonum sachalinensis*), and a hybrid of these two called **hybrid knotweed** (*Fallopia x bohemica,* syn. *Reynoutria x bohemica*). The invasive knotweeds are part of the Buckwheat family (Polygonaceae), which includes varied species like garden buckwheat (*Fagopyrum esculentum*), rhubarb (*Rheum rhabarbarum*), and the invasive Mile-a-minute weed [not currently found in Vermont] (*Persicaria perfoliata*). The common name – knotweed – is a bit of a misnomer, as the invasive "knotweeds" are more closely related to bindweeds than true knotweeds.

Japanese knotweed (pictured) leaves are truncate, alternating along the stem, and hairless on the underside surface. Giant knotweed leaves (not pictured) have long wavy hairs, and hybrid knotweed leaves (not pictured) have stout conical hairs especially prominent on the midrib at 20x. Photo credit: FPR staff.

The invasive knotweeds are herbaceous, rhizomatous perennials, with hollow, jointed stems. The leaves are arranged alternately, and generally spade shaped with a pointed tip. Japanese knotweed leaves have a flat base (truncate), giant knotweed leaves are heart-shaped (cordate), and hybrid knotweed leaves are slightly cordate. The flowers and seeds are similar in appearance, with Japanese knotweed having long panicles of small white flowers, giant knotweed having sparse, short panicles of small white flowers, hybrid knotweed having short panicles of small white flowers, and all having flowers that produce tiny seeds that have a triangular papery husk. These plants are all fairly tall for shrubs, ranging from 5' to over 20' in height.

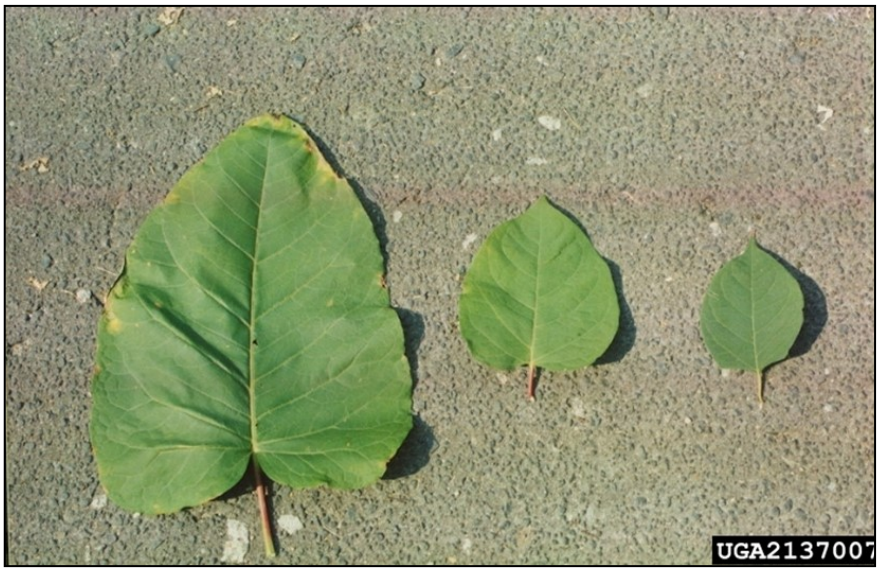


The inflorescences of (L-R) Giant knotweed, hybrid knotweed, and Japanese knotweed. Photo credit: Barbara Tokarska-Guzik, University of Silesia, Bugwood.

Natural History and Introductions:

Where Japanese knotweed originates (Japan, Korea, Taiwan), it can grow on land exposed from volcanic activity, acting as a pioneer species, and facilitating the eventual return of other species. It grows at high elevations, in full sun, along roads, and riparian areas. In its introduced range, it can grow aggressively in riparian areas, along roads, and in the built environment. Originally introduced to the United States in 1873 as an ornamental plant and utilized as a forage crop and for horticulture, only 5g of stem or root are needed for the plant to reroot (and this is similarly presumed for the other invasive knotweeds as well).

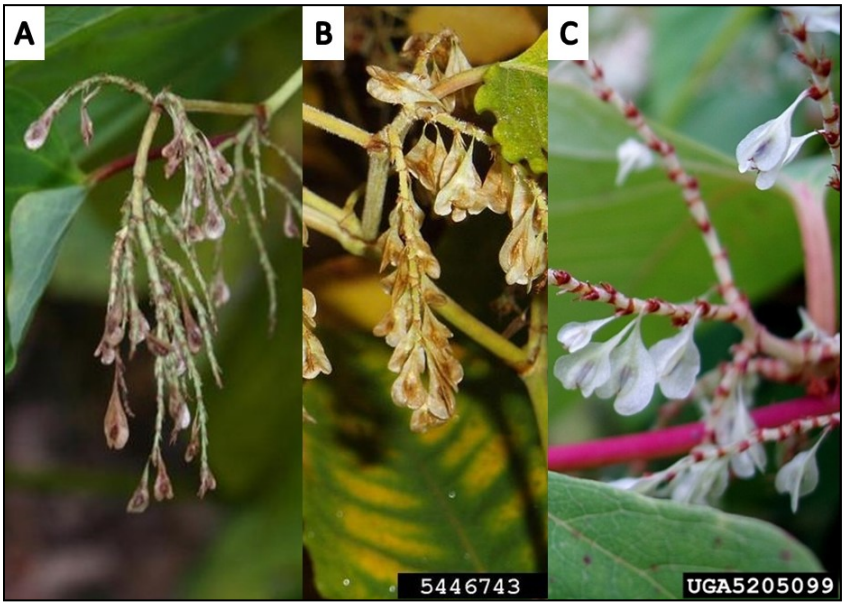
In the United Kingdom, Japanese knotweed is thought to be primarily clonal (growing vegetatively vs. from seed), and from a few initial introductions. However, research in the United States has shown that Japanese knotweed can produce viable seeds. This may be aided by hybridization, as it is rare for the plant to have both male and female fertile parts in the flower (perfect), rather than having some individuals that are perfect and others that only produce female flowers (gynodioecious).



Leaf size comparison of (L-R) Giant knotweed (7-16" long), hybrid knotweed (2-12" long), and Japanese knotweed (1-6" long). Photo credit: Barbara Tokarska-Guzik, University of Silesia, Bugwood.

Giant knotweed originates from the colder climates of northern Japan, Russia, and possibly other northern Asian islands. It grows at sea level up to high elevations, and also appears to be tolerant of a wide range of soil types but does best in moist soil. It is thought to have been introduced to the United States in the late 1800s as an ornamental plant and for "erosion control". This plant has perfect flowers and typically produces fertile seeds.

Some sources suggest that the hybrid knotweed was not identified until as late as the 1980s, mostly being misidentified as either Japanese knotweed or giant knotweed. Herbarium records show that the hybrid most likely arose in its introduced ranges in the late 1800s and was even mistakenly distributed as Japanese knotweed. Some places in the United States, like Idaho, have populations of knotweed that are almost exclusively hybrid knotweed.



Seed and husk of **A:** Giant knotweed **B:** hybrid knotweed, **C:** and Japanese knotweed. Photo credit: Leslie J. Mehrhoff, University of Connecticut, Bugwood.

Japanese knotweed is thought to be the prevalent species of knotweed across Vermont but could actually be over-reported because of confusion with the invasive hybrid knotweed. Hybrid knotweed is only officially recorded from one town in Vermont but is suspected to be more prevalent than currently recorded. Giant knotweed is locally abundant in parts of Vermont.

These bamboo look-alikes can be found across Vermont. They grow in dense stands that exclude locally evolved plants and change habitat for wildlife, can leave streambanks bare and susceptible to erosion when the plants die back each year, damage infrastructure including growing through foundations, walls, pavement, and pipes, and create roadside hazards by impeding visibility. The plants can be eaten when young sprouts emerge, and in their original range are used for their medicinal value, and in its introduced range, some pollinators including commercial honeybees can utilize the plants.

However, the immense negative impacts outweigh the potential positives, and these plants are considered some of the most invasive plants in the world. Japanese knotweed is listed as a Class B Noxious Weed in Vermont, and its hybrid is therefore also considered a noxious weed. Giant knotweed is listed on the unofficial watchlist in Vermont.

Thicket of Japanese knotweed Photo credit: Arthur Haines, GoBotany.

Here are a few quick ways to distinguish the invasive knotweeds from each other:

- Leaf size
  - Japanese knotweed has truncate leaves, roughly 1-6” in length
  - Hybrid knotweed has slightly cordate leaves, roughly 2-12” in length
  - Giant knotweed has strongly cordate leaves, roughly 7-16” in length
- Leaf hairs
  - Japanese knotweed lacks hairs on the lower surface of the leaves
  - Hybrid knotweed has stout, conical hairs viewable with a 20x hand lens
  - Giant knotweed has long hairs on the lower surface of the leaves
- Plant height
  - Japanese knotweed is 5-8’ tall
  - Hybrid knotweed is 6-16’ tall
  - Giant knotweed is 9-20’ tall

To learn more about knotweed, check out VTinvasives.org and these additional resources:

Japanese knotweed

Centre for Agriculture and Bioscience International
GoBotany
Flora of North America

Hybrid knotweed

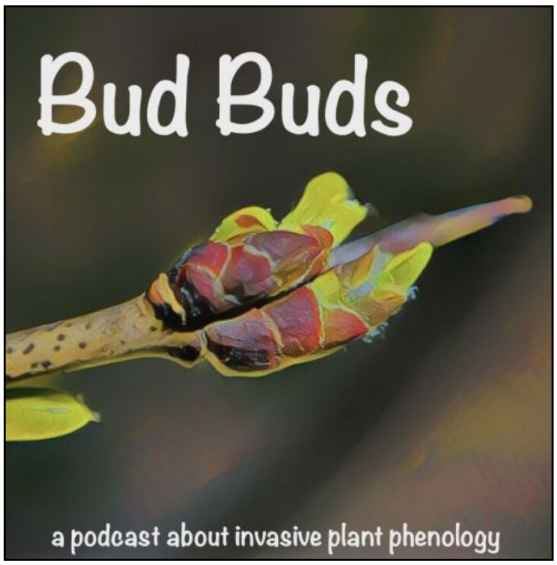
Centre for Agriculture and Bioscience International
Flora of North America
King County Washington Noxious Weed Control Program
Washington State Noxious Weed Control Board

Giant knotweed

Centre for Agriculture and Bioscience International
GoBotany
Flora of North America
Invasive Species Ireland

Invasive Plant Phenology

In the second full week of every month, volunteers around the state record and report invasive plant phenology, creating both a timely resource for best management options and a historic record of plant behavior. The observations below are from June 14-18, 2021. If you would like to be involved in this effort, please contact Pauline.Swislocki@vermont.gov. Observers are still needed in Bennington, Essex, Franklin, Rutland, Washington, Windham, and Windsor counties. For more information about the phenology of invasive plants in Vermont, check out Bud Buds, a new podcast from the Invasive Plant Program.



Addison County — Leaf Out: Japanese knotweed; Flower Buds: wild parsnip; Flowering: goutweed; wild parsnip; Fruit Forming: common buckthorn; Fruit Ripening: common buckthorn; shrub honeysuckle

Caledonia County — Leaf Out: Japanese knotweed; phragmites; Flowering: Asiatic bittersweet; common buckthorn; glossy buckthorn; shrub honeysuckle; Fruit Forming: common buckthorn; glossy buckthorn; Japanese barberry; shrub honeysuckle

Chittenden County — Leaf Out: Asiatic bittersweet; common barberry; common buckthorn; garlic mustard (first-year rosettes and second-year plants); goutweed; Japanese barberry; Japanese knotweed (>10' tall); multiflora rose; Norway maple; phragmites; shrub honeysuckle; wild chervil; Flower Buds: common buckthorn; multiflora rose; shrub honeysuckle; wall lettuce; wild parsnip; Flowering: wild chervil; dames rocket; garlic mustard; goutweed; multiflora rose; shrub honeysuckle; spotted knapweed; yellow flag iris; Fruit Forming: common buckthorn; garlic mustard; Japanese barberry; shrub honeysuckle; yellow flag iris; Fruits Ripening: amur maple; shrub honeysuckle

Grand Isle County — Leaf Out: common buckthorn; garlic mustard (first-year rosettes); wild parsnip; Flowering: Autumn olive; Fruit Forming: common buckthorn; garlic mustard; multiflora rose; shrub honeysuckle

Lamoille County — Flowering: wild chervil; goutweed

Orange County — Leaf Out: Asiatic bittersweet; Japanese knotweed (>5' tall); Fruit Forming: common buckthorn

Orleans County — Flowering: wild chervil

FORESTS, PARKS & RECREATION VERMONT AGENCY OF NATURAL RESOURCES

For more information, contact the Forest Biology Laboratory at 802-505-8259 or:

Windsor & Windham Counties	Springfield (802) 289-0613
Bennington & Rutland Counties	Rutland (802) 786-0060
Addison, Chittenden, Franklin & Grand Isle Counties	Essex Junction (802) 879-6565
Lamoille, Orange & Washington Counties	Barre (802) 476-0170
Caledonia, Orleans & Essex Counties	St. Johnsbury (802) 751-0110

Forest health programs in the Vermont Department of Forests, Parks, and Recreation are supported, in part, by the US Forest Service, State and Private Forestry, and conducted in partnership with the Vermont Agency of Agriculture, Food, and Markets, USDA-APHIS, the University of Vermont, cooperating landowners, resource managers, and citizen volunteers.