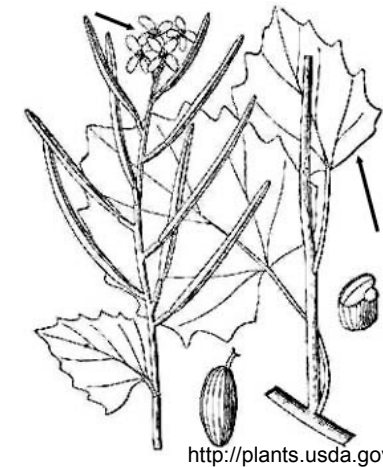


# Invasive Plant Control

# Garlic Mustard (*Alliaria petiolata*)

**Look:** Cool season biennial (2 year life cycle)

- First year: Rosettes of dark kidney shaped leaves with rounded teeth will be green throughout the winter ready to flower in early spring the second year. Strong garlic smell when crushed.
- Second year: Cluster of white cross-shaped flowers on stalks. Some plants will have more than one stalk. Leaves more heart shaped and sharply toothed. Seeds develop in a slender pod by mid-summer. 800-6,000 seeds can be produced by one plant.



**Issues:** Extremely prolific and aggressive out competing native woodland ephemerals like trillium, wild ginger and hepatica. Recent studies have found that garlic mustard releases antifungal chemicals into the soil disrupting the natural symbiotic relationship between mycorrhizal fungi and native tree and plant development. This is bad news for our native plant populations.

**Control:** Early detection is best. Small infestations (and medium ones too if you have the time) can be controlled through hand pulling. Hand pulling should be done as early as possible in the spring preferably before flowering. Pulled specimens without flowers can be composted but plants pulled with flowers should be bagged and removed from site or composted if your compost will get hot enough to kill any seeds that might develop after the fact. Plants that are pulled and left on the ground if conditions are moist enough, can still flower and go to seed with all roots exposed. At least the top inch or “crown” of the root should be taken with every plant. The top of the root will re-sprout if left in the ground. Return to the site at least two more times after the initial pulling to pull any remaining or re-sprouted plants. Seeds can remain viable for up to 5 years, so the goal is to prevent the plants from going to seed. For large infestations weedwacking or mowing plants to the ground repeatedly (once every 2 weeks from May-July) can help prevent re-seeding. Hand removal and bagging of plants with mature fruits can be done from June through August.



Careful application of herbicide may also be an option in certain areas for instance, you may have a massive invasion that stretches into a wooded area not open enough for a mower to navigate. Unless you have an extreme problem with garlic mustard I would recommend using any other non-chemical control.

**If you are considering using chemical control remember:**

Like any weed control method, herbicides will fail if used incorrectly. Because garlic mustard thrives a variety of areas including sensitive woodlands and wetland borders, herbicide exposure to water resources, the susceptibility of surrounding native plants to the herbicide, and the potential impact of herbicides on soil and amphibious organisms must be considered in choosing the most appropriate product for your particular weed control program. Furthermore, using any herbicide correctly means using:

- **An herbicide which has a label allowing applications on the particular use site;**
- **The correct concentration (rate);**
- **An adjuvant if recommended** (adjuvants are spray solution additives that may make the herbicide more effective);
- **The right application method;**
- **The correct timing to coincide with plant susceptibility.**

*As always with herbicide use, carefully read and follow all use directions and any restrictions or precautions listed on the product label. If in doubt, contact your local extension agent, pesticide dealer, Department of Agriculture, or the herbicide manufacturer for advice or clarification.*

Herbicide can be applied to the basal rosettes at any time of year (temperature permitting--above 50 degrees F). Treating the first year rosettes will effectively prevent reseeding interrupting the life cycle. Thoroughly wet all leaves with a glyphosate herbicide as a 2-percent solution in water (8 ounces per 3-gallon mix). Do not apply so heavily that herbicide drips off the leaf surface and only apply if rain is not expected for about 8 hours. Include a surfactant (adjuvant) unless plants are near surface waters (ponds, streams, vernal pools, etc.,). Extreme care must be taken not to get glyphosate on desirable plants as the product is non-selective and will kill almost any plant it contacts. Treatments should be done in the early spring (apply to the rosettes) when most other non-target vegetation is dormant. Refer to manufacturer's label for specific information and restrictions regarding use. Spray shields may be used to better direct herbicide and limit non-intentional drift.

You may be able to hire a **trusted ecological landscaper** to apply the herbicide for you.

**It's edible too.  
Recipes: Pesto Petiolata**

- 3/4 cup extra virgin olive oil**
- 1 garlic clove**
- 2 Tbl pine nuts or walnut pieces**
- 1/4 tsp salt**
- 1/3 cup freshly grated Parmesan cheese**
- 4 cups of garlic mustard leaves or use 2 cups garlic mustard and 2 cups basil leaves**

Place all of the ingredients except the basil in a blender or food processor. Blend until smooth, then add the garlic mustard and/or basil a handful at a time, blending until all of the greens are incorporated and the pesto is smooth.

Makes about 1 cup.

Notes: For the best flavor, pick the rosette leaves before the plant has flowered. I personally wouldn't use leaves from roadside plants because I don't know what the roadside crews use on the roads or along the roads. If freezing, omit the cheese and add in when ready to use the pesto. I like to freeze 1/4 scoops of pesto in baggies, then cut the corner off and squeeze the pesto out.

- Andrea Hoerr

# Japanese Knotweed (*Polygonum cuspidatum*)

## Look: Perennial

- Hollow bamboo-like stems growing 3-10 feet high with swollen joints at leaf nodes. Large, heart-shaped, smooth-edged leaves. Dies back every fall then re-sprouts from same root mat. Reproduces vegetatively through rhizome networks and root and stem fragments. Flowers are small white/greenish on branched clusters. Seeds are produced in late summer; they are a secondary means for re-generation.

**Issues:** Extremely aggressive and resilient forming dense thickets that overrun native plant communities. Once established, a colony is extremely hard to eradicate. Root and stem fragments as small as ½” can form new plant colonies. Knotweed re-sprouts vigorously following any disruption like cutting, mowing, digging and even sometimes herbicide treatment.

## Control: Two systems- Mechanical and Chemical

Depending on the size and location of the knotweed either *or both* systems of control may be appropriate to use. Mechanical control aims at starving the roots by removing the green vegetation or up rooting the plants all together and is best suited for small, isolated patches. To be successful, mechanical control programs need to be aggressively administered for at least two or three years. Remove all cut vegetation from site or be sure to thoroughly dry the material because any piece of stem or root can re-sprout and colonize another patch.

Chemical control programs should always consider the suitability and sensitivity of the site and should match the project with the correct herbicide and application method. Chemical applications should be initially applied just before flowering with follow-up applications to suppress any re-growth. Combination plans using both mechanical and chemical treatments like tilling then herbiciding re-growth, may be appropriate in some areas.





Mechanical Control (continued)

**Hand Cutting:** Using a machete, loppers or pruning shears, cut the stems down to the ground surface as often as possible, but at least every 2-3 weeks from April (or as soon as the plant appears) through August. Sprouting slows after August, so you can reduce cutting frequency, but try and prevent the plants from ever exceeding six inches (15cm) in height. Pile the cut stems where they will quickly dry out.

**Mowing:** Using a weed-eater or mower, cut as low as possible and as often as possible, but at least every 2-3 weeks through August. Be sure you are not scattering stem or root fragments onto moist soil or into the water. Goats are reported to eat knotweed and in some circumstances controlled goat grazing may be an option similar to intensive mowing. Be aware they will eat desirable vegetation as well.

**Digging/Pulling:** If the knotweed has established in soft soil, or better yet sand, try pulling the plant and major rhizomes up by the root crown to remove as much of the root system as you can. Although you will almost certainly not kill the plant in one treatment, you will reduce the root mass. Each time you see new sprouts (start looking a week after you pull and search at least 20 feet away from the original plant), uproot them as well, trying to pull out as much of the root as you can each time. This is probably only feasible with small patches. Be sure to carefully dispose of any root material.

**Tilling:** Used alone, tilling or otherwise physically disturbing the root system will not provide control and will create many re-sprouts. This approach may however offer some benefit in an integrated strategy, since it will increase the shoot to root ratio. The more shoots there are per linear foot of root, the more likely you will be to be able to physically pull them out, exhaust them by depriving them of energy (i.e. by cutting the shoot off) or kill them with herbicides.

**If you do try and control knotweed manually, be sure you practice the four T's: be timely, tenacious, tough and thorough. And as always, carefully dispose of any stem or root material.**

Control summaries from *Controlling Knotweed in the Pacific Northwest*, Jonathan Soll, The Nature Conservancy, 2004.

*Traditional western cuisine combines rhubarb with strawberries. Japanese knotweed, a superior relative of rhubarb, makes this union even better. Layered between cottage cheese, breadcrumbs, and walnuts, it can't be beat.*

**2 cups breadcrumbs**

**1/4 cup corn oil**

**2 cups cottage cheese**

**3 cups Japanese knotweed shoots, sliced**

**2-1/2 cups wild or commercial strawberry jam**

**1 cup walnuts, chopped**

1. Mix the breadcrumbs with the corn oil.

2. Layer a large, oiled casserole dish with soy-cottage cheese, Japanese knotweed, strawberry jam, oiled breadcrumbs, and walnuts, pressing everything down with the palm of your hand.

3. Bake, uncovered, 30 minutes in a preheated 350°F oven.

4. Chill. \

**(Note: You definitely should peel Japanese knotweed shoots that are over 1 foot tall because the skin tends to be stringy.)**

Serves 6

Time: 20 + 30 minutes

# Oriental Bittersweet (*Celastrus orbiculata*)

## Look: Perennial

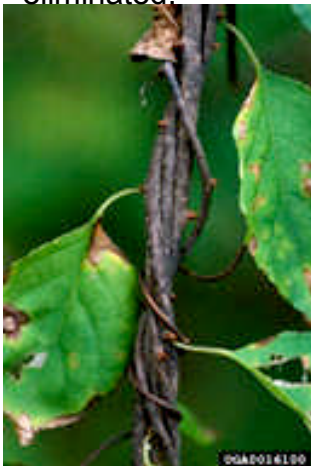
- Oriental bittersweet is a deciduous woody perennial climbing vine or trailing shrub. Stems of older plants 4" in diameter have been reported. The leaves are alternate, glossy, round, with finely toothed margins. There are separate female (fruiting) and male (non-fruiting) plants. Female plants produce clusters of small greenish flowers in axillary clusters (from most leaf axils), and each plant can produce large numbers of fruits and seeds. The fruits are three-valved, yellow, globular capsules that at maturity split open to reveal three red-orange, fleshy arils each containing one or two seeds.



**Issues:** Oriental bittersweet is a serious threat to plant communities due to its high reproductive rate, long range dispersal, ability to root sucker, and rapid growth rate. Climbing Oriental bittersweet vines severely damage native vegetation by constricting and girdling stems. Vines can shade, suppress, and ultimately kill native vegetation. Oriental bittersweet has been shown to hybridize with the relatively rare American bittersweet (*Celastrus scandens* L.). Hybridization may lead to the loss of American bittersweet's genetic identity through introgression. Both are members of the Celastraceae (Stafftree) family.

## Control: Management Recommendations

Since Oriental bittersweet produces numerous seeds, extensive seed reserves can become established in the soil within a year or two. Seeds of Oriental bittersweet remain viable for several years and control actions must continue until seed sources are eliminated.



**Cutting:** Cut climbing or trailing vines as close to the root collar as possible. This technique is feasible on small populations; as a pretreatment on large impenetrable sites; in areas where herbicide cannot be used; or if labor resources are not sufficient to adequately implement herbicidal control. This treatment will prevent seed production and strangulation of surrounding woody vegetation. Oriental bittersweet will resprout unless cut so frequently that its root stores are exhausted. Treatment should begin early in the growing season and be repeated at two-week intervals until autumn.

**Pulling:** This method is appropriate for small initial populations or environmentally sensitive areas where herbicides cannot be used. Using a pulaski or similar digging tool, remove the entire plant, including all roots and runners. Juvenile plants can be hand pulled depending on soil conditions and root development. Any portions of the root system not removed will potentially resprout. All plant parts, if mature fruit is included, should be bagged and disposed of in a trash dumpster to prevent reestablishment. The plant can be chipped and mulched if no seeds are present.

Careful application of herbicide may also be an option in certain areas for instance, you may have a massive invasion that stretches into a wooded area not open enough for a mower to navigate. Unless you have an extreme problem with bittersweet, I would recommend using any other non-chemical control.

**If you are considering using chemical control remember:**

Like any weed control method, herbicides will fail if used incorrectly. Herbicide exposure to water resources, the susceptibility of surrounding native plants to the herbicide, and the potential impact of herbicides on soil and wildlife must be considered in choosing the most appropriate product for your particular weed control program. Furthermore, using any herbicide correctly means using:

- **An herbicide which has a label allowing applications on the particular use site;**
- **The correct concentration (rate);**
- **An adjuvant if recommended** (adjuvants are spray solution additives that may make the herbicide more effective);
- **The right application method;**
- **The correct timing to coincide with plant susceptibility.**

*As always with herbicide use, carefully read and follow all use directions and any restrictions or precautions listed on the product label. If in doubt, contact your local extension agent, pesticide dealer, Department of Agriculture, or the herbicide manufacturer for advice or clarification.*



Plant Conservation Alliance: Alien Plant Working Group-  
<http://www.nps.gov/plants/alien/fact/cylo1.htm>  
Invasive Plants of the Eastern US-  
<http://www.invasive.org/eastern/eppc/bittersweet.html>

Systemic herbicides like triclopyr (e.g., Garlon® 3A and Garlon® 4) and glyphosate (e.g., Accord®, Glypro®, Rodeo®) are absorbed into plant tissues and carried to the roots, killing the entire plant within about a week. This method is most effective if the stems are first cut by hand or mowed and herbicide is applied immediately to cut stem tissue. Herbicide applications can be made any time of year as long as temperatures are above 55 or 60 degrees Fahrenheit for several days and rain is not expected for at least 24 hours. Fall and winter applications will avoid or minimize impacts to native plants and animals. Repeated treatments are likely to be needed. In areas where spring wildflowers or other native plants occur, application of herbicides should be conducted prior to their emergence, delayed until late summer or autumn, after the last killing frost occurs, or carefully targeted. If native grasses are intermingled with the bittersweet, triclopyr should be used because it is selective for broad-leaved plants and will not harm grasses. Follow-up monitoring should be conducted to ensure effective control. Glyphosate products referred to in this fact sheet are sold under a variety of brand names (Accord®, Rodeo®, Roundup Pro® Concentrate) and in three concentrations (41.0, 50.2 and 53.8% active ingredient). Other glyphosate products sold at home improvement stores may be too dilute to obtain effective control. Triclopyr comes in two forms – triclopyr amine (e.g., Garlon® 3A, Brush-B-Gone®, Brush Killer®) and triclopyr ester (e.g., Garlon® 4, Pathfinder®, and Vinex®). Because Garlon® 3A is a water-soluble salt that can cause severe eye damage, it is imperative that you wear protective goggles to protect yourself from splashes. Garlon® 4 is soluble in oil or water, is highly volatile and can be extremely toxic to fish and aquatic invertebrates. It should not be used in or near water sources or wetlands and should only be applied under cool, calm conditions.

**Basal bark application**

Use a string trimmer or hand saw to remove some of the foliage in a band a few feet from the ground at comfortable height. To the exposed stems, apply a 20% solution of triclopyr ester (Garlon® 4) (2.5 quarts per 3-gallon mix) in commercially available basal oil with a penetrant (check with herbicide distributor) to vine stems. As much as possible, avoid application of herbicide to the bark of the host tree. This can be done year-round although efficacy may vary seasonally; temperatures should be above 50 degrees F for several days.

**Cut stem application**

Use this method in areas where vines are established within or around non-target plants or where vines have grown into the canopy. Cut each vine stem close to the ground (about 2 in. above ground) and immediately apply a 25% solution of glyphosate (e.g., Accord®) or triclopyr (e.g., Garlon® 3A) mixed with water to the cut surface of the stem. The glyphosate application is effective at temperatures as low as 40°F and a subsequent foliar application may be necessary. The triclopyr application remains effective at low temperatures (<60°F) as long as the ground is not frozen. A subsequent foliar application may be necessary to control new seedlings. Homeowners can apply products like Brush-B-Gone®, Brush Killer® and Roundup Pro® Concentrate undiluted to cut stems. Using a paint brush or a plastic spray bottle, apply herbicide to the cut surface.



# Black Swallow-wort (*Cynanchum rossicum*)

## Look: Perennial

- Twining herbaceous vine with dark green pointed oval leaves about 3-4" long by 2-3" wide occurring in pairs along the stem. Plants have rhizomes (root nodes) that sprout new plants. Grows in clumps of many stems, forming extensive patches. **Flower:** five-petaled star shaped dark purple to almost black with white hairs, about ¼" across, in clusters. **Fruits:** slender tapered pods, 2 to 3" long by about ¼" wide, turning from green to light brown as they mature.

**Issues:** Extremely aggressive and resilient forming dense thickets that overrun native plant communities. Once established, a colony is extremely hard to eradicate. Root fragments left in the soil will re-sprout. Swallow-wort re-sprouts vigorously following any cutting or mowing. There is also concern that monarch butterflies will lay eggs on swallow-wort instead of milkweed; the hatching caterpillars cannot develop on swallow-wort.

## Control: Mechanical

The best method for small patches or for maintenance after reclamation of an area is to hand dig the plants making sure to include as much of the root system and rhizomes as possible. If the Swallow-wort does not have mature pods when pulled then leave the pulled plants out to dry and then compost or mulch the dead plants. If it does, bag the pods before disposal. One possibility is to bag the pods in a paper leaf disposal bag and burn it during the burning season. With larger patches it is important to keep the plants from going to seed. In open areas, mow in July as flowers and/or immature pods are forming. This will allow some plants to re-flower so at least one follow-up mowing will be necessary in August or September (depending on growing conditions). The rhizomes are very hardy though so the more time you let the plant grow, the more energy it can store in the rhizomes and the harder they will become. Multiple mowings after the initial flowering accomplishes two things; it further taxes the reserves in the rhizomes and prevents them from re-seeding. If the patches are in difficult places (i.e. under bushes, in fences) cutting then covering with about 1' of mulch and removing any vines that grow through may be a solution. This will need to be done for 2 or more years.



*Black Swallow-wort flowers are tiny at ¼" across*



*The vines twist upon themselves creating a climbing support.*

***Get it before the pods open!! This happens in the late summer/early fall.***



Careful application of herbicide may also be an option in certain areas. Unless you have an extreme problem with black swallow-wort I would recommend using any other non-chemical control.

**If you are considering using chemical control remember:**

Like any weed control method, herbicides will fail if used incorrectly. Because black swallow-wort thrives in suburban and urban environments as well as natural areas, herbicide exposure to pets, people, and wildlife must be considered in choosing the most appropriate product for your particular weed control program. Furthermore, using any herbicide correctly means using:

- **An herbicide which has a label allowing applications on the particular use site;**
- **The correct concentration (rate);**
- **An adjuvant if recommended** (adjuvants are spray solution additives that may make the herbicide more effective);
- **The right application method;**
- **The correct timing to coincide with plant susceptibility.**

*As always with herbicide use, carefully read and follow all use directions and any restrictions or precautions listed on the product label. If in doubt, contact your local extension agent, pesticide dealer, Department of Agriculture, or the herbicide manufacturer for advice or clarification.*

Two systemic herbicides - Garlon® 4 (triclopyr ester) and Roundup Pro® (glyphosate) – have been found to be effective in controlling swallow-wort. These herbicides should be applied when plants are actively growing, after flowering has begun. DO NOT SPRAY TOO SOON. Avoid the temptation to spray the plants as soon as they emerge in May. Only when the plants flower will they be large enough to receive enough spray on the exposed leaf surface to deliver a killing dose to the roots. Plants that are sprayed before pods form will probably not produce a viable seed crop that season. Be patient. Systemic herbicides do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots. Swallow-wort control may take a few years and it is important not to use more herbicide than is necessary.

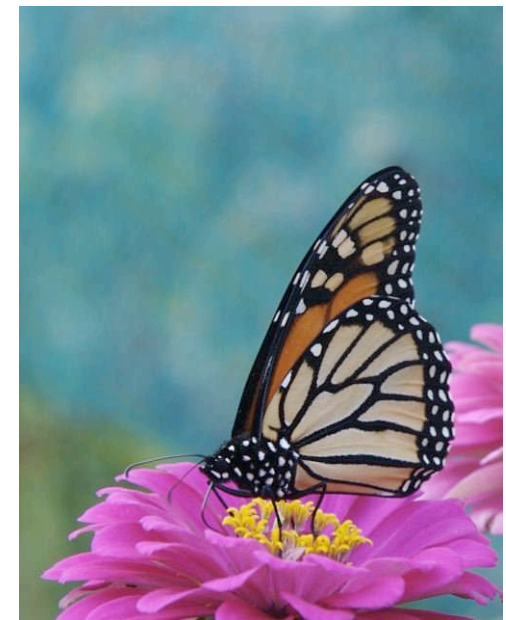
**Cut stem application**

For cut stem applications use a 50 to 100% solution of herbicide concentrate. Roundup Pro® is much more effective than Garlon® 4 for cut stem application. Apply the herbicide solution immediately to cut stem surfaces. As mentioned above with foliar applications, if treated plants have mature pods the seeds may ripen after treatment and disperse, leading to new infestations. If possible, cut plants low and bag and dispose of the portions with pods.

**Foliar application**

Experience shows that foliar sprays of systemic herbicides (i.e., herbicides absorbed into the plant and carried internally) only kill plants in the upper layers of the infestation, requiring repeated applications to effectively control the entire mass. It is important to treat plants before pods begin to form to ensure that viable seeds are not produced. If that is not possible, plants with pods should be cut or mowed first and then sprayed once they regrow. Regrowth will be rapid in summer. Herbicide application to the new growth should be conducted from August through early September. If mowing is not possible, for example in wooded areas, cut plants by hand just below the lowest pods, and spray the new growth. In situations where foliar sprays are undesirable, for example when desirable native plants or other non-targets would be harmed, sponging the herbicide on individual plants, using the same concentration as foliar sprays is an option.

You may be able to hire a **trusted ecological landscaper** to apply the herbicide for you.



Plant Conservation Alliance: Alien Plant Working Group-  
<http://www.nps.gov/plants/alien/fact/cylo1.htm>