

Controlling English Ivy

(*Hedera helix*)

in the Pacific Northwest

Although produced by and the responsibility of The Nature Conservancy, this document grew from a workshop co-sponsored by Metro, The City of Portland Parks, Natural Resources Division, The Society for Ecological Restoration, Northwest Chapter and The Nature Conservancy in February 2002. As well as extensive literature review, the data and field experience of more than 20 individuals and organizations (primarily) from northwestern Oregon went into this document. Funding for the production of this guide and the research that supported it was provided by the Northwest Service Academy of the AmeriCorps and the United States Fish and Wildlife Service. In addition, the Oregon Department of Agriculture and the No Ivy League in Portland, Oregon provided friendly review. Thank you all.

Editors Note: The discussion in this document is specific to *Hedera helix* (English ivy) and not particular named cultivars. Some cultivars apparently behave ecologically like *H. helix* and are likely to respond similarly to the treatments described here, some apparently do not. Because of the risk that other cultivars will prove invasive, the authors urge caution in the use of any ivy cultivars for landscaping. Please seek out and use other landscaping choices.

English Ivy Description

English ivy (*Hedera helix*) is a trailing or climbing vine (**photograph 1 and 2**) belonging to the family Araliaceae (ginseng) and is native to Europe. Brought to North America by colonial settlers, *H. helix* is widely cultivated as ornamental/utilitarian groundcover in the Pacific Northwest (PNW).



Photo 1. Ivy ground cover



No Ivy League, Portland, Oregon

Photo 2. Ivy leaves and viney stems

Because of its' wide planting, climbing habit, and because seeds are spread by birds, ivy has become widespread in natural areas and unmanaged green/open spaces, where it buries native groundcover vegetation (**photograph 3**) and climbs and kills or topples matures trees (**photograph 4**). Because of its great potential to fundamentally change Pacific Northwest forested habitats, English ivy can fairly be called the kudzu of the Pacific Northwest (**photograph 5**).

Vines attach to the bark of trees, brickwork, and other surfaces by way of numerous, small root-like structures, which exude a glue-like substance. Older vines are known to reach a foot in diameter. Leaves are typically dark green, alternate (they alternate sides on the stem) and simple (the leaf is not composed of little leaflets). Juvenile leaves are 3-5 lobed (**photographs 1 and 2**), but mature leaves or leaves in full sun are ovate (roundish) to rhombic (angular but not square)(**photograph 6**).



Photo 3. Ivy smothering native fern

Mature plants produce umbrella-like clusters of greenish-white flowers in the fall (**photograph 7**). The black, berry-like fruit (**photograph 8**), containing a few hard, stone like seeds typically mature in the spring.

Ecological Threat

English ivy is an aggressive invader that threatens nearly all forested habitat types in the northwestern U.S. up to at least 3000' in elevation (900 meters). English ivy cover is rapidly reaching catastrophic levels, especially in urban and near urban areas of the Pacific Northwest.



Photo 4. Ivy toppling native tree



Photo 5. Ivy carpet over forest



Photo 6. Mature ivy leaves

more, the added weight of vines makes infested trees susceptible to blow-over or tip-over, especially during winter storms. English ivy also serves as a reservoir for bacterial leaf scorch (*Xylella fastidiosa*), a plant pathogen that is harmful to native trees such as elms, oaks, and maples.

Once established at a site, English ivy can be expected to move beyond its intended borders into neighboring yards, parks and other lands, either by vegetative means or by seed dispersed by birds.

As habitat for wildlife, a monoculture of ivy is a poor replacement for a diverse native forest understory. Areas dominated by ivy have lower diversity of birds, mammals and amphibians, and appear to be good habitat only for rats. Although some native birds do eat the berries, ivy fruit seems to be preferred mostly by non-native starlings.

Without prompt action, many thousands of trees will be toppled or killed over the next decade in the Portland metro area alone.

Ivy is capable of growing along the ground as well as into the upper forest canopy. The dense growth and abundant leaves, which spring from the stems like small umbrellas, form a thick canopy just above the ground, and prevent sunlight from reaching other plants. Similarly, vines climbing up tree trunks spread out and surround branches and twigs, preventing most of the sunlight from reaching the leaves of the host tree. Loss of host tree vigor, evident within a few years, is followed by death a few years later. Further-



Photo 7. Flowering mature ivy patch



Photo 8. Ripe ivy fruit cluster (purple) and unripe (green)

Despite its propensity for quickly and completely covering the ground, English ivy actually increases erosion problems, especially on steep slopes, since its shallow, sparse root system doesn't provide the deep soil anchoring of mature trees and shrubs.

Basic Ecology

English ivy grows easily in many types of soil, from full sun to complete shade, and once established, is fairly drought tolerant. In the PNW, ivy grows in elevations up to about 3000 feet. In lower elevations, ivy grows throughout the year, although growth may slow or stop during extended drought or during intense cold periods. Ivy reproduces either vegetatively via stolons (root-like stems) or through seeds (**photograph 9**). Roots form when stem nodes contact moist soil, leading to the formation of a dense mat of vegetation. Ivy roots are vigorous resprouters, meaning that a broken root left in the soil will almost certainly grow a new stem. Ivy fruits can be spread great distances by birds. It is unknown whether the seed requires passage through an animal intestinal tract to germinate.

Ivy has two distinct growth phases, the immature, vegetative stage and the mature, fruiting stage. During the vegetative stage, the plant grows rapidly and tends to sprawl across the ground (or climb any available vertical surface - see below). These characteristics are responsible for both the popularity of the plant as an ornamental ground cover, and unfortunately, its threat as an invasive weed. When a vine hits any upright object (trees, shrubs, houses, power or telephone poles, fences, etc...), it climbs, and can even reach the tops of even mature conifers of 300 feet (90 meters), climbing as much as 30 feet (10 meters) per year.

The fruiting stage typically occurs on climbing plants, but may also occur on prostrate patches of sufficient age, especially in full sunlight (**photograph 7**). Because these patches may form thick mats, the ivy essentially climbs on itself to produce upright, fruiting stems. In either case, flowers are produced in the fall and fruits mature in the spring.

Away from established ivy patches, new occurrences result from birds spreading seeds. Regardless of origin, once established in an area ivy cover gradually increases until it eliminates all other ground cover and reduces tree canopy coverage by killing mature trees through a combination of shading and over-weighting. Following the loss of canopy dominant trees, the increase in sun exposure not only increases ivy's ability to produce fruit, but also may allow other less shade tolerant weed species (especially Himalayan blackberry [*Rubus armeniacus* (*R. procerus*, *R. discolor*)] or traveler's joy - old man's beard [*Clematis vitalba*] in our area) to become established.



Photo 9. Ivy seedling

In the end, the results of societal passivity regarding ivy will be extensive loss of shade trees, declines in native flora and fauna, water quality and forest productivity; and increases in erosion, slope failures and landscaping / management costs for private citizens, the forest industry and public agencies alike.

Control Summary

Because there are effective manual/mechanical and chemical control methods, current and future ivy problems are really due to a lack of knowledge, will or money (or all three). Manual options include a variety of approaches to hand-pulling, chopping or digging that, while generally environmentally safe and effective, typically cost from \$2000 to \$8000 per acre even at minimum wage (i.e. 300 to 1300 hours or more of hand removal work per acre). Thus, substantial volunteer work forces are necessary for effective manual control in most situations. There are several effective chemical control options, offering good control 10-20 times less expensive than manual / mechanical methods. Early data suggest that herbicide treatment may slow recovery of native species when compared to manual control, but clearly does not stop it. Currently, there are no effective biological control agents, although goats will defoliate ivy.

Manual Approaches

Manual removal is a safe, effective and generally ecologically friendly but costly method of eradicating local infestations of English ivy. Sampling work conducted by TNC indicates that a carefully executed manual pull can consistently reduce ivy cover from 80% cover or more to 2-6% one year later without follow up treatment, and to 1-2% with a single follow up. Other local groups involved in ivy removal have made similar observations.

Unfortunately, manual control of English ivy is quite expensive (or at least labor intensive). Based on research conducted by The Nature Conservancy (TNC) and The Three Rivers Land Conservancy, as well as more approximate figures reported by other local groups, it typically requires from 300 to well over 1,000 human hours to perform the initial manual clearing on an acre of heavily infested ground. This assumes extensive ivy cover, gently sloped land and moist soil. Lower numbers may result from situations in which there are few or no native plants remaining, or if the ivy cover is not extensive. Higher numbers, sometime substantially higher will result from areas with abundant native vegetation mixed with heavy ivy cover, very steep slopes, dry soil or barriers such as logs and (native or non-native) blackberry. The pulling rate will also be greatly affected by the strength and dedication of the person(s) doing the pulling, root depth and density and soil conditions.

Nearly all sites require at least a second round of clearing to complete the initial restoration, then, annual or bi-annual maintenance to control stubbornly resprouting roots and new seedlings. As mentioned above, the initial pulling usually results in cover values of 2-6% a year after the initial clearing. As a result, depending on your site and the effectiveness of the initial clearing, you should expect the second pulling to still require a substantial commitment of effort or resources. One-percent coverage represents roughly 435 square feet (40 square meters) per acre. Again based on TNC research, follow up treatment will therefore range from 20-60 human hours per acre under typical conditions.

How to pull ivy

General

There are nearly as many strategies for manual removal as there are practitioners, ranging from disorganized grabbing and pulling, to meticulous strand-by-strand removal by well-coordinated teams. Most are variations on the simple concept of pulling up the plant by hand and trying to remove as much of the root as possible while minimizing ground disturbance and harm to remnant native plants. The City of Portland's Ivy Removal Project (No Ivy League) lists more than 20 strategies for groups working together to do manual removal (www.noivyleague.org). The approach you choose will depend on a number of factors including the density of the ivy, how much native vegetation is mixed in with the ivy, whether you are on a steep slope or a flat surface, and whether you are working alone or with a group. Within a group, the temperament and experience of the group will affect the strategy you choose to employ.

The essential elements to efficient, effective ivy removal and long-term recovery of native vegetation are:

- removing as much of the root system as possible,
- minimizing trampling and churning of the soil,
- protecting native plants that are present,
- clearing an area thoroughly before moving on.

Because ivy is both an aggressive resprouting species (it re-grows easily from root fragments) and it has long, relatively fragile roots, it is important to pull the vine at the spot where the root comes out of the ground to get effective control. Ivy roots or series of connected nodes may be continuous over several meters just below the soil surface, and are capable of resprouting from almost any broken root end. At the same time, in order to minimize trampling it is important to avoid repeated walking across the same area while uprooting the plants. Protecting surviving native plants also requires more careful pulling. Working efficiently combines many of these concepts.

Case Study Examples

1. *In areas with no remaining native plants:*

In cases with no remnant native plants it may be helpful to use shovels, digging forks or mattocks to loosen the ivy root systems. The No Ivy League recommends a method they term log-rolling, in which the ivy mat is uprooted and rolled up. The "log" of ivy is rolled up ahead until it is too large to move. It is then cut off and disposed of, either as part of a large pile or moved offsite. Alternatively they pull and scatter the fragments on the ground surface.

2. *In areas with significant remaining native plants:*

A basic approach that works well for TNC is having "ivy pullers" work from a kneeling position (wearing rainpants or using a waterproof pad helps keep things comfortable in the winter). Start by grabbing a single vine and uprooting it only as far as you can reach, then set it aside and grab the next one you can reach. Uproot that one as far as you can and set it aside. When you have cleared/uprooted everything you can reach without moving, shift position and start again. Although it may appear slow and methodical, this technique accomplishes several things very well. It minimizes bending over, which conserves energy and helps prevent back pain. It also increases concentration. In addition, kneeling minimizes walking back and forth, which reduces trampling. It also encourages very thorough work and reduces follow up treatment time. Lastly this approach minimizes damage

to remaining native plants, which reduces the need for replanting. When vines do break off, are cut or are fully uprooted, TNC recommends rolling them up into a crude ball because it makes it easier to tell what has been pulled from what hasn't.

To bag or not to bag

Disposing of pulled ivy becomes an important issue when you consider that there can be more than 10 tons per acre. It can be bagged and hauled off, piled on gurneys and hauled off, piled on site, or scattered on site. The No Ivy League recommends scattering the pulled stems, but others report that this makes site assessment difficult and leads to missing some living, rooted ivy. Bagging adds costs and effort, and removes nutrients from the site. Making piles causes dead spots on the ground and can allow some ivy to re-root, if the pile is not turned. For these reasons we recommend removing ivy if the site is easily accessible and making tall narrow piles if it is not. Where ivy cover is not dense, pulled stems and roots can be scattered and left on site without compromising pulling effectiveness.

Risks of Manual Control

Although careful planning and training help to minimize them, manual control has its own unique side effects. There is no available data that precisely documents the effects of hand pulling. However, some degree of trampling, soil churning, and loss of desirable vegetation is inevitable (**photograph 10**). Native vegetation can be uprooted accidentally, and vegetation and duff (organic material, often with ferns) can be stripped off of rocks. The severe soil disturbance can leave a site vulnerable to surface erosion and to invasion by other weed species.



Photograph 10. Large area of ground manually cleared of English ivy

More than one reviewer mentioned the importance of timing manual removal to minimize effects on native vegetation and wildlife (especially breeding birds and amphibians). In order to minimize damage to native plants and disturbance of local wildlife, some programs (including TNC and ODFW) focus manual control efforts during winter months (approximately November to February). Although this apparently reduces impacts to native plants and animals, many PNW amphibians are active during this time and care should be taken to minimize impacts on them.

Chemical Approaches

The literature reports mixed, but usually incomplete control with growing season application of various over the counter herbicides including triclopyr (Garlon 3a and in many “shrub-killers”), glyphosate (Round-up, Rodeo, Aquamaster, Gly Star) and 2-4 D (too many to list). The waxy layer on the leaves appears to limit many herbicides, especially hydrophilic compounds such as glyphosate, from effectively permeating the leaves. Local experiments done by TNC, City of Portland and Metro, however, suggest that under some circumstances herbicides can provide safe and effective control of ivy, even when applied during winter.

Summary of herbicide literature (*For extensive references on published research on chemical control of ivy, please refer to the websites listed at the end of this document, especially tncweeds.ucdavis.edu*)

In container pots, two applications, one month apart, of 2,4-D (Weedar 64) applied at 1.1 kg/ha (1.0 lb/A) provided control of English ivy. Two applications of glyphosate (Roundup) applied at 4.5 kg/ha (4.0 lb/A) effectively inhibited regrowth and provided some control of mature vines. Regrowth with reduced shoot weight was observed with one treatment of 2,4-D and glyphosate at the rates stated above. The same observation was noted for one or two applications of glyphosate applied at a lower rate of 2.2 kg/ha (2.0 lb/A). Regrowth occurred with plants sprayed with one or two applications of Dicamba (Banvel) or triclopyr (Garlon) at the rate of 0.6 kg/ha (0.5 lb/A). A glyphosate spot application at 25% v/v solution provided good control in one study.

Important Note: FOLIAR APPLICATION RATES FOR RODEO OR AQUAMASTER ABOVE 8% ARE NOT WITHIN CURRENT LABEL GUIDELINES AND ARE THEREFORE NOT LEGAL. THIS EXAMPLE IS GIVEN ONLY TO SHOW THAT SOME OF THE ISSUE WITH GLYPHOSATE EFFECTIVENESS ON IVY HAS TO DO WITH GETTING THE CHEMICAL ABSORBED BY THE IVY PLANT.

Cutting (using a nylon cord weed-eater to cut to the stem surface just before treatment) followed by a 25% solution of glyphosate also provided control of English ivy. Excellent control of *H. helix* that had been cut and then sprayed was achieved with a 2% solution of 2,4-D. A lower rate of glyphosate (2% solution) and cutting provided only slight control. Glyphosate only (2% solution) did not control English ivy. The herbicide triclopyr or mowing alone provided no control. Control evaluations were made 1 year post-treatment.

Recent herbicide research done in Portland

Over the last several years, Metro, the City of Portland and The Nature Conservancy have been (independently) testing herbicides for the control of English ivy within the Portland metropolitan

region. All have found that glyphosate (in either the Round-up Pro or Rodeo formulation) or triclopyr (Garlon 3a) can be extremely effective against English ivy and reasonably gentle on native species when applied during a sunny period during winter (ideally early- mid January). The herbicide is mixed at 2-5% volume / volume (v/v) with the surfactant Li-700 (for glyphosate or near water) or Hasten (for triclopyr) at 0.5 - 1.0% v/v. Control rates above 95% with a single careful treatment are typical. The fatty acid pelargonic acid (sold under the brand name Scythe) can also be added to the mix at 0.5 - 1% concentration to aid herbicide penetration. Even at 1%, but especially at higher rates, it may increase damage to desirable evergreen plants, because it damages plant tissue by disrupting cell membranes.

Recent discussions with a field representative of the herbicide manufacturer Monsanto suggest a 2:1 or greater ratio combination of glyphosate and triclopyr (Garlon 3a, a Dow Agrosiences product), with glyphosate at 2% volume will enhance control of perennial species such as ivy and blackberry compared to glyphosate alone. The same individual points out that Li-700 consistently underperforms other surfactants when used with glyphosate. That said, although several well known and effective surfactants are labeled for aquatic or riparian use, Li-700 is the only surfactant approved by NOAA-Fisheries for use along salmonid bearing waterways, because of its' extremely low toxicity to fish and wildlife. Furthermore, because water may move triclopyr through the soil, it should be used with caution in a broadcast application near surface water when rain is forecast to occur in the near future.

As always, with any herbicide use carefully read and follow application directions and safety information provided on the herbicide label. The label is the law. When in doubt, please contact your local Soil Water and Conservation District or the Department of Agriculture.

How to use herbicides on English ivy

Effectively killing ivy without damaging or destroying resident native vegetation depends on two factors, treatment timing and careful application. This approach will help you maximize delivery of herbicide to ivy roots and minimize delivery to native plant leaves and roots.

Timing - Spray late enough in the late fall / early winter to ensure that most native species are dormant, but soon enough that they are not close to bud break. For most Portland area sites this means December to mid- January, with late January - early February as a fall back. This timing also allows time for ivy leaves to reappear after being temporarily buried by fall leaf drop. At the TNC study site (Camassia Natural Area, West Linn, OR) Indian plum and snowberry are the first to break bud, usually sometime between the last week of January and the first week of February. Because herbicides can be absorbed through the stems or buds it is wise not to push the envelope of activity in the spring.

Spot applications of patches missed during the first winter treatment or applications in areas with no remnant native vegetation can be made during the growing season. It is generally preferable to wait until after the period of maximum vegetative growth (or even post flowering) in order to achieve the most effective translocation (movement) of the herbicide into the roots. Balance this goal with trying to spray before new spring leaves have established a thick waxy coating. These same guidelines may be applied to areas of ivy infestation in which remnant native plants are not a concern.

Application - Spray during a clear day and ideally before another one. If possible, temperatures

should be 65 degrees F or above, but that rarely occurs in winter in this region. Settle for clear and above freezing. These circumstances help ensure that the ivy will be actively growing and will have time to fully absorb the herbicide before rain may wash it off. Spray the herbicide so as to contact the upper surface of as many leaves as possible (and bottom where possible), spraying them to “just wet” or less (avoid dripping). At the same time, carefully avoid getting herbicide on buds, leaves or young stems of evergreen natives, even if it means allowing some ivy leaves to remain unsprayed (a follow up treatment can target those later).



Photo 11. Photograph taken four months after herbicide treatment with 2% Rodeo and Hasten/Scythe solution. Note the native vegetation and spiderwebs within the plot.

What to expect - Winter applications may take a long time to show their effect. At TNCs study site, the full impact of treatments done in late January is not apparent until May (**photograph 11**). Lico-rice ferns and sword ferns are particularly vulnerable to some herbicides and if their protection is important, the applicator should take special care to avoid exposing them to herbicide.

Cost

A careful applicator can treat a typical acre in two to four hours. Depending on ivy density of course, expect each acre to require 5-25 gallons of herbicide solution as described above. This results in total costs in the range of \$100-\$500 / acre assuming \$25-\$100 / hour for operator cost and \$50 / gallon for chemicals. Contracting the work out, steep slopes or otherwise difficult terrain or a high density of native vegetation may slow application and increase the costs. Metro Parks and Greenspaces reports contracted ivy removal to cost \$229 / acre for manual removal from trees at 4.5 feet above ground and an additional \$309 (including chemical cost) for follow-up spraying as described above.

Integrated Approaches

Manual, mechanical, grazing or mowing methods can be effectively combined with herbicide treatment. For example, herbicides can be used to spot spray resprouting ivy vines following an initial hand clearing, presumably targeting the roots that are most resistant to hand removal, and reducing the total volume of herbicide necessary.

Defoliation (mowing or grazing) followed by allowing the plants to resprout new leaves will raise the

ratio of young (thin wax layer on the leaf) to old leaves (thick wax layer) and increase the plants' uptake of herbicides and thus presumably increase treatment effectiveness. This approach will, however, also reduce the total leaf area, thereby reducing the amount of herbicide that can potentially be translocated to the plant roots. Depending on the presence and density of native vegetation, follow-up treatment can be done either as soon as 2-3 leaves form on each stem or the following winter as described above.

Alternatively, hand-pulling can follow herbicide application. This can be especially useful in areas around remnant native vegetation that may not have been sprayed effectively in order to protect the natives from herbicide drift.

Best Management Practices

It can not be over-emphasized; there is no single "best" method. Apply the tools that are available based on your specific ecological goals and the resources you have available. Nevertheless, we have broken the ivy control world down to the following general categories and offer the following as recommended "best practices," combining ecological and economic concerns.

Areas of ivy monoculture:

Unless there is a particularly strong non-ecological reason for using manual control (i.e. you have a lot of volunteers or a site in which herbicide use is prohibited), areas devoid or nearly devoid of native ground cover should be treated using herbicides or an integrated herbicide - manual approach rather than strictly manual approaches. In this case it is simply difficult to justify the high cost of manual removal when **a**) there is little chance for non-target impacts of the herbicide and **b**) there are so many acres of ivy infested forest that need attention.

If done carefully, an initial winter treatment using either 2-5% v/v solution of triclopyr or glyphosate (or both) as described above can provide 95% control or better in a single treatment with little impact to scattered remnant perennial vegetation. Follow-up treatment can be either a second herbicide application or spot manual removal done at least 6 months but up to a year after the initial treatment. Because the ivy takes several months to die, planting can begin as soon as the first fall after the first treatment. If performed carefully, follow-up "spot" treatment with herbicide or hand removal can be done with negligible impact to any planted native vegetation.

Planting the site as soon as possible with native vegetation should be strongly considered. Seeding with native grasses to stabilize the soil surface, then planting in with shrubs and trees is a good strategy.

Dense ivy with scattered native vegetation:

As in the worst-case scenario example above, in these situations an herbicide-based approach can protect most of the remaining native perennial vegetation and effectively control the ivy, while controlling project costs. Integration with manual control by spraying very carefully around individual native plants or patches of more intact vegetation will improve the survival of remnant native vegetation.

In some cases, at least some replanting of native species should be included in the treatment plan

(especially on steep slopes), although you may be surprised at how fast remnant native vegetation can increase in cover once the competing ivy is removed (**photograph 11**).

Dense ivy patches within substantial native vegetation:

If an integrated approach is chosen, the balance should be tipped towards manual approaches, with herbicide use limited to careful spot treatment of locally dense infestations of ivy.

Planting should be necessary only on a spot basis in most cases. A very rapid increase in native vegetation following ivy removal where there is substantial native vegetation in place at the time of treatment is typical.

Light ivy cover within a native matrix:

This is the ideal time to use an all-manual approach. Because remnant native species will quickly occupy growing space, there should be very little need for replanting. Furthermore, volunteers will be extremely gratified to **a**) clear a large area in a few hours and **b**) leave the area looking really good instead of stripped bare. Winter is a good time for this approach because the ivy's green leaves are more conspicuous when other vegetation is dormant.

Additional Resources

www.noivyleague.org

The website of the City of Portland's Ivy Control Project (No Ivy League). Full of information on ivy control with a strong focus on community education, manual control and protection of mature trees.

tncweeds.ucdavis.edu

The home of The Nature Conservancy's Invasive Species Program. Contains an extensive and well-referenced literature review of ivy control methods. Also contains extensive information about herbicides, adjuvants and weed control equipment.

www.nps.gov

Website of the National Park Service, get a national perspective from the federal government.