**Best Practice suggestions for Ivy (English, Atlantic, and Persian ivy): Draft March 30, 2024**

**Tree ivy**

1. Regarding ivy “survival rings,” an herbicide-free, manual control method is to cut tree-ivy vines around the tree during the spring growth period, May and June, possibly July. The classic technique is to cut all vines at chest height and a second cut low to the ground, peeling the vines off the tree for tree hygiene and to ensure no vines were missed (or can regraft) as can happen with one-cut methods. During spring growth, sap flow is upward from the roots, where a cut vine will “bleed out,” diminishing root reserves, and letting the tops “wither on the vine.” In localities where deer browse keeps ivy leaves from photosynthesizing, the organically-cut vine may eventually starve and die. In localities without deer, there is the likelihood that vines at the base of the tree will remain alive to regrow and reinfest the tree.
2. The classic two-cut survival ring is slow and labor intensive. The most efficient control to kill both the roots and tops of tree ivy is to inject “old growth” tree-ivy vines with Copperhead/imazapyr shells. For professional practitioners, treat them similarly and, if possible, at the same time as invasive tree sweeps that can be lanced any time of year. Lance vines greater than 1.5 inches in diameter, or a shell every 4 inches on larger vines. For the uninitiated, injection shells are actual .22 caliber bullet casings with herbicide gel instead of gunpowder. There is an “EZ-Ject” lance engineered for easy applications, but shells may also be hand-tapped into the cambium, just inside the bark.
	1. Diamondback/glyphosate (the second of two choices for EZJect shells) don’t seem to be nearly as effective, but likely have less chance of off-target effects.
		1. I’ve never seen any off-target issues to trees or surrounding vegetation from tree-ivy treatments with either imazapyr or glyphosate. I theorize that it’s hard to over-apply herbicide at label rates because the ivy plant is deceptively larger than its vine diameter suggests, given much of the ivy network is almost a separate epiphytic plant with adventitious roots (bristle brush hairs) independently gleaning water and nutrients from the tree trunk and canopy. Nonetheless, ivy retains its vascular connections as a network that shares resources where needed, helping it thrive in any conditions (sun, shade, wet, dry) as it relentlessly seeks fertile ground. This network enables systemic applications to be highly effective.
			1. There are limited cases where roots share systemic herbicides through root grafts (alder) or root suckers (locust), but these off-target translocations are mostly through the same interconnected species. However, I once observed cross-species damage through (I theorize) root exudates when I injected glyphosate into knotweed and the surrounding ivy also died. Many plants’ roots exude nutrients and moisture to soften up soil for root growth and to attract protective microbes, so systemic herbicides may be present in root exudates.
				1. Adventitious roots of ivy don’t penetrate a tree’s bark, therefore any exudates tainted with herbicide should not be a threat through healthy bark. Even if actual roots established in rotting trunks and debris, any tainted exudates shouldn’t have access to a tree’s live vascular system or have a significant effect on a much larger tree.
				2. Where ivy’s actual roots touch down near the base of the tree, a tree’s primary roots usually have more protective bark than fibrous feeder roots, so there should not be significant uptake of herbicide-tainted exudates. The vast majority of herbicide is spent on the target at proper label rates, so it’s important not to overapply imazapyr due to its mobility and efficacy. In the case of glyphosate, most exudates would be chemically bound by minerals in the soil (until glyphosate breaks down into inert elements, usually within months).
	2. After lancing (injecting) large vines, wait a season to allow time for the herbicide to systemically affect both roots and tops, reducing seed production and potentially translocating herbicide to grafted ivy vines too small to inject (this needs to be studied). Follow up 6-plus months later with detail cut & treat sweeps for live ivy vines at the same time as typical secondary sweeps for missed holly/laurel/hawthorn, etc. See below.

**Piggybacking on sap-flow**

1. If injecting, aim shells into the vine close to the tree since you can’t inject the back (tree) side of the vine, and because there may be more sap flow near the moist interface of vines that cling to the trunk and glean water flowing down the tree.
2. If not injecting, the best timing for cut & treat applications for tree vines is fall and winter on dry days (mid-Sept to late March, before spring leaf growth in April/May). The reason being is that evergreens actively photosynthesize in winter and absorb atmospheric moisture via its very dispersed leaf canopy. Its adventitious roots also glean water and nutrients from funnel-shaped deciduous trees (Bigleaf maple and Red alder) that offer winter sunlight. Maple especially concentrates stormwater down the trunk, so much so that Bigleaf maple opportunistically sends its own roots up it own trunk in rainforests (warranting caution with herbicide in these conditions). Given that relative water availability is from the canopy of the plant-network, sap-flow is generally downward in fall and winter, Sept to as late as March to build plant reserves for the spring flush. Hydro-phobic soils may not have recharged until late winter and therefore aren’t the primary water resource until spring. The timing of fungal contributions of water & nutrient resources to plants may also play a role and deserves study.
	1. Note that this fall/winter timing for cut & treat application on the bottom cut of the vine will kill the ivy roots, but not necessarily the tops until a summer of desiccation.
		1. I’ve observed that the canopy of properly-cut survival rings can survive as an epiphyte through a normal summer drought cycle if there are humid conditions in a shady wetland – even without setting root in the crotch of a rotting trunk.
	2. If you haven’t previously lanced vines large enough to set seed, then you should treat both the bottom and top half of the cut vine in a cut &treat application in hopes that there’s upward sapflow to hinder seed production. Take 20 seconds to observe how well herbicide soaks in, and note how different weather conditions change evapotranspiration and the rate of intake on both sides of the cut. Fruiting vines change to a rounder leaf shape, most often seeding when growing vertically. It’s difficult to carry an injection lance during cut & treat applications, but it’s possible to carry and hand-tap shells into vines too onerous to saw (I tap shells at a 15-degree (to level) angle, theorizing that this near-horizontal angle allows sap to more easily emulsify the herbicide gel inside the shell. I avoid tapping shells perpendicular to the vine, because a slight angle gives a greater chance of tapping directly into the cambium layer of the vine’s vascular system.
		1. I have observed downward sap-flow all winter as late as Mar 31 when contract budgets necessitated a “one-cut & treat survival ring” (contrary to the classic “two-cut” survival ring cut at breast height and the base of the tree).
			1. One-cut survival rings *with herbicide* effectively double efficiency.
	3. Sap flow in the spring growth-flush is upward April-May-June (in the northwest U.S.), and therefore not effectively herbicide-treatable until July, but more effectively treated if you wait until September.
		1. I’ve seen tree-ivy vines cut in summer (as late as August) exude orange sap (“self-rinsing” from the lower portion of the cut, washing herbicide from the cut-stump and not intaking herbicide to the roots). This happens when summer evapotranspiration is active and sap-flow generally upward, although I don’t know whether the xylem (upward sapflow) and phloem (downward sapflow) may be simultaneously active depending on relative water availability (atmospheric vs. ground moisture) and the timing of growth cycles.
	4. Note that “cut-stump” (cut & treat applications) treatment of vines, trees, or blackberry stems is usually done with concentrated products with 40-50% active ingredient (for professional, licensed practitioners) of imazapyr or triclopyr. Concentrated glyphosate (18-50% a.i.) can be used (compared to the 2% active ingredient often found in over-the-counter consumer products), but municipalities are phasing out glyphosate due to public concerns. These concentrated products may be diluted 1:1 with water for half-strength 25% applications. Aquatic versions (available only to licensed professionals) of glyphosate tend to “bead up” when applied to cut stumps and therefore benefits from an added trace amount of surfactant to help penetrate into fresh cuts (apply herbicide within a couple minutes of the cut, or ASAP particularly in dry sunny conditions). Professionals usually add food coloring to herbicide so off-target mishaps are visible and can be washed off the applicator, or an errant touch of herbicide to a desired plant can be pruned to avoid uptake.
		1. My preferred applicator bottles are 2 oz. Nalgene dropper bottles (more precise, but tends to gum up requiring a safety pin to unclog), or, 4 oz. Grout Sealer brush applicator bottles.
			1. Vertical cuts of ivy vines with a handsaw enable easier application of herbicide with a dropper bottle. One half of a cut vine can be treated, then pressed together to wet both the upper and lower cut. With horizontal cuts, gravity makes it harder to wet the upper portion of the cut.
		2. For very large vines, avoid chain saws that can damage and kill the tree. Mini-chainsaws are more precise, but require eye protection and face shield. Still, it’s prudent to finish the last bit of cut with a handsaw. Chainsaws create a gap between cuts that make it harder to press vines together, requiring a handsprayer to wet both sides of cuts, too close and risky to the applicator. Better to not use any chainsaw to avoid injuring trees, and to avoid facial injuries. Best to EZ-Ject (lance) large vines and use a handsaw or handclips for smaller vines.
3. Classic “survival rings” with two cuts at chest and ground heights, plus grubbing ivy vines in a radius around trees is, in my view, an old-school practice originating in the volunteer community having free labor.
	1. I consider classic two-cut survival rings with grubbing to be labor-inefficient and also ineffective. Manual practices cause repetitive-use injuries, particularly to smaller body-types.
		1. Grubbing ivy roots at the sensitive base of a tree is risky to the health of the tree given potential damage to tree roots intertwined with ivy. Where deer browsing is prevalent, vines seem to atrophy and pull out easier at the tree base. But, any missed ivy root fragments remain a “forever problem” with sprouting leaves too small for dilute foliar sprays to affect a larger root fragment.
		2. I also have concerns that manual grubbing of vines at the base of the tree disturbs soil in an area that may have heightened deposition of atmospheric pollution from a large volume of tree leaf canopy than concentrates down the trunk (professional practitioners generally utilize chemical methods to avoid erosion, thereby retaining the soil sponge and filter for tainted stormwater, perhaps all the more important at the base of the tree).
4. Thicker vines larger than pencil or pinky-size aren’t affected by typical foliar sprays, where herbicide works on a molecule to cell ratio (if I’m not mistaken). Like invasive trees, thicker ivy vines need to be cut & treated with a concentrated herbicide.

There’s a distinctly different regard for large “old growth” ivy and ground ivy. Large vines are considered to be like invasive trees, requiring injections or concentrated cut stump applications (foliar sprays don’t affect large vines). Expansive areas of carpeting ground ivy (with spaghetti-size vines) are treated with foliar sprays.

**Spraying Ground ivy**

1. Foliar sprays of carpeting ivy are not effective until July after full leaf expansion when photosynthesis is more fully active and sending carbs to the roots. Newer leaves have a softer/thinner cuticle that may allow better foliar spray penetration, but rootward sap flow in July may not be as strong as in the fall.
	1. The spray season is generally summer/fall, July – October but potentially throughout winter to March if temperatures are above 42F and reach at least 50F during some part of the day (according to Oregon’s BMP’s, the 2020 Integrated Weed Maintenance calendar (<https://4ccwma.files.wordpress.com/2020/11/2020-invweed-calendar-nov2020.pdf>). Autumn is prime time to spray, but low temps, dew, and forest leaf-drop need to be worked around.
		1. Autumn sprays on warm-enough days should metabolize the herbicide into ivy, but the plant may not present die-off until the growth period in the following April/May. This is good for erosion prevention in winter, and ivy leaf-drop in spring adds mulch benefits and perhaps nitrogen to soil.
2. It may not be cost effective to spray carpeting “ivy deserts” if the reinvasion rate is too high due to nearby invasive seed sources (“seed rain” within a “seed shed”). In these cases, one-cut-&-treat survival rings (with herbicide) should be combined with a 5-ft radius foliar spray of ground ivy around the tree in the proper season. This saves the tree, reduces local seed production, and slow ivy’s regrowth back up the tree.
	1. Broadcast foliar sprays of larger ivy deserts (negating the need for a radius spray) can be aggressive if the seed bank is primarily native, tolerating some off-target “collateral damage” in favor of thorough eradication of infestations. This will probably take repeat applications with skilled applicators who can avoid native plants. Without those skills, a layperson could transplant select native plants into pots, managing water and sun to keep them alive until planting out after the broadcast herbicide applications.
		1. It’s often good to spray early in a contract period to see an application’s effectiveness, and then follow up later to catch missed patches.
			1. Following budget cycles, Jan-March might be a good first spray (warm/dry weather permitting) when other native vegetation is dormant and less susceptible to off-target damage. Die-off should show by May/June, then follow-up sprays can be done in summer and fall, July-October.

**Sandblasting**

Sandblasting is the idea that carefully-calibrated abrasive material can blast away unwanted paint/rust/corrosion, yet leave the desired item intact. Similarly, careful choices and measured dilutions of herbicide can better affect target plants while minimizing effects to intermixed desired plants.

1. This is best illustrated with ivy encroaching on a snowberry patch. It’s easy to foliar spray ivy underneath a snowberry patch and not worry about effects through leafless snowberry stems.
	1. This may not be true with triclopyr esters (Element 4, Garlon 4, Garlon 4 Ultra), where these products are used in basal bark applications (at 15 – 25% a.i.) that are intended to penetrate through bark into the cambium.
		1. So, 3 -4% triclopyr sprays may not be strong enough to affect hardwood stems, but triclopyr amines (Element 3A or Garlon 3A) or triclopyr choline (Vastlan) may have less chance of off-target basal bark effects.
	2. The volatility of triclopyr esters seems to affect Osoberry more than other plants, perhaps due to its respiring lenticels.
	3. Choose triclopyr amine or choline in wetland situations (ivy amongst salmonberry patches), but this requires a full 2% of Agri-dex surfactant to penetrate through the leaf cuticle, plus maxing the recommended percentage of herbicide (typically 4%). Be patient for Vastlan to show effects.
2. Ivy in sword ferns: Herbicide translocation in ground ivy (how far does the herbicide effectively travel in the vine beyond the treated portion) may affect efforts to kill vines intermixed with fern leaves.
	1. Ivy is a dispersed plant and can therefore accumulate herbicide in the network, even if a vine or two are missed.
		1. This may be less true in July applications where there seems to be little effect on vines in a fern plant, but more effective with October foliar applications that may have better kill of ivy in ferns given more pronounced rootward sap flow (and hopefully more horizontal sap exchange through adjacent network vines).
			1. I have tried a cut & treat grid (every 4 feet) of prostrate ivy in July, with little translocation.
3. Ivy in sunny exposures: Ivy’s leaf cuticle in sunny exposures is thicker and less receptive to sprays, requiring the addition of a “penetrant” into the herbicide-surfactant mix.
	1. Pelargonic acid has been suggested, but potentially risks severe eye damage at higher concentrations.
		1. There’s an Ortho consumer product with 0.47% imazapyr and 5% pelargonic acid, suggesting a tested dilution rate for pelargonic acid. This consumer product alone may work well enough on ivy, but imazapyr’s mobility is an issue during rain periods.
	2. I recently tried Acetic acid (regular vinegar) on ivy in a southern exposure, with a mix diluted to: 4% Vastlan, 2% Agridex, and 1.7% acetic acid. There seemed to be a precipitate despite only 1 gallon of vinegar diluted in a 3-gal backpack, so there may be chemical reasons to use pelargonic acid.
	3. Apparently, pelargonic acid is only available industrially by-the-barrel. So, a question to consider is whether the Ortho product (with 0.47% imazapyr and 5% pelargonic acid) would be effectively added to a 3-4% triclopyr spray (plus usual 2% surfactant) in sunny conditions (?).
	4. Whip & Drip in sunny exposures: this jargon describes string trimming ivy followed by an herbicide spray to get herbicide into the plant via open cuts on scored vines. There could be basal-bark type penetration through vines with leaves removed and vines more exposed.
		1. I’ve heard recommendations of a 25% glyphosate spray after the string trimming, but this intuitively seems a little hot, and expensive. I’ve tried 12% glyphosate and trace surfactant with good results, with the added benefit of being able to plant shortly after a glyphosate application, not the case with triclopyr and less so with imazapyr.
		2. Ester versions of triclopyr (Element 4, Garlon 4, or Garlon 4 Ultra) should work well with Whip&Drip, both through open cuts and basal bark penetration. I’m guessing a lower basal bark concentration might work fine, perhaps 5 – 10% dilution, with 1-2% added surfactant (the recommended surfactant available to wetland-licensed professionals is “Agri-Dex.”

**Ivy Species**

1. Atlantic ivy (Hedera hibernica) is difficult to manually pull because stems often break, resulting in regrowth from root fragments. I therefore tend to spray Atlantic ivy aggressively despite off-target damage, knowing that manual detail follow-up doesn’t work well and return maintenance doesn’t always happen.
2. Persian ivy (Hedera colchica) seems susceptible to foliar spray, perhaps due to a thinner cuticle with its propensity to grow and therefore be planted in shady environs.

**History of local evolving practices:** We began ivy sprays in Seattle starting with a “4-2-2 Portland mix” proposed by practitioners in Oregon: 4% glyphosate, 2% triclopyr, 2% surfactant. This mix is still recommended in Oregon’s BMP’s. Glyphosate has its benefits, but for better or worse, practitioners must pragmatically take into account public opinion as part of the restoration ecosystem and phase out glyphosate.

* 1. Locally in Seattle/King County, the ivy foliar formulations have evolved to a least a 3 to 4% triclopyr concentration, but usually a 4:2 mix of triclopyr: surfactant percentage (sans glyphosate).
	2. According to Oregon’s BMP’s (<https://4ccwma.files.wordpress.com/2020/11/2020-invweed-calendar-nov2020.pdf>):
		+ 1. “Triclopyr formulas: Triclopyr ester is used very little, requiring cool temperatures and larger distances to water. Triclopyr amine (or salt) was the predominant formulation for some time, as Element 3A and Garlon 3A. The amine formulation works very quickly on herbaceous species and remains critical for some species. It has a signal word of “Danger” for severe eye damage. Triclopyr choline was introduced in 2016 in Vastlan and has been useful for some treatments, especially winter ivy. It appears to be slower and/or less effective, especially when a quick kill is needed. It has a signal word of “Warning,” for substantial eye damage. Treatments in the calendar do not currently distinguish between the amine and choline formulations.”
		1. I have personally noticed 4% Vastlan to be slow and less effective, requiring patience to see effects. Municipalities require access to eye wash stations when pouring and diluting concentrated Garlon 3A, but a good idea with Vastlan as well (eye protection always!).

**Summary of suggestions** (to double professional efficiency and reduce re-invasion rates):

1. Prioritize invasive tree sweeps, including tree-ivy and fruiting ivy, as the first phase in a site.
	1. Lance large ivy vines and invasive trees with Copperhead/imazapyr shells
		1. This reduces seed production
		2. Creates jobs in the off season
		3. Gives time to translocate herbicide to tree root suckers and ivy’s smaller grafted vines before cut&treat follow-up phases in summer/fall.
2. Reform the classic “two-cut” survival ring plus manual grubbing.
	1. If not injecting, practice “one-cut-&-treat” survival rings with concentrated herbicide (Sept. through winter to March).
	2. Instead of grubbing around a tree, spray ground ivy in a 5-foot radius around an infested tree (if not sheet-spraying an entire site of carpeting ivy) in the appropriate season (July – October).

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