INTEGRATED WEED MAINTENANCE FALL 2020

Statement of Intent

The calendar is now 5-years-old: Time for some changes!

Originally written for Metro's use in managing its natural areas, the calendar is now available to a wider audience of professional land managers. The 4-County Cooperative Weed Management Area (CWMA), of which Metro is an active member, now hosts the weed calendar as part of its Technical and Scientific Review Committee. As host, the Technical Committee will review and update the calendar annually.

If you are new to the calendar, the calendar's intent is to provide the best treatment method and timing for professionals. We also intend these "best treatments" to act as a starting point, which would apply to 80% of sites, as considered by Portland's invasive species management community. These recommendations are not intended to be comprehensive, for all conditions and situations. Other factors may lead a manager to vary these recommendations or choose another strategy altogether. You, the professional in the field, are in the best position to say when that happens.

Two additional notes: this list of species reflects Metro's original priorities. It does not necessarily reflect any other organizations' priorities, capacity or regulatory targets, although the overlap with other lists is substantial.

Also, the treatments reflect a tendency toward managing larger (>1/4 acre) sites. For this reason, there may be bias away from manual or mechanical treatments. These strategies might actually work better on smaller sites: your judgement takes precedence.

Finally, in addition to the treatment calendar based on species, we provide a discussion of complex topics, a summary list of species, and an integrated calendar based on treatments.

As noted above, all of these documents will be reviewed annually, allowing for shifts in conditions and prevailing views. Goodness knows, if anyone is used to constant change, it's a land manager!

Good luck and be safe out there…

Mitch Bixby
Fall 2020

Background

The treatment calendar was originally created by Metro, in response to a 2013 funding levy. That levy focused exclusively on stewardship, with specific goals of reducing maintenance costs and protecting habitat quality through effective weed management. The calendar was based on the King County Weed Management Calendar, with King County's permission.

Notes from the editor

The revision of this calendar has proved both enlightening and complicated. Much has changed in the world of environmental management since King County (WA) first released its well-known and highly respected *Weed Management Calendar* in 2003. Years later and many miles south in Portland (OR), methods and views continue to evolve. As old methods are tested over time and new species of concern arrive, changes are needed. A range of managers, from sizable government organizations to 2-person contracting firms, now have substantial and varied experience with these species. Perhaps most remarkable has been the overall consistency in treatment recommendations. Still, there has been a variety of input, which has been difficult to synthesize. In several cases, it seemed important to present the discussion for the consideration of land managers. In the case of winter treatments, which CAN be effective while minimizing damage to native flora and fauna, we have included three tabs with more detail regarding technique. Please take time to become familiar with the nuances presented there.

The following topics should be considered by professionals using this calendar:

• **Surfactant:** Varies amongst organizations, but commonly used surfactants include Syltac, MSO, 'R11 (aq), Agridex (aq), LI-700 (aq), and Competitor (aq). The surfactant is frequently cited as having significant effect, either positive or negative, on the effectiveness of the active ingredient. Effectiveness of particular rates continues to be a matter of discussion. While 1% (or, alternately, 1 oz./gallon) has been the accepted rate for the last 10 years, there is curiosity about and some support for, the effectiveness of 0.25-0.5% surfactant rates. The State of Washington is required to compile information on surfactants/adjuvants. We recommend Washington's fact sheet as a reasonably up-to-date resource (www.techlinenews.com/herbicides/2018/spray-adjuvants-registered-for-use-on-aquatic-sites-in-washington).The parenthetical (aq) indicates regular use in streamside buffers as of February 2014.

• **Nesting season:** Nesting season is by far the source of most comments. There was substantial concern that May–June was too short and should be extended to at least April 15 – July 31, with argument made for March 1 – September 1. There were other, simultaneous concerns that the recommended restriction of the cutting window removes a potentially necessary tool. So, the description of the cutting window represents an attempt at striking a balance. Weigh carefully all factors before cutting brambles and woody shrubs between April and August. The City of Portland has information about avoiding bird impacts at **www.portlandoregon.gov/bes/77851**.

• **Interchangeability:** Many species appear to respond as well to triclopyr [ester or amine salt] as glyphosate. Comments were made that many species appear to respond just as well to one active ingredient as to the other. Reasons for recommending a particular active ingredient (besides effectiveness) would include already using that ingredient on other species on that site; limiting effects on particular functional group (for example, using triclopyr to avoid targeting grasses); imminent seed set (choosing triclopyr); or minimizing risks to crews, especially eyes (choosing glyphosate).

• **Aminopyralid:** Be aware of the difference between Milestone (40.6% aminopyralid) and Capstone [formerly Milestone VM+] (2% aminopyralid AND 16% triclopyr amine). Milestone 0.2% solutions [0.25 oz/gal] are effective for some non-annual dicots. Know the other potential side effects of aminopyralid, including possible impacts on trees and its capacity to remain the soil with pre-emergent effects.

• **Imazapyr & Knotweed:** There has been discussion about potential pre-emergent effects of imazapyr. Reports from the field, though, are not seeing this effect, so more organizations are now using low rates of imazapyr as their default

herbicide in treating knotweeds. While it may not outright kill plants, it does consistently knock it back for more years than glyphosate. NOTE: The rate used will depend on the product:

Alligare and Habitat contain different concentrations of active ingredient. Consult the label for mixing rates.

• **Mixing:** Combining herbicides, especially triclopyr and glyphosate, can lead to a precipitate forming ("white sludge"), which can clog sprayer nozzles. Be sure to add triclopyr first, then glyphosate, then surfactant. Follow all mixing instructions on product labels."

• **Cut stump, girdle, and frill ["hack and squirt"]:** Generally these can be effective all times of year, but some times are better than others and some species respond better than others. Pay particular attention to "self-rinsing" in late winter/early spring as newly-running sap can wash herbicide off the stump.

• **Frilling and tree-of-heaven (Ailanthus altimissima):** No tree species is more problematic or more difficult to kill. Cut/stump and girdling seem not to be effective. Frilling (vertical hatchet cuts spaced around the base, followed by 50-100% triclopyr) is now considered the most effective treatment.

• **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.

Fall and Winter Herbicide Applications

Controlling Weeds within Desirable Vegetation and Extending the Treatment Season

Killing invasive weeds without harming remnant native vegetation is the Holy Grail for restoration. Without species-specific herbicides, we have to rely on exploiting differences in phenology, sensitivity, and uptake; careful application; and being content with doing more good than harm (as well as mitigating the harm and always considering non-chemical approaches as part of practicing Integrated Pest Management). Depending on the target species, fall and winter applications can be used effectively to limit impacts to many of our native deciduous and ephemeral species while still delivering effective weed control.

Be aware of the following factors when applying herbicide in fall or winter:

Flexibility in response to good spray conditions

Here in the Portland area, we generally have several multi-day dry periods scattered through our famously wet autumns and winters. Successful herbicide use during this time generally requires temperatures above 42°F (preferably 50°F for at least part of the day). Because moisture on leaves will dilute herbicides, and rain or heavy fog after can wash them away, allow a day of dry weather before application and 1-2 days afterwards for full uptake. Because it is difficult to accurately predict these "windows of opportunity" quick response by applicators can maximize production during these fleeting periods.

Adapting tank mixes for winter conditions

Many of our evergreen broadleaf weeds (English ivy, Vinca, laurel etc…), develop a progressively thicker cuticle layer during the summer. By fall or winter, these leaf conditions, combined with slow growth rates, mean applicators must make allowances to get herbicides into plants and to translocate them effectively to the roots. Strategies to consider include keeping herbicide rates low (2%) and increasing the use of adjuvants, including surfactants, penetrants and uptake enhancers such as foliar nitrogen. However....

Careful application (true in growing season too!)

Although many of our native forbs and shrubs are either dormant or underground by late October, they can still be harmed or killed by herbicide contact with their stems, especially when oil-based herbicides or surfactants are used. This becomes increasingly true as buds swell in advance of bud-break in late winter. Because increased adjuvants are generally necessary in winter to achieve good control (see above), careful application is necessary to avoid non-target affects.

Knowledge of site ecology

For all sites, a good understanding of what native or otherwise desirable vegetation is persisting is necessary to develop the most effective treatment approach. The forb layer, especially ephemeral forbs such as trillium, false Solomon's seal etc. or any winter annuals, are both the hardest to detect and the hardest to restore. Timing pre-treatment site visits for when ephemeral species are visible and exploring within dense weed patches should be considered a best practice.

Patience with treating larger landscapes

Finally, if you have a large area to treat during fall and winter, it may require multiple years before enough treatment days accumulate. As with many things patience is a virtue.

Situations where fall and winter application may be most useful:

- Wherever there is a substantial mix of native and non-native vegetation.
- When you have more to get done than you can during the "normal" season.
- When manual control is not feasible.

Species and methods for fall and winter herbicide application

SPECIES	APPLICATION GUIDELINES	COMMENTS
English or Irish ivy *(Hedera sp.)*	Increasing surfactant rate and/or adding penetrants (e.g. Scythe) and uptake enhancers (e.g. Bronc) may improve control.	Wait for deciduous leaves to settle down through the ivy "canopy" in fall to begin treatment. This strategy can also backfire if leaves fail to settle as intended.
Himalayan and evergreen blackberry *(Rubus sp.)*	Keeping herbicide rates down to 2% may improve total translocation to roots.	Wait for onset of fall rains to end drought induced dormancy.
Holly *(Ilex sp.)*, laurel *(Prunus laurocerasus and other sp.)* and others weedy trees *(Prunus sp., Crataegus etc.)*	Effectiveness of late-winter/early spring treatments may vary as sap starts running.	Some suggest covering stump with plastic or a stump "cookie" to prevent rain from washing herbicide off.

Herbicide treatment of English ivy

Of all the species in this calendar, English and Irish ivies have been the most difficult to assign precise management recommendations. Even the most experienced land managers have learned somewhat different lessons about timing, and effects, particularly as regards to existing native flora. Preserving existing native cover ranges from important to critical, depending on several factors as discussed below. There is real potential for doing serious environmental harm in spraying ivy, and its prevalence on the landscape means managers will be faced with this dilemma often.

Excluding impacts on native vegetation, *Hedera* species, as well as other broadleaf evergreen weeds like *Vinca*, can be effectively treated with foliar applications of herbicides during much of the year in the Pacific Northwest. There are at least two situations when the risks of spraying may outweigh potential benefits. They are:

- Spring growth, when chemical treatment will probably kill vine leaders, but not kill the plant. Risks to existing natives go up substantially in spring.
- Fall under substantial deciduous cover, when many ivy leaves are "protected" by recently fallen leaves

There is disagreement about spraying dry sites in late summer. Some have seen poor herbicide translocation caused by drought-stress, and consider it a third scenario to avoid spraying. Others find late summer sprays are slow-acting but very effective and include it in the annual treatment calendar.

Treatment timing and technique are most appropriately determined by assessing the density of both target species and desirable vegetation. In all cases, managers must weigh the value of protecting existing natives against the costs of a) less efficient treatment or b) additional planting to replace lost native vegetation. Furthermore, because nearly all ivy infestations require 2 or more years for effective control regardless of treatment approach, a manager with time might combine treatments (chemical + handpull, for example) and accept more gradual progress that typically yields more effective control and increased protection of native vegetation.

High ivy cover – high native cover:
This is the most difficult scenario because the remaining native vegetation presents both high replacement costs and high ecological value. Late summer/early autumn is when many natives are returning nutrients to their roots, making them potentially more vulnerable to herbicide. On the other hand, leafless stems are harder for crews to see, leading to possibility of damage in winter sprays. In these situations, there is disagreement on how best to minimize damage to native cover. If your leaning is to avoid risk of spraying senescing leaves, then late October – early February is generally favorable for most native shrubs (ferns excepted). If your leaning is to avoid risk of spraying leafless stems, then a July-late October window is considered optimal. In all situations, the existing native flora will determine the ideal treatment window. Applicators should be ready to exploit any period of two or more dry days with temperatures above 42°F. Applicators should also consider adding adjuvants such as nitrogen or a higher rate of penetrant – surfactants to increase uptake. Some loss of native vegetation should still be expected even with careful spot spraying.

High ivy cover – low native cover:
Where native vegetation is scarce, and especially where substantial replanting is planned, treatment should focus on efficiency and managers should budget for replacing the minimal collateral damage with additional planting. Take time in spring to note which plants are growing under ivy mats, and when. Knowing this will inform future treatments. Applicators should avoid significant pockets of native vegetation or even large individuals, which can be the focus of targeted spraying or hand-pulling the following year. The easiest treatment window includes the period

immediately following spring growth and extends to late summer/early autumn or whenever leaf fall hides ivy leaves.

Low ivy cover – high native cover:
Similar to "high ivy - high native" (described above), treatment should focus on protecting native vegetation by exploiting favorable treatment windows and careful application. While the risk of significant native mortality is likely lower due to lower overall herbicide volumes, special care should still be taken. Careful application, including avoidance, can mitigate some treatment effects during vulnerable periods for natives. Treatments should lean heavily towards spot-spray, rather than broadcast; managers should consider integrating hand removal into treatment for these situations.

Low ivy cover – low native cover
This situation is likely found under dense tree canopies, such as young conifer forests. Because of the low risk of overspray on natives, treatment should focus of effective ivy treatment.

Herbicide treatment of weedy blackberry

Weedy blackberry presents substantial challenges to clear, unambiguous management recommendations. Like ivy, the question "what works best on blackberry?" inspires a range of strategies, all well-reasoned and supported by years of experience. This range revolves mostly around timing, though to a lesser degree than ivy. Again, preserving existing native cover ranges from important to critical, depending on several factors, discussed below. There is real potential for doing serious environmental harm in spraying blackberry, and its prevalence on the landscape means managers will be faced with this dilemma often.

Apart from the real ecological concerns about effects on breeding birds, weedy *Rubus* species (and many other broadleaf evergreen weeds) can be effectively treated with foliar applications of herbicides during much of the year in the Pacific Northwest. In general, it is best to avoid spraying between spring emergence and early fruit set; chemical treatment will generally kill off new growth, but not kill the plants.

There is disagreement about spraying dry sites in late summer. Some have seen poor herbicide translocation caused by drought-stress, and consider it another scenario in which to avoid spraying. Others find late summer sprays very effective, taking advantage of the same process (sensescence) that causes concern for native plants, and have made a regular practice of late-summer/early autumn blackberry sprays.

Treatment timing and technique are most appropriately determined by assessing the density of both target species and desirable vegetation. In all cases, managers must weigh the value of protecting existing natives against the costs of a) less efficient treatment or b) additional planting to replace lost native vegetation. Furthermore, because nearly most weedy plant infestations require multiple years for effective control regardless of treatment approach, a manager with time might combine treatments (cutting + spraying, in particular for blackberry) and accept the slower progress that often results in more effective long-term control and increased protection of native vegetation.

High weed cover – high native cover

This is the most difficult scenario because the remaining native vegetation presents both high replacement costs and high ecological value. Late summer/early autumn is when many natives are returning nutrients to their roots, making them potentially more vulnerable to herbicide. On the other hand, leafless stems are harder for crews to see, leading to possibility of damage in winter sprays. In these situations, there is disagreement on how best to minimize damage to native cover. If your leaning is to avoid risk of spraying senescing leaves, then late October – early February is generally favorable for most native shrubs (ferns excepted). If your leaning is to avoid risk of spraying leafless stems, then a July-late October window is considered optimal, especially when paired with a spring/early summer cuts. Prior cuts can minimize total blackberry cover, thus minimizing spray and risk of sidekill. In all situations, the existing native flora will determine the ideal treatment window. Applicators should be ready to exploit any period of two or more dry days with temperatures above 42°F. Applicators should also consider adding adjuvants such as nitrogen or a higher rate of penetrant – surfactants to increase uptake.

High weed cover – low native cover

Where native vegetation is scarce, and especially where substantial replanting is planned anyway, treatment should focus on efficiency and managers should budget for replacing the minimal collateral damage with additional planting. Take time in spring to note which plants are growing under can thickets, and when they're growing. Knowing this will inform future treatments. Applicators should avoid significant pockets of native vegetation or even large individuals, which can be the focus of targeted spraying or hand-pulling the following year. The easiest treatment window includes the period immediately following spring growth and extends to late summer/early autumn.

Low weed cover – high native cover
Similar to "high weed - high native" (described above), treatment should focus on protecting native vegetation by exploiting favorable treatment windows and careful application. While the risk of significant native mortality is likely lower due to lower overall herbicide volumes, special care should still be taken. Careful application, including avoidance, can mitigate some treatment effects during vulnerable periods for natives. Treatments should lean heavily towards spot-spray, rather than broadcast; managers should consider integrating hand removal into treatment for these situations.

Low weed cover – low native cover
This situation is likely found under dense tree canopies, such as young conifer forests. Because of the low risk of overspray on natives, treatment should focus of effective blackberry treatment.

Species List with Treatment Summary

MANUAL: Handpull, weedwrench, or dig
MECHANICAL: Mow, cut, weedwhip, or chainsaw
NR: Not recommended
Most species respond to manual/mechanical for small (<100sf) patches

COMMON NAME	SPP CODE	SPECIES NAME	NOTES, WARNINGS, AND CAVEATS	REFERENCE	LIKELY TREATMENTS FOR LARGE SCALE			
					MANUAL	MECHANICAL	CHEMICAL	BIOCONTROL
Bittersweet nightshade	SOLDUL	*Solanum dulcamara*			X		X	
Black locust	ROBPSE	*Robinia pseudoacacia*	Be sure to chemically treat cut stumps			X	X	
Butterfly bush	BUDDAV	*Buddleia davidii*			X		X	
Clematis	CLEVIT	*Clematis vitalba*	Watch for native Clematis ligusticifolia			X	X	
Common reed	PHRAUS	*Phragmites australis spp. australis*	Watch for Scirpus microcarpus			X	X	
Drooping sedge	CARPEN	*Carex pendula*	Be aware of native lookalikes				X	
False-brome	BRASYL	*Brachypodium sylvaticum*	Observe good boot/tire hygiene after being at these sites.		X		X	
Garlic Mustard	ALLPET	*Alliaria petiolata*	Followup spray and followup handpull are essential; observe good boot/tire hygiene after being at these sites.		X	NR	X	
Geraniums	GERLUC; GERROB	*Geranium lucidum, G. robertianum*	Multiple followups needed. Sorry. Observe good boot/tire hygiene after being at these sites.				X	
Goatsrue	GALOFF	*Galega officinalis*	Current spray options having mixed success				X	
Goutweed	AEGPOD	*Aegopodium podagraria*					X	
Hawkweeds	HIEAUR	*Hieracium aurantiacum, et al.*				X	X	
Hawthorne (English)	CRAMON	*Crataegus monogyna*	Girdle/frill much less effective than cut stump			X	X	
Hedge bindweed	CALSEP	*Calystegia sepium*	No strong treatment recommendations were given		X		X	

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					MANUAL	MECHANICAL	CHEMICAL	BIOCONTROL
Himalayan blackberry	RUBARM	*Rubus bifrons (armeniacus), R. lacinatus*	Take precautions during nesting season if spring cutting is essential			X	X	
Holly (English)	ILEAQU	*Ilex aquifolium*	Be sure to chemically treat cut stumps			X	X	
Ivy (English/Irish)	HEDHEL	*Hedera helix, H. hibernica*	Wide variety of effective times, generally tied to the site's natives			X	X	
Knapweed: Spotted, Meadow & Diffuse	CENMAC, etc.	*Centaurea maculosa, C. pratensis, C. diffusa*	Biocontrols present for meadow knapweed				X	
Knotweeds: Japanese, Giant, Himalayan, and hybrid	POLCUS	*Polygonum cuspidatum, P. bohemicum, P. sachalinense*	May require shift in herbicide after 3-4 years; biocontrol recently approved.		NR	NR	X	
Laurel (English) and Portuguese (P. lusitanica)	PRULAU	*Prunus laurocerasus*				X	X	
Lesser celandine	RANFIC	*Ranunculus ficaria*	All plants must go to trash; possibly surrounding soil, too		X		X	
Milk thistle	SILMAR	*Silybum marianis*	Biocontrol (Rhinocyllus conicus) bad for native thistles				X	X
Norway maple	ACEPLA	*Acer platanoides*					X	
Pennyroyal	MENPUL	*Mentha pulegium*					X	
Poison hemlock	CONMAC	*Conium maculatum*	Observe good boot/tire hygiene after being at these sites.			X	X	
Pokeweed	PHYAME	*Phytolacca americana*					X	
Policeman's Helmet	IMPGLA	*Impatiens glandulifera*			X	NR	X	
Purple loosestrife	LYTSAL	*Lythrum salicaria*	Leave for biocontrol if possible			X		X

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COMMON NAME	SPP CODE	SPECIES NAME	NOTES, WARNINGS, AND CAVEATS	REFERENCE	LIKELY TREATMENTS FOR LARGE SCALE			
					MANUAL	MECHANICAL	CHEMICAL	BIOCONTROL
Reed canarygrass	PHAARU	*Phalaris arundinacea*	Perhaps more than any species here, RCG depends heavily on on-site water levels			X	X	
Rush skeleton-weed	CHOJUN	*Chondrilla juncea*	Biocontrols available				X	
Scots broom	CYTSCO	*Cytisus scoparius*			X	X	X	X
Spurge laurel	DAPLAU	*Daphne laureola*	Response to herbicide varies		X			
Sweet cherry	PRUAVI	*Prunus avium*				X	X	
Tansy ragwort	SENJAC	*Senecio jacobaea*	Leave for biocontrol if possible					X
Teasel	DIPFUL	*Dipsacus fullonum*				X	X	
Thistle (bull, Canada)	CIRVUL; CIRARV	*Cirsium vulgare, C. arvense*	Biocontrols mixed success west of the Cascades			X	X	
Thistle (Italian, slender-flowered)	CARTEN	*Carduus pycnocephalus, C. tenuiflorus*	Tends to flower 2-3 weeks ahead of Canada & takes longer to set seed			X	X	
Tree-of-heaven	AILALT	*Ailanthus altissima*	Be sure to chemically treat cut stumps. See frilling discussion in *Notes from the Editor*.			X	X	
Vinca	VINMAJ	*Vinca major, V. minor*				X	X	
Yellow archangel	LAMGAL	*Lamiastrum galeobdolon*	Current spray options having mixed success			X	X	
Yellow-flag iris	IRIPSE	*Iris pseudacorus*	Screen downstream for fragments if using manual treatment		X		X	

Weed Maintenance Calendar by Species

Please note: This weed maintenance calendar is intended to be general guidelines for use by restoration or vegetation management professionals who are working to limit the impact of invasives on natural area restoration projects. For each weed, each row represents one management approach. When using herbicides, always follow the label of the product being used. Herbicide suggestions in this document should not be followed if they contradict the label on the product being used. Make sure to follow all local, state or federal regulations that apply to the particular project site. It is most effective to use an integrated vegetation management strategy. **Always make sure that the benefits of the activity outweigh the impacts.**

				WINTER			SPRING			SUMMER			FALL		
				December	January	February	March	April	May	June	July	August	September	October	November
DT	*Acer platanoides*	NORWAY MAPLE	Life cycle					*Leaves emerge*	*Flower*	*Seeds*	*Leaves*				
			Manual or mechanical	Weed wrench smaller (<2" diameter) stems while soil is moist. Will require regular followup.											
			Chemical	Cut stump w/ 50% triclopyr						Cut stump w/ 50% triclopyr					
PH	*Aegopodium podagraria*	GOUTWEED	Life cycle					*Leaves emerge*		*Flower*	*Seeds*	*Leaves (year-round in some cases)*			
			Manual or mechanical					If handpulling, get all roots, and put in garbage							
			Chemical								4% glyphosate or 2% triclopyr				
DT	*Ailanthus altissima*	TREE-OF-HEAVEN	Life cycle						*Leaves emerge*		*Flower*	*Fruit*	*Leaves*		
			Manual or mechanical	Weed wrench smaller (<2" diameter) stems while soil is moist. Will require regular followup.											
			Chemical	Frill only w/ 50-100% triclopyr. Cut stump/girdle is ineffective.						Frill only w/ 50-100% triclopyr. Cut stump/girdle ineffective on this species.	2% triclopyr		4% glyphosate		
"B"H	*Alliaria petiolata*	GARLIC MUSTARD	Life cycle	*Rosettes*				*Flower*		*Seeds form*	*Seeds viable*			*Rosettes*	
			Manual or mechanical					When handpulling, get all roots. Avoid in late summer.			Don't pull when seedpods are dry				
			Chemical				2% glyphosate possible for rosettes	2% glyphosate (1st treatment)		1% triclopyr (2nd treatment)	Don't spray once seedheads start filling in			2% glyphosate possible for rosettes	
PG	*Brachypodium sylvaticum*	FALSE-BROME	Life cycle					*Plants emerge*		*Seedheads emerge*	*Flowering*	*Seeds viable/present*			
			Manual or mechanical							Cut seedheads		Cut/bag seedheads			
			Chemical										2% glyphosate; remove seed first		
DS	*Buddleia davidii*	BUTTERFLY BUSH	Life cycle					*Leaves emerge*			*Flowering*		*Flower/Seed*		
			Manual or mechanical	Weed wrench smaller (<2" diameter) stems while soil is moist. Will require regular followup.											
			Chemical	Cut stump w/ 50% triclopyr						Cut stump w/ 50% triclopyr					
PH	*Calystegia sepium*	HEDGE BINDWEED	Life cycle					*Plants emerge*		*Flower*	*Seeds*	*Leaves*			
			Manual or mechanical												
			Chemical								4% glyphosate or 2% triclopyr				
PH	*Carduus pycnocephalus & C. tenuiflorus*	ITALIAN & SLENDER-FLOWERED THISTLES	Life cycle				*Leaves emerge*		*Flowering*		*Seeds*		*Leaves*		
			Manual or mechanical					Handpull							
			Chemical					2% triclopyr or 0.2% [.25oz/gall] aminopyralid							
PG	*Carex pendula*	DROOPING SEDGE	Life cycle				*Leaves emerge*		*Flowering*		*Seeds*		*Leaves*		
			Manual or mechanical					Handpull							
			Chemical								2% glyphosate				

Weed Maintenance Calendar by Species

				WINTER			SPRING			SUMMER			FALL		
				December	January	February	March	April	May	June	July	August	September	October	November
PH	*Centaurea maculosa, C. pratensis, & C. diffusa*	SPOTTED, MEADOW & DIFFUSE KNAPWEEDS	Life cycle					*Rosettes*		*Flowers*			*Rosettes*		
			Manual or mechanical												
			Chemical												
			Biocontrol												
PH	*Chondrilla juncea*	RUSH SKELETON-WEED	Life cycle												
			Manual or mechanical												
			Chemical												
			Biocontrol												
PH	*Cirsium arvense*	CANADA THISTLE	Life cycle												
			Chemical												
			Biocontrol												
BH	*Cirsium vulgare*	BULL THISTLE	Life cycle												
			Chemical												
			Biocontrol												
PV	*Clematis vitalba*	OLD MAN'S BEARD/ TRAVELER'S JOY	Life cycle												
			Manual or mechanical												
			Chemical												
H	*Conium maculatum*	POISON HEMLOCK	Life cycle												
			Manual or mechanical												
			Chemical												
DT	*Crataegus monogyna*	ENGLISH HAWTHORN	Life cycle												
			Manual or mechanical												
			Chemical												
DS	*Cytisus scoparius*	SCOTS BROOM	Life cycle												
			Manual or mechanical												
			Chemical												
			Biocontrol												
ES	*Daphne laureola*	SPURGE LAUREL	Life cycle												
			Manual or mechanical												
			Chemical												
H	*Dipsacus fullonum*	TEASEL	Life cycle												
			Manual or mechanical												
			Chemical												

Life cycle
Rosettes
Flowers
Rosettes

Manual or mechanical
Dig up; in compacted soils will need to use fork tool or digging knife; most effective when soil is moist

Chemical
2% triclopyr + 0.5% aminopyralid [Milestone]

Biocontrol
Larinus seed weevils active

Life cycle
Bolt
Flowers
Seed

Manual or mechanical
Dig up; in compacted soils will need to use fork tool or digging knife; most effective when soil is moist

Chemical
2% triclopyr + 0.5% aminopyralid [Milestone]

Biocontrol
Gall midge &/or gall mites result in discolored/malformed stems; stems die back from root moth.

Life cycle
Plants emerge
Flower
Seeds
Leaves

Chemical
2% triclopyr or 0.2% [.25oz/gall] aminopyralid
Spray will not inactivate seedheads

Biocontrol
Stem weevil & stem gall fly active in growing stems. Seed head weevil Rhinocyllus conicus active--but attacks natives, not recommended.

Life cycle
Rosettes
Plants emerge
Flower
Seeds
Leaves
Rosettes

Chemical
2% triclopyr or 0.2% [.25oz/gall] aminopyralid
Spray will not inactivate seedheads

Biocontrol
Seed head gall fly in developing seed heads. Seed head weevil Rhinocyllus conicus active--but attacks natives, not recommended.

Life cycle
Leaves emerge
Flower
Seeds

Manual or mechanical
Handpull seedlings

Chemical
4% glyphosate + 2% triclopyr [followup w/ 50% glyphosate cut stump]

Life cycle
Rosettes
Bolting
Flower
Seeds
Leaves
Rosettes

Manual or mechanical
Digging possible for small patches

Chemical
2% triclopyr

Life cycle
Leaves emerge
Flowers
Fruit
Leaves

Manual or mechanical
Weed wrench smaller (<2" diameter) stems while soil is moist. Will require regular followup.

Chemical
Cut stump w/ 50% triclopyr [girdling not effective]
Cut stump w/ 50% triclopyr [girdling not effective]

Life cycle
Leaves emerge
Flowers
Seeds
Leaves

Manual or mechanical
Weed wrench smaller (<2" diameter) stems while soil is moist. Will require regular followup.
Pull small plants, weed wrench large plants
Cut mature stands with saws or other tools

Chemical
2% triclopyr or glyphosate for new seedlings

Biocontrol
Seed beetle & seed weevil adults active on blooms, larvae feed in seedpods, emerge as new adults when pods dry.

Life cycle
Leaves evergreen
Flowers
Berries ripening
Berries viable
Leaves evergreen

Manual or mechanical
Dig up as much root as possible while soil is moist

Chemical
Triclopyr on cut stump; 2% glyphosate +1% triclopyr may be effective foliar option.

Life cycle
Rosettes
Leaves
Flower
Seeds

Manual or mechanical
Handpulll

Chemical
2% triclopyr

Weed Maintenance Calendar by Species

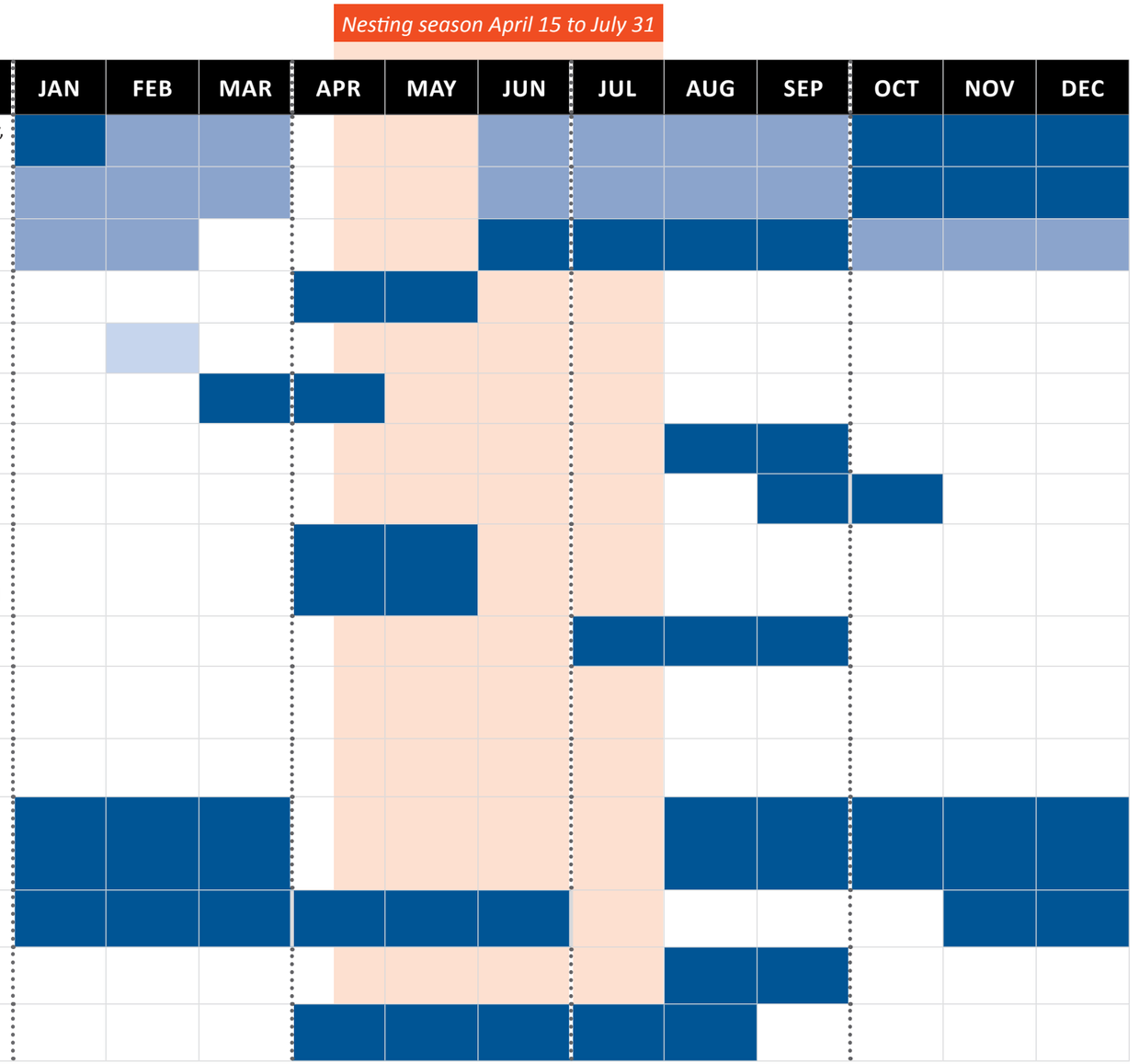
				WINTER			SPRING			SUMMER			FALL		
				December	January	February	March	April	May	June	July	August	September	October	November
PS	*Galega officinalis*	GOATSRUE	Life cycle					*Plants emerge*		*Flower*	*Seeds*	*Leaves*			
			Manual or mechanical	Effectiveness untested											
			Chemical						2% triclopyr + 0.5% glyphosate as 1st treatment	2% triclopyr as 2nd treatment					
H	*Geranium robertianum, G. lucidum*	HERB-ROBERT & SHINY GERANIUM	Life cycle				*Plants emerge*		*Flower*	*Seeds*	*Leaves*				
			Chemical				2% triclopyr								
EV	*Hedera hibernica, H. helix*	IRISH/ENGLISH IVY	Life cycle	*Fruit*			*Leaves evergreen*						*Flower*		
			Manual or mechanical	Cut/dig effective whenever soil is moist											
			Chemical								4% glyphosate + 2% triclopyr [followup w/ 50% glyphosate cut stump]				
PH	*Hieracium aurantiacum, H. vulgare, H. pratensis*	HAWKWEED SPP.	Life cycle				*Rosettes*		*Bud/Flower*		*Flower/Seed*				
			Manual or mechanical				Dig up including roots and runners								
									Remove and discard flowers						
							Cover with landscape fabric or black plastic								
			Chemical				2% triclopyr								
ES/T	*Ilex aquifolium*	ENGLISH HOLLY	Life cycle	*Leaves evergreen*					*Flower*		*Fruit*				
			Manual or mechanical	Weed wrench small patches while soil is moist. Will require regular followup											
			Chemical	Cut stump w/ 50% triclopyr or glyphosate						Cut stump w/ 50% triclopyr					
H	*Impatiens glandulifera*	POLICEMAN'S HELMET	Life cycle					*Plants emerge*		*Flower*		*Flower/Seed*			
			Manual or mechanical							Pull or weed whack before seeds mature; compost on tarps					
			Chemical						For large patches, spray with 2% glyphosate						
PH	*Iris pseudacorus*	YELLOW-FLAG IRIS	Life cycle					*Plants emerge*	*Flowers*		*Seeds*		*Leaves remain*		
			Manual or mechanical								Remove seedheads and floating plants; dig shoreline if possible				
			Chemical						1% imazapyr				1% imazapyr or 5% glyphosate		
PH	*Lamiastrum galeobdolon*	YELLOW ARCHANGEL	Life cycle				*Leaves emerge*		*Flowers*		*Seeds*		*Leaves*		
			Chemical						2% triclopyr						
PH	*Lythrum salicaria*	PURPLE LOOSESTRIFE	Life cycle						*Plants emerge*		*Flower*	*Flower/Seed*	*Seed*		
			Manual or mechanical								Pull small plants; cut large plants at base				
			Chemical								2% glyphosate or triclopyr				
			Biocontrol						Leaf beetles, seed head weevil & root weevil active on plants, vulnerable to disturbance.						
H	*Mentha pulegium*	PENNYROYAL	Life cycle					*Plants emerge*	*Flower*	*Seeds*	*Leaves*				
			Manual or mechanical					None recommended (dig small patches)							
			Chemical					2% glyphosate [aquatic]							
PG	*Phalaris arundinacea*	REED CANARYGRASS	Life cycle				*Leaves emerge*			*Flower*	*Seeds*	*Leaves*			
			Manual or mechanical								mow/flail instead of 1st spray				
			Chemical				2% glyphosate on new growth					2% glyphosate (followup, esp. to mow/flail)			

Weed Maintenance Calendar by Species

				WINTER			SPRING			SUMMER			FALL		
				December	January	February	March	April	May	June	July	August	September	October	November
PG	*Phragmites australis var. australis*	COMMON REED	Life cycle					*Plants emerge*			*Flower*	*Seeds*	*Leaves*		
			Manual or mechanical				none suggested								
			Chemical									2% glyphosate (+0.5% imazapyr, if possible)			
H	*Phytolacca americana*	POKEWEED	Life cycle							*Plants emerge*		*Flowers*		*Fruit ripens*	
			Manual or mechanical							Dig early or cut stems regularly				Clip and bag berries	
			Chemical							2% triclopyr				4% glyphosate	
PH	*Polygonum cuspidatum, P. sachalinense, P. polystachyum, P. cuspidatum x sachalinense*	JAPANESE, GIANT, HIMALAYAN & HYBRID KNOTWEEDS	Life cycle					*Plants emerge*	*Rapid growth*		*Flower*		*Seed*		*Canes die back*
			Manual or mechanical								Cut to set-up spray				
			Chemical									spray when about 3ft: glyphosate, triclopyr or imazapyr			
												2% glyphosate or triclopyr, or 1% imazapyr, esp. on yellow leaves. Bent, unbroken stems translocate effectively.			
DT	*Prunus avium*	SWEET CHERRY	Life cycle					*Flower*	*Leaves emerge*	*Fruit*	*Leaves*				
			Manual or mechanical	Weed wrench while soil is moist. Will require regular followup											
			Chemical	Cut stump w/ 50% triclopyr						Cut stump w/ 50% triclopyr					
ES	*Prunus laurocerasus*	ENGLISH LAUREL	Life cycle	*Leaves evergreen*					*Flower*	*Fruit*	*Leaves evergreen*				
			Manual or mechanical	Weed wrench while soil is moist. Will require regular followup											
			Chemical	Cut stump w/ 50% triclopyr						Cut stump w/ 50% triclopyr					
PH	*Ranunculus ficaria*	LESSER CELANDINE	Life cycle		*Rosettes*		*Flowers*	*Seeds*							
			Manual or mechanical		Remove bulblets, tubers, & surrounding soil and put in garbage										
			Chemical		2% glyphosate until mid-season										
ES	*Rubus bifrons (armeniacus), R. lacinatus*	HIMALAYAN BLACKBERRY	Life cycle					*Leaves emerge*		*Flower*	*Fruit*		*Leaf die-back*		
			Manual or mechanical					Cut	Use care during nesting season (April 15-July 31)			Cut			
			Chemical								2% triclopyr				
BH	*Senecio jacobaea*	TANSY RAGWORT	Life cycle				*Rosettes*		*Bud/Flower*	*Flower*		*Flower/Seed*	*Seed/Rosettes*	*Rosettes*	
			Manual or mechanical				Dig up rosettes if soil is moist			Pull and bag flowering stems			Dig up rosettes if soil is moist		
			Chemical				2% triclopyr						2% triclopyr on rosettes		
			Biocontrol	Flea beetle larvae feed on roots				Flea beetle adults feeding. Cinnabar moth/larvae on plants May-July (not recomm. for E. OR).						Flea beetle eggs on rosettes	
PH	*Silybum marianum*	MILK THISTLE	Life cycle	*Rosettes*			*Bolt*			*Flower*		*Seeds*		*Rosettes*	
			Manual or mechanical				Mow or handpull before flowers fully develop; pair with native seeding.					Litter/full veg layer prevents seedlings from establishing.			
			Chemical				2% triclopyr								
			Biocontrol						Seed head weevil Rhinocyllus conicus active--but attacks natives, not recommended.						
H	*Solanum dulcamara*	BITTERSWEET NIGHTSHADE	Life cycle						*Leaves emerge*	*Flower*	*Fruit*	*Leaves*			
			Manual or mechanical						Dig while soil is moist						
			Chemical					2% triclopyr							
EV	*Vinca major, V. minor*	VINCA	Life cycle	*Leaves evergreen*						*Flower*	*Seeds*	*Leaves evergreen*			
			Chemical								4% glyphosate + 2% triclopyr				

When and How to Treat Invasive Species

	TREATMENT	SEASONAL	TARGET SPECIES
1	**Cut stump**		black locust*, butterfly bush, clematis, English hawthorn, English holly, English laurel, ivy*, Norway maple, sweet cherry*, tree-of-heaven*
2	**Girdle/spray**		black locust*, butterfly bush, English holly, English laurel, Norway maple, sweet cherry*, tree-of-heaven*
3	**Frilling**		tree-of-heaven
4	**Aminopyralid**		Centaurea spp., rush skeletonweed, thistle
5	**Glyphosate**	Winter	lesser celandine
		Early spring emergents	pennyroyal, reed canarygrass+
		Late summer	drooping sedge, phragmites, purple loosestrife, reed canarygrass
		Fall	false-brome, garlic mustard, knotweed, pokeweed, yellow-flag iris
6	**Triclopyr**	Spring broadleaf	bittersweet nightshade, garlic mustard, geraniums, goatsrue, hawkweeds, poison hemlock, policeman's helmet, Scots broom sprouts, tansy ragwort, teasel, thistle—all species, yellow arch-angel
		Late summer broadleaf	Himalayan blackberry—after cut, knotweed
7	**Mix: Glyphosate (4/2/1%)**		clematis**, English/Irish ivy**, goutweed, hedge bindweed, spurge laurel, vinca
8	**Mix: Triclopyr (2/1/1%)**		goatsrue
9	**Mechanical: Cut**		Centaurea spp., false-brome, Himalayan blackberry, reed canarygrass, rush skeletonweed, Scots broom, yellow-flag iris reed canarygrass
10	**Mechanical: Pull**		garlic mustard
11	**Mechanical: Mash**		Himalayan blackberry
12	**Biocontrol**		purple loosestrife, rush skeletonweed, Russian knapweed, tansy ragwort



When and How to Treat Invasive Species

1. CUT STUMP	50% triclopyr amine, no surfactant
English hawthorn	
English holly	100% on resprouts
English laurel	
Norway maple	
butterfly bush	
sweet cherry*	*following year foliar with 2% triclopyr or glyphosate, as necessary
black locust*	*following year foliar with 2% triclopyr or glyphosate, as necessary
tree-of-heaven*	*following year foliar with 2% triclopyr or glyphosate, as necessary
ivy**	**pair airgapping (ie cut stump) with 4/2/1% mix
clematis**	**pair airgapping (ie cut stump) with 4/2/1% mix

2. GIRDLE SPRAY	50% triclopyr amine (girdle) OR 15-25% triclopyr ester (bark spray), no surfactant
English holly	
English laurel	
Norway maple	
butterfly bush	
sweet cherry*	*following year foliar with 2% triclopyr or glyphosate, as necessary
black locust*	*following year foliar with 2% triclopyr or glyphosate, as necessary
tree-of-heaven*	*following year foliar with 2% triclopyr or glyphosate, as necessary

3. FRILLING	Vertical hatchet cuts spaced around the base, followed by 50-100% triclopyr
tree-of-heaven	

4. AMINOPYRALID (SEE NOTES)	Spray foliage: 0.2% aminopyralid (Milestone™ 0.25oz/gal), 1% triclopyr, 1% surfactan
Centaurea spp.	
rush skeletonweed	
thistle	Italian/slender-flowered precede other species by 2-3 weeks

5. GLYPHOSATE	
WINTER	2% glyphosate to mid-season, 1% surfactant or dig all bulblets into trash, don't sift
lesser celandine	
EARLY SPRING EMERGENTS	2% glyphosate, 1% surfactant
reed canarygrass+	+flail/mow in July is good setup if practical
pennyroyal	

5. GLYPHOSATE (CONTINUED)	
LATE SUMMER	2% glyphosate, 1% surfactant
reed canarygrass	2nd spray
drooping sedge	
phragmites	+0.5% imazapyr, if possible
purple loosestrife	
FALL	2-4% glyphosate, 1% surfactant
knotweed	[Year 3+: 2% triclopyr / 1% surfactant or Scythe]
pokeweed	berries in trash, if possible
yellow-flag iris	
false-brome	
garlic mustard	rosettes

6. TRICLOPYR	
SPRING BROADLEAF	2% triclopyr amine, 1% surfactant
teasel	
thistle—all species	
policeman's helmet	
poison hemlock	
geraniums	
yellow archangel	
hawkweeds	
Scots broom sprouts	
bittersweet nightshade	
tansy ragwort	
garlic mustard	in late May
goatsrue	in late May
LATE SUMMER BROADLEAF	2% triclopyr amine, 1% surfactant
Himalayan blackberry after cut	
knotweed	

7. MIX: GLYPHOSATE (4/2/1%)	4% glyphosate, 2% triclopyr amine, 1% surfactant
English/Irish ivy**	**pair with airgapping (ie cut stump)
clematis**	**pair with airgapping (ie cut stump)
vinca	
spurge laurel	
hedge bindweed	
goutweed	

8. MIX: TRICLOPYR (2/1/1%)	2% triclopyr, 1% glyphosate, 1% surfactant
goatsrue	

9. MECHANICAL: CUT	
Himalayan blackberry	start new growth for summer triclopyr amine
reed canarygrass	reduce thatch / break stems for spray; july set-up for summer spray
Scots broom	release seed bank for spring (or summer) triclopyr amine
false-brome	in june
yellow-flag iris	cut seedheads in June
Centaurea spp.	cut seedheads in April/May
rush skeletonweed	cut seedheads in April/May

10. MECHANICAL: PULL	
garlic mustard	in June

11. MECHANICAL: MASH	
Himalayan blackberry	set-up option for an immediate summer triclopyr spray

12. ACTIVE BIOCONTROL	
tansy ragwort	manage only small patches, as necessary
rush skeletonweed	manage only small patches, as necessary
Russian knapweed	manage only small patches, as necessary
purple loosestrife	manage only small patches, as necessary