

Some herbicide recommendations for Invasive Species

From various sources and Purdue Forestry and Natural Resources Researchers

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Definitions loosely explained:

- **Growing season:** From bud break to leaves turning yellow. On average April through October.
- **Dormant season:** From leaf fall to just before bud break. On average November through March.
- **Calibration:** The process required before spraying any herbicide! A function of **volume** coming out of the sprayer during a given **time** and the **area** that you are able to cover during that time period. There are several techniques to calibrate a sprayer-contact your local extension agent.
- **Foliar application:** The application of a herbicide solution to the leaves of a plant to include the leaves beyond the outer layer during the growing season. Varying application rates per acre dependant on application device and carrier. Commonly given as a unit of measure per acre (e.g. pint per acre) but can be given as a percent solution (e.g. 3% solution). A surfactant should be used at 0.25% (follow the labels of surfactant and herbicide being used) of the total solution unless herbicide is surfactant loaded. Most invasive species have **very waxy leaves requiring a surfactant.**
- **Spot treatment:** The foliar application of a herbicide solution to a specific, targeted plant or small area. Application typically takes place using a small herbicide applicator ranging from a squirt bottle to a backpack sprayer or small tank sprayer that uses a directional nozzle. Commonly used to target individual plants and/or to minimize off-target application/damage.
- **Broadcast treatment:** The application of a herbicide solution to cover large areas and treating the entire surface that is below the pattern of the nozzle. This application type typically requires a motorized vehicle to apply the herbicide utilizing a boom or boomless spray nozzles.
- **Basal (bark) application:** The application of a herbicide solution to the basal area of the entire circumference of the lower 12-20 inches of each stem protruding from the ground. Most commonly a herbicide+ oil+ penetrant solution. Typically given as a percent solution.
- **Cut surface (stump):** The application of a herbicide solution to the cambium tissue (outside ring of the stem or the phloem outward). On smaller stems cover entire area of surface. On larger stems focus only on the cambium layer. Four

different options-herbicide concentrate, herbicide water solutions, herbicide+oil+penetrant solution, or ready-to-use (RTU) treatments.

- **Integrated Vegetation Management (IVM):** The use of multiple control techniques/tools to manage/control vegetation. Tools are as follows: Herbicide, Mechanical, Natural, and Biological.
 - Biological control for most species is either unfeasible or is out of your control to implement.
 - Natural vegetation control tools include prescribed fire, drought, flood, wind, etc. Only one of which you really have the ability to use and that is fire. Please consult the local DNR before considering to burn. Some species react differently to burning and you may only worsen the problem, but for other species it can be a great management tool if used properly.
 - Mechanical control techniques are often a vary labor and time intensive tools but can be an effective way to gain control over a difficult site. Mechanical control refers to the use of tools ranging from hand tools with blades to rotary head flail mowers and everything in between. This allows for the physical reduction or above ground removal of a plant. Mechanical means alone will often not succeed at controlling invasive species due to their sometimes amazing ability to resprout.
 - Herbicides can be a great tool if you know how to use them. Often, best control techniques incorporate the use of mechanical or natural techniques coupled with a properly timed and formulated herbicide application to achieve maximum control.

**Herbicides (for the purpose of this handout) fall into two major categories.
Herbicides used in the recommendations:**

No (or negligible) Soil Activity		Soil Active Herbicide*	
Active ingredient	Example Trade Name	Active Ingredient	Example Trade Name
glyosate triclopyr triclopyr fosamine triclopyr surfactant	Accord Concentrate Garlon 3A Garlon 4 Ultra Krenite S Pathfinder II Various names	imazapyr metsulfuron imazapic picloram 2,4-D+picloram clopyralid imazapyr aminopyralid+metsulfuron	Arsenal AC Escort XP Plateau Tordon K Tordon 101 Transline Stalker Opensight

*-soil active means that there is a possibility for the product to harm nearby plants by translocation

Percent solutions simplified per 3 gallons of solution:

.25%=1 ounce	15%= 58 ounces
1%= 4 ounces	20%= 2.5 quarts
2%= 8 ounces	30%=3 quarts
3%= 12 ounces	50%=6 quarts
5%= 19 ounces	80%=9.5 quarts

Recommendations

If you have questions or concerns regarding herbicide use, you can contact a local herbicide distributor (I like to talk to the folks at Townsend Chemical: 800-616-4221) or herbicide manufacturers' sales representatives for a particular product and species of concern. I am also willing to discuss your vegetation management concerns and you can email me at mkrausha@purdue.edu.

A few words on timing and weather:

Too hot, too cold, just right? Weather needs to be taken into account when utilizing herbicides as a control technique. Periods of extreme heat (greater than 85 degrees) or cold (below freezing), drought, excessive rainfall, humidity, etc. all play an integral role in the efficacy of herbicides on a plant both in how the plants react to the herbicide as well as what happens to the herbicide.

As a general rule of thumb, when a plant is in flower it is under a tremendous level of stress due to the energy it requires to produce flowers (and subsequently seeds). This type of stress, unlike drought and heat stress, creates an excellent time for treating the plant.

All species have a characteristic that favors treatment. There are windows in time that make for very selective control measures based on these characteristics. For example: Japanese honeysuckle is an evergreen plant that can be treated with a foliar herbicide such as glyphosate during the dead of winter when there exists a window of time that temperatures are above freezing (two-three days with 40+ degree days) which allows for targeted control with no off-target damage. Another example is Amur honeysuckle; it is one of the first plants to leaf out and one of the last to go dormant. This characteristic provides great windows to use a non selective product, selectively!

These are just a few thoughts to consider. Good luck and stay safe.

Always read and follow the label!!!!

Surfactant for all water solutions- 0.25% Invade 90, Nu-Film P or Nu-Film IR, *or* 1% methylated seed oil (MSO) or crop oil.

Basal/penetrating oil- Ax-it basal oil

Drift Retardant- Mist-Trol 336

***Lonicera spp.*- bush honeysuckles, *Elaeagnus umbellata*- autumn olive, *Ligustrum spp.*-privet species, *Euonymus alata*- winged burning bush, *Berberis thunbergii*- Japanese barberry, *Rhamnus cathartica*- European buckthorn, *Frangula alnus*- glossy buckthorn**

- **Cut surface application**- 15% Garlon 4 Ultra+3% Stalker+ 82% basal oil *or* 20% Garlon 4Ultra +80% basal oil *or* 50% Accord Conc. +80% water *or* 10% Arsenal AC +90% water *or* undiluted Pathfinder II during growing or dormant season.
- **Basal application**-15% Garlon 4 Ultra+3% Stalker+ 82% basal oil *or* 20% Garlon 4Ultra +80 basal oil *or* undiluted Pathfinder II during growing or dormant season
- **Foliar application** -1% Arsenal AC *or* 30% Krenite S *or* 2% Garlon 3A *or* 2% Accord Conc. *Or* 0.6 dry ounces per 3 gallons water of Escort XP *or* 30% Krenite S+0.6dry ounces Escort XP (July-Oct.)

Microstegium vimineum*- Japanese stilt grass, *Nepalese browntop*, *or microstegium

- **Foliar application**- 0.3% Plateau (1.2 ounces per 3 gallon sprayer) + 0.25% Nu-Film IR *or* MSO *or* repeated applications of 2% Accord Conc.+ surfactant. *surfactants are crucial to the effectiveness of herbicides on this species due to the plants hairy leaves.

***Ailanthus altissima*-Tree-of-heaven and *Paulownia tomentosa*- princess tree, *empress tree*,*paulownia*:**

- ***Do not cut!***
- **Basal application**-15% Garlon 4 Ultra+3% Stalker+ 82% basal oil *or* 20% Garlon 4Ultra +80% basal oil during growing or dormant season
- **Foliar application**-1% Arsenal AC *or* 30% Krenite S *or* 2% Garlon 3A *or* 2% Accord, 0.6 dry ounces per 3 gallons Escort XP *or* 30% Krenite S+0.6 dry ounces Escort XP

***Rosa multiflora*- multiflora rose**

- **Foliar application**- 0.2 dry ounces per 3 gallons water of Escort XP *or* 0.7 dry ounces Opensight per 3 gallons water *or* 2% Accord Conc. (may require multiple applications) *or* 2% Garlon 3A *or* 1% Arsenal AC. Timing with multiflora rose is critical. Plants tend to lose their leaves early in the year due to insects. Multiflora rose should be targeted from leaf out in the spring to the time that it flowers in May-June.
- **Basal and cut surface applications**- 15% Garlon 4 Ultra+3% Stalker+ 82% basal oil *or* 20% Garlon 4Ultra +80 basal oil *or* undiluted Pathfinder II during growing or dormant season
- **Soil treatment**- Escort XP can be used as a soil treatment for multiflora rose- see the label for more detailed instructions.

***Phragmites australis*- phragmites *or* common reed**

- **Foliar application**- 2% Accord Conc. *or* 2% Habitat *or* 1%Arsenal AC. Surfactants are crucial for herbicide efficacy due to plant characteristics. Use only herbicides that are labeled for aquatic use if growing in water.

*****The following species can grow as large vines in desirable plants and must be treated basally or by cut surface applications. If the plants are short and/or not climbing into a desirable plants, foliar applications can be made, but caution must be taken to minimize off target damage due to growth form.**

***Lonicera japonica*- Japanese honeysuckle**

- **Foliar application**- 2% Accord Conc. *or* 3-5% Garlon 3A
- **Cut Surface**- For large vines, cut and apply 20% Garlon 3A+80% water to cut surface

***Celastrus orbiculatus*- oriental bittersweet**

- **Foliar application**-2% Accord Conc. *or* 2% Garlon 3A
- **Basal application**- 20% Garlon 4 Ultra+ 80% basal oil
- **Cut surface**- 20% Garlon 4 Ultra +80% basal oil *or* 25% Accord Conc. +75% water