Non-Native Wisteria Control with Herbicides

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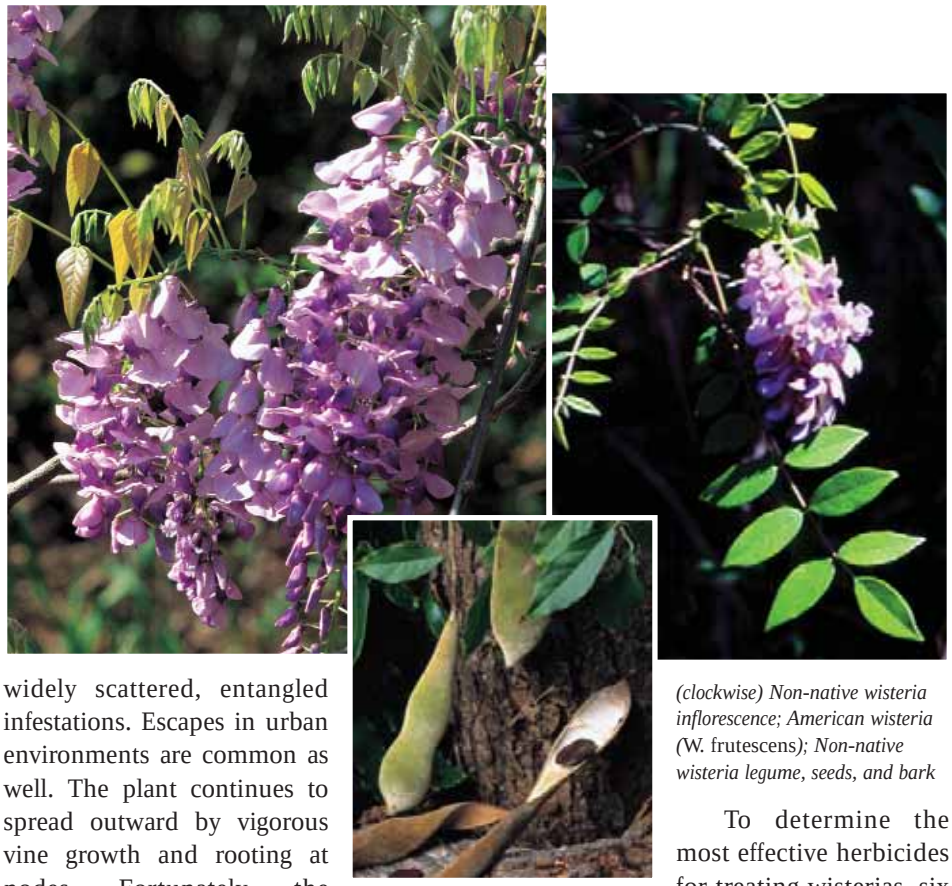
Chinese wisteria (*Wisteria sinensis* (Sims) DC) is a deciduous, perennial, leguminous woody vine that is invasive throughout much of the Eastern U.S. A related wisteria that invades the same range is Japanese wisteria (*W. floribunda* (Willd.) DC). It is difficult to distinguish Chinese from Japanese wisteria due to similar leaves, flowers, and probable hybridization. There are indications that hybrids of the two are the norm and not the exception (personal communications: Dr Jennifer Trusty, Auburn University). Interesting enough, Chinese wisteria twines clockwise (lower left ascending to upper right) while Japanese wisteria twines counter-clockwise, supposedly because of the well known north-south hemisphere differences in water draining and vine twining. This may be a remnant of continental drift after species differentiation in opposite hemispheres.

American wisteria (*W. frutescens* (L.) Poir.) is our native species that also occurs throughout the Eastern U.S. It inhabits mostly hardwood bottomlands and wetland margins, at rare times forming expansive entanglements. The American species can be distinguished from the exotic species by having pubescence on stems and leaves, a hairless legume, and the growth habit of climbing but not running. The oriental species lack leaf pubescence in late season and produce velvety, fuzzy legumes. Both Japanese and American wisterias' dangling inflorescence bloom from top to tip, while Chinese wisteria essentially blooms all at once before or just at leaf emergence.

The oriental invasive wisterias were imported into the U.S. in the early 1800s as ornamentals and continue to be sold with many varieties, even though their invasiveness is widely recognized. Traditional plantings at now abandoned farm homes have yielded oriental wisterias occurring across the eastern region in widely scattered, entangled infestations. Escapes in urban environments are common as well. The plant continues to spread outward by vigorous vine growth and rooting at nodes. Fortunately, the legumes (pods) and seeds are large and heavy, which restricts dispersal by birds and mammals. Legumes are 2.5 to 6 inches long and about 1 inch wide, with flat seeds about the size of a dime to a nickel. Some short distance movement of seeds along streams and rivers can lead to new infestations along waterways.



*(clockwise) Non-native wisteria inflorescence; American wisteria (*W. frutescens*); Non-native wisteria legume, seeds, and bark*

Vine entangled patches of non-native wisterias may exceed several acres and restrict plant and animal diversity, access, and forest productivity and recreation. Tall trees can be overtopped or strangled and their downfall exacerbates entanglements by vine over-growth. These dense infestations are exceedingly difficult to treat, while herbicide foliar sprays offer one viable option if suitable application equipment is available to project sprays into patches.

To determine the most effective herbicides for treating wisterias, six herbicides were tested in an experiment using a randomized complete block design with three replications of each treatment (Table 1). The test site was at a severe, uniform infestation in east central Alabama that was two to three acres in size. Plant traits gave indication that this was Chinese wisteria, although this is now questioned owing to recent correlative genetic analyses from many infestations (personal communication, Dr. Jennifer Trusty). Vine diameters often exceeded two inches, climbing into trees, while only areas with ground infestations were used. Plot size was 10 x 10 ft. One rate (near maximum labeled) for each herbicide was tested at two timings of application, July and September, to gain a primary test of efficacy. All plots were re-treated using the initial rate one year after the first

Herbicide Trade name (*active ingredient*)	Rate per acre	% solution
Tordon K (*picloram*)*	0.5 gal	1.25
Garlon 4 (*triclopyr*)	1.5 gal	3.75
Accord (*glyphosate (41%)*)	2.0 gal	10
Arsenal AC (*imazapyr*)	0.25 gal	0.625
Transline (*clopyralid*)#	21 fluid oz	0.41
Escort (*metsulfuron*)	4 dry oz	na

Table 1. Herbicides and rates tested as both treatment and re-treatment.
* Tordon K is not registered for use in Florida.
# Transline is only labeled for use on kudzu (*Pueraria montana*) in certain counties of Florida.

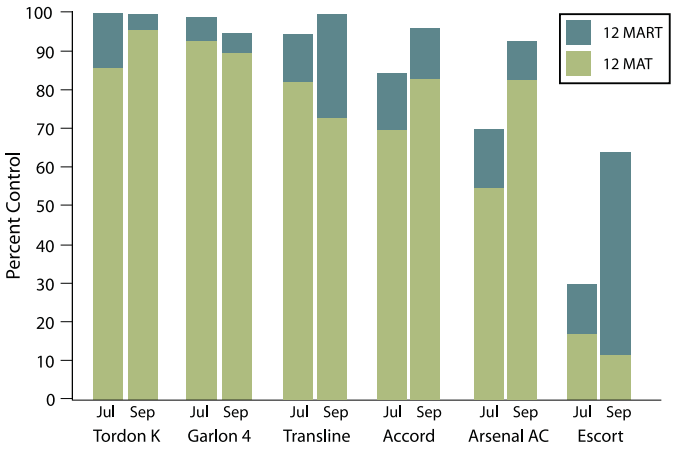


Figure 1. Percent control of non-native wisteria with six herbicides 12 months after treatment (MAT) and 12 months after re-treatment (MART) with July and September timings.

treatment, irrespective of the degree of control or regrowth. All applications were made with a CO_2-pressurized sprayer with 40 gallons per acre of herbicide-water mixture except for Accord that was applied at 20 gallons per acre according to label instructions. A 0.25-percent Entry II surfactant was added to all. Percent cover (essentially volume) of wisteria was assessed and recorded 12 months after treatment (12 MAT) and 12 months after re-treatment (12 MART) and judged relative to untreated check plots in each block.

What was learned

Effective herbicides that provided greater than 90 percent control 12 months after treatment (12 MAT) were Tordon K applied in September and Garlon applied at both timings (Figure 1). Greater than 80 percent control was gained by Arsenal and Accord applied in September and Transline applied in July. Escort was not effective, averaging 15 percent control after initial treatments and was the only herbicide judged significantly different from the other treatments by an analysis of variance and mean separation (analyses not shown).

These results suggest that Arsenal was more effective when applied in September as compared to July, although a single test is not conclusive. It was noted that abnormal vine regrowth and diminutive, yellow leaves characterized Arsenal and Accord symptoms 12 months after treatment, indicating that activity was still progressing even when re-treatments were applied. After re-treatments, near eradication was achieved with Tordon K at both timings and Transline in September, although these did not significantly differ from other herbicides except for Escort in July.

This test found that a range of herbicides can be effectively used for wisteria control depending upon the situation and the necessary safety to surrounding vegetation and revegetation. It should be recognized that invasive plants demand high levels of efficacy by any treatment to be successful in eradication and rehabilitation. High rates and/or repeated applica-

Wisteria control study site before treatments

Tordon K plot the summer after treatment

Transline plot the second summer after retreatment

Non-native wisteria can climb into tall trees

tions of Tordon K, Garlon, Transline, and Accord (a.k.a., Roundup, glyphosate and others) in mid- to late summer and Arsenal in late summer gave near eradication with two applications 12 months a part. The active eradication of individual wisteria infestations at this time could, because of the limited spread rate, be an effective strategy in ridding the land of these invasive species.

Tordon K, Transline and Garlon were not effective in controlling Chinese privet (*Ligustrum sinense* Lour.) that was present on the test site. Therefore, the invasive privet was released from competition with wisteria, indicating unsuitability of this treatment on co-invaded locations. Accord or a glyphosate herbicide would be a more effective treatment when both invasive species occur in mixtures. All tested treatments resulted in reestablishment of early successional plants 12 MAT, while the least species and regrowth occurred on Garlon plots. Tordon K and Transline herbicides are recognized as specific for control of legumes and foster establishment of aster species, while concerns for entry of these two herbicides into surface and ground waters have limited their use. Applications made away from surface waters and on non-sandy soils should be safe and offer effective eradication treatments for invasive wisteria.

As with most invasive eradication programs, wisteria infestations will require several treatments, surveillance for regrowth and spot treatments where needed. Then non-invasive plants should be encouraged or established to safeguard the site from re-invasion. In landscapes and gardens, American wisteria offers a suitable alternative to replace invasive wisteria because it looks similar, blooms longer, and tends to be less aggressive. Other "alter-native" vine species are yellow jessamine (*Gelsemium sempervirens* (L.) St.-Hil.), pipevine (*Aristolochia macrophylla* Lam.), crossvine (*Bignonia capreolata* L.), and trumpet honeysuckle (*Lonicera sempervirens* L.). All of these are fortunately more available now from plant outlets. *Keep the natives coming, growers…and plant natives to stop further invasions*!