

# CONTROLLING JAPANESE BARBERRY: ALTERNATIVE METHODS AND IMPACT ON TICK POPULATIONS

---

Jeffrey S. Ward, Scott C. Williams, and Thomas E. Worthley<sup>1</sup>

## ABSTRACT

Japanese barberry (*Berberis thunbergii*) is classified as invasive in 20 states and four Canadian provinces. It is also established in another 11 states. In addition to forming dense thickets that can inhibit forest regeneration and native herbaceous plant populations, barberry understories can harbor greatly enhanced levels of blacklegged ticks (*Ixodes scapularis*), which transmit the causal agents of several diseases, including Lyme disease (Williams and others 2009).

Since 2006, alternative methods to control barberry have been examined on 122 plots at 22 sites in southern New England and New York. Plot sizes ranged from 0.1 to 0.6 acres. Initial treatments (prescribed burning, mechanical mowing with a rotary wood shredder or with a brush saw, and directed heating with a propane torch) killed the aboveground stems in early spring. All initial treatments were equally effective in reducing clump size and cover (Ward and others 2009). Treatment costs ranked from least to most expensive were: prescribed burning, mechanical mowing with a brush saw, directed heating with a propane torch, and mechanical mowing with a rotary wood shredder. Without a follow-up treatment, individual clumps recovered to 50 percent of original size within 16 months of initial treatment (Ward and others 2010).

Follow-up treatments in July to kill the small sprouts that developed from the root crown included foliar application of triclopyr or glyphosate, and directed heating. Directed heating treatments were repeated in October. Effectiveness of follow-up treatments varied by initial size of barberry clumps. Mortality was greater than 86 percent for clumps smaller than 4 feet with directed heating or herbicide treatments. However, directed heating was less effective than herbicides for larger clumps ( $\geq 4$  feet); mortality was 65 and 90 percent mortality, respectively. All follow-up treatment options reduced barberry cover by 90 percent or more. Follow-up herbicide treatment costs were one-sixth that of directed heating. Regardless of follow-up treatment, some clumps will survive and additional treatments the following summer will be needed for eradication.

Control of Japanese barberry had an effect on earthworm biomass ( $F = 6.86$ , d.f. = 2,  $P < 0.003$ ). Earthworm biomass averaged 197 pounds per acre where barberry was controlled and 535 pounds per acre in dense barberry infestations. By comparison, earthworm biomass was 304 pounds per acre in adjacent forests without barberry. The high earthworm biomass may have contributed to the low litter weight on plots with barberry infestations, 2.3 tons per acre, compared with 5.0 tons per acre observed on our prescribed fire plots without barberry.

---

<sup>1</sup>Chief Scientist (JSW), Department of Forestry and Horticulture, Connecticut Agricultural Experiment Station, P.O. Box 1106, New Haven, CT 06504; Assistant Scientist (SCW), Department of Forestry and Horticulture, The Connecticut Agricultural Experiment Station; Assistant Extension Professor (TEW), Department of Extension, University of Connecticut, Haddam, CT 06438. JSW is corresponding author: to contact, call (203) 974-8495 or email at jeffrey.ward@ct.gov.

A surprise benefit of controlling Japanese barberry is the reduction of blacklegged (or deer) tick populations. Relative to adjacent plots where barberry infestations were left untreated, white-footed mice (*Peromyscus leucopus*) on plots where barberry was controlled had 27 percent fewer larval ticks. Controlling barberry also reduced the density of adult ticks by 58 percent. In addition, tick infection prevalence with the spirochete *Borrelia burgdorferi*, the causal agent of Lyme disease, was much higher in barberry infestations. As a result, 166 ticks per acre were infected with *B. burgdorferi* in untreated barberry infestations compared with 50 infected ticks per acre where barberry was controlled and only 20 infected ticks per acre in adjacent forests without barberry. Thus, controlling Japanese barberry can improve public health by reducing both the number of blacklegged ticks and *B. burgdorferi*-infected ticks that commonly feed on humans.

Japanese barberry can be effectively controlled in a single growing season by integrating an initial early-season treatment (prescribed fire or mechanical) that kills the aboveground tissues, followed by a mid-summer follow-up treatment such as directed heating or targeted herbicide application. Although time consuming, propane torches provide a nonchemical alternative in forests, nature preserves, parks, or other ecologically sensitive areas where herbicide use is restricted and where barberry infestations are still light.

## ACKNOWLEDGMENTS

We would like to thank Aquarion Water Company; Connecticut Chapter – The Nature Conservancy; Connecticut Department of Environmental Protection, Forestry Division; Propane Education and Research Council; and South Central Connecticut Regional Water Authority for financial and technical assistance as well as study sites.

## LITERATURE CITED

- Ward, J.S.; Williams, S.C.; Worthley, T.E. 2010. **Effectiveness of two-stage control strategies for Japanese barberry (*Berberis thunbergii*) varies by initial clump size.** *Invasive Plant Science and Management*. 3: 60-69.
- Ward, J.S.; Worthley, T.E.; Williams, S.C. 2009. **Controlling Japanese barberry (*Berberis thunbergii* DC) in southern New England.** *Forest Ecology and Management*. 257: 561-566.
- Williams, S.C.; Ward, J.S.; Worthley, T.E.; Stafford, K.C. 2009. **Managing Japanese barberry infestations reduces blacklegged tick abundance and infection prevalence with *Borrelia burgdorferi*.** *Environmental Entomology*. 38(4): 977-984.

The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.