

Northeast parks' regional strategy to control **KNOTWEED**

SUPPORTED BY U.S. DEPARTMENT OF AGRICULTURE

By Kathleen Kodish Reeder and Brian Eick

In October 2000, jointly managed Allegheny Portage Railroad National Historic Site and Johnstown Flood National Memorial received \$100,000 from the U.S. Department of Agriculture's Animal and Plant Health Inspection Service emergency funds to support knotweed control spearheaded by these parks. Natural resources in both parks have been threatened by Japanese knotweed (*Polygonum cuspidatum* Siebold and Zucc.) and giant knotweed (*Polygonum sachalinense* F.W. Schmidt ex Maxim.) (fig. 1). Working with local conservancy groups, The Pennsylvania State University, and federal and local government agencies, the parks are facilitating the development of a coordinated strategy to control both species of this invasive, exotic weed throughout the Conemaugh River watershed.

Giant knotweed is rapidly invading the riverbank of the historic lakebed at Johnstown Flood National Memorial.



Figure 1. Identifying effective control measures for giant knotweed became a high priority as the plant began invading major sections of Johnstown Flood National Memorial and Allegheny Portage Railroad National Historic Site. Left untreated, giant knotweed can grow 8–12 feet in height, blocking views of historic resources and access to trails.

KNOTWEED CHARACTERISTICS

As with many nonnative plants, the introduction of knotweed was based on good intentions. Anecdotal evidence indicates that knotweed was first planted in southwestern Pennsylvania as a soil stabilizer on coal tailings piles and other mining lands in the first half of the 1900s. However, because the plants can spread through their rhizomes (or rhizome fragments) and by seed, they can easily invade disturbed soils, such as riverbanks scoured by flooding, or landscapes altered by construction or mining. Once established, both species of knotweed are extremely persistent.

The most prevalent, and problematic, species in the two parks is giant knotweed, which is rapidly invading the riverbank of the historic lakebed at Johnstown Flood National Memorial. If not controlled, the plant (capable of growing 12 feet high) will have an impact on visitor use by blocking views of historic resources and access to trails. Before treatments were begun, knotweed occupied a combined total of approximately 35 acres in the two parks. If it spreads until the entire riverbank is lined with large, dense stands, giant knotweed will significantly reduce native plant diversity and degrade the quality of wildlife habitat.



DEVELOPING A CONTROL STRATEGY

Realizing in 1995 that controlling the pervasive knotweed would require a comprehensive, long-term strategy, the parks developed a program based on three goals: (1) obtaining an understanding of the plant's reproductive ecology in order to reduce invasions; (2) developing an integrated pest management plan based on proven treatment methods; and (3) promoting regional awareness of knotweed and effective control measures.

To obtain information about the reproductive ecology of both knotweed species, the National Park Service funded a two-year study by Amy Niewinski and Dr. Todd Bowersox at The Pennsylvania State University School of Forest Resources. The research report, issued in 1999, indicated that the giant and Japanese knotweed populations sampled have the potential to produce viable seeds (Niewinski, A. T., T. W. Bowersox and L. H. McCormick. 1999. Reproductive ecology of giant (*Polygonum sachalinensis*) and Japanese (*Polygonum cuspidatum*) knotweed. National Park Service Technical Report NPS/PHSO/NRTR-00/079. University Park, PA. 37 pp.). The seeds, which have no dormancy requirement, remain viable in the seedbed and are capable of establishing new, perennial populations. Non-shaded locations that are free of a well-developed leaf litter provide the best potential for seedling establishment. Conversely, knotweed is unlikely to become established in forested ecosystems with sufficient amounts of shade and abundant leaf litter.

TEST TREATMENT

Unfortunately, information about eradication treatments was inconsistent. The National Park Service, therefore, funded research by Drs. Larry McCormick and Todd Bowersox (McCormick, L. H., and T.W. Bowersox. 1998. Eradication and control of Japanese knotweed at the Staple Bend Unit, Allegheny Portage Railroad National Historic Site. Penn State School of Forest Resources, University Park, PA. 15 pp.) to develop an effective method of eliminating knotweed while allowing the establishment of native plant species. The two-year study, begun in 1996, revealed that two herbicides, glyphosate and imazapyr, are effective in controlling knotweed. However, imazapyr readily travels to the roots of non-target vegetation. In other words, imazapyr would kill trees adjacent to the treatment areas even if those trees were not directly sprayed. Glyphosate will not kill plants that are not directly sprayed. The parks, therefore, chose to base their integrated pest management plan on using glyphosate.

The herbicides glyphosate and imazapyr are effective in controlling knotweed.



Figures 2, 3, and 4 (top to bottom). These three photos represent the three major stages in treating a targeted area in the Staple Bend Tunnel Unit of Allegheny Portage Railroad National Historic Site. The pre-treatment view (top) features knotweed emerging in spring (May 1998). The post-treatment view (middle) of the same scene, taken a year later, illustrates the effectiveness of the herbicide treatment in preventing the return of knotweed. The third photo in the series shows that by August 1999, native pioneer plant species, mostly pilewort, were able to flourish once the knotweed had been eradicated.

During spring and late summer 1998, the researchers tested the effectiveness of a foliar application of 4% glyphosate with a surfactant in water on a three-acre site that was completely covered by giant knotweed (see fig. 2). By the subsequent spring, there had been a 97% reduction in the number of adult plants. In July, surviving adult plants were treated with an application consisting of 4% glyphosate in water. Monitoring in September 1999 revealed that no adult plants had survived and knotweed seedlings comprised less than 1% of the cover (see fig. 3).

Most encouraging of all, native plant germination in the treatment area was phenomenal. Pilewort (*Erechtites hieracifolia*) and pokeweed (*Phytolacca americana*) quickly formed dense cover (see fig. 4). Seedlings of staghorn sumac (*Rhus typhina* L.), smooth sumac (*Rhus glabra* L.), and black cherry (*Prunus serotina* Ehrh.) were also found. Subsequent monitoring in 2000 revealed that nearly 100% of the groundcover consisted of native pioneer plant species, and surviving knotweed plants still formed less than 1% of the cover. Knowing that knotweed does not thrive under dense plant cover, the parks' managers expect that seed germination and rhizomatous spread from knotweed populations adjacent to the parks will be greatly reduced in areas where the native plant communities have been restored.

OUTREACH AND FOLLOW-UP

As effective as the described eradication treatment may be, the parks' natural resource staff are aware that their efforts will ultimately fail if others do not use similar control methods on neighboring lands, rights-of-way, and waterways (fig. 5). To encourage this local and regional awareness, the parks have participated in the development of the Kiski-Conemaugh Rivers Conservation Plan, a comprehensive regional plan that addresses the basin's land, water, biological, and cultural resources. Because of the parks' efforts, identification and control of invasive plants, particularly knotweed, have been added to the plan. The parks have, likewise,

assisted the Conemaugh Valley Conservancy and the Southern Alleghenies Conservancy in developing control plans.



Figure 5. This scene features knotweed growing along the south fork of the Little Conemaugh River, approximately one-half mile upstream from the Johnstown Flood National Memorial boundary. The importance of convincing owners of neighboring lands, rights-of-way, and waterways to implement effective knotweed eradication methods is paramount to the success of the comprehensive regional plan to protect the resources of the watershed.

Fortunately, the grant funds awarded by the U.S. Department of Agriculture will enable the National Park Service not only to expand the treatment areas within the two parks, but also to support control efforts by other groups and to develop public outreach and education activities. In 2001, the cost of the initial treatment of knotweed in critical areas of the Allegheny Portage Railroad National Historic Site was approximately \$500 per acre. Ultimately, although eradicating all knotweed from the landscape would be cost-prohibitive, the National Park Service hopes that a comprehensive regional management plan will protect the critical resources of the watershed and reduce the spread of knotweed throughout western Pennsylvania. **PS**

ABOUT THE AUTHORS

Kathleen Kodish Reeder (kk1@psu.edu) is Writer-Editor for the Northeast Region, National Park Service; University Park, Pennsylvania.

Brian Eick is currently Natural Resource Management Chief at Appomattox Court House National Historical Park, (brian_eick@nps.gov).

