Management Plan for Invasive Species at Green Mountain College:

JAPANESE KNOTWEED

Scientific name: Polygonum cuspidatum  
Common name: Japanese Knotweed

Other species managed under this plan: Giant Reed (Phragmites australis)

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A. PRIORITY high

B. DESCRIPTION

Japanese Knotweed is an herbaceous perennial that is a pioneer species in its native range of Asia, and has become an invasive weed in riparian areas and areas disturbed by humans where it has been introduced in North America and Europe (Talmage and Kiviat 2004). It often outcompetes native plant species by beginning rapid growth early in the spring, around April in our region, reaching heights as much as 2 m by June (Barney et al. 2006, McHugh and Marangelo 2006). Japanese knotweed prefers full sun and moist sites but also invades riparian forests (Seiger ESA). It spreads primarily by way of vegetative reproduction, though a few recent studies have shown it may be able to spread by seed (Forman and Kesseli 2003, McHugh and Marangelo 2006). River flooding is a key vector for dispersal of its rhizomes and stem fragments (McHugh and Marangelo 2006). Flowering is done from August to September and dieback happens at the first frost (Barney et al. 2006, McHugh and Marangelo 2006).

Note: The wetland invasive species Phragmites (Phragmites australis) is similar to Japanese Knotweed in its ecology and management.

C. CURRENT DISTRIBUTION ON THE SITE

The riparian buffer zone on the Green Mountain College campus has infestations of Japanese Knotweed that have grown in area and stem density over the past 5 years. There are also stands of it south of the track and behind the barn. The stands range in density and age from sparse and juvenile to well-established and monospecific. See figure 1 for stands managed during fall of 2006. In spring 2007, Phragmites is not known to occur on campus, but because it is spreading rapidly in nearby drainages this plan proposes the same monitoring and response to Phragmites as proposed for Knotweed.

D. DAMAGE & THREATS

Japanese Knotweed can exclude native plant species located under its canopy through competition for light, water, other resources, and through allelopathy (McHugh and Marangelo 2006). In doing so it may lower habitat diversity and quality for wildlife (Talmage and Kiviat 2006).

E. GOALS

The ultimate goals are to eliminate established populations of Japanese Knotweed from campus and to prevent future invasions of Japanese Knotweed and Phragmites.
F. OBJECTIVES (Measurable)
Two objectives for Japanese Knotweed control are (1) to remove 99% or more of the population during the course of three years throughout the entire campus, and (2) to establish a sustainable system for monitoring and controlling knotweed to eliminate new populations and prevent its reestablishment.

G. MANAGEMENT RECOMMENDATIONS
(1) Cutting will be used to weaken stands, although this method is relatively ineffective at eradicating stands because plants sprout well from cut stems (McHugh and Marangelo 2006). Pulling and tilling are not recommended because the plant easily spreads by rhizomes and most populations are in close proximity to rivers that can wash fragments downstream. Mowing is not feasible with the large stature (1-2 m) of most stands. Cutting of the aerial sections using loppers is the method currently in use. The stems can be piled on site or removed to locations further from the river. It is important for stem fragments to be prevented from entering the river because they may colonize downstream (Talmage and Kiviat 2004). Cutting should be scheduled when it will have the maximum negative effect on the root systems (McHugh and Marangelo 2006). By itself, labor-intensive cutting may kill small stands, but in large stands is probably unsustainable and best seen as a stopgap measure to buy time. To affect the root system, McHugh and Marangelo (2006) recommend 2-3 cuttings per month during the time of April-August over the course of 3 years. Barney et al. (2006) conclude 4 cuttings per season may be needed to have a net affect on root biomass.

(2) To eradicate knotweed stands, we will integrate early summer stem cutting with late summer use of herbicides. Stems will be cut in May to June and herbicides used in August. Glyphosate has been shown to be an effective herbicide for Japanese knotweed (Barney et al. 2006). The herbicide application will be restricted to target plants and kept out of the river by using a glyphosate formulation designed for riparian and wetland habitats (Rodeo), and by applying chemical with a cut and fill or stem injection method (McHugh and Marangelo 2006, Barney et al 2006, and Talmage and Kiviat 2004). Herbicides will be applied by a licensed and trained professional. Paul Marangelo of The Nature Conservancy has these credentials and is interested in helping the college control local Knotweed populations to prevent its spread down the river.

(3) Control of Japanese Knotweed now should facilitate recolonization by riparian forest floor species that are still locally common, e.g., Ostrich Fern, White Snakeroot, and Jewelweed. Planting native species is thus not a high priority. On the other hand, the effects of forest floor restoration are poorly understood, and would be a worthwhile subject for study. In the future, plantings of native species using material grown from local seed may be combined with either of the first two control methods.

(4) Cooperative arrangements with partners in the Poultney River watershed will be sought that enhance management of Japanese Knotweed. It is important to plan control activities at a watershed scale to reduce the chance for recolonization. The planning required for a watershed level removal of Japanese knotweed is beyond the scope of this proposal; but it should be an objective to explore in the future.
H. ACTIONS PLANNED (Treatments and monitoring)

April-May 2007= Initial monitoring to determine the size, density, and location of Japanese knotweed populations on the entire campus. Monitoring can be completed by the spring work-study student and volunteers.

May-June 2007= Japanese knotweed along riparian buffer zone of campus will be cut using loppers; beginning at the south/upstream end of campus. At least 50% of the riparian buffer zone will be completed in early May the spring work-study student and volunteers can provide the labor; once the semester is over the two summer employees will be responsible for removal.

August 2007= Herbicides applied to the areas where Japanese knotweed was removed in May-June. Herbicide applications will be completed by a licensed individual (Paul Marangelo).

September-October 2007= Monthly monitoring of the treated areas to determine the effectiveness of control. Monitoring can be completed by the fall work-study student and volunteers.

April-May 2008= Survey to determine the status of populations on the entire campus at the beginning of the growing season. Monitoring can be completed by the spring work-study student and volunteers.

May-June 2008= The remaining Japanese knotweed will be cut along the riparian buffer zone and main campus. In early May the spring work-study student and volunteers can provide the labor; once the semester is over the two summer employees will be responsible for removal.

August 2008= Herbicides applied to areas treated during May-June 2008. Herbicide applications will be completed by a licensed individual (Paul Marangelo).

September-October 2008= Survey of entire campus to determine the effectiveness of treatment. Management plan will be amended based upon these data.

I. HOW ACTIONS WILL BE EVALUATED (Criteria for success)

Effectiveness of control will be based on a GPS survey of Japanese Knotweed in late April or early May each year. The management goal is to reduce knotweed stand area, stem density, and number of stands to 50% (of spring 2007 levels) by spring 2008, 10% by spring 2009, 1% by spring 2010, and 0% by spring 2011.

J. RESOURCE NEEDS

One work-study student is available for 7 hours per week during the semesters. Student volunteers have been recruited in the past from clubs, classes, and other sources. There are two summer employees that work 30 hours per week in May and June. WHIP (Wildlife Habitat Improvement Program) funding will be available to support one student employee during July and August 2007-2009.
K. REFERENCES
Talmage, Erin, and Erik Kiviat. 2004. Japanese Knotweed and water quality on the Batavia Kill in Greene County, New York: background information and literature review. Report to: Greene County Soil and Water Conservation District and New York City Department of Environmental Protection.