

# HIGHLIGHTS

## Beetles overcoming purple loosestrife infestations at Delaware Water Gap National Recreation Area

The flowering spikes of purple loosestrife (*Lythrum salicaria*), an invasive alien weed that degrades wetland plant communities and wildlife habitat, turn wetlands into purple carpets. To suppress *Lythrum* populations and allow native species to return to Delaware Water Gap National Recreation Area (Pennsylvania and New Jersey), we took an integrated pest management approach utilizing biological control agents. We expected to wait 5–10 years to see biocontrol results from the methods we are using, and it looks like we are right on schedule.

We released three groups of biocontrol organisms in the park beginning in 1999 to be continued through at least 2007. *Galerucella californiensis* and *G. pusilla* beetles feed on young shoots and foliage; *Hylobius transversovittatus* beetles are root-borers; and *Nanophyes marmoratus* beetles are flower-feeders. We selected release sites based on location, wetland size and type, purple loosestrife infestation level, and the presence of special concern species. Cornell University and the New Jersey and Pennsylvania Departments of Agriculture provided the beetles.

*Galerucella* releases were made throughout the park from 1999 to 2004, with 22 sites receiving initial releases in 1999 or 2000 and eight key sites receiving supplemental releases in 2002 or 2003. The root-boring *Hylobius* beetles have been released at 10 sites (2000–2004) and the flower-feeding *Nanophyes* at five sites (2003–2006) (table 1). Additional *Hylobius* and *Nanophyes* beetles will be purchased and released in 2007.

**Table 1. *Lythrum* biocontrol beetle releases 1999–2006, Delaware Water Gap National Recreation Area**

Year	<i>Galerucella</i>	<i>Hylobius</i>	<i>Nanophyes</i>
1999	11,000	N/A	N/A
2000	65,300	1,200	N/A
2002	13,250	300	N/A
2003	30,000	400	1,300
2004	200	100	950
2006	N/A	N/A	850
Total	119,750	2,000	3,100

Note: Figures are for total individuals released.

Monitors visit release sites annually for up to five years to determine success or failure in establishing viable beetle populations following protocols developed at the New Jersey Department of Agriculture Beneficial Insects Lab. *Galerucella* beetles have established at 11 of 14 key sites and dispersed along the Delaware River and from other release sites. (Upper Delaware Scenic and Recreational River, Pennsylvania and New York, also has a biocontrol program and staff has observed *Galerucella* spreading along the Delaware there.) *Nanophyes* have not been recovered and establishment in the park is not confirmed. *Hylobius* adults are nocturnal and larvae feed within plants. Because of the secretive nature of this beetle, we have not monitored these root-borers.

We chose 14 sites to monitor effectiveness of the biocontrol organisms in suppressing purple loosestrife. We visit these sites at least once every two years, any time from late June to mid-July, when purple loosestrife plants should be well grown, flower buds present in healthy plants, and feeding damage evident. Purple loosestrife abundance, based on visual estimates of percentage of cover, is ranked as low (<25%), medium (25–75%), or high (>75%). Feeding damage is ranked on a scale of one (little or no damage) to five (damage severe and extensive) (fig. 1). We consider a site to be rated “control achieved” (i.e., management objective met) when purple loosestrife abundance is low and biocontrol beetles are established at the site. In 2005–2006, purple loosestrife abundance was low, accompanied by moderate to severe *Galerucella* feeding damage, at 7 of 14 monitoring sites (table 2).

Results of plot-based sampling at one site (fig. 2) indicate that the downward trend in purple loosestrife



**Figure 1. At high population densities, *Galerucella* beetles skeletonize *Lythrum* plants as they have these along the Delaware River shoreline in June 2004.**

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abundance, and the upward trend in beetle feeding damage between 2001 and 2006, is statistically significant. Furthermore, in the summer of 2006, we observed that most of our marshes were not purple (fig. 3). We conclude that biocontrol agents have contributed to a significant decline in purple loosestrife abundance at this site. Overall, our results to date are consistent with those seen at other sites in Pennsylvania and New Jersey, where *Galerucella* have dispersed to new areas and control has been achieved at release sites in 5–10 years.

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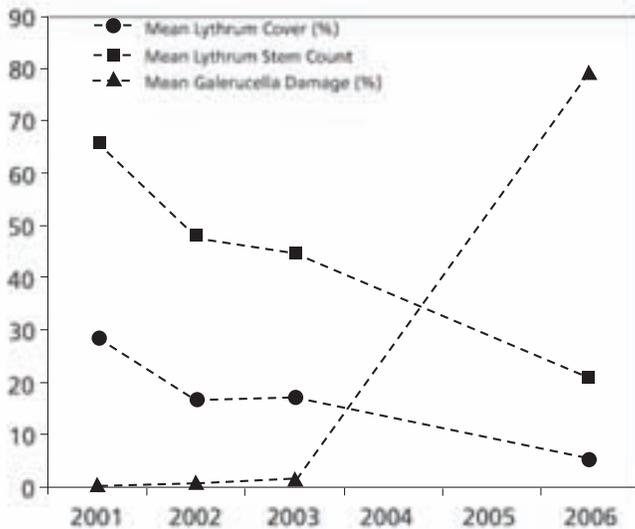
**Table 2. Changes in purple loosestrife (*Lythrum salicaria*) cover, 1999–2006, Delaware Water Gap National Recreation Area**

Site Name	Lythrum Cover		
	2005–2006 <sup>1</sup>	2003–2004	1999–2000
Bevans	Low <sup>2</sup>	Moderate	Low
Birchenough	Low <sup>2</sup>	High	High
Bushkill Access	High	Moderate	High
Camp Kittatinny	Low <sup>2</sup>	Moderate	High
Community Drive		Low <sup>2</sup>	Moderate
Conashaugh Corner	Moderate	Moderate	Moderate
Flat Brook Pompey	High	Moderate	High
Montague Rivershore	Low <sup>2</sup>	Moderate	Moderate
Old Dingmans	Low <sup>2</sup>	Moderate	Moderate
Old Dingmans Upper Pond	Low <sup>2</sup>	High	High
Shimers	Moderate	Moderate	Moderate
Smith Ferry Rivershore	Moderate	Moderate	Moderate
Sussex VoTech	Low <sup>2</sup>	Moderate	Moderate
Thunder Mountain		Moderate	Moderate

Note: Change is measured from pre-release conditions in 1999–2000 to 2006 conditions.

<sup>1</sup>Key to *Lythrum* cover: Low: <25%; Moderate: 25–75%; High: >75%.

<sup>2</sup>Management objective for *Lythrum* suppression has been met.



**Figure 2. Trends in Lythrum abundance and Galerucella feeding damage, 2001–2006, Birchenough wetland, Delaware Water Gap National Recreation Area.**



**Figure 3. These photos illustrate purple loosestrife suppression before (top, August 2002, *Lythrum* spikes in foreground) and after (bottom, August 2006) the introduction of biocontrol agents at Camp Kittatinny wetland, Delaware Water Gap NRA. NPS (2)**