

# Monitoring purple loosestrife (*Lythrum salicaria*) control using *Galerucella* spp. in Goodyear Swamp Sanctuary, 2004

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## INTRODUCTION

This report updates spring sampling efforts to evaluate the effectiveness of *Galerucella* spp. as a biocontrol agent of the exotic purple loosestrife (*Lythrum salicaria*) in the Goodyear Swamp Sanctuary in 2004. A complete background on such biocontrol efforts, how they pertain to Goodyear Swamp Sanctuary and a discussion of results through 2003 are provided in MacNamara (2004) and Albright et al. (2004).

In June 1997, 50 adults of each *Galerucella calmariensis* and *G. pusilla*, leaf-eating beetles, were introduced into the Goodyear Swamp Sanctuary (N42°48.6'W74°53.9'). Beetles were released into cages at sites 1 and 2 (Figure 1), with the intent to monitor the qualitative and quantitative effects of the beetles on purple loosestrife and to examine the extent of recovery, if any, of the native flora (Austin 1997). Sites 3-5 were introduced into the study in 1998 to monitor the spread of *Galerucella* spp. over time (Austin 1998). It was expected that these beetles would lessen the competitive ability of purple loosestrife by feeding upon their meristematic regions, resulting in defoliation, impaired growth, decreased seed production, and increased mortality (Blossey et al. 1994).

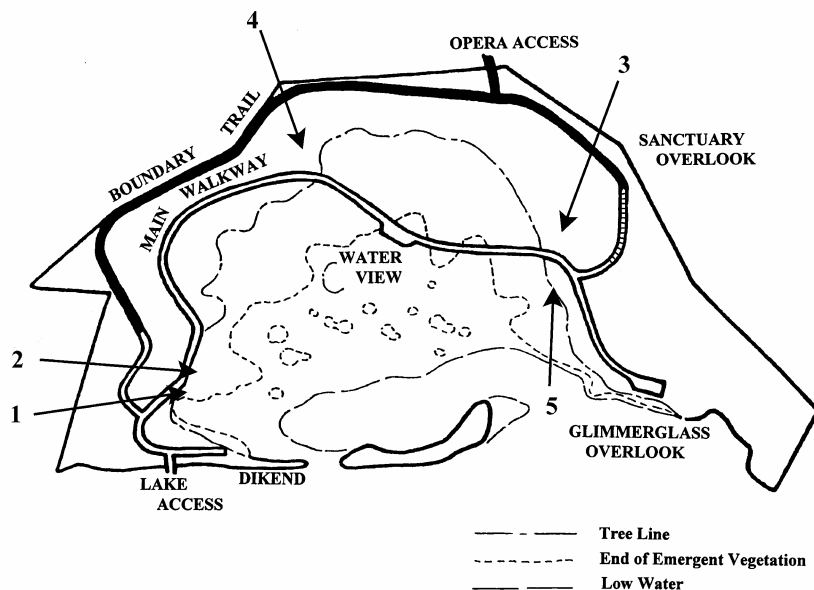


Figure 1. Map of Goodyear Swamp Sanctuary showing sampling sites. Sites 1 and 2 are where *Galerucella* spp. were stocked in 1997; sites 3-5 were to evaluate the spread of *Galerucella* spp. over time.

## METHODS

Spring monitoring protocols established by Blossey (1997) were followed; five 1m<sup>2</sup> quadrats were established (Figure 1) in which to assess the success of *Galerucella* spp. abundance, their success in controlling *L. salicaria* and changes in the percents cover of other plant species over time.

Spring monitoring (3 June 04) included an assessment of *Galerucella* spp., *L. salicaria*, and *Typha* spp. The number of *Galerucella* spp eggs, larvae and adults were estimated using abundance categories for each quadrat (Table 1). The number of stems of *L. salicaria* within each quadrat was counted and the five tallest were measured. The percent cover of *L. salicaria* was estimated, as well as the percent damage attributable to *Galerucella* spp. Fall monitoring as typically conducted did not occur in 2004. However, percents cover of plants present were estimated on 26 August.

## RESULTS AND DISCUSSION

All monitoring data are represented by abundance and frequency categories defined in Table 1. Changes between these frequency categories can represent a substantial change in abundance.

Abundance Categories		Frequency Categories		
number	category	range	category	mid point
0	1	0%	A	0 %
1-9	2	1-5%	B	2.5 %
10-49	3	5-25%	C	15 %
50-99	4	25-50%	D	37.50 %
100-499	5	50-75%	E	62.50 %
500-1000	6	75-100%	F	87.50 %
> 1000	7	100%	G	100 %

Table 1. Categories prescribed by Blossey's (1997) protocol for abundance and frequency.

Egg and larvae of *Galerucella* spp. abundances are shown in Figures 2 and 3. The timing of the survey apparently pre-dated the development of larvae. Adult *Galerucella* spp. abundance was similar to that of 2002 (Figure 4). The somewhat lower abundances of all life stages of *Galerucella* spp. than in 2001 was likely due to the reduction of *L. salicaria* cover (Figure 5) and number of stems (Figure 6) since that time. The percent damage to *L. salicaria* by *Galerucella* spp. was higher than that in most years (Figure 7).

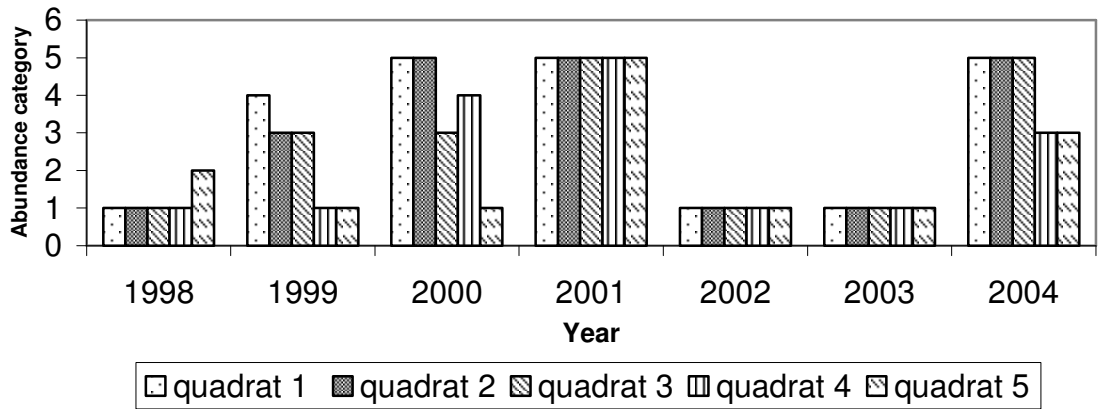


Figure 2. Comparison of *Galerucella* spp. egg abundance from yearly spring samplings. Abundance categories taken from Table 1.

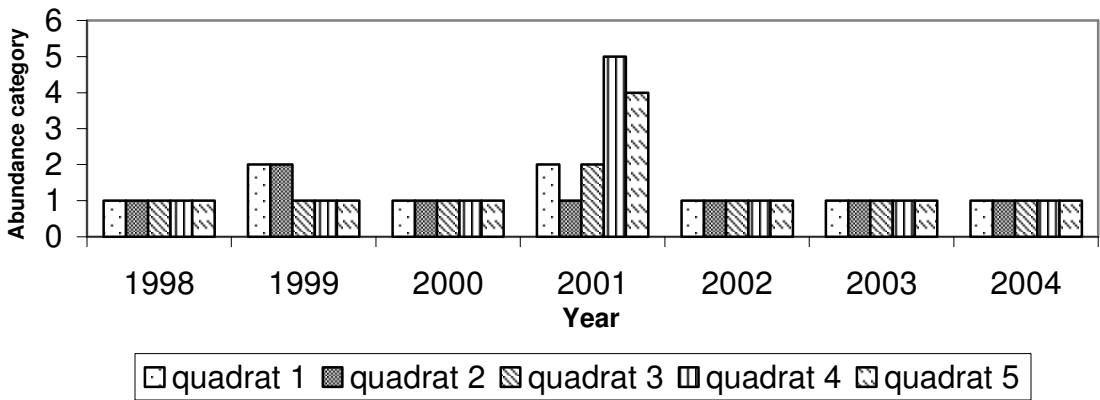


Figure 3. Comparison of *Galerucella* spp. larval abundance from yearly spring samplings. Abundance categories taken from Table 1.

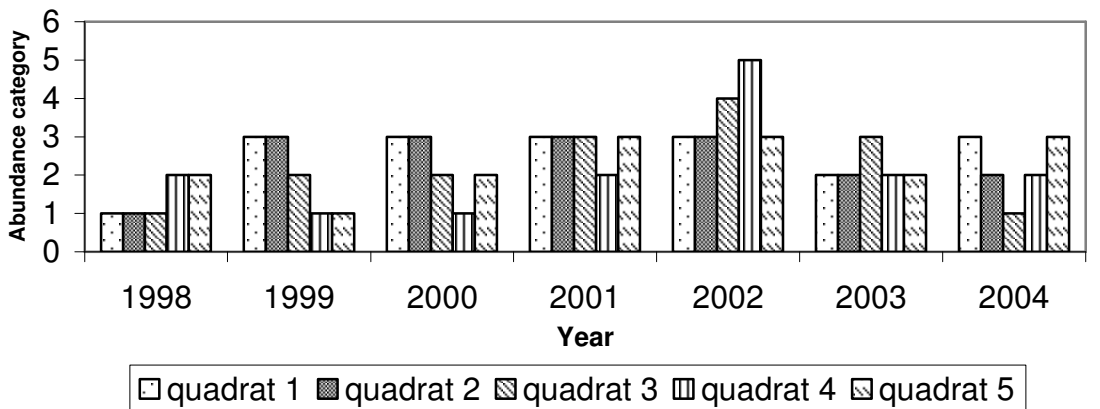


Figure 4. Comparison of *Galerucella* spp. adult abundance from yearly spring samplings. Abundance categories taken from Table 1.

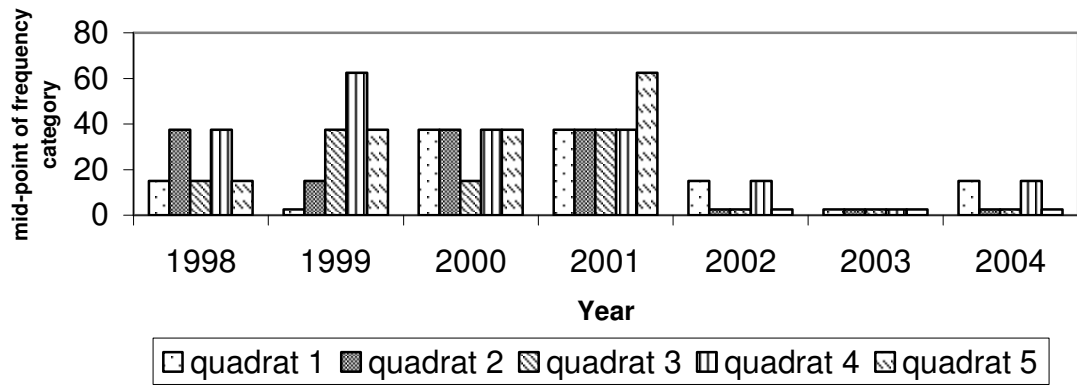


Figure 5. Comparison of percent cover estimations of purple loosestrife plants from yearly spring samplings. Frequency mid-points taken from Table 1.

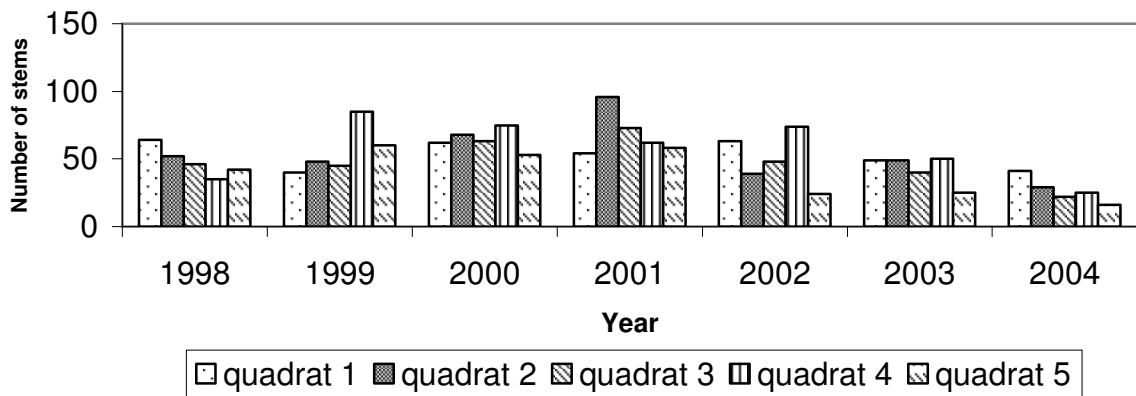


Figure 6. Comparison of the number of purple loosestrife stems from yearly spring samplings.

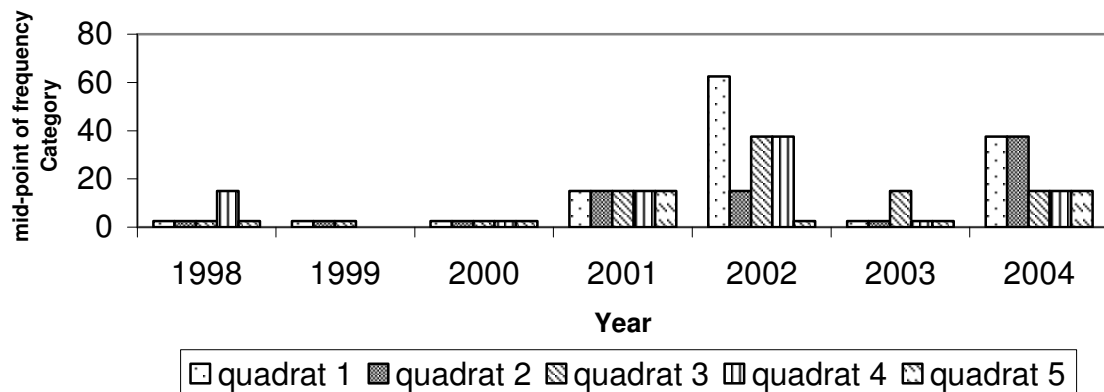


Figure 7. Comparison of percent damage estimations to purple loosestrife leaves from yearly spring samplings. Frequency mid-points taken from Table 1.

Table 2 provides percent coverage by plants within the quadrats on 26 August. Coverage by plants other than purple loosestrife has been increasing concurrent with the decline of loosestrife (Albright 2004).

Plants	Quadrats					Common name
	1	2	3	4	5	
<i>Myosotis</i> sp.	C	D	C	C	D	Forget-me-not
<i>Sparganium americanum</i>	C	B	C	C	C	Burreed
<i>Polygonum hydropiperoides</i>	C					Mild Water Pepper
<i>Ludwigia palustris</i>	C	D	C			Water Purslane
<i>Epilobium leptophyllum</i>		B		B		Narrow-leaved Willow Herb
<i>Nuphar variegata</i>			B	C		Yellow Pond Lily
<i>Cornus sericea</i>	B	D				Red Osier
Grass	B	B	E	D	C	Grass
<i>Rorippa nasturtium-aquaticum</i>		B				Watercress
<i>Bidens</i> sp.	B				B	Begger's Ticks
Unk. Rush	B			B		Rush
<i>Cicuta bulbifera</i>	B	B		B	B	Water-Hemlock
<i>Galium</i> sp.	B	B	B	B	B	Bedstraw
<i>Lemna minor</i>	B			B	B	Duckweed
<i>Thalictrum</i> sp.		B				Rue (Early and Tall)
<i>Lycopus americanus</i>		B	B	B		Bugleweed
<i>Polygonum hydropiper</i>		B	B		B	Water-Pepper
<i>Lysimachia terrestris</i>			B			Swamp Candles
<i>Salix</i> sp.			B		B	Willow
<i>Alisma triviale</i>			B	B	B	Mud Plantain
<i>Impatiens capensis</i>				B		Jewelweed

Categories Percentages of cover

B	1-5%
C	5-25%
D	25-50%
E	50-75%
F	75-100%

Table 2. Percents cover of plants in each quadrat in the Goodyear Swamp Sanctuary, 26 August 2004.

## REFERENCES

- Albright, M.F., W.N. Harman, H.A. Meehan, S.S. Fickbohm, S. Groff and T. Austin.  
2004. Recovery of native flora and behavioral responses by *Galurucella* spp. following biocontrol of purple loosestrife. *Am. Midl. Nat.* 152:248-254.

- Austin, T. 1998. Biological control of purple loosestrife in Goodyear Swamp Sanctuary using *Galerucella* spp., summer 1997. In 30<sup>th</sup> Ann. Rept. (1997). SUNY Oneonta Bio. Fld. Sta., SUNY Oneonta.
- Austin, T. 1999. Biological control of purple loosestrife in Goodyear Swamp Sanctuary using *Galerucella* spp., summer 1998. In 31<sup>st</sup> Ann. Rept. (1998). SUNY Oneonta Bio. Fld. Sta., SUNY Oneonta.
- Blossey, B. 1995. A comparison of various approaches for evaluating potential biological control agents using insects on *Lythrum salicaria*. Biol. Control 5:113-122
- Blossey, B. 1997. Purple loosestrife monitoring protocol, 2<sup>nd</sup> draft. Unpublished document. Dept. of Natural Resources, Cornell University.
- Blossey, B., D. Schroeder, S.D. Hight and R.A. Malecki. 1994. Host specificity and environmental impact of two leaf beetles (*Galerucella californiensis* and *G. pusilla*) for the biological control of purple loosestrife (*Lythrum salicaria*). Weed Science 42: 134-140.
- Groff, S. 2002. Biological control of purple loosestrife (*Lythrum salicaria*) in Goodyear Swamp Sanctuary using leaf-eating beetles (*Galerucella* spp.). In 34<sup>th</sup> Ann. Rept. (2001). SUNY Oneonta Bio. Fld. Sta., SUNY Oneonta.
- MacNamara, C. 2004. Monitoring the effects of *Galerucella* spp. (Coleoptera: Chrysomelidae) as a biocontrol agent of purple loosestrife in Goodyear Swamp Sanctuary, summer 2003. In 36<sup>th</sup> Ann. Rept. (2003). SUNY Oneonta Bio. Fld. Sta., SUNY Oneonta.
- Malecki, R.A., B. Blossey, S.D. Hight, D. Schroeder, L.T. Kok and J. R. Coulson. 1993. Biological control of purple loosestrife. Bioscience 43:680-686.
- Meehan, H. and M. Albright. 2003. Monitoring the effects of *Galerucella* beetle as a biocontrol agent of purple loosestrife (*Lythrum salicaria*) in Goodyear Swamp Sanctuary, summer 2002. In 35<sup>th</sup> Ann. Rept. (2002). SUNY Oneonta Bio. Fld. Sta., SUNY Oneonta.
- Skinner, L. 1996. Biological control of purple loosestrife – a new control method for a tough wetland invader. Aquatic Nuisance Species Digest 1 (4) 43-45.
- Stuckey, R.L. 1980. Distributional history of *Lythrum salicaria* (purple loosestrife) in North America. Bartonia 47: 3-20.
- Welling, C.H. and R.L. Becker. 1990. Seed bank dynamics of *Lythrum salicaria*: implications for control of this species in North America. Aquat. Bot. 38:303-309.