

Purple Loosestrife (*Lythrum salicaria*) Management in Minnesota



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Background

- ☼ Native to Eurasia
- ☼ Introduced to U.S. in early 1880's
- ☼ Brought over as an ornamental
- ☼ Emergent aquatic perennial
- ☼ Occupy any type of wet habitat



Description

1. Has a square, woody stem and whorled leaves
2. Leaves are lance-shaped, stalk less, and rounded at the base
3. Loosestrife plants grow from three to seven feet high (1-2 meters), depending upon conditions, and produce a showy display of magenta-colored flower spikes throughout much of the summer
4. Flowers have five to seven petals.
5. Mature plants can have from 30 to 50 stems arising from a single rootstock





Flowers



Leaves



Seeds

Flowers on spike;
closely attached
to stem

2-7 ft in height

5-6 petals per flower

Stiff, four-sided stem

Opposite leaf arrangement



Illustration provided from the California Department of Food and Agriculture
http://www.google.com/imgres?imgurl=http://www.cdfa.ca.gov/phpps/ipc/purpleloosestrife/images2/plscoloursketch2.gif&imgrefurl=http://www.cdfa.ca.gov/phpps/ipc/purpleloosestrife/pls_looklike.htm&usq=_p0iX69VpbAD-zbR76RVJXK0jFyA=&h=752&w=400&sz=52&hl=en&start=10&zoom=1&itbs=1&tbnid=Z3XpbPcOLyJXNM:&tbnh=141&tbnw=75&prev=/images%3Fq%3Dpurple%2Bloosestrife%26hl%3Den%26gbv%3D2%26tbs%3Disch:1

Effects on the ecosystem

1. Replaces native vegetation
2. Destroy wetland areas
3. Drastically can impede the flow of water
4. Degrade the quality of habitat for wildlife



Specialized Wetland Bird Species Impacted by Purple Loosestrife

Marsh Wren



Black Tern



Pied-Billed Grebe



Least Bittern

(Blossey et al. 2001)

Natural Enemies Model

- Non-native species become invasive by escaping the controlling influence of their natural enemies

(Keane and Crawley, 2002)

Classical Biological Control

- The use of non-native natural enemies to reduce populations of a non-native pest



Classical Biological Control Disadvantages

- Not risk-free, e.g., unanticipated host switching
- Won't establish or control target pest
- Establishes but does not increase or spread on its own
- Successful only 16-26% of the time



Agents Approved for Release

Leaf-feeding beetles (Coleoptera:
Chrysomelidae)

Galerucella californiensis

Galerucella pusilla



Root-boring weevil (Coleoptera: Curculionidae)

Hylobius transversovittatus



Flower-feeding weevils (Coleoptera:
Curculionidae)

Nanophyes marmoratus

Nanophyes brevis



Implementation in Minnesota

1. First release in 1992
2. Establish a rearing program
3. Develop methods to assess establishment and control success

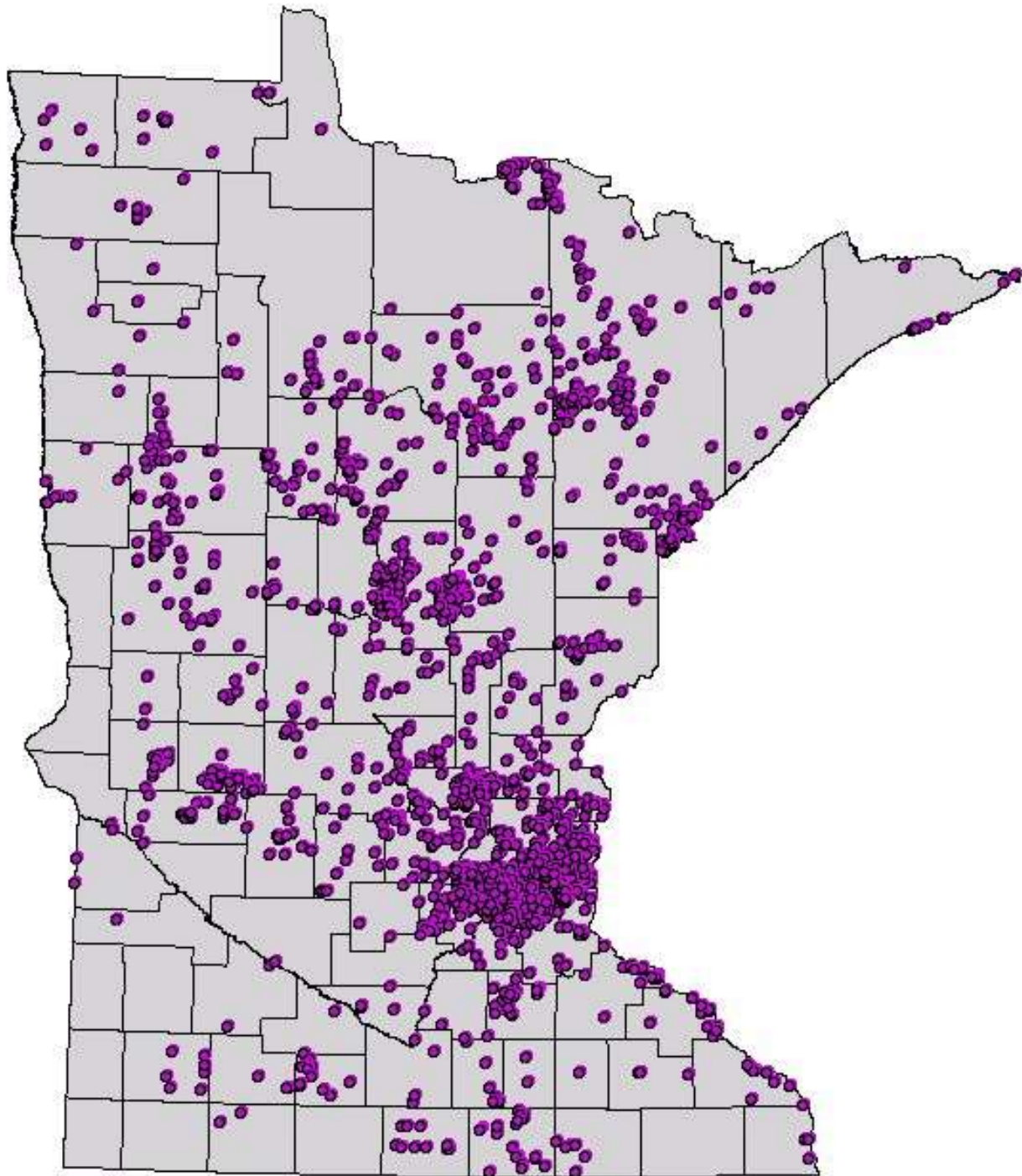


Cooperative Rearing Program

- ⚙ MN Department of Agriculture
- ⚙ County Agriculture Inspectors
- ⚙ MN Department of Natural Resources
- ⚙ University of Minnesota
- ⚙ MN Department of Transportation
- ⚙ Schools and Nature Centers
- ⚙ Boy Scout, 4H Clubs
- ⚙ NPS & USFWS



DNR has moved from rearing to collecting and re-distributing



Minnesota

Purple
loosestrife
infestations

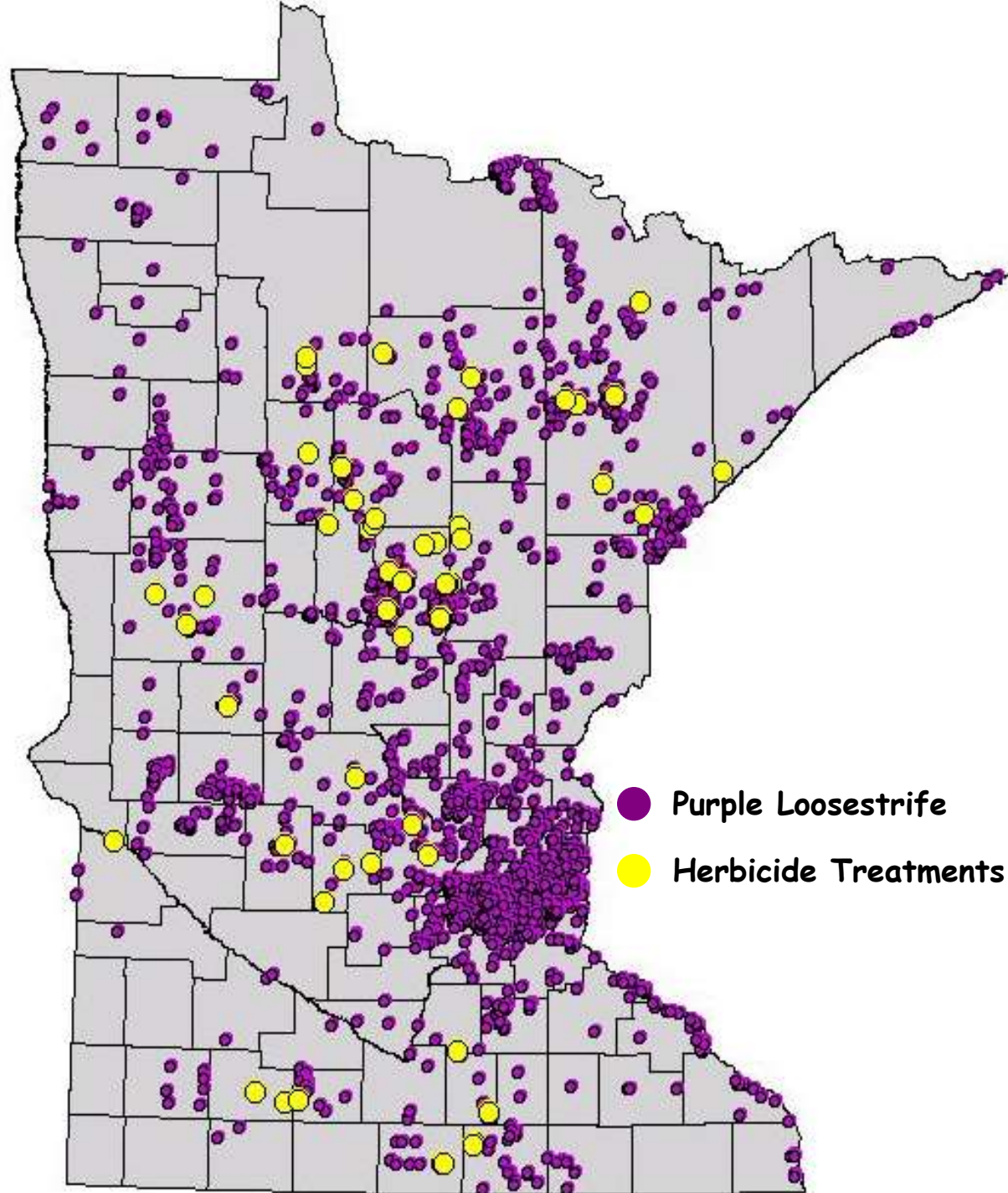
In 2009 the
recorded number
of sites was 2,394

~ 60,000 acres
state-wide

Purple Loosestrife Herbicide Treatments

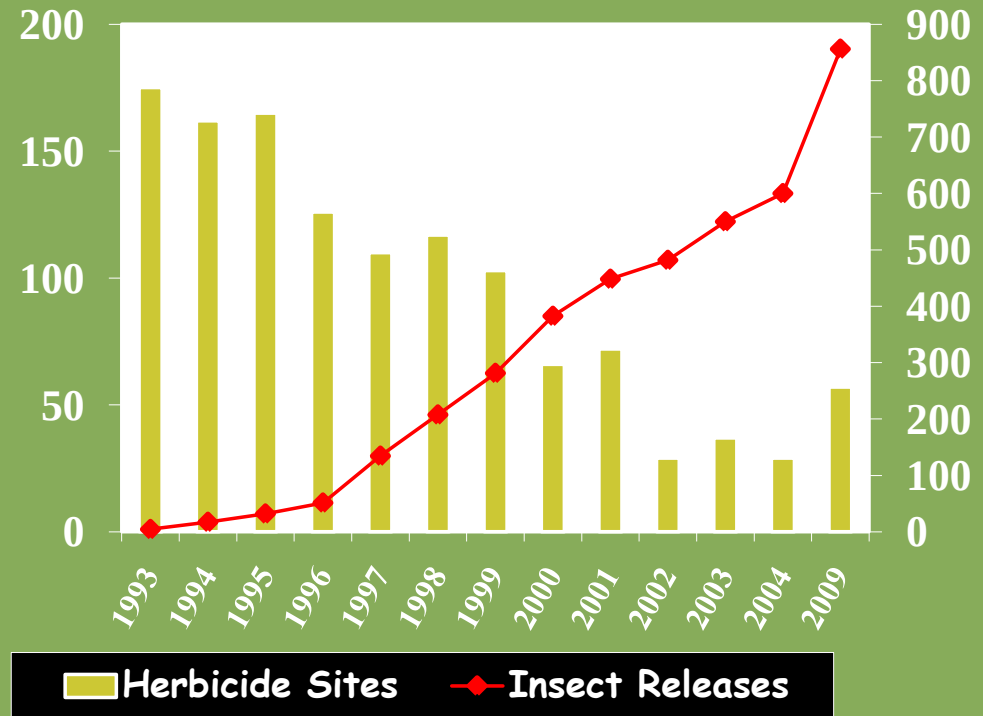
Statistics in 2009

- 57 sites treated
- <1 gal herbicide used
- ~10 acres treated



Purple Loosestrife Biocontrol - Benefits to MN

Year	Herbicide (gal)	Cost (\$)
1989	471	\$102,000
1991	No data	\$77,900
1993	48	\$65,000
1995	35	\$63,000
1997	7	\$36,000
1999	9.5	\$26,000
2001	1	\$19,700
2003	0.8	\$8,800
2005	0.4	\$9,000
2007	1.1	\$12,400
2009	0.35	\$9,000



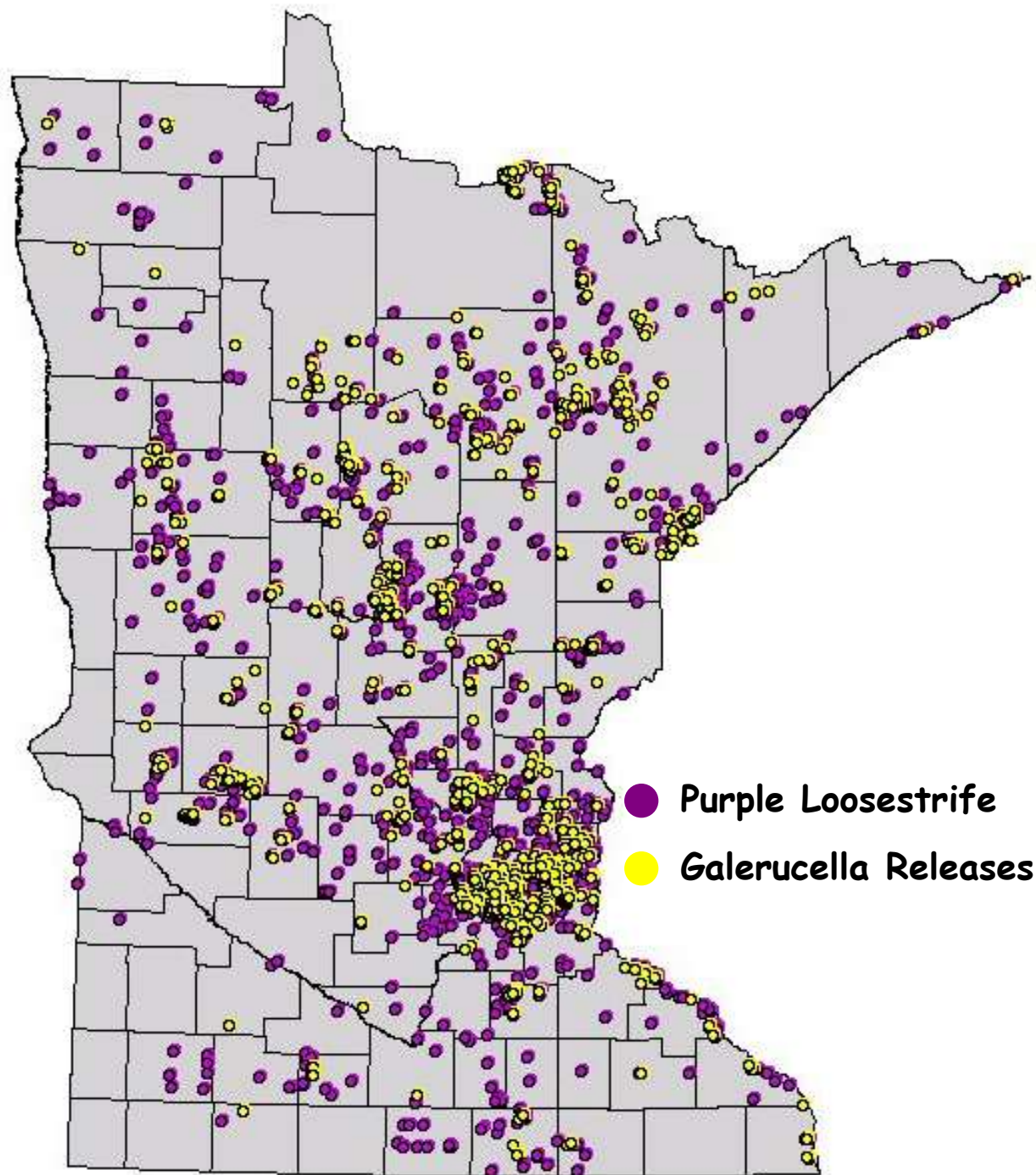
Biological Control Releases in MN (1992-2009)

Statistics

- 1735 releases
- 856 sites
- 9 million beetles

Evaluation (2009)

- 209 sites visited
- 33% (71 sites)
significant defoliation



Galerucella spp. Site Assessment in Minnesota (2005)

GRADE

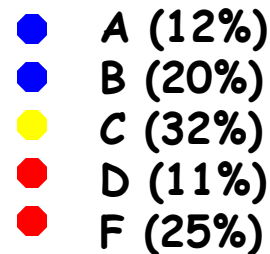
A = 90-100% defoliation

B = 50-89% defoliation

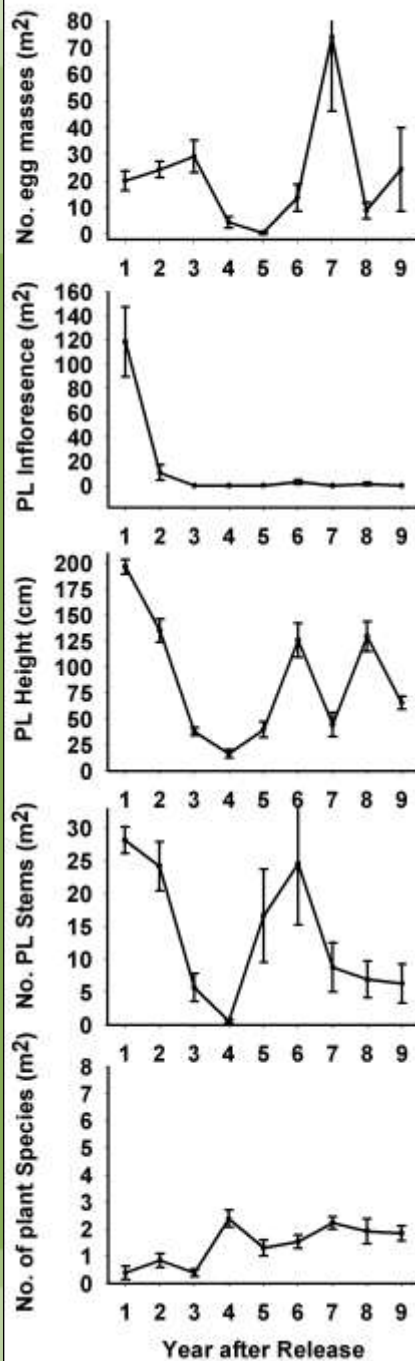
C = damage near release
point with insects
present

D = No damage, few
insects present

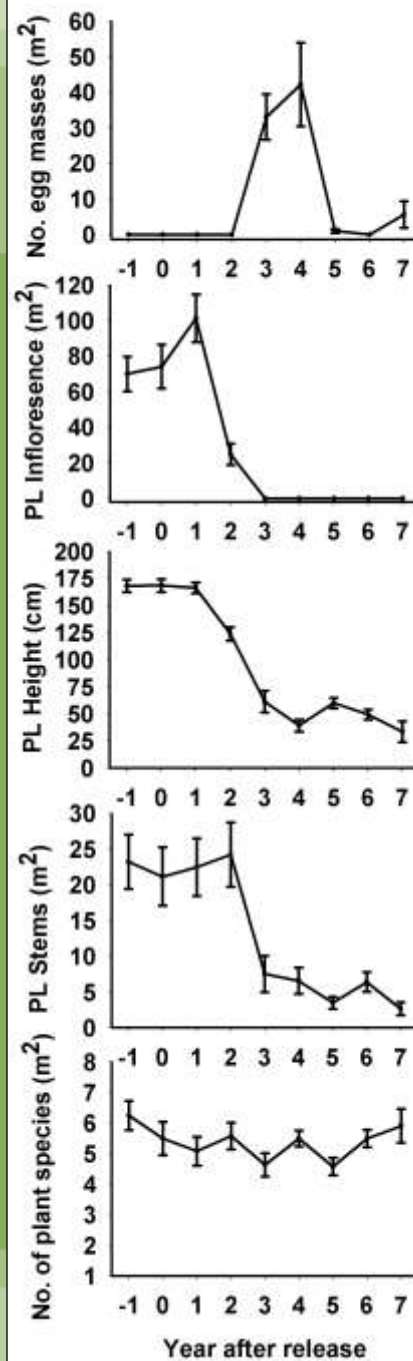
F = no insects or damage
present



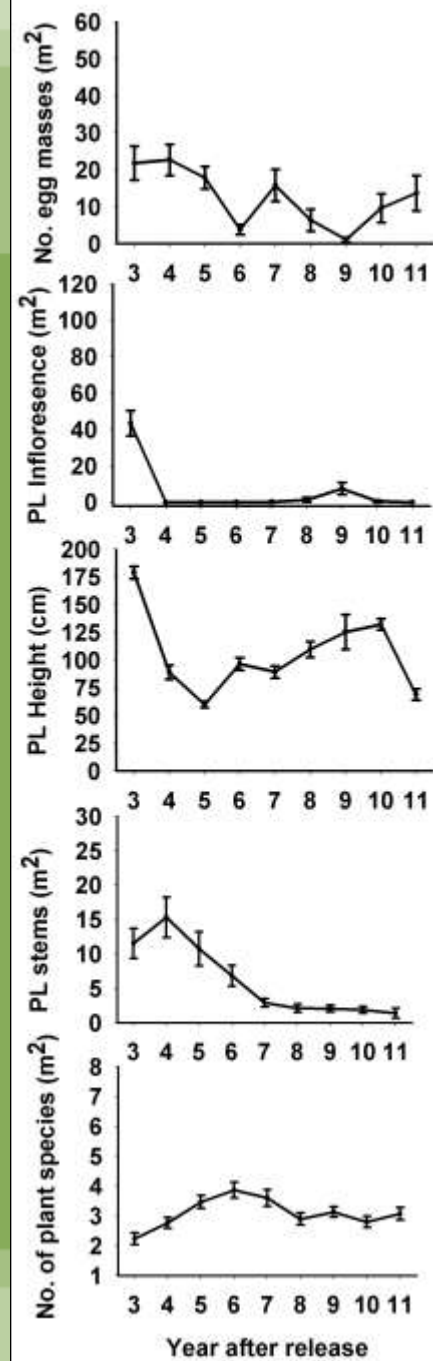
Winona



Marine Lake



Circle Lake



1987 - Winona, MN



2000 - Winona, MN



2002 - Winona, MN



2003 - Winona, MN



2005 - Winona, MN



2009 - Winona, MN



Pigs Eye Lake, MN 2000



Pigs Eye Lake, MN 2003



Pigs Eye Lake, MN 2004



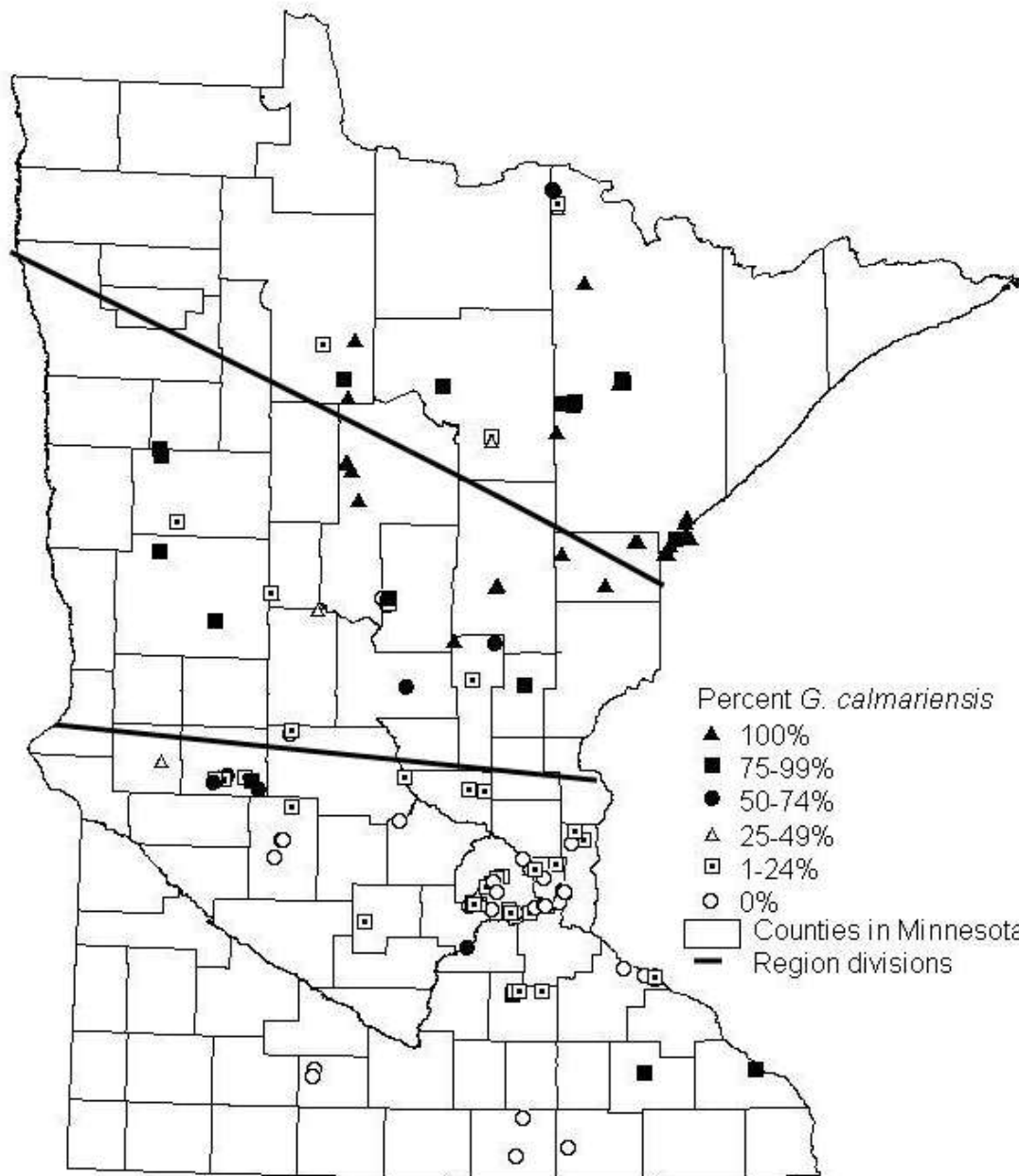
Frontenac 2000



Frontenac 2004



Biocontrol Competition



Release sites may fluctuate, release sites were released 85% *Californiensis* and 15% *Pusilla*

Perspectives

1. Challenge of managing invasive species is not going away
2. No silver bullets - once established eradication is not realistic
3. Management is possible, but its a long-term commitment (don't do more harm than good)
4. Biological control is a valuable tool for managing invasive species
5. Risk should be weighed carefully in decision making

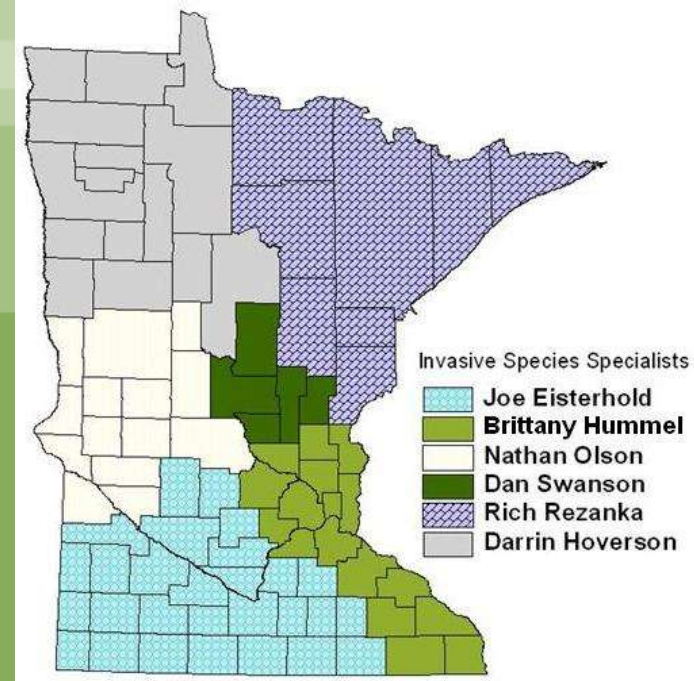
Questions?

Acknowledgments

- ⚙ Rich Rezanka, Invasive Species Specialist
- ⚙ Luke Skinner, Invasive Species Program Supervisor
- ⚙ Other DNR staff

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Ecosystem Impacts of Purple Loosestrife

Reduction in plant biodiversity	Brown 1999 Gabor et al. 1996 Mal et al. 1996 Mal et al. 1997 Welling and Becker 1990 Weiher et al. 1996 Weihe and Neeley 1997
Reduction of high quality bird habitat	Hickey 1997 Hickey and Maleki 1984, Lor 2000 Rawinski and Malecki 1984 Whitt et al. 1999
Alteration of wetland function	Barlocher and Biddiscombe 1996, Emery and Perry 1996 Grout et al. 1997 Templer et al. 1998



Species Impacted by Purple Loosestrife

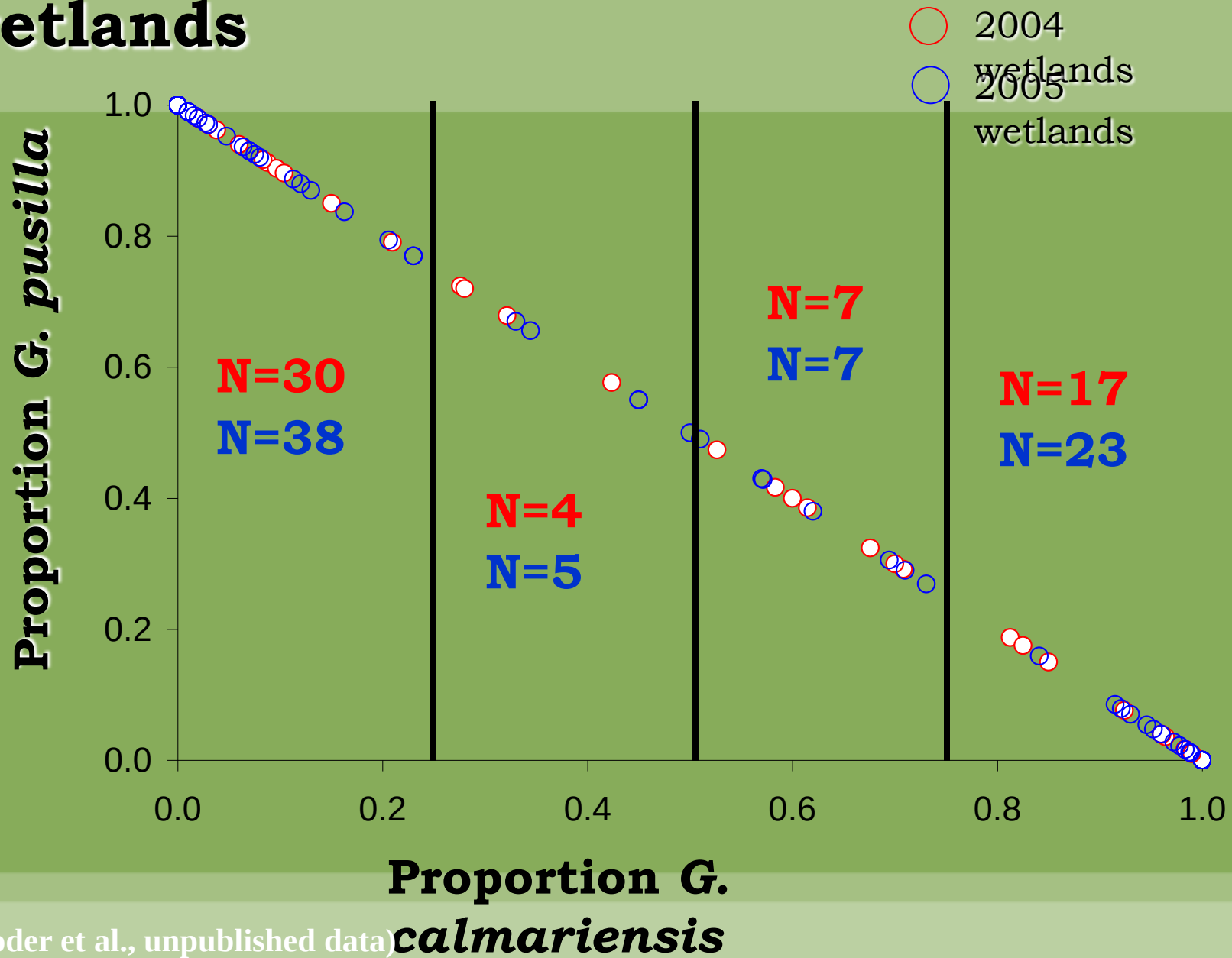


(Mal 1992, Skinner et al. 1994, Thompson et al. 1987)

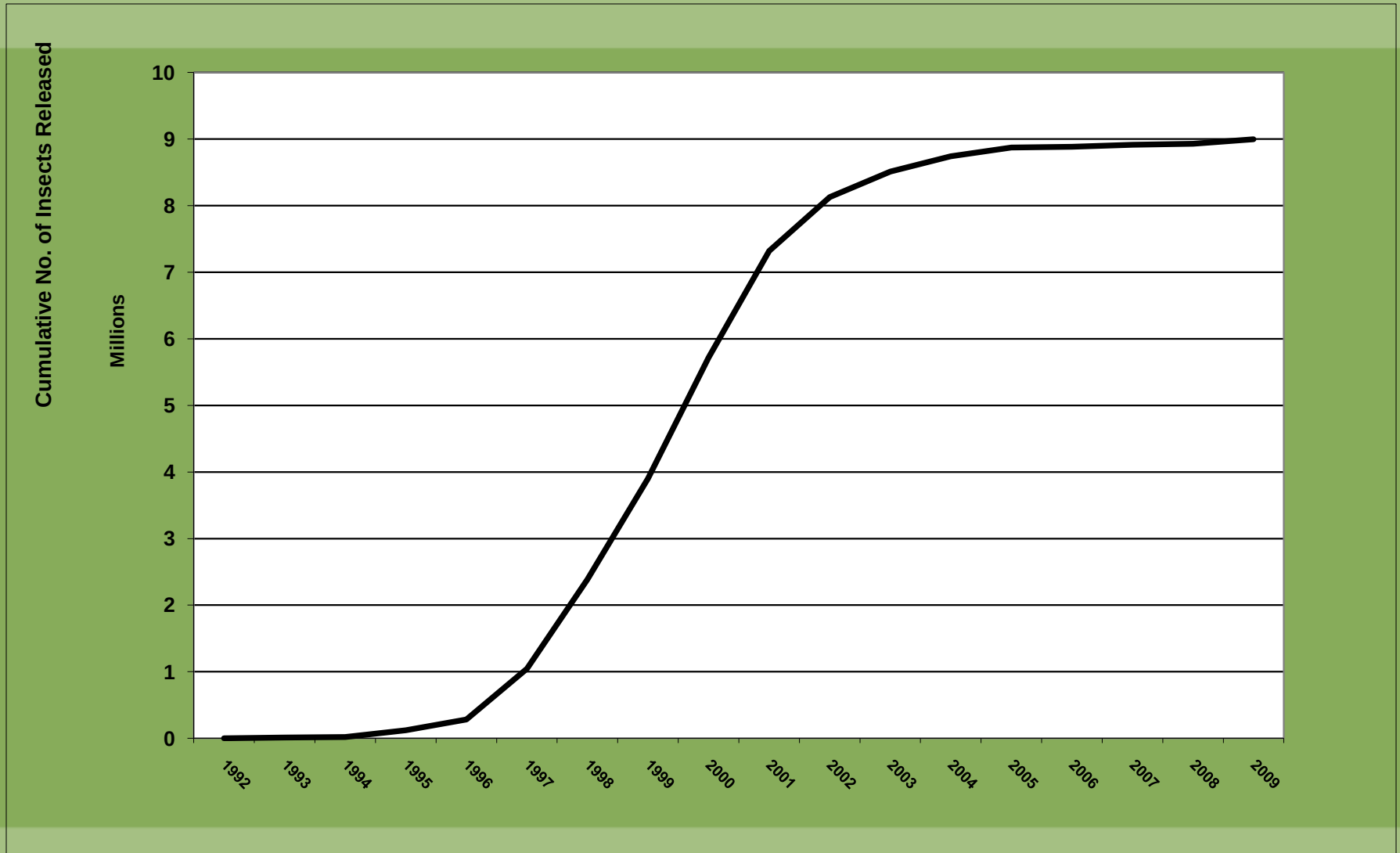
Summary of number of insects released in each region to control purple loosestrife (1992-2009).

Minnesota DNR Regions	Number of Release Sites	Number of Insects Released
1 – Northwest	141	1,370,116
2 – Northeast	228	1,638,503
3 – Central	422	5,242,102
4 – South	65	705,304
Totals	856	8,956,025

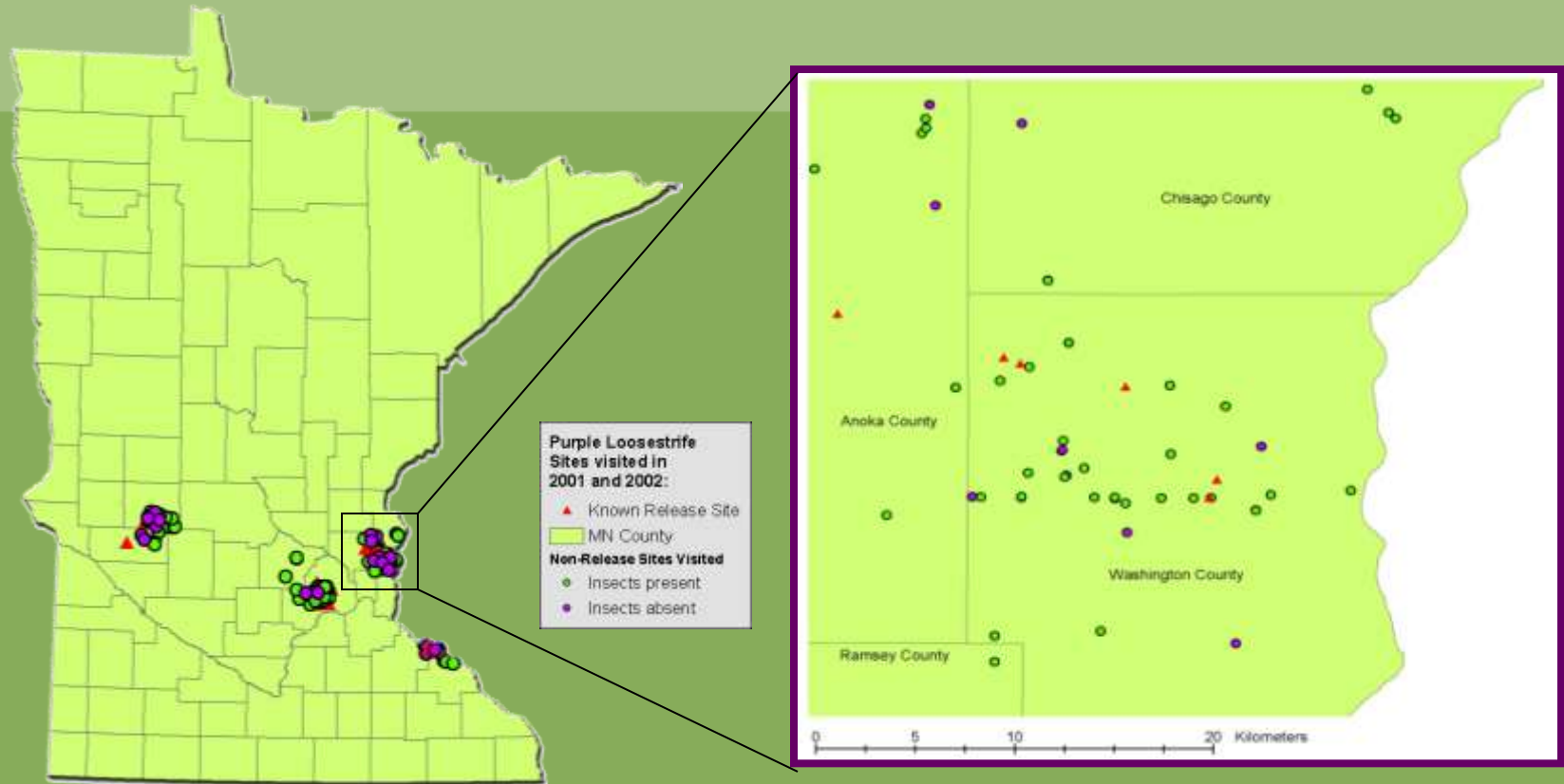
Species composition in Minnesota wetlands



Cumulative number of insects released to control purple loosestrife by year.



Landscape Scale Movement Study



Location	Area (km ²):	Number of Established Release Sites:	Number of Non- Release Sites Visited:	Mean Dispersal Distance (km) from Release Site ± SE:	Max Dispersal Distance (km) from Release Site:	Number of years to Galerucella presence ± SE:	% of Sites Visited with Galerucella spp. Present:
Pope/Swift	1772	11	39	5.5 ± 1.0	20.9	3.2 ± 0.2	72
Northeast	1154	6	47	7.0 ± 0.7	20.4	2.8 ± 0.2	89
Minnetonka	2129	28	62	2.4 ± 0.4	17.9	2.4 ± 0.1	95
Frontenac	825	3	19	4.1 ± 1.1	17.8	3.8 ± 0.2	69
Total	5880	48	167	4.7 ± 0.4	19.3 ± 8.2	2.8 ± 0.1	85

Purple Loosestrife

Biological Control



1987



2000



2002



Winona

