

Volunteer Purple Corps: Managing the Spread of Purple Loosestrife (*Lythrum salicaria*) with People and Beetles in the Burt and Pickerel-Crooked Lakes Watersheds

**Tip of the Mitt Watershed Council
Management Plan
June 2007**

INTRODUCTION

The Tip of the Mitt Watershed Council initiated the Volunteer Purple Corps in 2006 to protect and restore native species and habitats. Drawing upon Michigan State University's (MSU) Purple Loosestrife Project, this effort has continued the control and management of purple loosestrife within a geographically defined area of the Pickerel, Crooked, and Burt Lake Watersheds (Figure 1). Volunteers worked to perform a detailed inventory of purple loosestrife in their watersheds. This project expanded upon an established survey protocol in an effort to classify purple loosestrife stands according to their threat to native species and high quality habitat, and subsequently prioritize sites for control and management. As a result, a long-term management strategy has been produced.

With the completion of the project, a volunteer corps has been established for portions of the Burt, Crooked, and Pickerel Lakes Watersheds. These volunteers will continue to survey, monitor, and manage purple loosestrife within the project area. The Volunteer Purple Corps has served as a model to other watersheds; it is part of the Watershed Council's goal of implementing more purple loosestrife control and management programs within Northern Michigan.

Biology and Life History

Purple loosestrife (*Lythrum salicaria*) is an emergent aquatic plant of Eurasian origin (Blossey, 2003). At full height purple loosestrife is 2m (6+ ft) tall with several stalks on mature plants. The plants bloom in late summer (July through September), and the purplish/pink flowers have 5 or 6 petals, with each spike made up of many flowers. The leaves have smooth edges, are arranged opposite, and alternate at 90 degrees along the stem. The stalks are multi-sided, with 5 or 6 sides to each stem. Oftentimes the previous year's stalks remain erect through the winter and spring.

Purple loosestrife inhabits wet areas, but can persist in a range of conditions, including some upland habitats. It is typically found on the margins of lakes, ponds, streams, and wetlands. The purple loosestrife plant roots in the soil, and is not a submerged or floating aquatic plant. The plant typically likes sunny conditions and oftentimes occupies the same niche as cattails and bulrushes.

The reproductive capacity of purple loosestrife is one of the most significant and relevant life history characteristics of this herbaceous perennial plant. Each mature plant can produce up to 2 million seeds each year. Densities as high as 80,000 stalks per acre have been recorded, with the potential of producing as many as 24 billion seeds per acre. The seeds can remain viable even after 20 months of submergence in water. Seed set begins in mid to late July and continues through late summer. Germination is restricted to open moist soils and requires temperatures above 20°C (Blossey, 2003). Seeds may be dispersed by water, wind, and in mud attached to animals. Purple loosestrife also spreads vegetatively. Root or stem segments can form new flowering stems. Muskrat cuttings and mechanical clipping can also contribute to rapid spread by floating in riverine and lacustrine systems.

Impacts

Although the overall impact of purple loosestrife on native plant communities has heeded debate, research (Mal et al., 1992; Thompson et al., 1987; Farnsworth et al., 2001) shows that purple loosestrife is responsible for displacement of native plant communities.

Wetlands are the most biologically diverse, productive component of our ecosystem. Purple loosestrife is a highly invasive wetland perennial plant that is considered a threat to native wetland flora and fauna. Once it becomes established, purple loosestrife oftentimes becomes the dominant vegetation by out-competing native plants. As a result, as native plant communities are degraded, so too are the wildlife species that depend on them. Studies show that declines in ducks, geese, and other wetland birds as well as muskrats, mink, and some amphibians are correlated with purple loosestrife establishment. Purple loosestrife also reduces spawning habitat for some fish. Because its stiff stems collect silt and debris, purple loosestrife can change shallow water habitats into more terrestrial ones, which do not accommodate the feeding and breeding habits of native aquatic animals (Thompson et al., 1987).

Purple loosestrife congested waterways may also obstruct recreational activities such as boating and swimming by restricting water access (Goldblatt, 2004). Other recreational activities such as hunting and trapping may be impacted, as hunting grounds are often lost to monotypic stands of purple loosestrife (Goldblatt, 2004).

Current Management Efforts in the Burt and Pickerel-Crooked Lakes Watersheds

In 1997, Michigan State University and the Michigan Sea Grant College Program, together with Michigan Department of Natural Resources, U.S. EPA, Michigan Department of Agriculture, public schools, nature centers, and citizen groups from across the state came together to form the Purple Loosestrife Project. The innovative project joined students, educators, citizens, and scientists in the biological control of purple loosestrife using its natural insect enemies, namely the *Galerucella* beetle. The extensive effort has created a successful model for future purple loosestrife control and management projects.

The Purple Loosestrife Project's Loosestrife Locator Card, distributed state-wide in 1998, includes the survey method on which the VPC project based its survey protocol. However, additional criteria were also inventoried to gauge threats to nearby high quality habitats and therefore prioritization for control and management of the infested area.

Spring Lake, a small (6 acre) inland lake on the westernmost edge of the Pickerel-Crooked Lakes Watershed prior to 2000 was heavily infested with purple loosestrife. Through the efforts of volunteers and the Purple Loosestrife Project, the loosestrife population has been dramatically reduced due to the initial release of the *Galerucella* beetles in 2000 and successive yearly supplementation. Spring Lake not only serves as an excellent demonstration of the effectiveness of biological control but also is a source of *Galerucella* beetles. In the spring of 2005, a small group of volunteers participated in the Watershed Council's Beetle Collection Day and collected approximately 200 beetles for release to other Northern Michigan wetlands, ditches, and shorelines in the hopes that this method of biological control would begin in other purple loosestrife infested areas. Successive stocking of these areas are anticipated in the future with additional beetles extracted from Spring Lake.

The Pickerel-Crooked Lake Association (PCLA) and the Burt Lake Preservation Association (BLPA) are active lake associations dedicated to protecting their respective watersheds. Both organizations have expressed their concern about the growing threat of purple loosestrife to the Watershed Council staff and participated in the Spring Lake 2005 Beetle Collection Day. Several members of PCLA have surveyed the combined lakes' shoreline, mapped existing purple loosestrife stands, and treated the areas with the herbicide Rodeo®. Both PCLA and BLPA have continued efforts to control and manage purple loosestrife and were recruited for participation in the Volunteer Purple Corps.

MANAGEMENT PLAN

The VPC management plan is based on defining management units, or areas, within the project area and determining their respective management objectives and techniques. Observing discrete management units will allow future management efforts to be focused on areas that share common characteristics and are prioritized for the same level of management.

Overall, 12 management areas were identified for the Pickerel-Crooked Lakes and Burt Lake Watersheds. Management units are based on the geographic distribution of the infestation and its environment type. Infestations were included in a management area when an obvious grouping of sites existed. The environment type (shoreline, roadside, or river channel) was also used to group sites. Other consideration for defining management areas included level of disturbance or development in the nearby area, and density of sites.

The majority (7) of the management areas are defined as shoreline infestation, followed by roadside (3) and river channel (2), however this does not correspond to the overall area of infestation. The 12 management areas are indicated in Figures 2 and 3.

Prioritizing Management

Although all infested areas should be subject to appropriate management at some point in time, it is important to prioritize management areas. Priorities for management indicate the order to deal with management areas. Responding to high priority areas and gradually proceeding to medium and low priority areas will benefit the overall management of purple loosestrife in the project area. The following criteria were used to establish priority among management areas:

- 1) Biological significance. Infested areas found within or immediately upstream of a biologically significant area receive higher priority.
- 2) Density. Low to medium density units receive higher priority.
- 3) Occurrence of adjacent seed sources. Isolated areas receive higher priority.
- 4) Occurrence of ecological barriers to seed movement.

Management areas are ranked as high, medium, and low according to their priority for management. As resources become available, management efforts should expand from high priority areas to medium and low priority areas. Over time, as management efforts are employed, it is anticipated that the characteristics that originally determined the management area's priority will change. Therefore, it is recommended that prioritization be reevaluated every 3-5 years, using the same criteria, to determine if management recommendation should be modified.

High:

Pickerel-Crooked Lakes Watershed's management areas #2, #5, and #7

Management area #2 is considered high priority due to the biologically significant, high quality wetlands within the Little Traverse Conservancy's Oden Island Preserve and adjacent to the Minnehaha Creek within the Mackinaw State Forest. Spread of purple loosestrife within this large, undeveloped wetland system would severely compromise its integrity. Therefore, eradicating the identified infestations within this management area is critical. In addition, these areas will also respond well to management due to their relative isolation and low density.

Management area #5 is considered high priority due to its low density and isolation. In addition, its proximity to the "Black Hole" (the channel between Pickerel and Crooked Lakes, and also a Little Traverse Conservancy preserve) adds to its consideration for high prioritization.

Management area #7 is considered a high priority due to the biologically significant, high quality wetland within the Mackinaw State Forest, low density and relative isolation.

Burt Lake Watershed's management areas #1 and #2

Management area #1 is considered high priority due to its low density, high isolation, and, in the case of the two locations, proximity to biologically significant areas. The Brutus Road and Ellinger Road locations are near the Maple River and Hassler Creek, both significant tributaries to Burt Lake.

Management area #2 is considered high priority due to its low density and relative isolation.

Medium:

Pickereel-Crooked Lakes Watershed's management areas #3, #6, and #8

Management area #3 is considered a medium priority mostly because it is situated in a developed area and is of medium density. Its position along the shoreline and proximity to the Crooked River and its riparian wetlands and the Little Traverse Conservancy's Oden Island Preserve, however, warrant management to control the seed influx to these more pristine habitats.

Management area #6 is considered medium priority. Its low density and isolation would otherwise elevate its prioritization; however, its distance to any areas of biological significance lessens its priority for management.

Management area #8 is considered medium priority due to its combination of higher density, relative isolation, and proximity to a potential influx of new seed (tributaries Berry and Cedar Creeks).

Burt Lake Watershed's management area #3

Management area #3 is considered medium priority. Its density would otherwise lower its prioritization; however, it is thought that by managing this roadside corridor of purple loosestrife would help reduce seed contributions to the Indian River corridor. It is assumed that the seed source to management area #3 has been the Indian River corridor and that it is otherwise isolated.

Low:

Pickereel-Crooked Lakes Watershed's management areas #1 and #4

Although these management areas are near riparian and shoreline wetlands, they are considered a low priority due to their high density, lack of ecological barriers, and potential influx of purple loosestrife seeds from upstream. In addition, PCLA has released *Galerucella* beetles along the Crooked River (management area #4), and it is believed that the beetles may already have an impact in this area.

Burt Lake Watershed's management area #4

Management area #4 is considered a low priority because of the high density and potential for continuous seed influx from Burt Lake and other upstream tributaries.

Management Option Selection

Selection of the appropriate management objective and technique for each management area is determined by the characteristics of each site. Management objectives must be practical and realistic. Implementing management techniques is labor-intensive and costly. Although both PCLA and BLPA are committed to managing the spread of purple loosestrife within the project watersheds, it will likely take years of persistence before results are evident and even then, it is doubtful the species will be completely eradicated. Therefore, as a more practical management goal, management objectives are categorized as either “suppress and contain” or “eliminate.” Successfully meeting the “suppress and contain” objective would be to observe no expansion (or possible decrease) of the overall infestation area and to observe a reduction in individual plant vigor. Reduction in plant vigor may manifest as reduced stem quantities and flowering, and overall plant height. Furthermore, an overall increase in native plant species may be observed as purple loosestrife loses its foothold.

High:

Pickereel-Crooked Lakes Watershed's management areas #2, #5, and #7
Burt Lake Watershed's management areas #1 and #2

Management objective: Eliminate

Management technique: It is recommended that all of the high priority areas be chemically treated for effective elimination of all purple loosestrife.

The following application technique should be followed: The most effective time for herbicide application is during peak bloom. Inspect each plant for signs of *Galerucella* beetles. If beetles or signs of beetle herbivory are present, do not follow through with chemical application. If no signs are present, cut blooming or spent flower stalk and carefully discard into black plastic bag. Wearing protective clothing and chemical-grade rubber gloves, saturate an absorbent rag with Rodeo® (isopropylamine salt of glyphosate) and apply to freshly cut stem. Do not allow chemical to make contact with water or any nearby, non-purple loosestrife species. In addition, do not attempt to pull loosestrife. It is nearly impossible to remove all of the rootstock and may accelerate the spread of the species.

Medium:

Pickereel-Crooked Lakes Watershed's management areas #3 and #6

Management objective: Eliminate

Management technique: Due to the management areas' low densities, it is recommended that chemical applications be used to eliminate the infestations within these management areas. The application technique detailed below is recommended.

Pickereel-Crooked Lakes Watershed's management area #8

Management objective: Suppress and contain

Management technique: Although there is no evidence of the *Galerucella* beetles in this management area, the area would support and benefit from the introduction of the beetles given the density and area of the purple loosestrife. It is recommended that the beetles be released at the center of the infestation. Establishing a core population will be most effective as the population will move laterally as it expands.

Burt Lake Watershed's management area #3

Management objective: Suppress and contain

Management technique: Although there is no evidence of the *Galerucella* beetles in this management area, the area would support and benefit from the introduction of the beetles given the density and area of the purple loosestrife. It is recommended that the beetles be released at regular intervals beginning at the furthest point from the Indian River and moving toward the river channel. It is believed the beetles will spread into the Indian River Channel (management area #4) as the purple loosestrife is suppressed within management area #3.

Low:

Pickereel-Crooked Lakes Watershed's management areas #1 and #4

Management objective: Suppress and contain

Management technique: In both management areas, reports indicate beetles are present. It is recommended that the existing *Galerucella* beetles be protected and new beetles be introduced to further populate these areas. Future monitoring of these areas will reveal the extent of the beetle population and their impact.

Burt Lake Watershed's management area #4

Management objective: Suppress and contain

Management technique: Due to the extent of the infestation and likely influx of seed to the area it would be impractical and impossible to eliminate purple loosestrife from the management area. The area, however, is a good candidate for the *Galerucella* beetles. It is uncertain whether any beetles have made it to this point in the chain of lakes, and difficult to predict when they may naturally arrive. Therefore, it is recommended that

beetles (approximately 25-50) be released to the area at regular intervals (every +/- 200 yards) beginning at the mouth of the Indian River to Mullett Lake.

Management Evaluation

The Watershed Council, along with the VPC, will continue to manage and monitor the project area over time. The two groups will work together, sharing their current management efforts and observations; the management plan will serve as a guide to move forward with management efforts. As progress is made toward the management plan, the Watershed Council and the VPC will also monitor the management areas. As purple loosestrife responds to the applied management techniques, it will be important to reevaluate the project. Specifically, as purple loosestrife infestations expand or decrease, a revised survey may need to be conducted. After several growing seasons, it may become evident if this is necessary. Similarly, the management areas' boundaries may need to be redefined and the management objectives and techniques reassigned. A useful tool to aid in determining these decisions is the Purple Loosestrife Project's sampling sheets. The Watershed Council and the VPC may use the fall sampling sheet to monitor purple loosestrife density and vigor, and the spring sampling sheet to monitor *Galerucella* populations within beetle-release management areas. The nature of managing invasive species, particularly one as prolific and challenging to control as purple loosestrife, requires a flexible protocol, keen observation and dedicated managers. It is believed that together, the Watershed Council and VPC can apply these traits and begin to successfully manage purple loosestrife within the project area.

LITERATURE CITED

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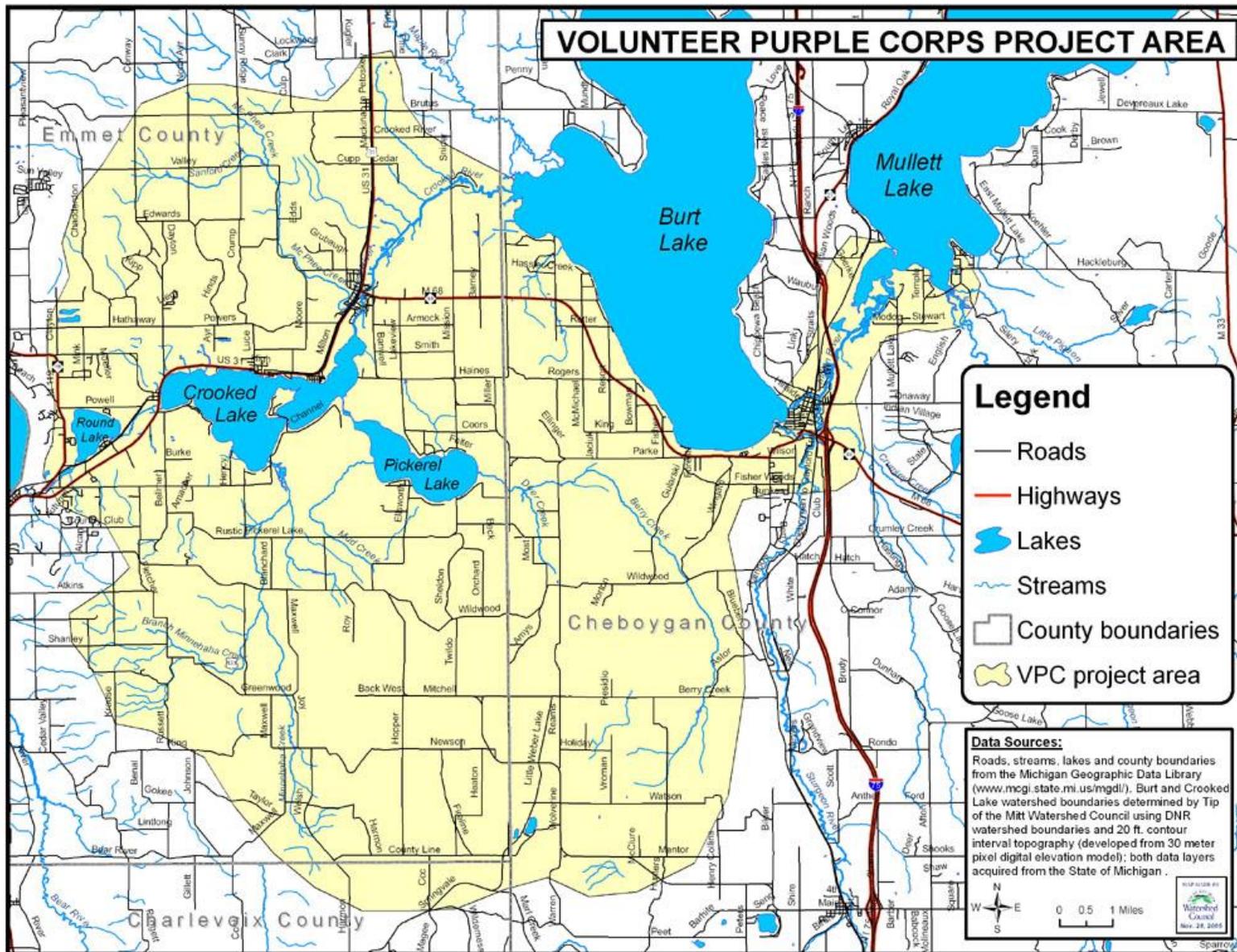


Figure 1. Map of the proposed Volunteer Purple Corps survey area in the Pickerel-Crooked and Burt Lake Watersheds.

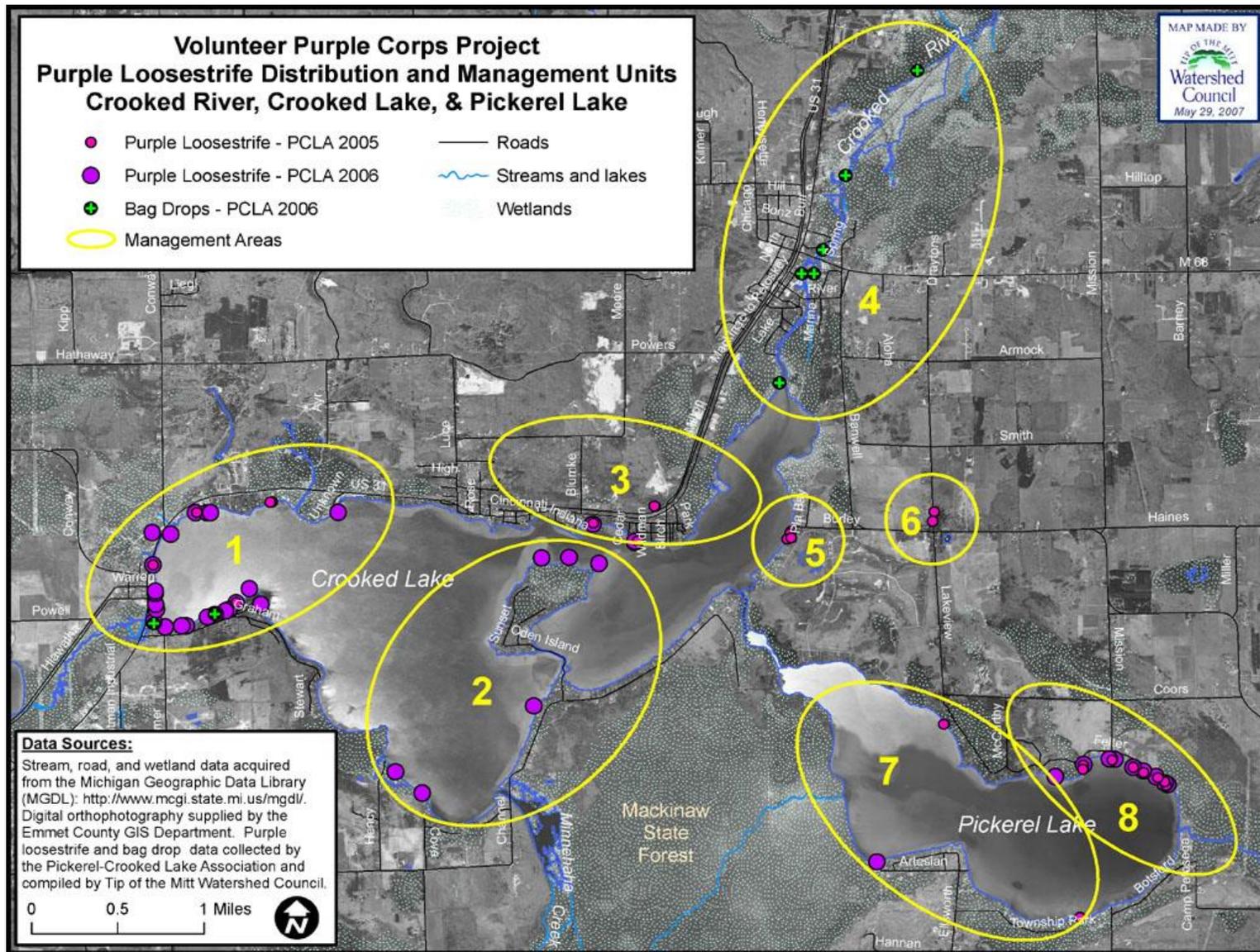


Figure 2. Locations of purple loosestrife around the Crooked River, Crooked Lake, and Pickerel Lake. The circles indicate the management units for this watershed.

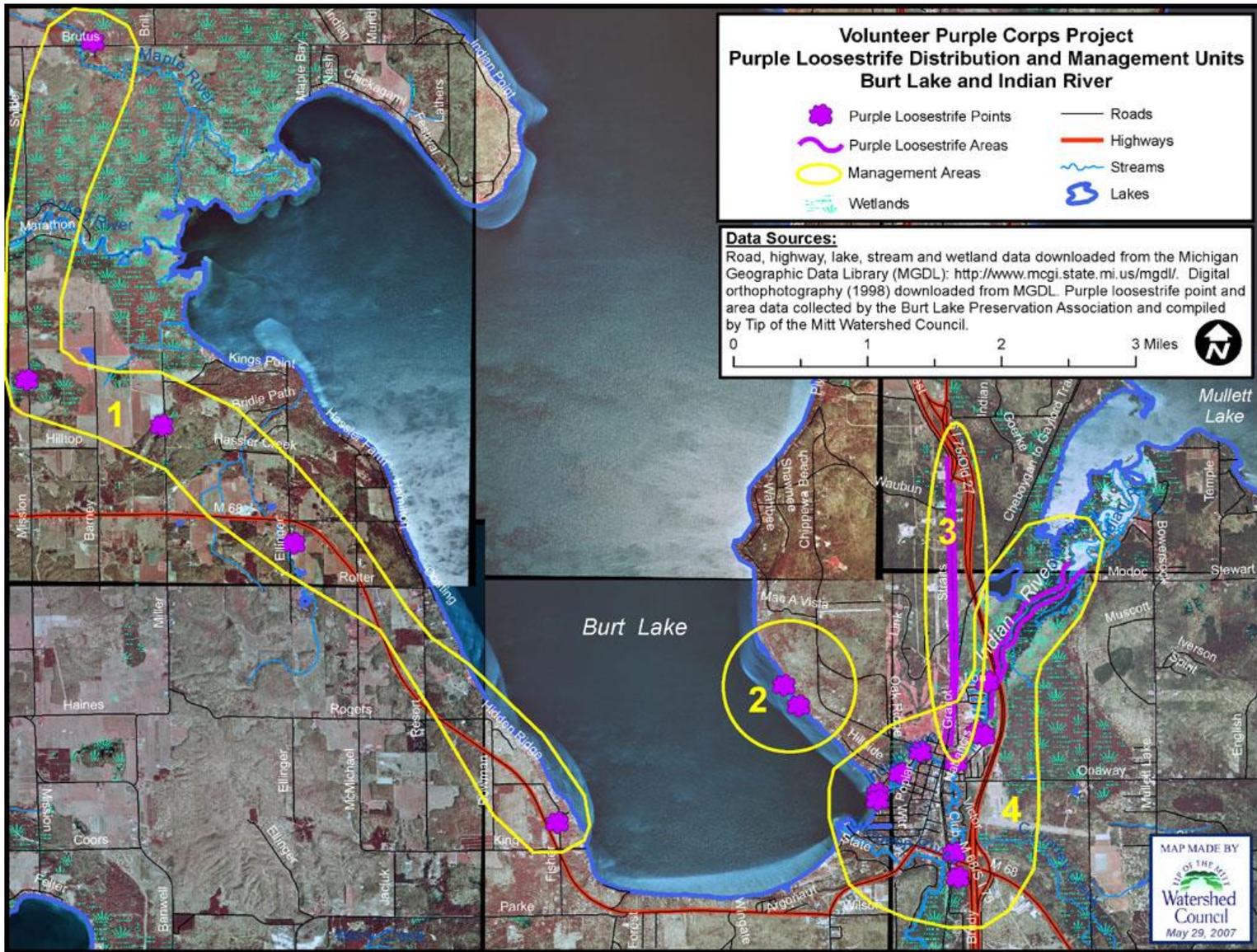


Figure 3. Locations of purple loosestrife around Burt Lake and Indian River. The circles indicate the management units for this watershed.