

We Energies
2013 Annual Report - Nuisance Plant Control Survey
Way Dam & Michigamme Reservoir
FERC Project #1759

We Energies' Environmental department staff, Mr. Mike Grisar, Mr. Bill Braunschweig, Mr. Tim Muehlfeld, and Mr. Ron Arndt conducted surveys from a boat at the Way Dam and Michigamme Reservoir project on July 30 & 31, 2013 and August 19 through August 21, 2013. All waters and appropriate wetlands accessible from the boat were evaluated. Those species targeted for the survey included purple loosestrife (*Lythrum salicaria*) and Eurasian water milfoil (*Myriophyllum spicatum*). The visual meander survey included all visible shorelines and areas of shallow water adjacent to the shorelines for purple loosestrife. Shallow water was surveyed to a point where the water depth and clarity excluded visibility conducive to observing submerged vegetation. On average, this depth was at approximately 7-feet. The second survey conducted in August was specific to purple loosestrife.

Additionally, the We Energies' Environmental Department staff surveyed the Michigamme River from the Highway 95 bridge north of Channing, MI downstream to Newberg Road at the Way Dam project boundary. These surveys occurred on July 29 and August 22, 2013. This is an approximate 5-mile stretch of the river that We Energies committed to surveying during the annual agency meeting in fall 2008. The effort was done to determine the extent of purple loosestrife immediately upstream of the Way Dam project, and to attempt to minimize the potential for a prolific invasion within the project limits and further down through the Menominee system.

Visual observations for Eurasian water milfoil were made and compared to 2012 survey results. Relative changes in the extent and distribution of Eurasian water milfoil were noted. Specific locations of purple loosestrife were mapped using a Trimble XH GPS unit. Each location was identified as a stand and the number of plants, stems per plant, and relative age of the plants were recorded.

Way Dam and Michigamme Reservoir Project Area

Purple loosestrife

Purple loosestrife was observed, mapped, and removed at four locations in 2006. All four locations (stands 1-4) occurred within the eastern portion of the project area along the shorelines of the Michigamme River, three near the mouth of the Michigamme River where it empties into the reservoir and one in the far eastern reaches of the project area.

While the license requires a survey on an alternating year basis (even years), We Energies conducted interim surveys in 2007, 2009, 2011, and again in 2013. In 2007, purple loosestrife was observed at two of the same locations identified in 2006 (i.e. stands 1 and 3). It was observed at four new locations upstream from stands 1 and 3, three of which were in the vicinity of Weber Lake, and one was along the river channel upstream from Weber Lake.

During the 2008 survey, the purple loosestrife population in the Michigamme River portion of this reservoir experienced substantial increases from previous survey years. From 2006 through 2008, increases exceeding 600% and 300% were observed in the number of plants and the number of stems recorded, respectively. In a similar trend, the number of multi-year plant observations doubled in each year between 2006 and 2008. The number of stems recorded per

plant substantially decreased from 2007 to 2008 (approximately 14 stems/plant to fewer than 3 stems/plant).

A trend of an increasing purple loosestrife infestation again continued in 2009. Although fewer purple loosestrife locations were observed, the number of plants observed and total number of stems increased by over 60% between 2008 and 2009 (~24x and >5x that of 2006 levels, respectively). The number of stems observed per plant remained relatively constant between 2008 and 2009. The total number of multi-year plants more than tripled between 2008 and 2009.

The 2010 survey resulted in the continued exponential increase of purple loosestrife. When compared to 2009 results, the number of stand locations increased by nearly 2½ times. Approximately 6-fold increases were observed in both the number of plants and stems observed. The number of stems per plant continued to be relatively constant at approximately 3 stems per plant. However, 2010 multi-year plant observations increased 10x the levels observed in 2009.

For the first time since purple loosestrife began exponentially increasing in the Michigamme River portion of Way Dam, population declines were observed in 2011 from 2010 levels. The number of observed stand locations decreased by 22%. The total number of plants and stems observed decreased substantially, 68% and 77%, respectively. The number of stems per plant decreased slightly. The number of multi-year plants observed decreased by 65%. Purple loosestrife was found at 35 new locations in 2011.

Purple loosestrife observations yielded a negative result between the 2011 and 2012 monitoring years (Table 1). The number of stands, plants, and stems all increased. The highest recorded number of both plants and stems were documented in 2012 with the number of stands only slightly lower (-3) than the highest recorded in 2010. Additionally, the number of multi-year plants was the highest observed to date. However, by removing four of the stands from the calculations (stands 78, 96, 164, and 172), the total number of plants, stems, and multi-year plants observed would be greatly reduced to 111, 358, and 170, respectively. This would bring the number of plants and stems below 2011 recorded levels. Additionally, the number of stands and multi-year plants would be below 2010 numbers when they were at their peak.

Stands 78 & 96 are established stands that were first detected in previous years and at the time of detection, had well established multi-year plants present. Stands 164 and 172 were first detected in 2012 having been established with single plants in each that were at least 3-years old. 146 multi-year plants were observed in stand 164, with what appeared to be 1 plant that was at least 4 years old (initial infestation estimated to be 2008). In contrast, stand 172 had just 3 multi-year plants, one of which was estimated to be 3-years old (initial infestation estimated to be 2009). While these four larger stands contribute a large percentage to the total observed 2012 values, each was detected in their relative infancy with respect to the infestation.

In 2013, it was decided to conduct two separate surveys for purple loosestrife in an attempt to better locate plants that were developing later in the season and reduce the potential to find multi-year plants the following year. This also would reduce seed production and dispersal by plants not detected during the first survey. It has been noted that the flowering period for purple loosestrife in Way Dam has been variable and the peak flowering period presumably occurs in mid to late August during some years. By conducting the two surveys in 2013, it appeared that there was not a distinct peak flowering period, but rather the flowering of individual plants was spread out between the last week of July and the end of August. This appeared to be due, in part, to later growth and development of some plants.

Table 1. Summary of purple loosestrife observations in Way Dam 2006-2013.

	2006	2007	2008	2009	2010	2011	2012	2013		TOTAL
								July Survey	August Survey	
# of Observed Stands	4	6	30	28	68	53	65	39	25	61
# of Plants Observed	4	9	57	94	558	176	1239	240	50	290
# of Stems Observed	51	128	160	271	1732	397	1863	497	183	680
Stems Observed per Plant	12.75	14.22	2.81	2.88	3.1	2.26	1.50	2.07	3.66	2.34
Multi-year Plant Observations	2	4	9	31	314	110	429	190	43	233

In total, fewer purple loosestrife stands, plants, and stems were documented in Way Dam than the totals documented in 2012. Had only one survey been completed as with other years, the results are even more significant. By using only the July survey data for comparison, this allows for a more direct comparison to previous years. The number of observed stands, plants and stems decreased between 2012 and 2013 by approximately 40%, 81%, and 73% respectively. These are very positive indications that the removal of purple loosestrife has been productive. To further improve the management effectiveness, the second survey resulted in the removal of an additional 41% of all the stands detected in 2013.

Similar to 2012, just a few stands contained large proportions of the total plants and plants observed in 2013. Stands 172 (first observed in 2012) and stands 180 & 181 (first observed in 2013) cumulatively accounted for 53% of all the plants and 38% of the total stems observed in 2013. Statistically, if these 3 stands were removed, the total net improvements are even stronger between 2012 and 2013.

Purple loosestrife has been found at 220 total locations in the past 8 years. Of these, only 19 (approximately 9%) stands documented between 2006 and 2013 were locations where the purple loosestrife returned in 2013.

All of these factors combined including reduced stands, plants, and stems as well as the very small proportion of the total stands reoccurring from year to the next are indicative the manual removal of all plant materials is successful. While it is very labor intensive to conduct these manual removals, it is successful at least at those locations where the loosestrife can be observed.

The challenge is being able to visually observe all of the stands during the survey period. For example, the peak flowering period for purple loosestrife occurred relatively late in 2009. At the time of the 2009 survey, most of the plants observed had only just begun to flower making it difficult to find the plants. This resulted in having over 300 plants found in 2010 to be at least two-year old plants. Another contributing factor is that in some cases, shorelines are being infested by reed canary grass, a very dense and relatively tall growing invasive species that makes it difficult to spot the purple loosestrife. The aggressive nature of the reed canary grass tends to reduce the height and vigor of loosestrife plants making it even more difficult to observe loosestrife. An example of this is stand #78, where the shoreline is quite visible, but heavily dominated by reed canary grass. The late flowering period in 2009 and dense reed canary grass growth led to not locating this stand until 2010. 182 plants were found with the vast majority of the plants occurring as 1st and 2nd year plants. Fortunately, the stand was found, and accounted for 32% of all the plants observed in 2010. Similarly, stand 172 which was first detected in 2012, accounts for almost 50% of all the plants observed in 2012.

While a majority of the stand locations are centralized around the Weber Lake area and upstream, purple loosestrife occurrences expanded further downstream in 2012 into the main reservoir. This was beyond where it had been previously documented prior to 2010. Up until 2010, the furthest downstream observations occurred about ½-mile upstream of where the Michigamme River enters the reservoir basin. By 2012, purple loosestrife had been observed throughout much of the main reservoir basin; however, it was widely distributed and in relatively few locations. In 2013, many of the stands documented to have spread through the main basin between 2010 through 2012 were no longer present. This, too, suggests manual removal of purple loosestrife has been a highly effective technique to manage purple loosestrife through 2013.

The purple loosestrife infestation at Way Dam improved dramatically for the first time in 2011 since 2006. To a large degree this trend continued in 2012 when just four stands accounted for a majority of the total plants and stems recorded. Again, in 2013 just 3 stands accounted for a large proportion of the total plants and stems observed. From 2006 through 2010, it expanded exponentially in all categories except the number of stems observed per plant. Exponential increases of an invasive species like purple loosestrife is common. Early detection and prompt management of these infestations is critical for having long term success.

We Energies plans to continue surveying for purple loosestrife at the Way Dam & Michigamme Reservoir project site annually to minimize the potential for mature plants setting and releasing seed into the reservoir.

Eurasian water milfoil

Eurasian water milfoil was first detected in Way Dam during the 2011 season when an interim survey was conducted for purple loosestrife. This stand was observed immediately adjacent to a private campground and recreational site in the east portion of the reservoir. In 2012, 39 stands of Eurasian water milfoil were observed. These stands were scattered around the perimeter of the main basin and in those areas where the stream tributaries enter into the west portions of the reservoir. Many of the stands were located in relative close proximity to recreation sites and along shorelines between the recreation sites. The total number of Eurasian water milfoil stands and stand densities were not specifically recorded in 2013. However, observations that were made to compare 2012 results to the 2013 observations. These observations indicated stand densities in some of the 2012 documented stands were generally denser in 2013. New stands were detected in 2013 and occurred along shorelines in between stands first observed in 2012 as well as further upstream along shorelines coming into the main basin along the north and northeast shorelines. A majority of all the observed stands occurred in very sparse densities (<5% total cover).

The distribution of Eurasian water milfoil and a majority of the new stands having very low densities suggest the milfoil infestation is still in its infancy and expanding. These factors combined with the first observation occurring in 2011 also suggest the milfoil is spreading widely. It is very likely that the rapid spread and broad distribution is a result of recreational boaters spreading the milfoil. This was also evidenced by many cut stems floating in the vicinity of where boating and fishing was observed to be occurring in and adjacent to the documented stands.

Michigamme River – Highway 95 to Newberg Road

The increase in purple loosestrife within the Way Dam project lands is concerning as there is a viable purple loosestrife population occurring upstream of the Way Dam project area. In agreeing to conduct a survey on the Michigamme River further upstream from the project area, the company hopes to develop a better understanding of the extent to which purple loosestrife occurs upstream of the reservoir system. We Energies has also been collaborating with Ms. Ann Hruska of the NRCS Dickinson County Conservation District office to combat the purple loosestrife infestation on the Michigamme River.

In 2009, surveys commenced along that stretch of the Michigamme River from the north end of the Way Dam project area to the first road crossing at M-95 near the Dickinson and Marquette County line. The 2009 survey yielded 56 purple loosestrife stands. All stands were mapped and manually removed. Within these stands, 79 multi-year plants were encountered and 34 first-year plants (113 plants in total). A total of 361 stems were counted.

The Michigamme River survey continued in 2010 survey along the same stretch of the Michigamme River. A total of 362 plants were located of which a majority were multi-year plants. Among these plants, 1,234 total stems were tallied. All stands were mapped and manually removed. The same phenomenon that occurred in the Way Dam project area occurred along the Michigamme River with respect to not being able to visually see the purple loosestrife plants in 2009. This was primarily due to the late flowering that occurred in 2009. Reed canary grass infestations are not near as prominent along the river stretch as soil conditions and shaded stream banks are not as suitable for reed canary grass to grow.

The survey was again conducted in 2011 from M-95 down to the Way Dam project area. This year, population reductions were documented in the total number of stems observed (-85 stands), stems observed per plant (-1.47), and the number of multi-year plants observed (-35) (Table 2). Conversely, a slight increase in the total number of stands was observed (+9). The largest change occurred in having an increase of 230 total plants observed, almost a 40% increase. While some of these results are positive, the large increase in the number of plants observed was concerning that the source population upstream remained a significant threat to being able to prevent a widespread outbreak of purple loosestrife in the Way Dam project area.

This was again evidenced by the results in 2012. Substantial increases in the total number of stands, plants, stems, and multi-year plants were observed. Most notably was the substantial increase (>50%) in multi-year plants and the number of new stands observed. 154 stands observed in 2012 were new stands. A positive indication the management is working is that only 41 (15%) of the previously 282 documented stands between 2009 and 2011 were locations where the purple loosestrife returned in 2012.

For the first time in 2013, the purple loosestrife population decreased from those observations made the year before (Table 2). In total, 12%, 25%, and 35% reductions resulted in the total number of stands, plants, and stems observed, respectively. Similarly as what is described above for Way Dam, a more direct comparison between years can be made when considering only the July survey results since only a single survey was completed in previous years. If only the July survey data is considered, the reduction of purple loosestrife from 2012 to 2013 is even more significant yielding 54%, 79%, and 66% decreases in the number of stands, plants, and stems, respectively.

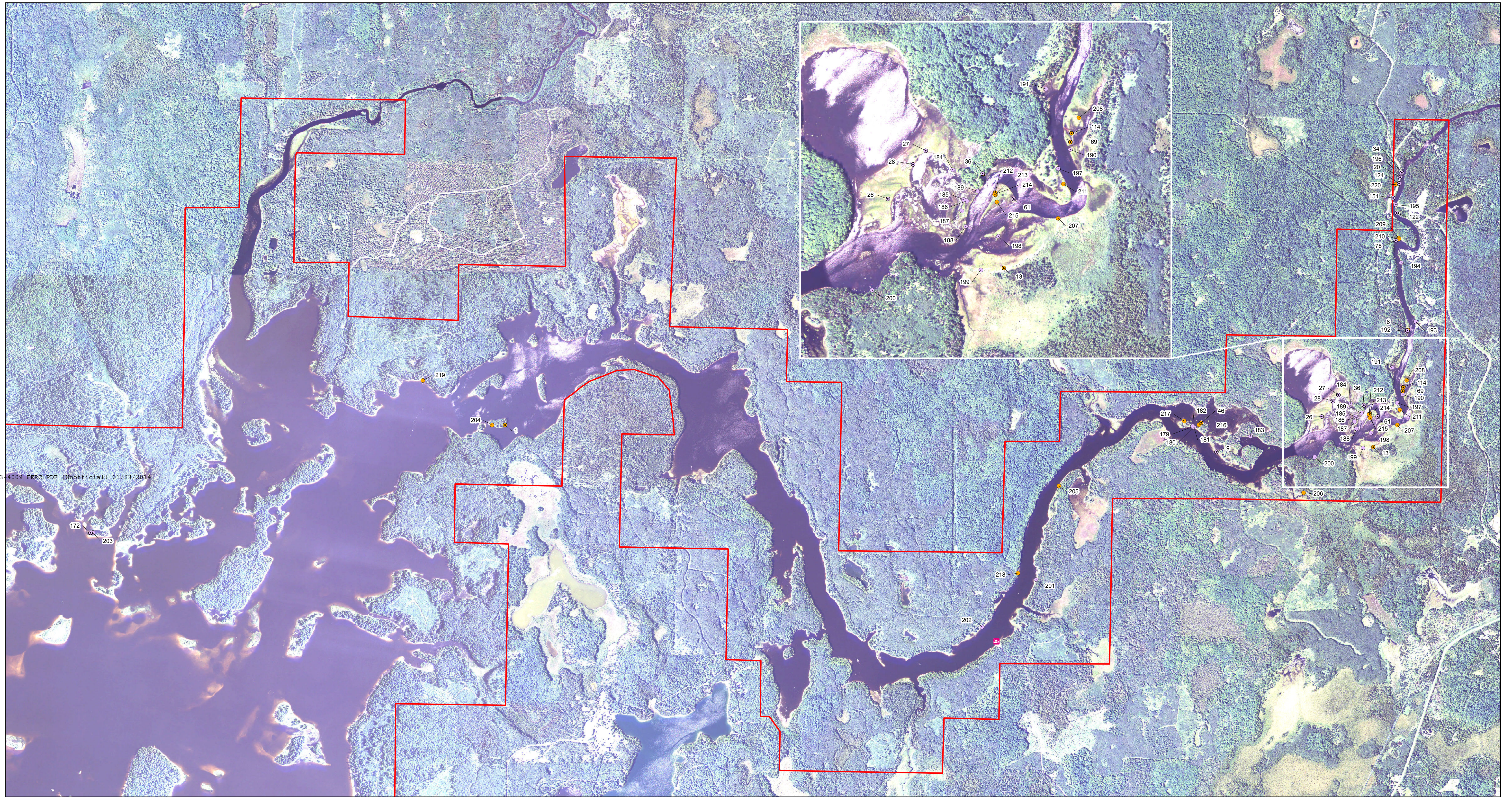
Table 2. Summary of purple loosestrife observations, Michigamme River 2009-2013.

	2009	2010	2011	2012	2013		
					July Survey	August Survey	TOTAL
# of Observed Stands	56	140	149	217	99	96	192
# of Plants Observed	113	362	592	915	361	325	686
# of Stems Observed	361	1234	1149	1732	585	547	1132
Stems Observed per Plant	3.19	3.41	1.94	1.89	1.62	1.68	1.65
Multi-year Plants Observations	79	317	282	525	280	244	524

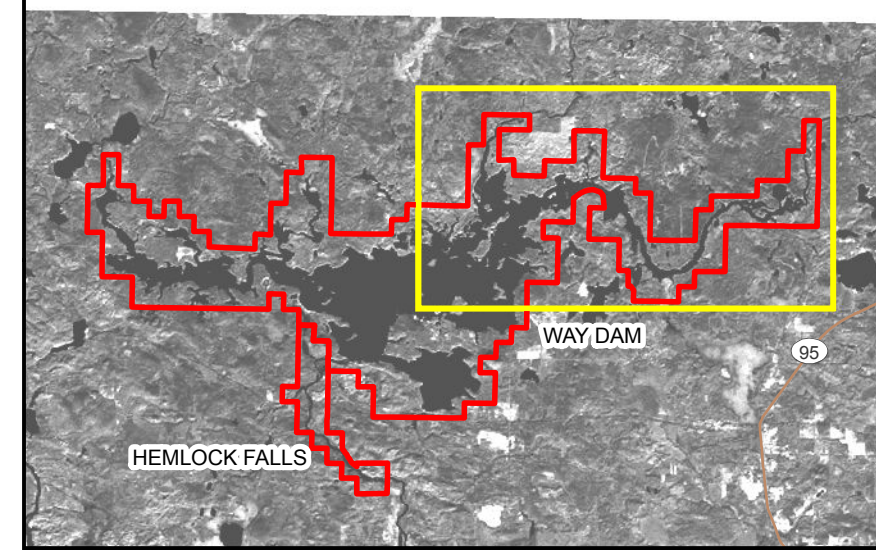
The effort to expand our understanding of source populations upstream of the Way Dam project area expanded in 2010 by further collaboration with Ms. Hruska. Ms. Hruska was awarded a Wilderness Shores Mitigation Enhancement Fund grant for conducting purple loosestrife management along the Michigamme River upstream of the Way Dam project area. In preparation for implementing this grant, Ms. Hruska conducted road surveys in August 2010 along access points from the M-95 crossing up to and north of Republic. Ms. Hruska found numerous dense monotypic stands of purple loosestrife along the shores of the Michigamme River in and around the Republic, MI area. Some of these stands were several acres in size. Many other small stands were observed along the Michigamme River banks at road vantage points from the M-95 crossing at the Marquette and Dickinson County line upstream to Republic. It was quite evident the source population(s) for the loosestrife occurring in the Way Dam project area is from the area in and around Republic, MI.

In 2011 and 2012, Ms. Hruska continued the purple loosestrife management efforts upstream of Way Dam by conducting a more detailed survey in the Republic area and on portions of the Michigamme River up and downstream of Republic. She also began implementing a biological control management program for purple loosestrife targeting the most problematic stands documented in the presence/absence surveys she conducted. Further monitoring and biological control measures continued to be implemented in 2013. Results indicate the prior releases of beetles have been effective in reducing the extent and productivity of the source populations upstream of Way Dam.

The management activities that have occurred both within the Way Dam project area and the approximate 5-mile stretch of the Michigamme River upstream have had a direct and positive impact on reducing the purple loosestrife infestation within Way Dam. We Energies plans to continue to survey and remove purple loosestrife from this stretch between Highway 95 and Newberg Road in 2014. We intend to continue collaborating with Ms. Hruska in further investigating source populations and management for purple loosestrife upstream of the Way Dam project area.

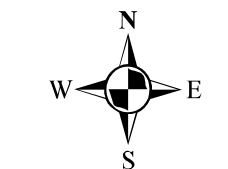


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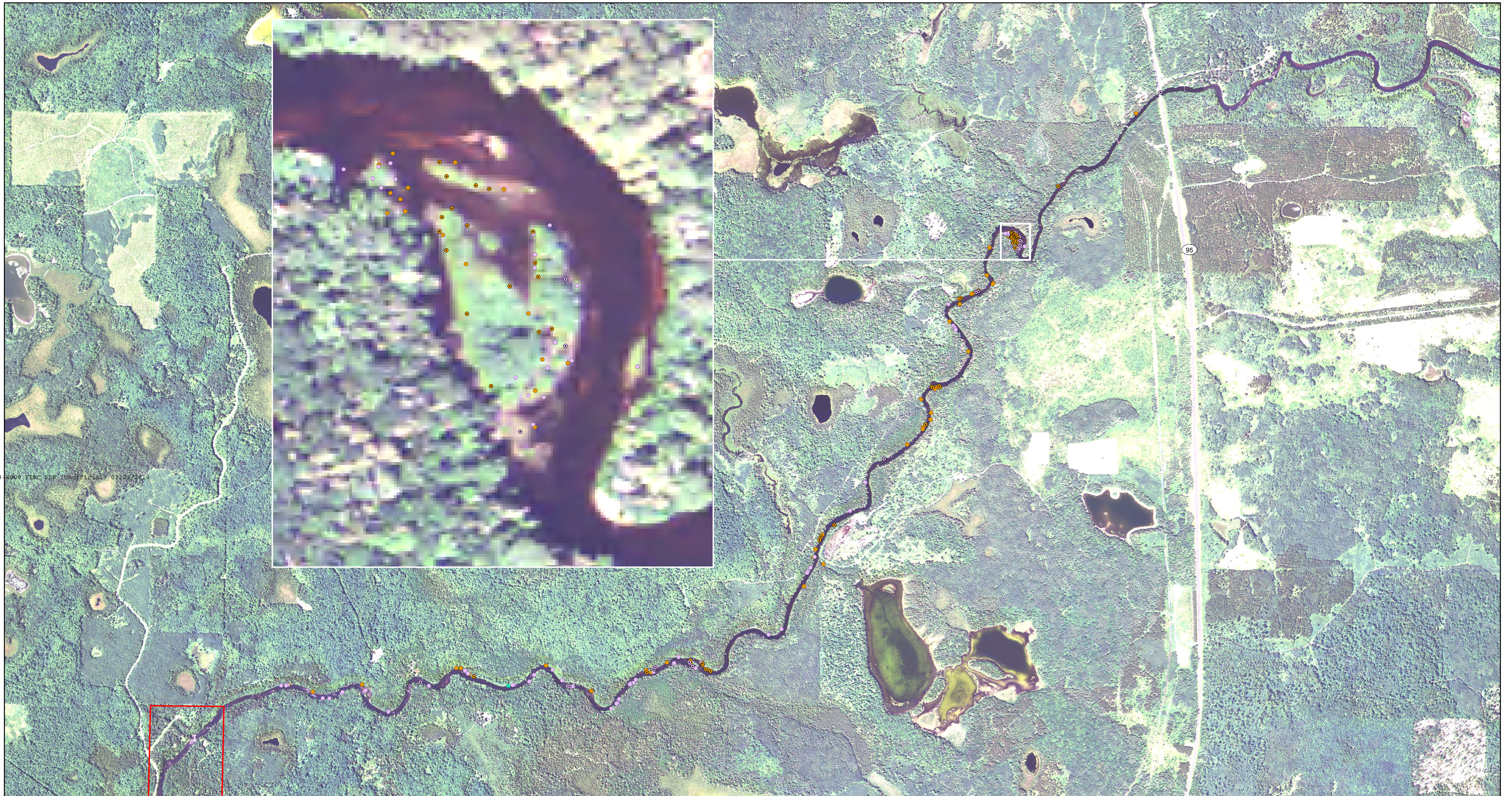
- Purple Loosestrife: Recurring Sites July 2013*
- Purple Loosestrife: New Sites July 2013
- Purple Loosestrife: Recurring Sites August 2013*
- Purple Loosestrife: New Sites August 2013
- Public Boat Launch
- FERC Hydro Project Boundary

* Recurring sites are those that have been mapped in previous years

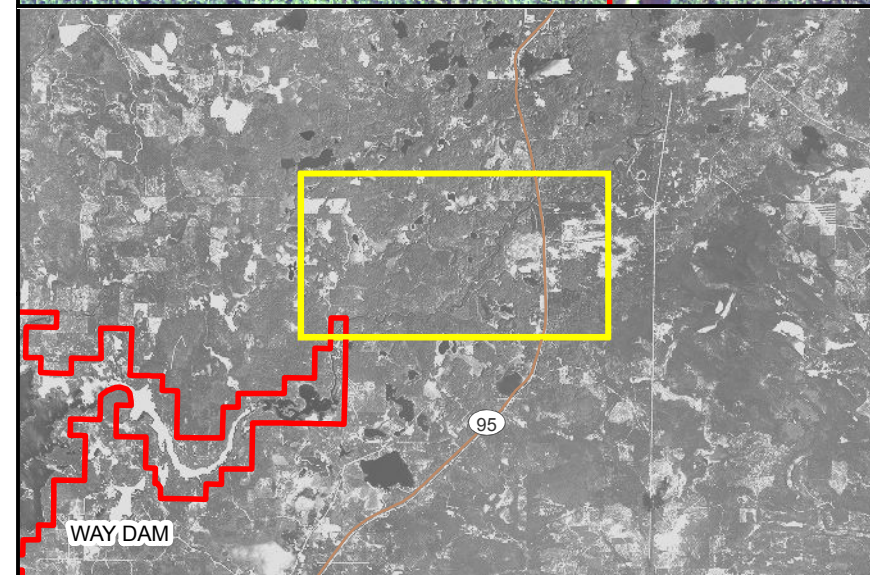


Way Dam Hydro Project - Year 2013 Purple Loosestrife Survey

Source: USDA - NAIP Imagery, 2012
GPS field data collected 7/29/2013, 7/30/2013, 7/31/2013,
8/19/2013, 8/20/2013, 8/22/2013

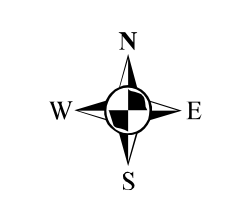
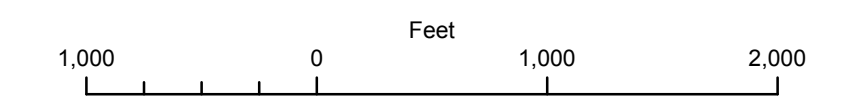


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- Purple Loosestrife: Recurring Sites July 2013*
- Purple Loosestrife: New Sites July 2013
- Purple Loosestrife: Recurring Sites August 2013*
- Purple Loosestrife: New Sites August 2013
- ▲ Beetle Release Site
- Public Boat Launch
- FERC Hydro Project Boundary

* Recurring sites are those that have been mapped in previous years



Michigamme River - Year 2013
Purple Loosestrife Survey

Source: USDA-NAIP Imagery, 2012
GPS field data collected 7/29/2013 & 8/22/2013