

## 2013 Through 2014 Interim Report on Yellow Floating Heart (YFH) Control Activities

The original plan for 2013 called for two subsurface herbicide treatments while the pond was still full and then a foliar herbicide spray after drawing down the pond. A contractor performed the first subsurface treatment in June using the herbicide Clipper (Flumioxazin). Clipper works by interfering with a plants ability to produce chlorophyll. Although Clipper killed leaves, it soon became apparent YFH roots were not seriously harmed. Based on the poor response to Clipper and new research indicating the next planned subsurface herbicide (Diquat) was not effective on YFH, we decided to immediately start drawing down the pond.

As the water level dropped, Greg Cleereman sprayed the exposed YFH with AquaNeat, a generic aquatic formulation similar to Roundup (Glyphosate) while the soil was still moist and the plants still healthy. Glyphosate works by inhibiting a specific enzyme that plants need in order to grow. The specific enzyme is EPSP synthase. Without that enzyme, plants are unable to produce other proteins essential to growth, so they yellow and die over the course of several days or weeks. A majority of plants use this same enzyme, so almost all plants succumb to Glyphosate. This seemed to work very well, and plants died back very quickly.



We ultimately lowered the pond level by about 3.5 feet in about three days using a gasoline powered Semi-trash water pump purchased with grant funds. The pump will stay with Marinette County after the grant period ends. The shallow part of the pond has three sub basins which were left almost completely dry by the drawdown. In the main pond, the drawdown exposed all the YFH except for one small corner.



View of pond after first drawdown. The light green plants are dying YFH.

After the initial drawdown, some areas stayed moist and new green leaves became visible again, either because of re-sprouting or germinating seeds. Several big rainstorms brought water levels back up which encouraged germination of the seed bank or re-sprouting. The new growth provided an opportunity to hit the plants multiple times with herbicide. I started using a new herbicide Habitat (Imazapyr), in addition to the AquaNeat. Imazapyr works to prevent the synthesis of three amino acids produced only by plants which are required for their growth and maintenance. The shallow side of the pond was carpeted by YFH in August, but the Habitat spray really seemed to work.

Greg Cleereman sprayed four times and Nancy Tessmer sprayed several times. On the last herbicide treatment visit the YFH leaves were so small (dime sized or less) the efficacy of using an herbicide was doubtful. Instead, a garden tool that sliced the stem from the roots underground was utilized. In the rocky areas, rocks were pushed aside and root material was pulled out, to the extent possible.

After the growing season ended, both the main pond and the sub basins were drawn down one more time to facilitate a thorough freeze. At that time, it was already becoming so cold the pump was freezing at night.

Fall of 2012, County and DNR staff had hand pulled a large quantity of YFH from the pond and removed it to a compost pile a distance away. Summer 2013 we checked the pile of composted YFH for signs of germination and found none. Greg Sevener took a handful of seeds and tried unsuccessfully to get them to germinate. This gave us hope a good freeze would kill the remaining YFH seeds and roots still in the pond. Unfortunately, early and deep snow in the winter of 2013/14 seemed to have protected the YFH from being frozen out. The growing season started very late in spring of 2014, so we did not see growth in the pond until mid-May

The picture below shows the initial flush of YFH growth. The first draw down of the pond began June 3<sup>rd</sup>.



Even after the pond was drawn down, sediment remained moist enough to support YFH growth as shown in the picture below.



As soon as the pond was drawn down Habitat treatments were resumed. The herbicide was thought to be effective, but it is possible the plants were simply going dormant due to drying conditions that occurred as June ended and July began. In the main pond, and deeper pockets, YFH was physically removed by hand.

On July 9, 2015 several DNR staff, two Marinette County staff, and the Tessmer's met at the pond and considered future management options. The pros and cons of filling in the shallow portion of the pond were discussed at length. Heidi Bunk (DNR) told us that herbicides, including Habitat, lose their efficacy after a year or so of use and should be discontinued.

After the July meeting, Nancy Tessmer increased the amount mechanical removal of YFH. Early fall rains necessitated drawing down the pond again starting September 16, 2014. Mechanical YFH removal by Nancy Tessmer continued. The trash pump was removed for the year November 10, 2014. Over the course of 2014, no YFH was allowed to flower or reach any significant level of maturity. Any plant reaching a size large enough to hand pull was removed.

In the original cost estimate it was estimated that \$15,045 would be spent on contract herbicide treatments of the YFH. However, as described above, it was learned Clipper and Diquat had little effect on YFH. Also, the Marinette County Conservationist applied the Imazapyr and Glyphosate at substantially less than the original estimate. Finally, all herbicides were discontinued at Heidi Bunk's recommendation. Overall this results in approximately \$11,300 in savings.

During the winter of 2014/15 Greg Cleereman contacted and spoke to Nancy Tessmer regarding applying for an additional grant to partially fund filling in the shallow portion of the pond. It was decided to continue the regime of keeping the pond drawn down and physically removing or killing YFH throughout 2015. Where feasible, the top layer of pond sediment will be scraped up with a flat shovel to remove seeds and tubers that survived the winter of 2014/15.