vertex AQUATIC SOLUTIONS
A Rentokil Company

Aeration Case Study: Aquatic Midge Fly Swarming Controlled

Hibbs Grove, a residential housing development located in Cooper City, FL was experiencing an ongoing outbreak of swarming non-biting midge flies.

The midge flies(Order: Diptera, Family: Chironomidae) preventing them from enjoying their lakefront property. The community has a 6.5 acre lake with an average center depth of 22 feet, shaped like the capital letter “E”, located in the middle of the development.

While larvae densities greater than 1,000 per square meter are considered to be at nuisance levels, often densities over 4,000 larvae per square meter can occur on the bottoms of nutrient rich lakes, ponds, and canals (Apperson, C. and Waldrogel, M.).

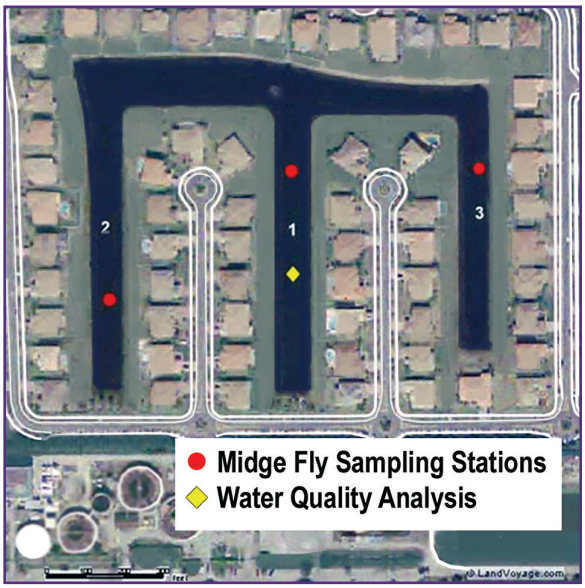
Midge fly larvae feed and develop within the rich organic matter and low oxygen level environment on the bottom before emerging at the water surface. Midges are generally large larvae that are red colored; hence, the term ‘blood worm’. Their red colored body is due to the presence of highly efficient hemoglobin that can store oxygen better than other organisms. This hemoglobin allows midges to live in habitats that have limited oxygen such as lake bottoms or areas of high organic pollution where other organisms cannot (Soil and Water Conservation Society).

Because of their unique ability to survive in the presence of very low oxygen, midge larvae are often free of competition for space and food and experience limited predation from fish and other insects. This absence of competition allows midge populations to quickly spread and dominate the bottom sediment.

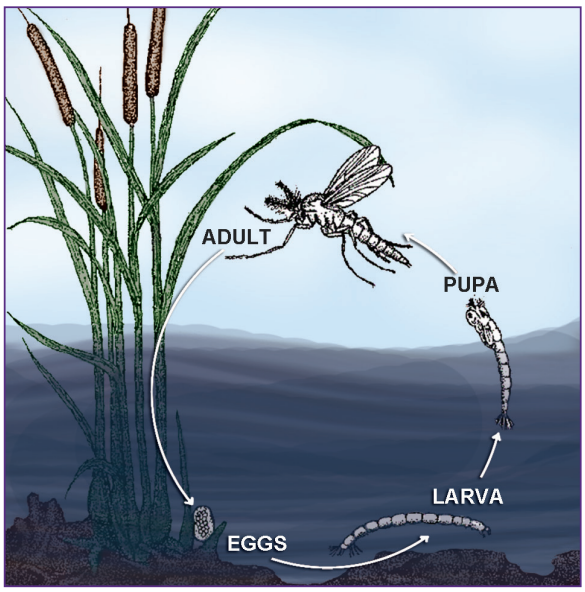
During the surface emergence cycle of midge flies, it is not unusual for several thousand adults per square meter of surface area to erupt on a nightly basis for several weeks. This emergence can cause a variety of health, safety and annoyance problems for those who reside within the flight range of these insects (Apperson, C. and Waldrogel, M.).

In order to combat their swarming midge fly problem, the residents of Hibbs Grove turned to Vertex for an environmentally safe solution. Vertex surveyed the lake and installed a CoActive Air 5 aeration system on February 5, 2005.

The system is designed to raise the lake’s bottom dissolved oxygen levels and create an overall healthier body of water. The Vertex aeration system provided diffused air through five Vertex XL2 CoActive AirStations™ placed at the deepest points throughout the lake, effectively circulating the entire water column 0.76 times per day.



Locations of sediment collection for midge fly sampling and location of water quality analysis.



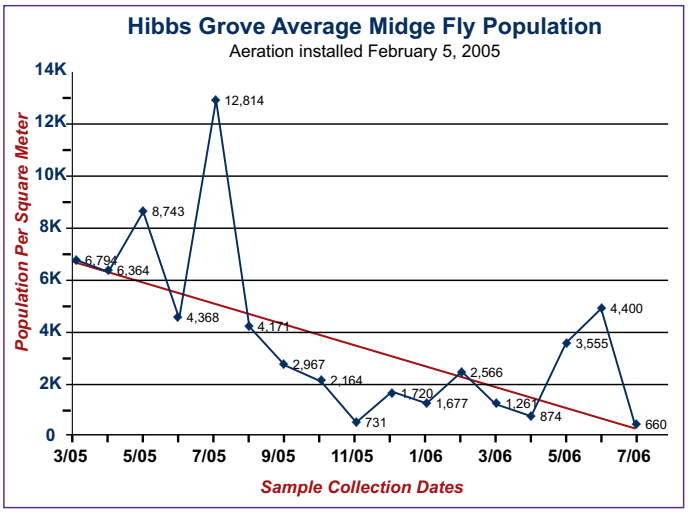
Life-cycle of a midge fly

Aeration Methods and Results

A total of three sediment samples were taken from the lake each month (Figure 2). One grab of the sediment was taken at each station within the lake using a 6" X 6" X 6" Ekman bottom dredge. Samples were analyzed in the Vertex Pompano Beach laboratory by slowly sieving the sediment to separate out the larvae (Ali, A. and Lobinske, R.). Larvae were counted and the totals for each individual sample were recorded. Both larvae and adults were preserved and sent to John Epler, an Aquatic Entomologist, for confirmation of correct identification of the subfamily, genus and species.

Results

The initial sampling data indicated an extreme infestation of midge larvae averaging 6,794 larvae/ m^2, more than six times the recognized nuisance level. After installation of the aeration system, oxygen levels increased and the accumulated organic muck on the bottom began to decompose thereby eliminating the habitat and food source that the midge larvae depended on, ultimately decreasing the number of larvae that emerged as adult flies. The changing environment at the bottom allowed predators of the midge fly, such as fish and other aquatic insects to inhabit the area and compete with the midges for space and resources. Both the increased predation and competition contributed to the decrease in midge fly numbers.



Conclusion

Within 16 months the midge fly larvae population had been reduced by 90 percent, from 6,794 larvae to just 660 larvae per square meter. Throughout the year, there had been a visible increase in dragonflies and beetles both of which are natural predators of the midge fly larvae.

With continued aeration, the oxygen levels are expected to remain elevated and continue breaking down the bottom muck and maintaining an environment advantageous for midge predators and competitive species thereby keeping the midge fly population in check.

References:

- Apperson, C. and Waldvogel, M. "Residential, Structural and Community Pests". North Carolina Cooperative Extension Service. May 2003. August 2004.
- Ali, A and Lobinske, R. 2004. Final Report: Investigations on Nuisance Chironomidae (Insecta: Nematocera: Diptera) in Wetlands of Sawgrass Country Club, Ponte Vedra Beach, Florida. IFAS, Mid-Florida Research and Education Center, University of Florida.
- "Family Chironomidae (Midge flies)". Soil and Water Conservation Society of Metro Halifax. January 2006. February 2006.
- "Identification Manual for the Larval Chironomidae (Diptera) of North and South Carolina" by John Epler. North Carolina Division of Water Quality: Index of Benthic Macro invertebrate Data by River Basin. August 2001. March 2006.
- "Welcome to the Chironomidae and Water Beetles of Florida Web Site!". Chironomidae and water beetles of Florida. January 2006. March 2006.
- Lobinske, R. "Midge fly sampling procedures and calculations". Personal interview. Jilek, T. and Gardner, J. March 2005.
- "Chaoborus punctipennis". An Image-Based Key to the Zooplankton of the Northeast (USA). Center for Freshwater Biology, Department of Zoology University of New Hampshire, Durham, NH 03824 USA. 2005. April 2006.
- "Non-biting midge, Chironomidae, Northern Sierra Nevada, California, USA". 2004. April 2006.