Waccamaw Silverside Monitoring Report

Ryan J. Heise and Brena K. Jones

Funded by
State Wildlife Grant Number T-22-R-1 F12AF001308,
and
Section 6 Recovery Funds, Project E3
and
Nongame and Endangered Wildlife Fund

North Carolina Wildlife Resources Commission
Aquatic Wildlife Diversity Program
Raleigh, NC

2014

Waccamaw Silverside Monitoring Report

Lake Waccamaw is a 3,615 hectare Carolina bay lake located in Columbus County, North Carolina (Figure 1). This natural lake is unique because of its water chemistry and large size, as compared to other bay lakes. There are 17 species of rare fish and mollusks that have been documented from Lake Waccamaw (Lindquist and Yarbrough 1979, Mottesi 1998, Shute et al. 2000). Three species of fish are known only from the lake and the Waccamaw River directly below the lake. The Waccamaw Silverside (*Menidia extensa*) is listed by the US Fish & Wildlife Service (USFWS) as threatened and the entire lake and a short reach of lower Big Creek (USFWS 1993) are designated as critical habitat. Other endemic fishes include the Waccamaw Darter (*Etheostoma perlongum*), and the Waccamaw Killifish (*Fundulus waccamensis*). The Broadtail Madtom (*Noturus sp.*) is another rare species that has been found in the lake and nearby counties.

One of the major goals of the North Carolina Wildlife Action Plan is to improve our understanding of species diversity in North Carolina, and to enhance our ability to make conservation decisions (NCWRC 2005). As part of this goal, we are conducting long-term monitoring surveys in areas that contain numerous endemic species, such as Lake Waccamaw. The results of this project support the USFWS recovery objectives for the Waccamaw Silverside by implementing a monitoring program (Part 6.0, USFWS 1993) to assess the status of the species and habitat quality of Lake Waccamaw.

Hydrilla (*Hydrilla verticillata*), a federal and state listed noxious weed, was first reported in Lake Waccamaw in October of 2012. This invasive plant poses a significant threat to the endemic species of Lake Waccamaw, especially Waccamaw Silversides, which prefer open water. The Lake Waccamaw Technical Advisory Committee (TAC), which includes members

from universities, state and federal agencies, non-governmental organizations (NGOs), and other stakeholders, has developed a plan to control and ideally, eradicate hydrilla, which includes the application of an herbicide (Fluridone). Due to the introduction of hydrilla to Lake Waccamaw and the initiation of multiyear chemical treatment, we added an additional fish survey location within the infested area. Treatment of the hydrilla began in early June 2013 and has continued through the fall of 2014.

Black Mat Algae (*Lyngbya wollei*), a species that can become invasive, was collected by North Carolina State University in 2013 within the area already infested with hydrilla. Initial surveys found 32 acres, but the coverage has reduced to 20 acres in 2014. This filamentous cyanobacterium is difficult to eradicate and options for control with the least risk are being discussed by the TAC.

North Carolina Wildlife Commission (WRC) staff, with help from NC State Parks personnel, collected a large Flathead Catfish (*Pylodictis olivaris*) in June 2014 from the WRC boating access area. This is this first official record of this nonnative, invasive species in the lake, although anecdotal accounts have existed for several years. The mostly likely method of introduction is via human transport and release. The illegal stocking of this predatory catfish will negatively affect sunfish populations and possibly other fishes of Lake Waccamaw. Outreach programs about invasive species are underway at Lake Waccamaw State Park and informational signs have been posted at boat ramps and other high-visibility locations around the lake.

The objective of this study is to conduct standardized surveys for priority species of fish in Lake Waccamaw. Relative abundance data (catch per unit effort) will be compared to future and previous surveys (Lindquist and Yarbrough 1979, Shute et al. 2000) to determine if changes in the listing status of these species are warranted, or if management activities need modification.

Methods

We established four long-term monitoring stations (Figure 1): the southwest shore of the lake near the dam (Site F1), the north shore near Dale's Seafood restaurant (Site F2), the southeast shore near the mouth of Big Creek (Site F3), and the northwest shore near a private residence (added in May 2013; Site F4). Collection locations were georeferenced using handheld GPS units.

Fishes were sampled using 3.1 and 4.6 m seines and the number of seine hauls and duration of sampling were recorded to determine catch per unit effort (CPUE). In addition, we conducted underwater visual surveys at Sites F1 and F3 for Broadtail Madtoms and Waccamaw Darters, which are not be easily collected using seines or dip nets in vegetated lake habitat. These two sites include large patches of the emergent plant (Maidencane, *Panicum hemitomon*) that provides habitat for the darters and madtoms. CPUE is expressed as the number of individual fish collected per minute of seining (indiv/min), or the number of fish observed per person-minute of visual surveys (indiv/p-min). During seining efforts, 25 individuals of each priority fish species (Table 1) were measured (total length) to assess the size distribution and released. Fish surveys will continue on an annual basis due to the presence of hydrilla, black mat algae, and Flathead Catfish.

Results

Waccamaw Silversides were present at all sites for each year of our monitoring and the annual mean CPUE for all sites ranged from 23.5 indiv/min of seining (2009) to 2.5 indiv/min (2014; Figure 2). The six-year mean CPUE of Waccamaw Silversides was highest at the south shore of the lake (16.6 indiv/min; Site F1) and lowest at the north shore (5.4 indiv/min; Site F2).

The mean CPUE of Waccamaw Silversides at the new site (2 years data; Site F4) was 1.1 indiv/min.

Waccamaw Killifish were also present at all sites in all 6 years with an annual mean CPUE ranging from 0.83 indiv/min (2009) to 2.1 indiv/min (2012; Figure 2). The mean CPUE was similar among sites and ranged from 1.3 indiv/min at Site F1 to 0.9 indiv/min at Site F2. Waccamaw Darters were present at Sites F1 and F3 from 2009-2014 (visual surveys) and were collected with the seines at site F2 in 2011, 2012, and 2014. Using the visual observations from 2009-2014, the annual mean CPUE for Waccamaw Darters ranged from 1.36 indiv/p-min in 2011 to 0.13 indiv/p-min in 2013 (Figure 2). Waccamaw Darters were most abundant at Site F1 with a CPUE of 1.02 indiv/p-min. Due to the above average rainfall in spring and summer of 2013 and 2014 the lake water was darkly stained and underwater visibility was low. This greatly reduced our ability to see Waccamaw Darters. No Broadtail Madtoms were observed (using visual or seining methods) at any of our sites. Twelve additional species were collected during these surveys and the Costal Shiner (*Notropis petersoni*) was the most abundant among these.

Discussion

The mean number of Waccamaw Silversides collected per minute of seining has varied over the past 6 years, but this species was collected with minimal effort (CPUE of 2.5 to 23.5 indiv/min). This variability in catch rate is expected due to the fish's schooling behavior and preference for open waters of the lake. CPUE is influenced by how close the nearest schools of silversides are to us at the initiation of our seining efforts. Young-of-the-year silversides comprised the majority of the individuals that we collected which indicates continued successful reproduction and recruitment.

Brook Silversides, a species that has naturally colonized the lake (Moser et al. 1998), was present at Sites F1 and F3. This species was collected very close to the shoreline in or near emergent vegetation. Waccamaw Silversides were typically collected in open waters, and habitat use of the adults and juveniles do not appear to overlap with the Brook Silversides so any competition is likely minimal.

Waccamaw Darters and Waccamaw Killifish were also collected with minimal effort suggesting that abundant populations exist within Lake Waccamaw. Visual surveys for Waccamaw Darters through large patches of emergent vegetation (Maidencane, *Panicum hemitomon*) were more effective for observing this species than seining, but these efforts were hindered by low water visibility in 2013 and 2014. We will continue our annual monitoring surveys of the fish to ensure that populations remain viable during the hydrilla treatment and to help refine our management strategies.

Acknowledgments

We thank numerous individuals from the North Carolina Wildlife Resources Commission, North Carolina State Parks (especially Ed Corey, Toby Hall, and Chris Helms), North Carolina Department of Transportation, North Carolina Museum of Natural Science, and volunteers for providing invaluable assistance while sampling in Lake Waccamaw.

Literature Cited

Lindquist, D.G., and C.G. Yarbrough. 1979. Status of the rare and endangered fauna of Lake Waccamaw, North Carolina. Annual report. North Carolina Wildlife Resources Commission. Raleigh, NC.

Mottesi, G.B. 1998. Lake Waccamaw state park aquatic inventory. North Carolina Wildlife Resources Commission. Raleigh, NC.

North Carolina Wildlife Resources Commission (NCWRC). 2005. North Carolina Wildlife Action Plan. Raleigh, NC.

Shute, J.R., P.L. Rakes, J.T. Baxter, and P.W. Shute. 2000. Survey of Lake Waccamaw and the Waccamaw watershed with emphasis on imperiled fishes. Final report to the U.S. Fish and Wildlife Service. Asheville, NC.

U.S. Fish and Wildlife Service (USFWS). 1993. Waccamaw Silverside (*Menidia extensa*) recovery plan. Atlanta, GA.

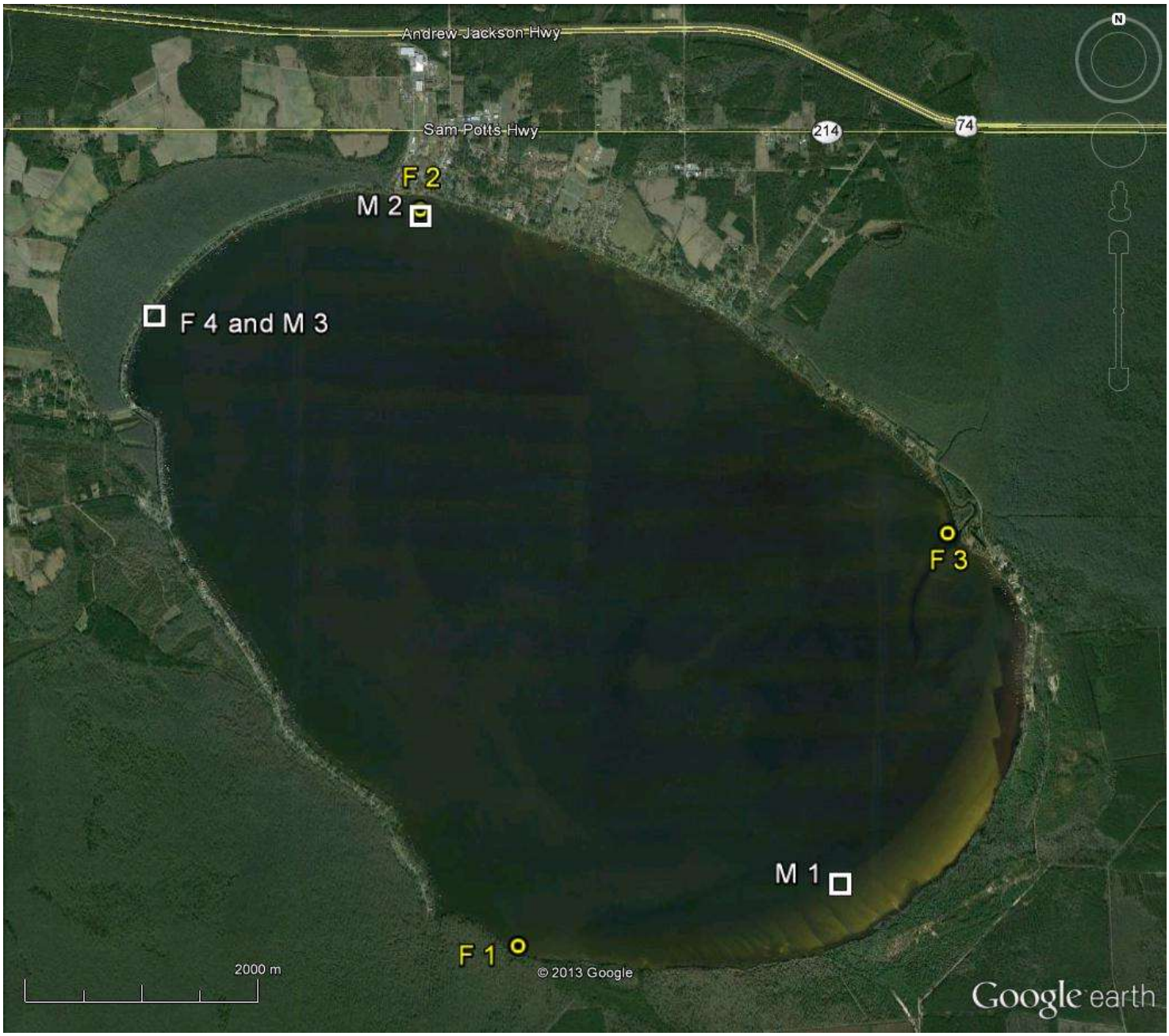

Figure 1. Fish (F1 – F4) and mollusk (M1 – M3) monitoring sites in Lake Waccamaw.

Figure 2. Mean catch per unit effort (CPUE) of Waccamaw Silversides, Killifish (#/min of seining) and Waccamaw Darters (#/person-min of visual observation) among years. Vertical bars represent standard deviation.