

NOTE

Angling effort on an embayment of Lake Guntersville, Alabama, before and after herbicide application

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INTRODUCTION

Aquatic vegetation control has the potential to cause conflicts among various user groups of water bodies (Wilde et al. 1992, Slipke et al. 1998). Homeowners with waterfront property generally voice the greatest support for controlling excessive plant growth, compared with nonresident boaters and anglers (Slipke et al. 1998). In addition, differences in aquatic plant management activities vary among anglers, with those seeking largemouth bass (*Micropterus salmoides* L.) preferring aquatic plants to fish, whereas those targeting other fish species typically express less opposition to aquatic plant control activities (Wilde et al. 1992, Slipke et al. 1998). Extensive coverage of aquatic plants has been shown to limit access and cause decline in angler use (Colle et al. 1987). Henderson et al. (2003) noted management of aquatic plants for an “optimal” level is difficult in reservoirs. Nearly all aquatic plant and fishery managers agree that some level of aquatic plants in a water body is ideal to maximize overall benefits (Bergstrom et al. 1996, Kirk and Henderson 2006), with selected control to provide for access, swimming, and nonangler boating activities.

Lake Guntersville, AL, is a 27,500-ha mainstem impoundment on the Tennessee River, which supports both a mixed native–exotic plant community and an economically important fishery for multiple species, including largemouth bass (McKee 2013). In fall 2011, an aquatic plant control controversy arose. Homeowners residing on Roseberry Creek, a 790-ha embayment on Lake Guntersville (34°37′05.60″N; 86°01′52.48″W), supported a whole-embayment herbicide treatment to reduce or eliminate hydrilla [*Hydrilla verticillata* (L. f.) Royle] and Eurasian watermilfoil (*Myriophyllum spicatum* L.). These two plants nearly covered the entire Roseberry Creek embayment. Homeowners on Roseberry Creek solicited and gained the support of the City of Scottsboro, AL, for cost sharing the herbicide

treatment. Many anglers who fished Lake Guntersville and Roseberry Creek opposed whole-embayment herbicide treatment, given that local government revenue would be used to fund some of the project. Angler opposition to this aquatic plant control activity was not surprising because nearly 70% of the anglers target largemouth bass on Lake Guntersville (McKee 2013). Public meetings were held, exchanges of different viewpoints expressed, but a decision with funding was made in January 2012 to treat Roseberry Creek with fluridone in May 2012 to July 2012. Nearly complete elimination of hydrilla and Eurasian watermilfoil was expected in Roseberry Creek. Proponents of the herbicide treatment noted that many other areas of Lake Guntersville contained aquatic plants for those anglers who desired to fish this habitat. Recent quantitative estimates of coverage by aquatic plants were not available in 2012 for Lake Guntersville, but they likely exceeded 6,000 ha (T. Goldsby, pers. obs.).

The objectives of this study were (1) to estimate angler boat use in Roseberry Creek before and after whole-embayment herbicide treatment, and (2) to compare these estimates to angler boat use for the entire reservoir in spring (February to May) 2012 and 2013.

MATERIALS AND METHODS

Aerial counts using a fixed-wing aircraft were made to estimate the number of boats fishing on Lake Guntersville. The reservoir was divided into 25 sections that covered a total of 20,300 ha. From 1 February to 31 May in 2012 and 2013, flights to count fishing boats in each section were made during 3 weekday and 3 weekend days (randomly chosen) each month. Flight time or shifts were randomized to include morning (8:00 A.M. to 11:00 A.M.), midday (11:00 A.M. to 2:30 P.M.), and evening (2:30 P.M. to 6:00 P.M.) counts. To count all boats that were fishing for the entire 25 sections took about 1.5 to 2.0 h, and boats that were under way were not counted. Roseberry Creek was a discrete section for counting angler boats. Twenty-three and 20 flights were conducted in 2012 and 2013, respectively, and included 11 weekend flights each year. Five flights were cancelled in 2012 and 2013 because of inclement weather.

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Between mid-May and early July 2012, Aqua Services Inc. (Guntersville, AL) applied fluridone to control Eurasian watermilfoil and hydrilla infestations in Roseberry Creek. A surface area of approximately 445 ha, at an average depth of 2.3 m, was treated from near the mouth of Roseberry Creek, where it enters the Tennessee River, to a line across that embayment adjacent to Jackson County Park. The entrance of Roseberry Creek from the mainstem of the Tennessee River is only 310 m wide, which limited inflows from the river and facilitated the maintenance of sufficient fluridone concentrations to control Eurasian watermilfoil and hydrilla. A total of 454 L of fluridone was applied in Roseberry Creek during May to July 2012. Fluridone concentrations were monitored from periodic water samples collected during the 6-wk application period. A concentration of 6 to 12 ppb fluridone was maintained throughout, though at times additional treatments were required. By fall 2012, Eurasian watermilfoil and hydrilla were completely eradicated in this embayment. Following eradication, small pondweed (*Potamogeton pusillus* L.), American pondweed (*Potamogeton nodosus* Poir.), and American eelgrass (*Vallisneria americana* Michx.) became established in Roseberry Creek (T. Goldsby, pers. obs.).

Aerial counts of angler boats for the reservoir were summed for each flight. To account for all variation in angler boat use, four-way ANOVA was conducted, which included flight time or shift, day (weekend or weekday), month, and angler boat use between years (2012 vs. 2013) being the primary factor to determine whether an annual difference occurred. The year-by-day and year-by-month interactions were also examined. The analyses for angler boat counts for the entire reservoir did not include anglers fishing in Roseberry Creek. Similarly, for Roseberry Creek, the same four-way ANOVA was conducted to test for differences among those factors, including angler boat use between 2012 and 2013. Angler boat counts were transformed to \log_{10} values for analysis because all arithmetic distributions were not normally distributed (Shapiro-Wilk's test; $P < 0.10$). Average boat counts were reported as geometric means; logarithmic averages were reconverted to arithmetic values. Box plots were used to compare the distributions of boat anglers in 2012 (preherbicide treatment) and in 2013 (postherbicide treatment) for both Roseberry Creek and the entire reservoir. When differences ($P < 0.10$) were detected in the ANOVA, least-significant difference tests were conducted to delineate statistical significance.¹

RESULTS AND DISCUSSION

In 2012 and 2013, geometric means of 13.5 and 13.2 angler boats were counted during each flight, respectively, in Roseberry Creek (Figure 1). This represented a difference of only 2%, which was not statistically different ($F = 0.09$, $df = 1, 31$, $P = 0.77$). For the entire reservoir (not including Roseberry Creek), geometric mean angler boat use increased 14% from 221 to 251 angler boats per flight in 2012 and 2013, respectively (Figure 1), although the increase was not statistically significant ($F = 0.52$, $df = 1, 31$, $P = 0.48$).

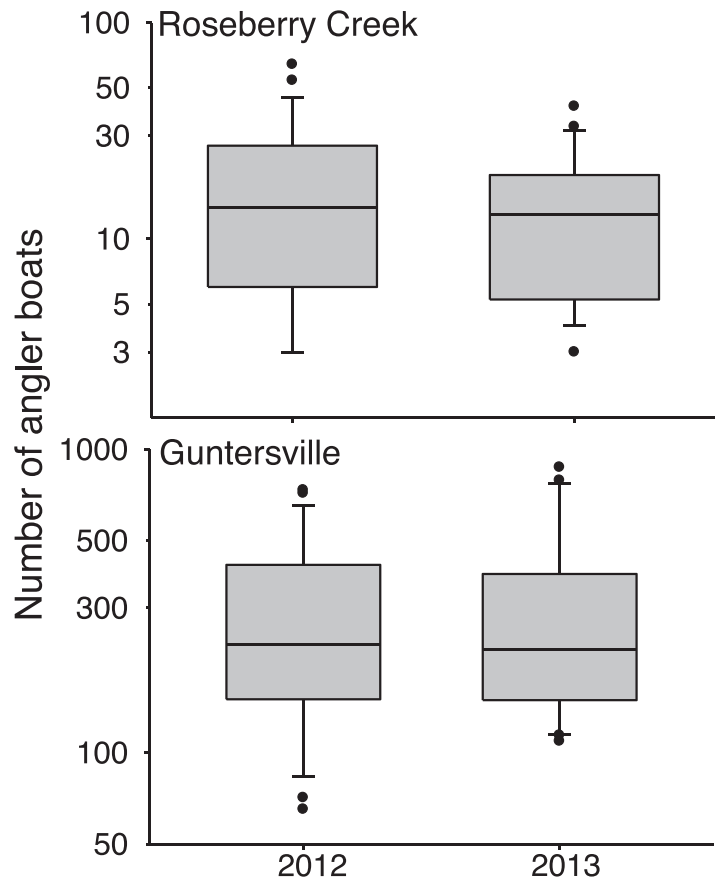


Figure 1. Box plots showing the distributions of angler boats in Roseberry Creek (top) and in Lake Guntersville (bottom). Shaded areas represent the 25th and 75th percentiles with the median. Error bars are the 10th and 90th percentiles, with the round dots showing the extreme range of angler boat distributions that lie < 10 th and > 90 th percentiles.

For the entire reservoir and Roseberry Creek, about twice as many anglers fished on weekend days as did on weekdays ($F = 10.04$ to 10.69 , $df = 1, 31$, $P < 0.01$). Monthly differences ($F = 6.61$, $df = 3, 31$, $P < 0.01$) in angler boat counts occurred in Roseberry Creek, and boat counts were greatest in March and April and lowest in May each year. Finally, for angler boat counts for the entire lake and Roseberry Creek, year-by-day (weekend or weekday) and year-by-month interactions did not occur and indicated boat counts were consistent between years for those factors ($P > 0.10$).

From previous studies, herbicide applications and subsequent declines in vegetation did not cause largemouth bass to leave the treatment areas or cause extremely large shifts in behavior or activity patterns (Bain and Boltz 1992, Boyer and Cichra 1994, Sammons et al. 2003, Sammons and Maceina 2005). Similar to largemouth bass behavior, anglers seeking this species continued to fish a 2,300-ha embayment in Lake Seminole, GA, after treatment with fluridone reduced hydrilla coverage by 69% (J. Staigl, U.S. Army Corps of Engineers, pers. comm.). In addition, visitation (angler and nonangler) to this area did not change between pretreatment to posttreatment herbicide periods (Sammons and Maceina 2003). This suggests that, although largemouth

bass anglers frequently voiced opposition to herbicide treatments, they did not leave preferred areas to fish at alternate sites following these herbicide applications.

Although local publicity concerning the whole-embayment herbicide treatment occurred, and opposition to treatment was strongly voiced by anglers, we did not detect a decline in angler boat use in Roseberry Creek following hydrilla and Eurasian watermilfoil control. In two South Carolina reservoirs, Henderson et al. (2003) predicted a slight increase in angler visits with greater plant coverage. Wrenn et al. (1996) speculated negative media attention fueled the “aquatic plant–largemouth bass fishing” issue in Lake Guntersville in the early 1990s because aquatic plants and fishing effort declined during that time. However, the reestablishment of other native submersed plants in Roseberry Creek possibly abated negative criticism to fluridone treatment, and anglers still fished in this embayment. Although we did not record angler preference for species sought in 2013, 13 of 16 angler boats (81%) fishing in this embayment were targeting largemouth bass from February to May 2012 (McKee 2013). Possibly, a higher proportion of anglers not seeking largemouth bass fished Roseberry Creek in 2013, but data collected by McKee (2013) suggested that in spring (March to May), most anglers (69%) target largemouth bass throughout Lake Guntersville. Nevertheless, anglers continued to fish Roseberry Creek after fluridone eliminated hydrilla and Eurasian watermilfoil, which had covered nearly the entire embayment and native plants became reestablished.

SOURCES OF MATERIALS

¹SAS statistical software, version 9.2, SAS Institute Inc., Cary, NC.

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