Lake Redstone Comprehensive Fisheries Survey Report
Sauk County, Wisconsin 2010

Waterbody Identification Code: 1280400

T13N3E Sections 1, 2, 11, 12, 13, 14, 23, 24

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May 2012

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SUMMARY

<u>Lake & location</u>
Lake Redstone, Sauk County, T13N3E Sections 1, 2, 11, 12, 13, 14, 23, 24

<u>Physical attributes</u>
Surface acres: 612
Mean depth: 14 feet
Maximum depth: 36 feet
Lake type: Drainage
Littoral substrate: 40% sand, 0% gravel, 0% rock, 60% muck
Trophic status: Eutrophic
Aquatic vegetation: Limited aquatic plant growth, however extensive in certain areas. Three invasive species present; Eurasian water milfoil, curly-leaf pondweed, and pink water lily.
Other Features: There is a dam located at the south end of the lake that has a top draw spillway.

<u>Purpose of surveys</u>
Baseline lake survey Tier 1 assessment.

<u>Dates of fieldwork</u>
Fyke netting survey conducted March 30 through April 8, 2010 and April 27 through April 29 (SN I, II). Electrofishing surveys conducted April 12, 2010 (SEI), and May 26, 2010 (SE II). Muskellunge recapture fyke netting conducted April 17 through April 27, 2011.

<u>Fishery</u>
Walleye and black crappie are abundant. Muskellunge, smallmouth bass, white crappie, and yellow perch are common. Yellow bullhead, bluegill and largemouth bass are present.

BACKGROUND

Lake History

Lake Redstone is a 612 acre, artificially impounded drainage lake in northwest Sauk County (Wisconsin 2001). Although there are other intermittent streams and springs that make up the 28.83 sq. mile watershed (Purdue 2010), the East and West Branch of Big Creek are the two biggest contributors to Lake Redstone. Water from the lake is released from a top draw dam located at the southernmost end of the lake which eventually drains into the Baraboo River. Redstone has a maximum depth of 36 feet and a mean depth of 14 feet. The southern end of the lake has scenic red sandstone cliffs which steeply slope into deep water with very little littoral habitat, while the many bays and the remainder of the lake has a gradual drop off and more littoral habitat. Three public boat access points exist on the lake, which are controlled by the township and county. Each site has a paved launch and trailer parking available. Local ordinance number 2001-01 identifies slow no-wake areas and designates a swimming area directly adjacent to the Sauk County Park beach. There are shore fishing opportunities at the Fox court boat landing in the north part of the lake and off of the Sauk County Park land at the southern end of the lake.

In 1956, before the lake was created, T13N3E Sections 12, 13, and 14 of Big Creek were surveyed and assessed for potential trout stocking at the request of the La Valle Sportsman Club. Following the survey, it was advised that the sampling area be considered for a potential brown and rainbow trout put-and-take fishery.

Seven years later the wheels were set in motion, and the idea of a lake in the area began. A landowner donated approximately 40 acres to Sauk County to create a park and lake (approx. 12-15 acres). Around the same time, the Lake Shore Development Corporation (LSDC) was looking to construct a lake in upper Sauk/lower Juneau County, but could not find a suitable place to construct a dam until it ran into the aforementioned land. Because the county would save tens of thousands of dollars, the county allowed the LSDC to build a dam at this site and land was to be donated back to the county to create a park. The LSDC began buying up land and construction began in fall of 1964. In March of 1965, reports of a washout at the dam site were confirmed. The LSDC could not afford the necessary dam repairs and after considerable negotiations, the Braniger Organization from Illinois assumed control of the project. By the summer of 1966, the lake was filled.

The lake reflects the extensive agricultural watershed it drains with heavy, late summer algal blooms. Organic decomposition depletes oxygen below 12 feet during the summer. A very active lake management district exists on the lake and they have been studying and conducting water quality improvement projects. One of the district's projects is the development of a sediment delivery model for the lake. This project is funded by a Lake Planning Grant from the Wisconsin Department of Natural Resources (WDNR). Another Lake Planning Grant was used to fund nutrient monitoring on the lake in 2000. The monitoring data was used to examine the potential to reduce phosphorus concentrations at the bottom of the lake. One of the options proposed was the installation of a bottom draw on the lake to discharge the phosphorus laden water. A feasibility study was conducted by the WDNR to evaluate this option. It found that overall; a bottom withdrawal would provide minimal water quality benefit to the lake. In addition, due to the high levels of hydrogen sulfide and ammonia concentrations in the hypolimnetic water, effluent limits and potential wastewater treatment of the discharge would be needed to prevent nuisance odors and to protect the downstream fishery in Big Creek (Marshall et al 2002).

In response to high levels of nonpoint pollution, Lake Redstone was part of the Crossman Creek & Little Baraboo Creek priority watershed project. The project was jointly sponsored by the WDNR, the Department of Agriculture, Trade and Consumer Protection, and the Sauk, Richland and Juneau County Land Conservation Departments. The project was selected in 1983 and was completed in the mid 1990's. Goals of the project were to protect and improve water quality and fisheries habitat by controlling erosion from farm fields, reducing stream bank erosion, reducing or controlling barnyard runoff, and better management of manure spreading in the watershed (WDNR 2002). When the priority watershed project was completed, 60% of eligible landowners had signed up, but only 65% of the signed projects were actually completed. The project did achieve its goal of a 70% phosphorus reduction and 50% sediment reduction from what had been coming into the watershed (WDNR 2002).

Aquatic Vegetation

Although aquatic vegetation in bay areas of the lake have been abundant, the majority of the lake is relatively unproductive because of limited light penetration due to turbidity, planktonic algal blooms, and steep drop offs. A comprehensive plant survey, which was conducted in August of 2005, found that coontail, elodea and small pondweed made up the majority of macrophytes in the lake (Sefton & Graham 2009). There were 8 other species recorded during the survey at lower frequencies. Three exotic plants were also identified during the survey; eurasian watermilfoil, curly-leaf pondweed, and pink water lily (Sefton & Graham 2009). Pink water lily was a newly identified exotic since the first two were confirmed in 1989.

In fish manager reports from 1972 to 1995, both planktonic algal blooms and abundant plant growth were noted in certain areas. Up until 2002, Lake Redstone Protection District volunteers who obtained a commercial applicators license applied copper sulfate or in some cases 2,4-D in problematic vegetation locations. In 2002, following an explosion of aquatic plants, professional applicators were hired as part of the approved aquatic plant management plan.

Fish Stocking

With the exception of three total stockings of walleye in 1967 and 1969, Lake Redstone did not receive stocked fish until 1982 (Table 1). No other stocking was done from 1969-1982 because of annual and semiannual die offs during both summer and winter months.

For the most part, walleye have been stocked annually since 1982 and muskellunge every other year since 1987. Northern pike were stocked once each in 1982 and yellow perch once in 1983. Channel catfish have been stocked twice, once in 1982 and once in 1993.

In 1997 the La Valle Hawg Hunters Club requested approval to stock smallmouth bass (which had previously not been present). The request was approved and two years (1998 and 1999) of smallmouth bass were stocked in the lake. There appears to be natural reproduction and the species is currently self sustaining.

Currently the DNR quota requests for Lake Redstone are; walleyes at a rate of 18 small fingerlings per acre and muskellunge at 1 large fingerling per acre each year. Walleye and muskellunge will continue to be stocked for the maintenance of stocked populations.

As of 2012, Lake Redstone follows the general inland fishing regulations with the exception of a 50 inch minimum for muskellunge and motor trolling is permitted (Table 2).

2010 DNR Comprehensive Fisheries Survey

METHODS

In 2010, a comprehensive fish survey was conducted. This survey evaluated adult populations of game fish as well as described the relative abundance of panfish and detected the presence of nongame fish.

Six fyke nets were set at ice out on the lower lake on March 30th, 2010. Four more were set in the upper lake on March 31st and were fished until April 8th (Table 3). This constituted the Spring Netting 1 sample and was used to mark adult walleye and muskellunge. An April 12th boom shocking event was used to capture marked walleyes and muskelunge (Spring Electrofishing 1). There was a good sample of muskellunge collected which allowed a preliminary muskellunge population estimate (PE) (Table 4). From April 27th to the 29th, 4 fyke nets were again set in the lake, but this time to further assess black and white crappies and to a lesser extent, bluegill populations (Table 3). On May 26th, another boom shocking event (Spring Electrofishing 2) was conducted. An attempt to get a PE on largemouth and smallmouth bass, however not enough recaptures were sampled (Table 4).

In the spring of 2011, 8 fyke nets were deployed throughout the lake to capture marked muskellunge (Spring Netting 1 2011). Fyke nets were fished from April 17-27 to complete the PE (Table 3).

During the 2010 survey, all game fish were measured, weighed, and sexed (if possible); and walleye, muskellunge, and bass were marked during fyke netting. Subsamples of dorsal spines, fin rays, and scales were collected from fish stratified within 0.5 inch bins for age/growth modeling during both capture methods.

Data Analysis

For this assessment several standardized metrics were calculated and comparative analyses were performed.

Catch per unit of effort (CPUE), a measure of relative abundance, is one of the basic tools used to evaluate a fishery. It quantifies the number of fish by the hours or miles sampled during electrofishing or the number of fish for each net per night fished during fyke netting. This can then be compared to other lakes or years when the same sampling method was used. CPUE for each species was compared to data from other similar lakes within the Wisconsin fish management database.

Population estimates (PE's) are an estimate of how many total fish (greater than a minimum size) which are in the lake. The number of adult fish or "legal" size fish are the main target. First, fish are marked by either a fin clip or are given a tag. During this survey, adult walleyes were marked by removing a small portion of the caudal fin and muskellunge were marked by completely removing a pelvic fin. After enough fish are marked, they are allowed to evenly redistribute in the lake. Following redistribution, fish are then sampled a second time and observed for marks or tags. Using the proportion of fish marked and the number of fish captured, one can estimate the total number of fish in the population. For the PE's calculated during the 2010-2011 sampling period for walleyes and muskellunge, the Chapman modification of the Peterson method was used. Fish densities can also be estimated by dividing the PE by the lake surface area. This is done so populations can be compared to other lakes.

Size structure compares the proportion of large fish in a sample to the total number of fish. A length frequency histogram shows the number or abundance of fish in each size group. An alternative way to look at the structure of a fishery, and perhaps a better tool for fisherman (particularly trophy fisherman) is proportional stock density (PSD) and relative stock density (RSD) (Anderson and Neumann 1996). These values look at the proportion of one size of fish versus a minimum size. For instance, the stock size (minimum value) for largemouth bass is 8 inches (Gabelhouse 1984). An RSD(15) value for largemouth bass would be the total number of bass that measured 15 inches or greater, divided by the total number of bass 8 inches or greater, and then multiplied by 100. A value of 30 means that of all the bass measured that were at least 8 inches long, 30% were at least 15 inches. This tool may be valuable to fisherman because it would give an idea of the quality of the fishery that is, more or less, susceptible to angling.

The structure of a fishery can also be looked at based on age. Similar to length frequency, an age frequency distribution shows the number or fish in each age group for a sample. This is estimated by aging a subsample of fish from each length group. Then an age length key is used to assign ages to the unaged fish in the sample based on the proportional age representation in the size groups (Hoenig and Heisey 1987). This helps determine year class strength, assess survival of year classes and recruitment variability.

Age can also be compared to the length of the fish at the time of capture to evaluate the growth rate of each species. The average fish length at a known age can be compared to other lakes, regional, or state wide averages. Scales, spines and fin rays can be used to accurately determine a fishes age because the annual growth pattern that differentiates winters and summers, is recorded in these structures.

Relative weight (W_r) is a tool biologists use to look at body condition of fish by comparing the length of the fish to an expected weight for that length. The standard weight at each length is listed by species (Murphy et al. 1991; Anderson and Neumann 1996). A value between 75 and 100 means that a fish has a relatively normal weight for its length. Above 100 and it's in great condition, under 75 and it's in poor condition.

RESULTS

General Fish Community

A total of 3,443 fish of 17 different species were collected during the 2010-2011 survey on Lake Redstone (Table 5). The catch per gear type is shown for 10 of the species sampled (Table 6). Walleye was the most abundant species. Black crappie also were abundant. Bluegill, muskellunge, smallmouth bass, white crappie, and yellow perch were common. Common carp, yellow bullhead, northern pike, channel catfish, and largemouth bass were present. Gizzard shad, golden shiner, spotfin shiner, and white sucker were observed but were not quantified.

There were only 6 northern pike captured during the 2010 sampling on Lake Redstone. The average length was 30.6 inches with a range form 21.5 – 39.0 inches. Channel catfish were present, but were also limited in the catch. The average length for the three fish sampled was 22.3 inches with a range from 10.8 – 28.8 inches. Although abundance of gizzard shad was not quantified during electrofishing II, it was noted that the entire shoreline was littered with spawning fish. This species had not previously been sampled nor reported on Lake Redstone.

Walleye

A total of 883 walleyes were sampled in the spring of 2010 (not including recaptures). The catch rate for fish ≥10inches during fyke netting was 8.9/net night, 37.9/mile during electrofishing I, and 10.8/hour during electrofishing II (Table 6). The catch rate for electrofishing I ranked in the 83rd percentile, while electrofishing II ranked in the 60th percentile when compared to lakes larger than 190.5 acres. Average length was 17.7 inches with a range from 5.1 – 29.5 inches. The 2010 size structure shows an improvement in distribution (when compared to 2000) with the majority of fish from 16 – 19 inches (Figure 1). PSD(15) values during both spring I and II electrofishing were above 95, while RSD(20) values were 21.1 and 17.9, respectively. Both PSD(15) values during the spring of 2010 were the highest since surveys started in 1969 and RSD(20) values were second only to spring II 2000 (Table 7). This may be a result in a more consistent frequency and size of stocked walleyes in the 2000's compared to the 1990's.

The adult population was estimated at 2,627 (95%CI 2,107 – 3,352, Chapman modification of Peterson estimate) with a density of 4.3/acre. This is above average for both a stocked fishery and naturally reproducing fishery.

Growth for male and female (as well as subadult) walleyes in Lake Redstone is above the state average (Figure 2). It takes 3 - 4 years for walleye to reach the legal length of 15 inches (Table 2). Although it would appear that females grow faster than the regional average, when looking at Figure 3, which combines both sexes, growth is right at the regional rate. Distribution of ages past year 3 look excellent with every age from 4 to 12 represented (Figure 4). The most well represented years correspond well with years that had very high stocking rates (30,000+ small fingerlings) (Figure 4, Table 1). The gradual decline in the frequency of ages (after age 3) is representative of natural mortality and there is no steep change when fish become legal size, so it doesn't appear walleyes are overharvested.

The relative weight of walleye looks good. As walleye surpass 23 inches, nearly every fish is robust for its length (Figure 5). The average relative weight for walleyes was 102.7. It should be noted, though, that spawning fish do tend to hold more weight.

Muskellunge

A total of 131 muskellunge were sampled in the spring of 2010 (not including recaptures). The catch rate for fish ≥20 inches during fyke netting was 2.1/net night, 2.1/mile during electrofishing I, and 1.2/mile during electrofishing II (Table 6). The catch rate for fyke netting ranked in the 96th percentile when compared to other lakes statewide. Average length was 35.7 inches with a range from 12.3 – 46.7 inches. The 2010 size structure for both males and females shows a good distribution with the majority of fish from 33 – 38 inches (Figure 6).

A preliminary population estimate was done during the spring of 2010. The adult population (≥30 inches) was estimated at 197 (95%CI 137 – 370, Chapman modification of Peterson estimate) with a density of 0.32/acre. The population estimate was calculated in the spring of 2011 using the second spring netting data for the recapture sample. This generated an estimate of 200 adults (95%CI 161-265, Chapman modification of Peterson estimate) for a density of 0.33/acre. Both density estimates are in the range for a potential trophy fishery (0.25 - 0.50/acre), which Lake Redstone is managed for.

Growth for muskellunge is above the statewide average at each age with the exception of age 8 (though only one fish was sampled at that age) (Figure 7). The age frequency corresponds well with years when muskellunge were stocked (Figure 8, Table 1).

Both male and female muskellunge are in good condition (Figure 9). The average relative weight for males was 102.9 and 114.4 for females.

Largemouth Bass

There were a total of 85 largemouth bass sampled during the 2010 survey. The catch rate of fish ≥8 inches during fyke netting was 0.0/net night, 5.2/mile during electrofishing I, and 4.7/mile during electrofishing II (Table 6). The catch rate for electrofishing I ranked in the 13^{th} percentile, while electrofishing II ranked in the 12^{th} percentile when compared to similar lakes within four southern Wisconsin drainage basins. Average length was 12.2 inches with a range from 3.6 – 19.9 inches. Although there is a higher frequency of fish from 11.5 – 13.5 inches when compared to 2000, the 2010 length frequency distribution shows a gap from 15.5 – 19.5 inches (Figure 10). CPUE has dropped in both the 2004 and 2010 survey when compared to surveys done from 1999 – 2002 (Table 9).

While the CPUE has dropped recently, PSD(12) has steadily been increasing from 1998 – 2010 in both the spring and fall electrofishing surveys. However, RSD(15) and RSD(20) in 2010 have both decreased since the last two spring surveys (Table 8).

Growth is at or slightly above the statewide average and below the regional average (Figure 11). It takes 5 – 6 years for largemouth bass to reach legal length (Table 2). All age groups from 2 to 6 are represented (Figure 12). However, there is a large drop off of fish after age 6, which is about the age where bass are coming into legal size. This may indicate that there is a significant amount of exploitation once the fish reach legal size, or that recruitment of bass is variable from year to year.

Largemouth bass in Lake Redstone appear to be in excellent condition. The majority of fish were above the average relative weight of 100 at every length (Figure 13). The average relative weight for largemouth bass was 116.3.

Smallmouth Bass

There were a total of 147 smallmouth bass sampled during the 2010 survey. The catch rate during fyke netting was 0.0/net night, 13.6/mile during electrofishing I, and 4.2/mile during electrofishing II (Table 6). The catch rate for electrofishing I was ranked in the 89^{th} percentile, while electrofishing II was ranked in the 69^{th} percentile when compared to other lakes statewide. Average length was 12.9 inches with a range from 6.1 – 18.0 inches. The distribution of lengths looks excellent with the highest concentration of fish between 12.0 – 13.5 inches (Figure 14). Both PDS(12) and RSD(15) values have been improving since smallmouth bass were first surveyed (Table 9).

Growth of smallmouth bass is right at the state average and slightly below the regional average (Figure 15). It takes 5 -6 years for a smallmouth bass to reach legal length (Table 2). The age distribution shows a good representation of fish with all ages present from 2 – 9 (Figure 16). Smallmouth bass are normal in regards to body condition, with the average relative weight at 100.7 (Figure 17).

Crappies

Black Crappie

A total of 532 black crappies were sampled. The catch rate was 16.8/net night during May fyke netting, and 1.0/mile during electrofishing II (Table 6). The catch rate for electrofishing II was ranked in the 1st percentile when compared to other lakes statewide. The average length was 8.4 inches with a range from 4.2 – 14.4 inches. The length frequency distribution shows a mode at 7.5 inches with all sizes represented from 4.0 – 12.0 inches (Figure 18).

Growth is excellent, especially after age two (Figure 19). Black crappies exceed both the state and regional average after that age. The age frequency shows the majority of fish at three years old (Figure 20). Crappie often exhibit variable recruitment which is apparent in the age frequency distribution.

Black crappies are slightly above average in terms of body condition with the average relative weight at 105.8 (Figure 21).

White Crappie

A total of 157 white crappies were sampled. The catch rate was 5.3/net night during the first fyke netting event, 3.5/net night during the second fyke netting event, and 0.5/mile during electrofishing II (Table 6). The average length was 8.8 inches with a range from 4.1 – 12.8 inches. The length frequency shows a good distribution with all lengths represented from 6.0 – 12.5 inches (Figure 22).

White crappies are fast growing on Lake Redstone. After age two, growth is better than both the state and regional average (Figure 23). The age frequency shows the majority of fish at two and three years old (Figure 24). White crappies show a good body condition with an average relative weight of 119.1 (Figure 25).

The ratio of black to white crappies in this survey was 3.4 to 1. This is a major change in the fishery since white crappie had previously outnumbered black crappie. During spring fyke netting in 2002, the ratio of white to black crappies was 2.4 to 1. All other survey observations would indicate the same conclusion; white crappie had always outnumbered black crappie in Lake Redstone until the 2010 survey.

Bluegill

A total of 603 bluegills were sampled. The catch rate was 10.1/net night during the first fyke netting event, 5.8/net night during the second fyke netting event, and 10.5/mile during electrofishing II (Table 6). The catch rate for electrofishing II was ranked in the 12th percentile when compared to other lakes statewide. The average length was 6.2 inches with a range from 3.1 – 8.5 inches. The length frequency shows the majority of fish between 6.0 – 7.5 inches with all lengths represented from 3.0 – 8.5 inches (Figure 26).

Bluegills in Lake Redstone grow faster then the state average and slightly below the regional average (Figure 27). The age frequency shows a good distribution of fish from ages 2 – 6 (Figure 28).

Bluegills are not doing as well as the other species when it comes to body condition with an average relative weight of 85.4 (Figure 29). However, fish ≥4.5 inches are doing better with an average relative weight of 102.2. There may be a few explanations for this. First, smaller bluegill might be competing for the same food source (zooplankton) that the new found gizzard shad population would be utilizing and thus depressing smaller bluegills (Devries & Stein 1992; Garvey & Stein 1998; Stein et al. 1995). Another reason might be that our weighing scales were not sensitive enough to accurately weigh small fish and would consistently under weigh fish smaller than 4.5 inches.

Yellow Perch

A total of 115 yellow perch were sampled. The catch rate was 1.9/net night during the first fyke netting event, 1.0/net night during the second fyke netting event, and 1.0/mile during electrofishing II (Table 6). The catch rate for electrofishing II was ranked in the 1st percentile when compared to other lakes statewide. The average length was 6.3 inches with a range from 4.7 – 9.0 inches. The length frequency shows the majority of fish between 5.0 – 6.5 inches with all lengths represented from 4.5 – 9.0 inches (Figure 30).

DISCUSSION & RECOMMENDATIONS

Lake Redstone provides an excellent overall fishery, with a variety of quality fishing opportunities. Management should focus on maintaining the current diverse fish community. Because of the eutrophic nature of the lake it has average to above average growth rates for all panfish and gamefish analyzed. Public access is good with three boat ramps maintained by the township and county.

Because depths over 12 feet have either low dissolved oxygen or are anoxic, the majority of the lake is not utilized by fish. For this reason, areas that are utilized by both fish and other organisms, should be either enhanced or protected. Further remediation to control, remove, and/or manage nutrients already in the lake and coming into the lake could potentially change the status of this area of the lake. A study done from 2005 – 2007 to assess critical habitat was done on Lake Redstone. The study identified 20 critical habitat sites around the lake (Sefton & Graham 2009).

White crappies have always outnumbered black crappies until the 2010 survey. Slightly improved water clarity from 2006-2008 might have aided in the switch to favoring black crappies (Wisconsin DNR 2010).

Low relative weight for bluegills below 4.5 inches is a concern and the issue should be looked at closer. The recent arrival and establishment of gizzard shad may be impacting this size range of bluegill (Devries & Stein 1992; Garvey & Stein 1998; Stein et al. 1995). In future surveys, a more precise weight scale should be used to help eliminate human and gear error when weighing small fish.

Although not many channel catfish were sampled during the 2010 survey, the gear used in this survey does not successfully capture catfish with any consistency. In 1998, baited hoop nets were used to sample channel catfish, but limited numbers were found. If there is interest in this fishery, stocking multiple years could be done in order to help channel catfish take a foothold. Also, hollowed out logs or other spawning habitat could be created to further promote a fishery (Becker 1983; Marzlof 1957).

Largemouth bass CPUE numbers have been declining during electrofishing from 1999 to 2010, there is a gap in the size structure from 15.5 – 19.5 inches, and there is a dramatic drop of in the age frequency from age 6 to age 7. There could be any number of things at work here. Since there is a gap in the size structure above the legal limit and the age structure drops of after age 6 (where bass are coming into legal size), there might be an over harvest problem. This alone might not be the only problem. High gizzard shad abundance could be having a negative impact on growth, survival, and recruitment of young of the year (Davies et al. 1982; DeVries et al. 1991; Garvey and Stein 1998). There is a dip in the age frequency at age 4 indicating there was lower recruitment 4 years ago. Further surveys should look at assessing recruitment to look at spawning success.

Smallmouth bass have been and continue to be a success story. Spring CPUE continues to improve, PSD(12) and RSD(15) values also are improving, and the size and age structure look good. Given that the fishery is relatively new, this is not unusual.

Both the 2010 and 2011 density estimate for muskellunge (0.32/acre and 0.33/acre) look good for a potential trophy fishery. The population is maintained by stocking, as shown by the age structure. The minimum size limit for muskellunge in Lake Redstone changed from 40 inches to 50 inches in 2012 to help create a trophy fishery..

The adult density of walleye (4.3/acre) is evidence of a high density when compared to other waters in the state for both a naturally reproducing and stocked fishery. However, the fish are still growing fast because of the ample forage. A study done on the lake using oxytetracycline (OTC) marked small fingerlings from 2000-2001 indicated that there could be some occasional natural reproduction occuring (Table 10). From 2003-2006 heavy stocking occurred, which could also explain the high number of adults in the 2010 survey. Future surveys should try to further define the contribution of naturally reproduced young of the year (YOY) on a longer temporal scale.

Gizzard shad are a new arrival on Lake Redstone. The control and/or management of gizzard shad is not an easy task. Populations can explode given the right conditions (i.e. warm water, mild winter temps, rock/sand shoreline) (Bodola 1966). Under high abundances, they can have negative impacts on multiple species' young of the year because of direct competition for zooplankton or indirectly, by consuming phytoplankton (Bodola 1966; DeVries and Stein 1992; Stein et al. 1995). Extreme thermal swings and lengthy cold water/sever winter temperatures can cause large die-offs (Clark 1969). Draw downs during spawning, chemical treatment, predatory control, and removals have all been attempted to reduce numbers with some success (Irwin et al 2001, 2003). However, there are ramifications for each procedure and control measures are typically short lived (Irwin et al 2001). The gizzard shad and any impacts to desirable gamefish will need to be monitored and management actions evaluated.

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Tables and Figures

Table 1. Fish stocked in Lake Redstone from 1967 – 2010.

Year	Species	Strain (Stock)	Age Class	Number Fish Stocked	Avg Fish Length (IN)
1982	CHANNEL CATFISH	UNSPECIFIED	FRY	6,000	4
1993	CHANNEL CATFISH	UNSPECIFIED	FINGERLING	8,800	3
1983	FATHEAD MINNOWS	UNSPECIFIED	ADULT	100,000	3
1987	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,200	3
1991	MUSKELLUNGE	UNSPECIFIED	FINGERLING	850	11
1992	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,000	10
1993	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,200	11
1995	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,200	9
1997	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	560	10
1997	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	350	12
1998	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	275	12
1999	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	337	12
1999	MUSKELLUNGE	UNSPECIFIED	YEARLING	301	15
2000	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	612	12
2000	MUSKELLUNGE	UNSPECIFIED	YEARLING	368	14
2001	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	1,224	10
2003	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	1,224	11
2005	MUSKELLUNGE	UPPER CHIPPEWA RIVER	LARGE FINGERLING	1,224	12
2008	MUSKELLUNGE	UPPER WISCONSIN RIVER	LARGE FINGERLING	1,224	11
2010	MUSKELLUNGE	UPPER WISCONSIN RIVER	LARGE FINGERLING	612	13
2011	MUSKELLUNGE	UPPER CHIPPEWA RIVER	LARGE FINGERLING	612	10
1982	NORTHERN PIKE	UNSPECIFIED	FRY	310,000	1
1998	SMALLMOUTH BASS	UNSPECIFIED	LARGE FINGERLING	1,000	7
1999	SMALLMOUTH BASS	UNSPECIFIED	LARGE FINGERLING	1,000	6
1967	WALLEYE	UNSPECIFIED	FRY	2,700,000	1
1969	WALLEYE	UNSPECIFIED	FINGERLING	22,925	3
1969	WALLEYE	UNSPECIFIED	FINGERLING	24,850	3
1982	WALLEYE	UNSPECIFIED	FRY	50,000	1
1983	WALLEYE	UNSPECIFIED	FINGERLING	1,500	5

Year	Species	Strain (Stock)	Age Class	Number Fish Stocked	Avg Fish Length (IN)
1983	WALLEYE	UNSPECIFIED	YEARLING	5	11
1984	WALLEYE	UNSPECIFIED	FINGERLING	2,800	2
1984	WALLEYE	UNSPECIFIED	FINGERLING	2,140	8
1984	WALLEYE	UNSPECIFIED	FINGERLING	2,200	3
1986	WALLEYE	UNSPECIFIED	FINGERLING	9,135	3
1987	WALLEYE	UNSPECIFIED	FINGERLING	12,000	4
1988	WALLEYE	UNSPECIFIED	FINGERLING	2,100	8
1989	WALLEYE	UNSPECIFIED	FINGERLING	15,136	2
1989	WALLEYE	UNSPECIFIED	FINGERLING	2,000	7
1991	WALLEYE	UNSPECIFIED	FINGERLING	13,992	3
1992	WALLEYE	UNSPECIFIED	FINGERLING	19,337	3
1992	WALLEYE	UNSPECIFIED	FINGERLING	250	8
1995	WALLEYE	UNSPECIFIED	FINGERLING	6,854	5
1995	WALLEYE	UNSPECIFIED	LARGE FINGERLING	30	8
1997	WALLEYE	UNSPECIFIED	SMALL FINGERLING	20,600	2
1997	WALLEYE	UNSPECIFIED	SMALL FINGERLING	1,482	5
1998	WALLEYE	UNSPECIFIED	FRY	1,050,000	0
1999	WALLEYE	UNSPECIFIED	FRY	1,101,000	0
1999	WALLEYE	UNSPECIFIED	SMALL FINGERLING	61,200	2
2000	WALLEYE	UNSPECIFIED	FRY	1,100,000	1
2000	WALLEYE	UNSPECIFIED	SMALL FINGERLING	61,969	2
2001	WALLEYE	UNSPECIFIED	FRY	1,100,000	1
2002	WALLEYE	LAKE MICHIGAN	LARGE FINGERLING	621	8
2002	WALLEYE	ROCK-FOX	LARGE FINGERLING	5,626	8
2003	WALLEYE	LAKE MICHIGAN	SMALL FINGERLING	30,660	2
2004	WALLEYE	MISSISSIPPI HEADWATERS	SMALL FINGERLING	30,550	2
2005	WALLEYE	UNSPECIFIED	SMALL FINGERLING	33,019	2
2006	WALLEYE	ROCK-FOX	SMALL FINGERLING	25,145	1
2006	WALLEYE	ROCK-FOX	SMALL FINGERLING	9,200	3
2008	WALLEYE	ROCK-FOX	SMALL FINGERLING	11,016	1
2009	WALLEYE	ROCK-FOX	SMALL FINGERLING	11,016	2
2009	WALLEYE	UNSPECIFIED	LARGE FINGERLING	6,150	8
2010	WALLEYE	ROCK-FOX	SMALL	11,736	2

Year	Species	Strain (Stock)	Age Class	Number Fish Stocked	Avg Fish Length (IN)
			FINGERLING		
2010	WALLEYE	UNSPECIFIED	LARGE FINGERLING	3,055	8
2011	WALLEYE	ROCK-FOX	SMALL FINGERLING	10,579	1
1983	YELLOW PERCH	UNSPECIFIED	YEARLING	2,000	4

Table 2. Fishing regulation 2012 – 2013 for Lake Redstone, WI.

Species	Open Season	Daily Limit	Minimum Length
Largemouth Bass and Smallmouth Bass	May 1 - March 6	5 in total	14 inches
Rock, Yellow (Striped) and White Bass	open all year	none	none
Panfish: Bluegill, Pumpkinseed, Sunfish, Crappie, Yellow Perch	open all year	25 in total	none
Bullheads	open all year	none	none
Catfish (Channel, Flathead)	open all year	10 in total	none
Muskellunge	May 1 - Dec. 31	1	50 inches
Northern Pike	May 1 - March 6	2	26 inches
Walleye and Sauger (includes hybrids)	May 1 - March 7	5 in total	15 inches
Motor Trolling is permitted on Lake Redstone.			

Table 3. Net locations for fyke nets fished on Lake Redstone from March 30 until April 8, 2010, nets fished from April 27 until April 29, 2010, and nets fished from April 17 until April 27, 2011.

Net Number	Latitude	Longitude	SN I 2010	SN II 2010	SN I 2011
1	43.58769	-90.08884	X		X

2	43.59729	-90.09393	X		X
3	43.60033	-90.0989	X		X
4	43.60408	-90.0933	X		
5	43.61136	-90.08663	X		X
6	43.62024	-90.09068	X		X
7	43.61291	-90.09135	X	X	
8	43.62226	-90.07947	X	X	X
9	43.62928	-90.09409	X		
10	43.62957	-90.09532	X	X	X
11	43.61415	-90.08477		X	X
12	43.59706	-90.09921			X
13	43.60432	-90.09936			X
14	43.60209	-90.09296			X
15	43.61225	-90.0926			X
16	43.61699	-90.08757			X

Table 4. Lake Redstone boom shocking starting and ending locations.

Date	Station	Distance (mile)	Start Latitude	Start Longitude	End Latitude	End Longitude
4/8/2010	Gamefish 1	2.7	43.62408	-90.08801	43.60831	-90.09886
4/8/2010	Gamefish 2	2	43.60263	-90.09882	43.59606	-90.09963
4/8/2010	Gamefish 3	1.9	43.59368	-90.09705	43.60592	-90.08784
4/8/2010	Gamefish 4	1.5	43.60896	-90.08832	43.61888	-90.08316
5/26/2010	Panfish 1	0.5	43.60954	-90.09699	43.60935	-90.09933
5/26/2010	Gamefish 1	1.5	43.60935	-90.09933	43.60203	-90.10489
5/26/2010	Panfish 2	0.5	43.58981	-90.09398	43.59343	-90.09659
5/26/2010	Gamefish 2	1.5	43.59343	-90.09659	43.60569	-90.09062
5/26/2010	Panfish 3	0.5	43.62033	-90.08446	43.62119	-90.07636
5/26/2010	Gamefish 3	1.5	43.62119	-90.07636	43.61884	-90.08545
5/26/2010	Panfish 4	0.5	43.63183	-90.0938	43.62917	-90.09856
5/26/2010	Gamefish 4	1.3	43.62917	-90.09856	43.6202	-90.09042

Table 5. Species list from 2010 Survey, Lake Redstone, WI.

Black crappie	Pumpkinseed
Bluegill	Smallmouth bass

Channel catfish	Spotfin shiner
Common carp	Walleye
Golden shiner	White crappie
Largemouth bass	White sucker
Muskellunge	Yellow bullhead
Northern Pike	Yellow perch

Table 6. Catch summary for spring fyke netting and electrofishing samples from Lake Redstone, 2010. Six fyke nets were fished on March 31, ten nets from April 1 - 3, and eight nets from April 6 - 8 (Fyke netting I). Six fyke nets were set from April 27 - 29 (Fyke netting II). Electrofishing I was done on April 12 (4.67 hours or 8.1 miles of gamefish only effort), and Electrofishing II on May 26 (1 hour or 2 miles of effort for gamefish and panfish, and 4.2 hours or 7.84 miles of effort for gamefish only). Catch rate for largemouth bass, muskellunge, smallmouth bass, and walleye reflect values of stock length or larger.

	Fyke netting I	**Fyke netting II**	**Electrofishing I**		**Electrofishing II**	
Species	Mean Catch per net night	Mean Catch per net night	Catch per hour	Catch per mile	Catch per hour	Catch per mile
Black Crappie	5.5	11.2	-	-	2.0	1.0
Bluegill	10.1	3.8	-	-	21.0	10.5
Common Carp	0.1	0.1	-	-	18.6	10.9
Largemouth Bass	0.0	0.0	9.0	5.2	8.8	4.7
Muskellunge	2.1	0.0	3.6	2.1	2.1	1.2
Smallmouth Bass	0.0	0.0	23.6	13.6	7.9	4.2
Walleye	8.9	1.1	68.1	37.9	20.0	10.8
White Crappie	1.6	3.5	-	-	1.0	0.5
Yellow Bullhead	0.8	1.6	-	-	1.0	0.5

Yellow Perch	1.9	0.7	-	-	2.0	1.0

Table 7. Walleye CPUE, PSD and RSD values for boom shocking on Lake Redstone, WI from 1969 – 2010

Year	Season	PSD(15)	RSD(20)	RSD(25)	RSD(30)	N/Mile >10"
1969	Fall	0	0	0	0	
1972	Fall	0	0	0	0	
1997	Fall	10.3	3.4	0	0	13.5
1998	Spring	28.6	7.1	0	0	
1998	Fall	30.4	8.7	0	0	4.2
1999	Spring	77.8	0	0	0	4.2
1999	Fall	61.5	15.4	0	0	
2000	Spring I	76.9	7.7	0	0	3.3
2000	Spring II	81.8	27.3	0	0	2.2
2000	Fall	1	0	0	0	19.2
2001	Fall	9.5	2.6	0	0	34.4
2002	Spring I	31	4.8	2.4	0	28
2002	Spring II	13.3	1.9	1.0	0.0	70.0
2002	Fall	26.9	1.4	0.7	0.0	66.7
2003	Spring	48.1	3.8	1.9	0.0	
2004	Spring	64.3	2.4	0.0	0.0	9.5

2004	Fall	26.5	5.9	0.0	0.0	8.5
2010	Spring I	95.9	21.1	0.6	0.0	37.9
2010	Spring II	98.8	17.9	2.4	0.0	10.8

Table 8. Largemouth bass CPUE, PSD and RSD values for boom shocking on Lake Redstone, WI from 1997 - 2010.

Year	Season	PSD(12)	RSD(15)	RSD(20)	RSD(25)	N/Mile >12"	N/Mile >8"
1969	Fall	0.0	0.0	0.0	0.0		
1972	Fall	0.0	0.0	0.0	0.0		
1975	Fall I	13.3	0.0	0.0	0.0		
1975	Fall II	0.0	0.0	0.0	0.0		
1997	Fall	42.5	25.0	0.0	0.0	4.0	9.3
1998	Spring	49.2	21.3	0.0	0.0		
1998	Fall	36.4	13.6	0.0	0.0	4.4	12.0
1999	Spring	44.4	19.8	2.5	0.0	5.7	12.7
1999	Fall	34.2	9.2	0.0	0.0		
2000	Spring I	36.7	12.7	0.7	0.0	13.8	37.5
2000	Spring II	42.5	13.7	0.7	0.0	12.7	29.8
2000	Fall	21.1	7.8	1.1	0.0	3.6	17.0
2001	Fall	56.5	14.5	0.0	0.0	7.1	12.5
2002	Spring I	47.5	7.5	5.0	0.0	12.7	26.7
2002	Spring II	62.7	13.3	0.0	0.0	31.3	50.0
2002	Fall	65.0	11.0	2.0	0.0	15.2	23.3
2004	Spring	82.4	58.8	5.9	0.0	3.2	3.9
2004	Fall	41.2	20.6	2.9	0.0	3.5	8.5
2010	Spring I	69.0	9.5	0.0	0.0	3.6	5.2

2010	Spring II	70.3	5.4	0.0	0.0	3.5	4.7

Table 9. Smallmouth bass CPUE, PSD and RSD values for boom shocking on Lake Redstone, WI from 2000 - 2010.

Year	Season	PSD(12)	RSD(15)	RSD(20)	RSD(25)	N/Mile >12"	N/Mile >7"
2000	Fall	80.0	0.0	0.0	0.0	0.8	0.9
2001	Fall	60.0	0.0	0.0	0.0	2.2	3.6
2002	Spring I	42.9	7.1	0.0	0.0	4.0	9.3
2002	Spring II	31.3	0.0	0.0	0.0	3.3	10.7
2002	Fall	38.5	0.0	0.0	0.0	2.3	6.1
2003	Spring	46.7	13.3	0.0	0.0	#DIV/0!	#DIV/0!
2004	Spring	56.5	32.6	0.0	0.0	5.9	10.9
2004	Fall	32.0	16.0	0.0	0.0	2.0	6.3
2010	Spring I	73.1	22.2	0.0	0.0	9.8	13.6
2010	Spring II	77.8	29.6	0.0	0.0	2.9	4.2

Year	Season	PSD(12)	RSD(15)	RSD(20)	RSD(25)	N/Mile >12"	N/Mile >7"
2000	Fall	80.0	0.0	0.0	0.0	0.8	0.9
2001	Fall	60.0	0.0	0.0	0.0	2.2	3.6
2002	Spring I	42.9	7.1	0.0	0.0	4.0	9.3
2002	Spring II	31.3	0.0	0.0	0.0	3.3	10.7
2002	Fall	38.5	0.0	0.0	0.0	2.3	6.1
2003	Spring	46.7	13.3	0.0	0.0	[redacted]	[redacted]
2004	Spring	56.5	32.6	0.0	0.0	5.9	10.9
2004	Fall	32.0	16.0	0.0	0.0	2.0	6.3
2010	Spring I	73.1	22.2	0.0	0.0	9.8	13.6
2010	Spring II	77.8	29.6	0.0	0.0	2.9	4.2

Table 10. Percent of oxytetracyline (OTC) marked walleye young of the year during fall elecroshocking 2000 and 2001 Lake Redstone.

2000		**2001**	
Number sampled	% OTC Marked	Number sampled	% OTC Marked
26	77%	33	100%

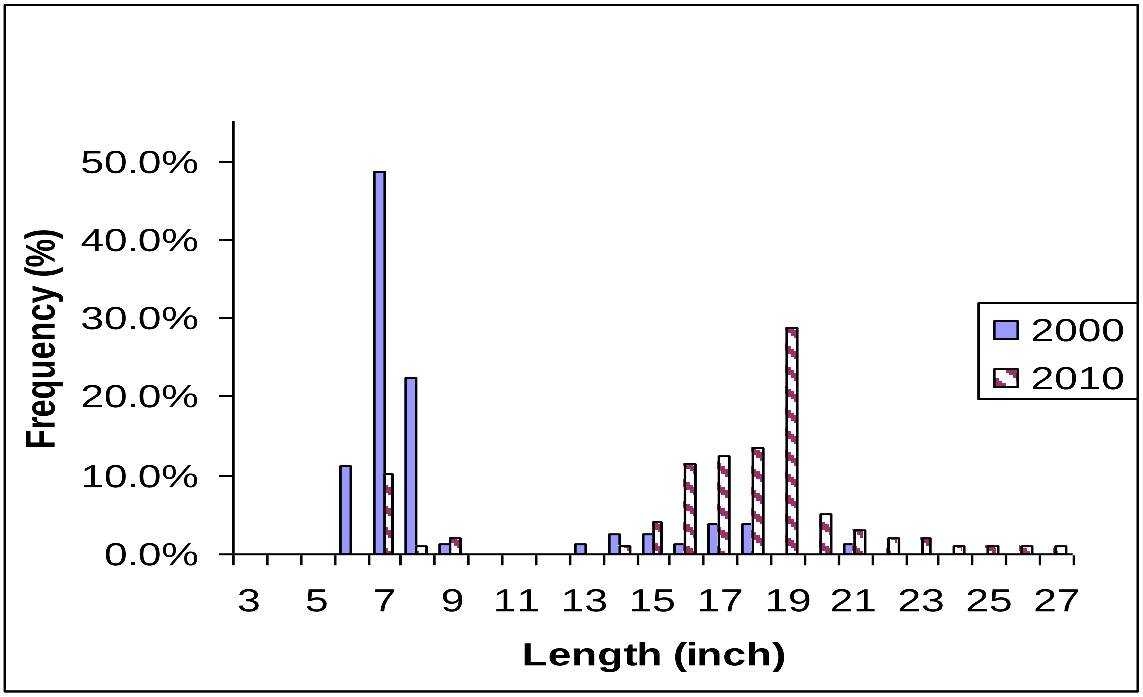

Figure 1. Walleye length frequency for Lake Redstone, WI during spring boom shocking 2000 and 2010.

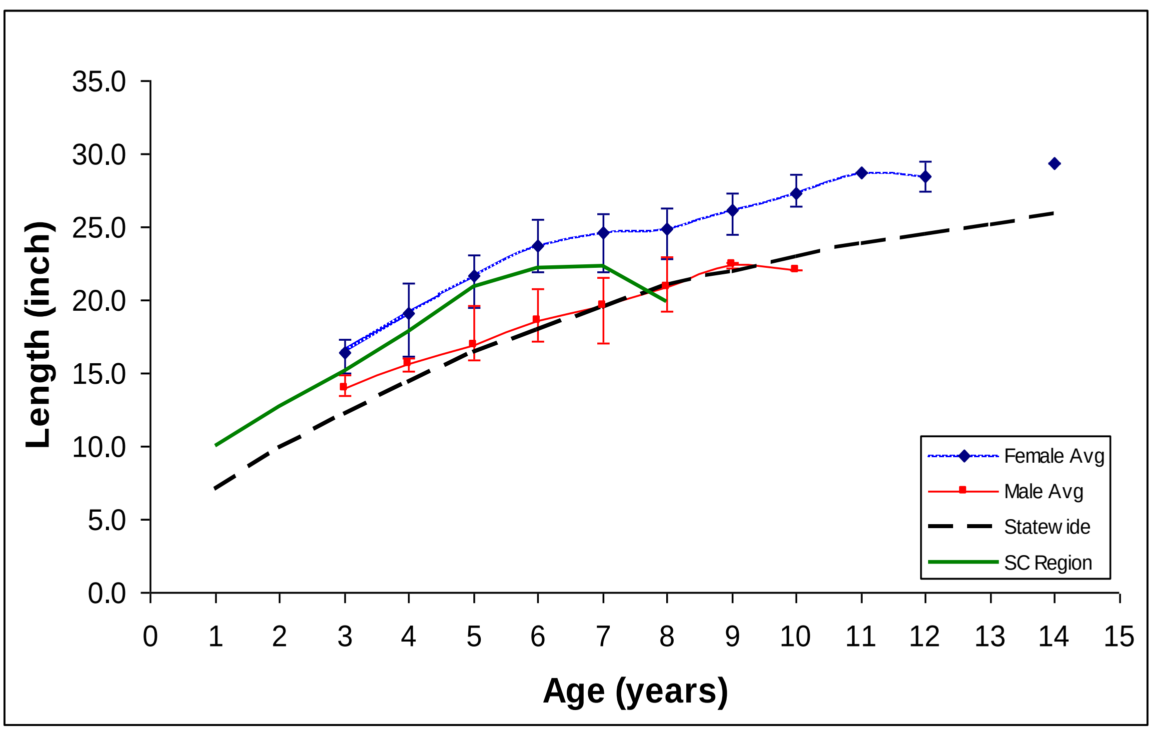

Figure 2. Average male and female walleye length at age for the south central region, the state, and Lake Redstone, WI 2010. Error bars for Male and Female Avg. values represent the range of sizes in the sample.

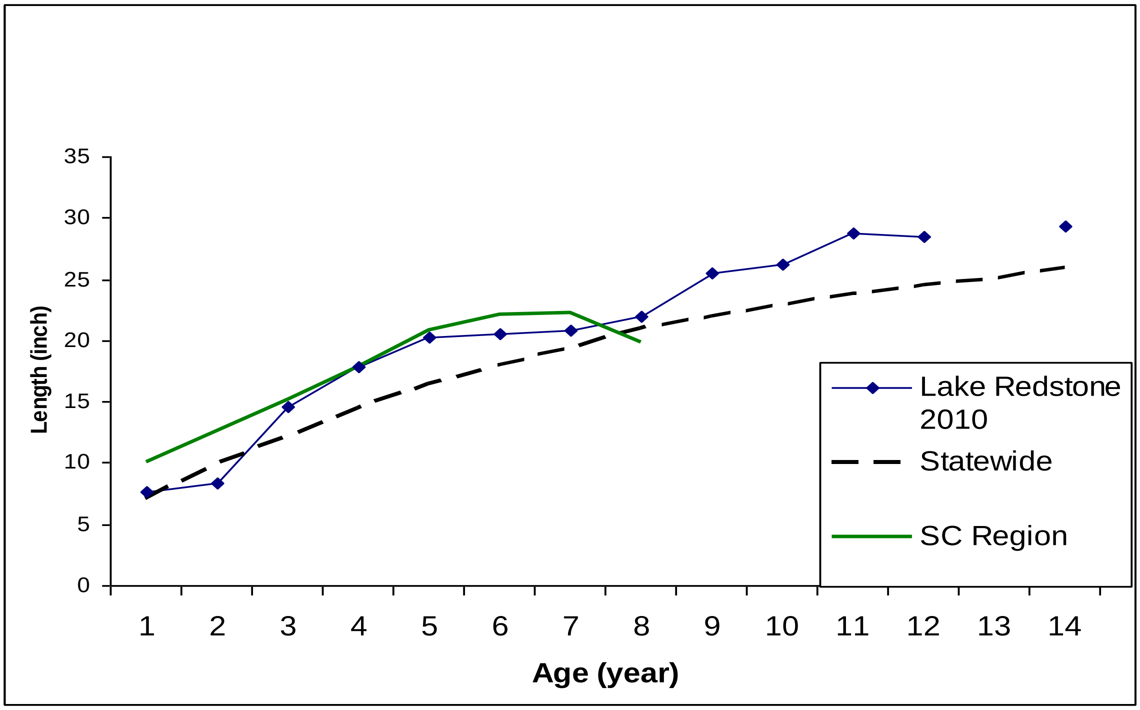

Figure 3. Average walleye length at age for the south central region, the state, and Lake Redstone, WI 2010. Error bars for Lake Redstone 2010 values represent the range of sizes in the sample.

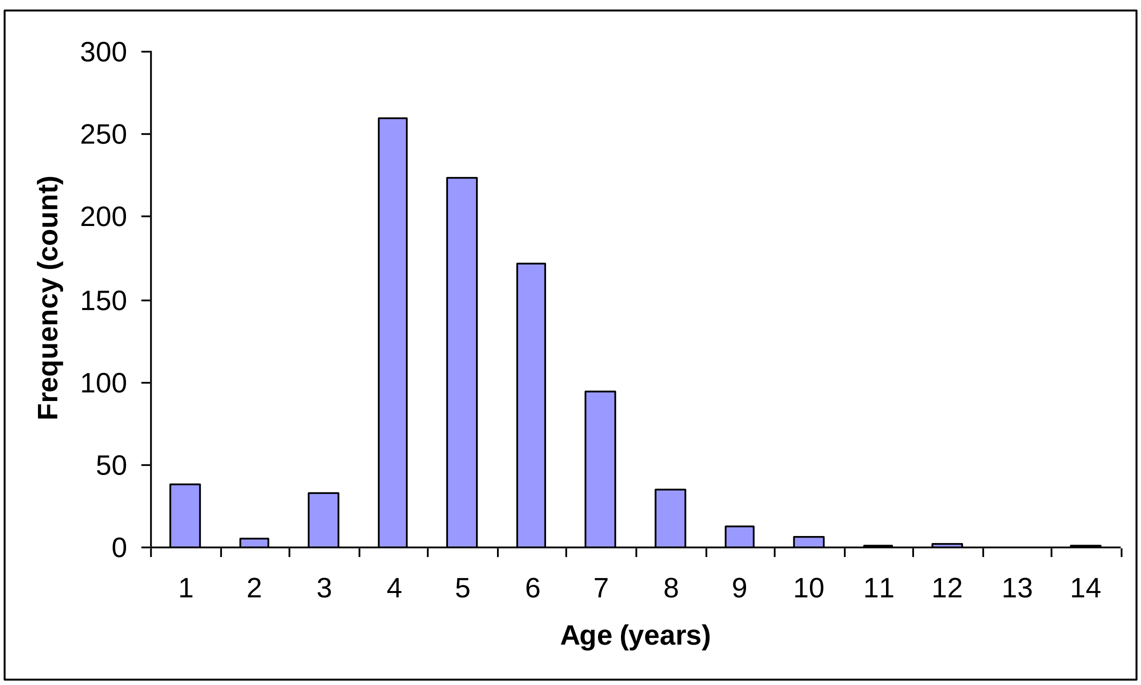

Figure 4. Walleye age frequency distribution for Lake Redstone, WI 2010.

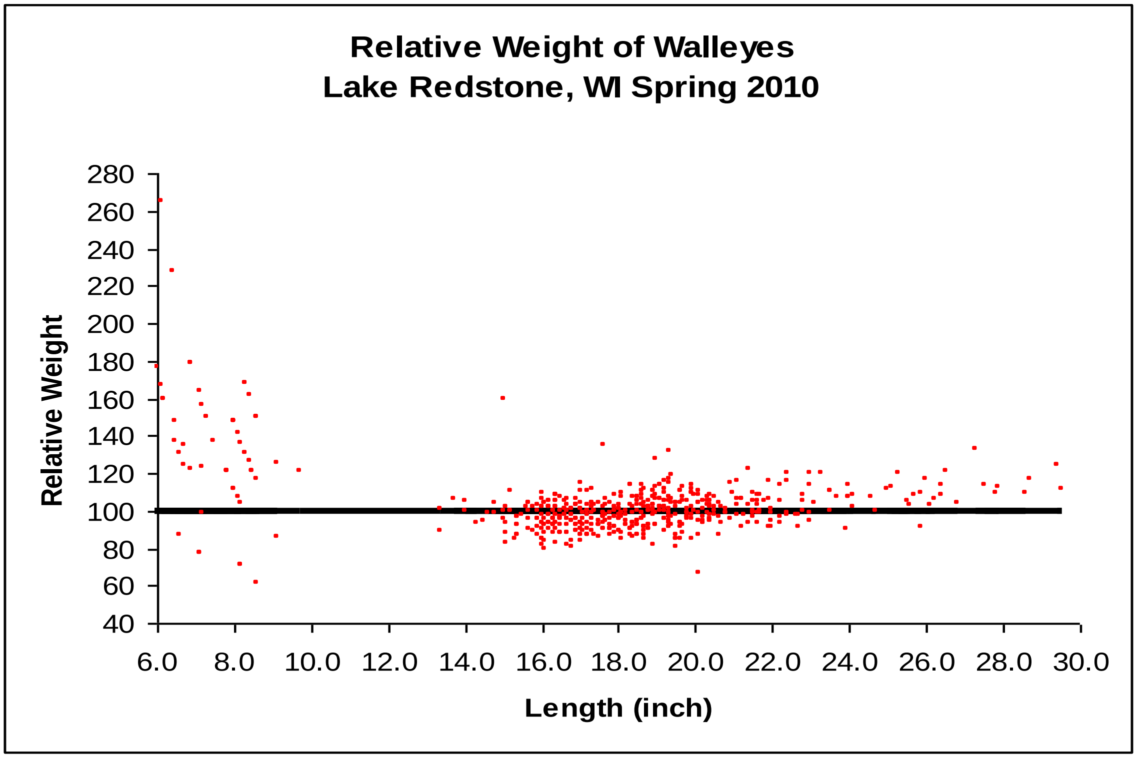

Figure 5. Relative weight of walleye for Lake Redstone, WI, 2010.

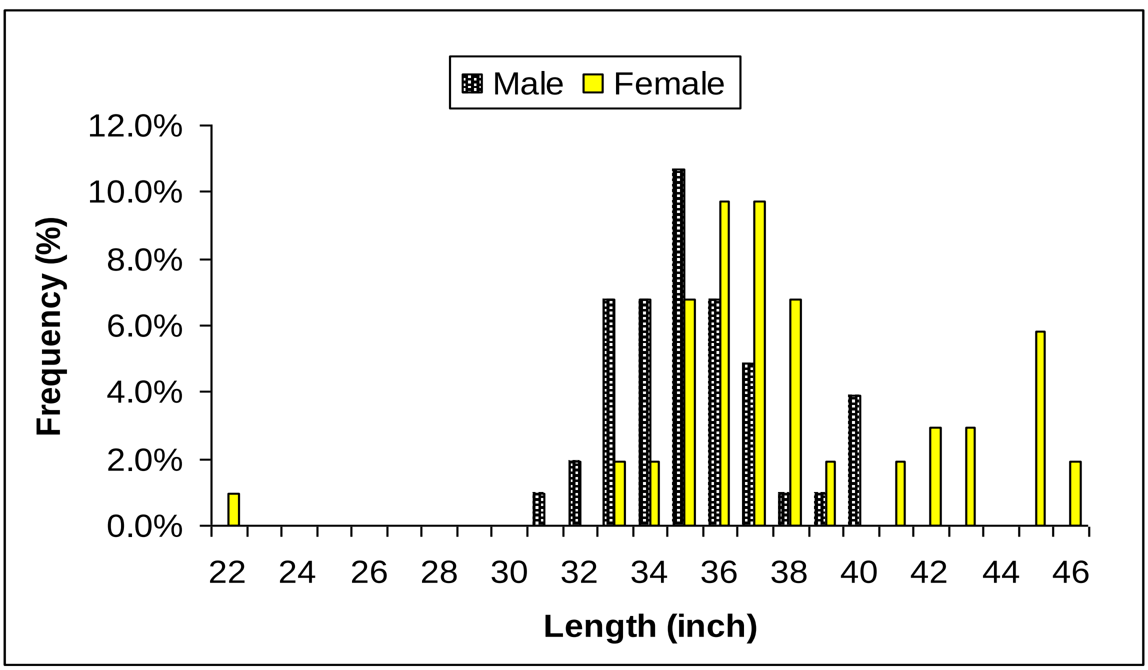

Figure 6. Muskellunge length frequency for Lake Redstone, WI during spring fyke netting 2010.

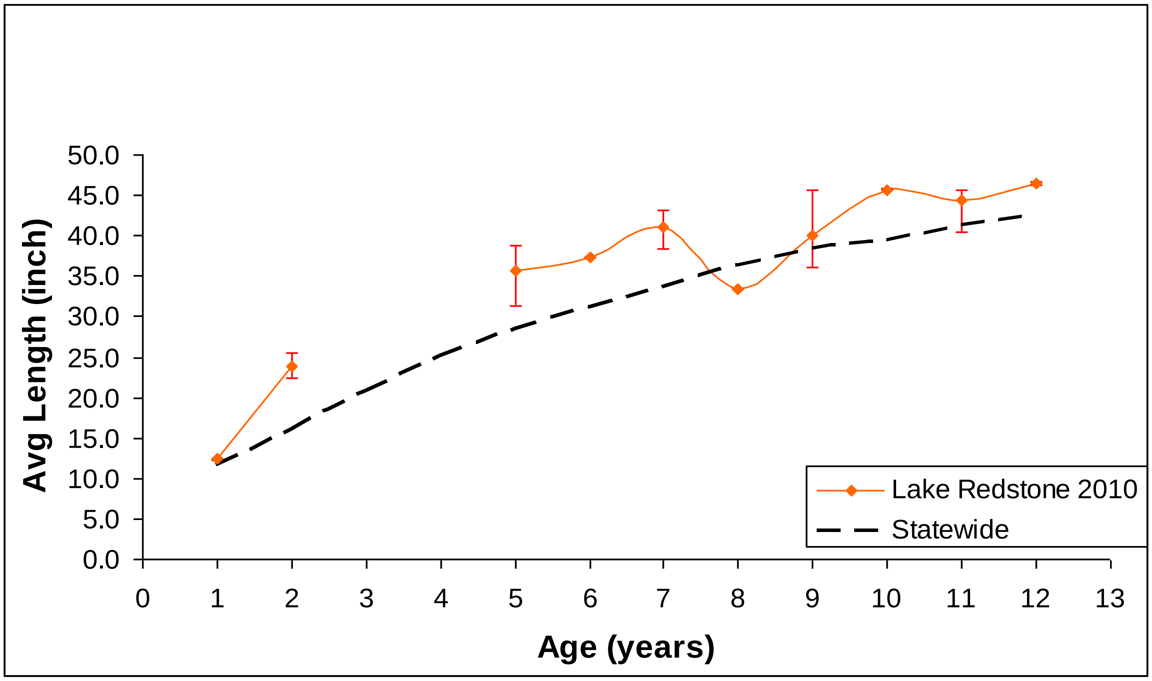

Figure 7. Average muskellunge length at age for the state and Lake Redstone, WI 2010. Error bars for Lake Redstone 2010 values represent the range of sizes in the sample.

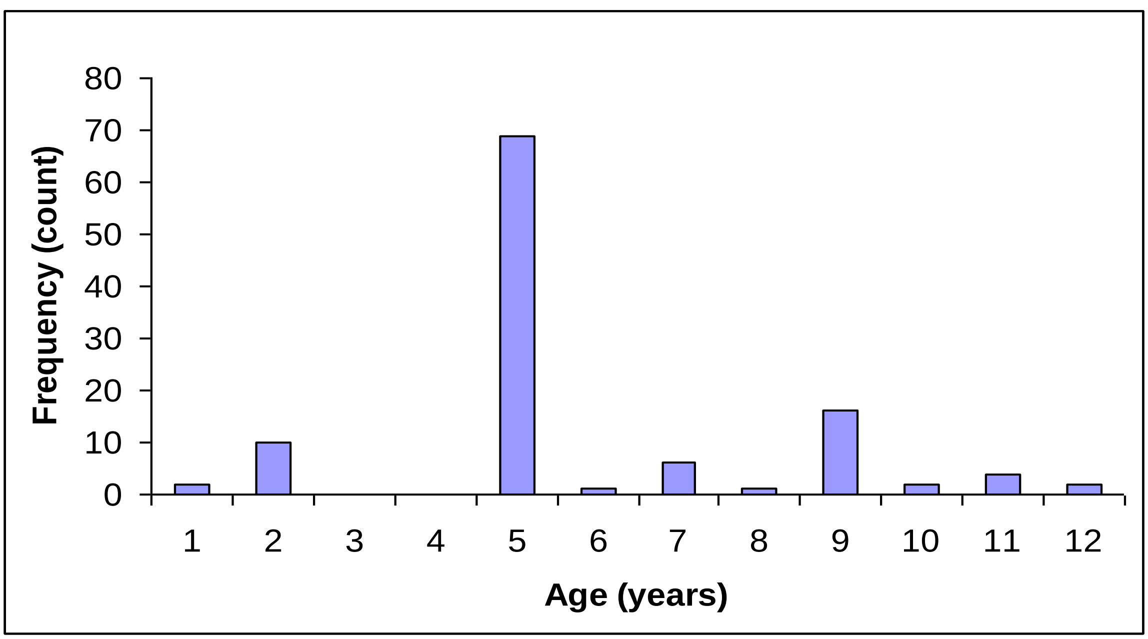

Figure 8. Muskellunge age frequency distribution for Lake Redstone, WI 2010.

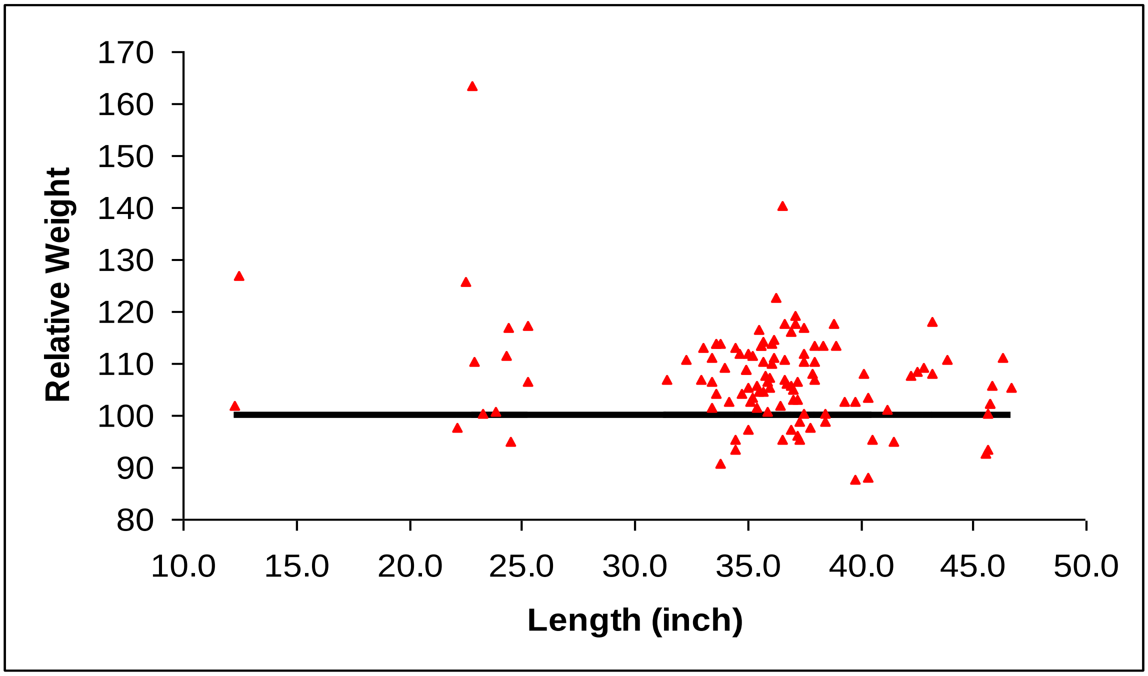

Figure 9. Relative weight of muskellunge for Lake Redstone, WI, 2010.

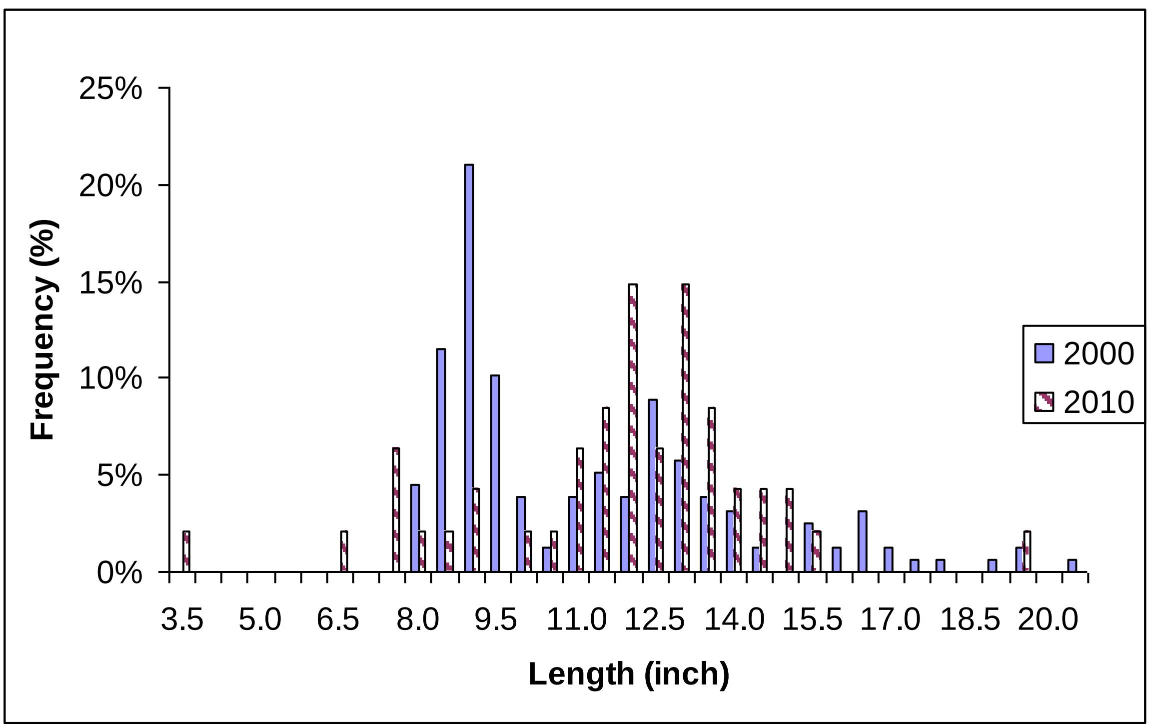

Figure 10. Largemouth bass length frequency for Lake Redstone, WI during spring boom shocking 2000 and 2010.

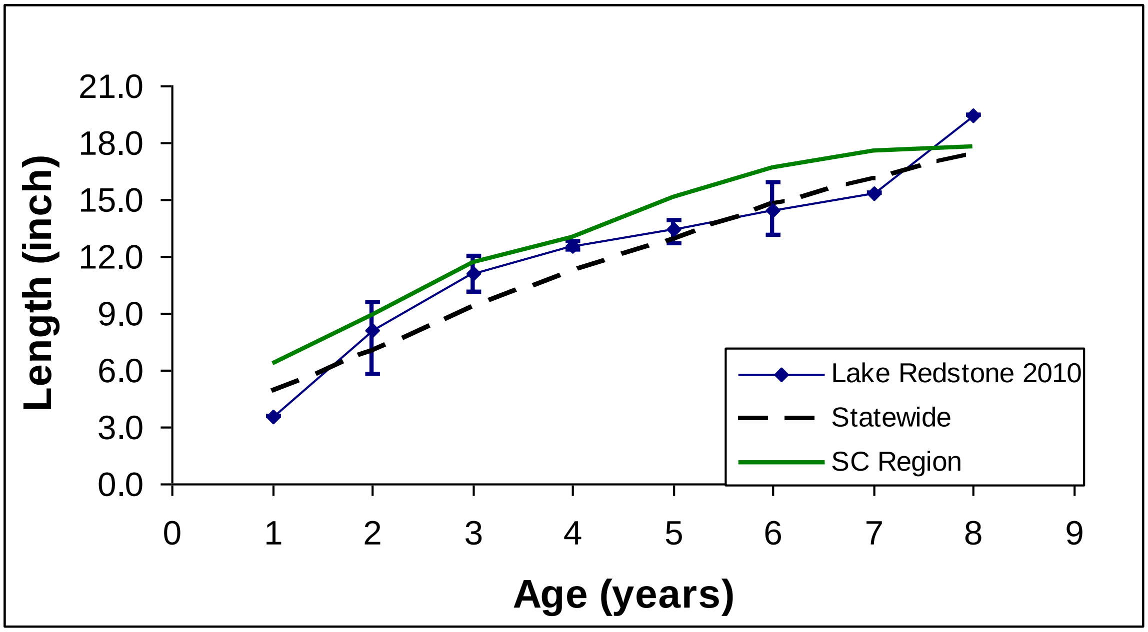

Figure 11. Average largemouth bass length at age for the south central region, the state, and Lake Redstone, WI 2010. Error bars for Lake Redstone 2010 values represent the range of sizes in the sample.

Figure 12. Largemouth bass age frequency distribution for Lake Redstone, WI 2010.

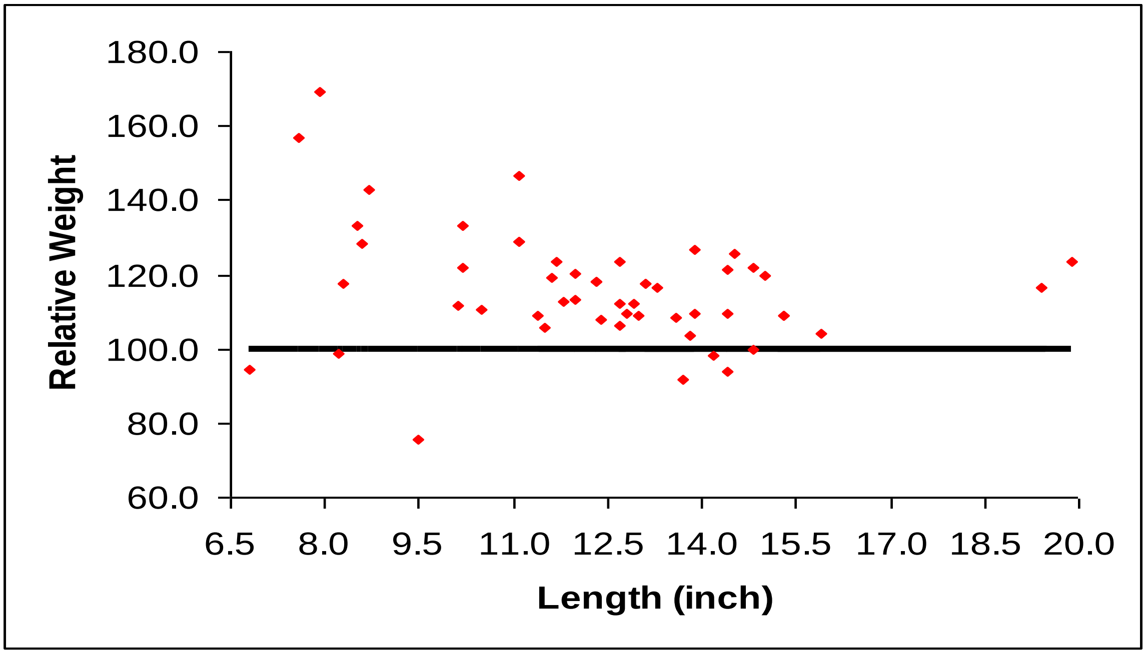

Figure 13. Relative weight of largemouth bass for Lake Redstone, WI 2010.

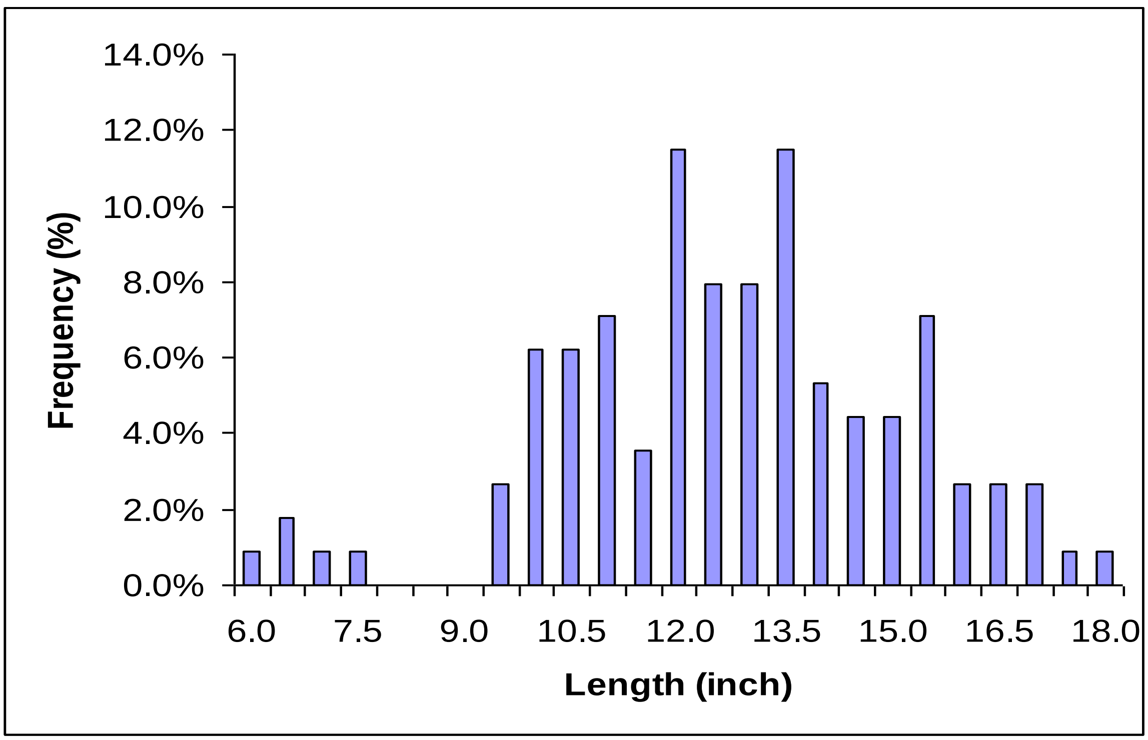

Figure 14. Smallmouth bass length frequency for Lake Redstone, WI during spring boom shocking 2010.

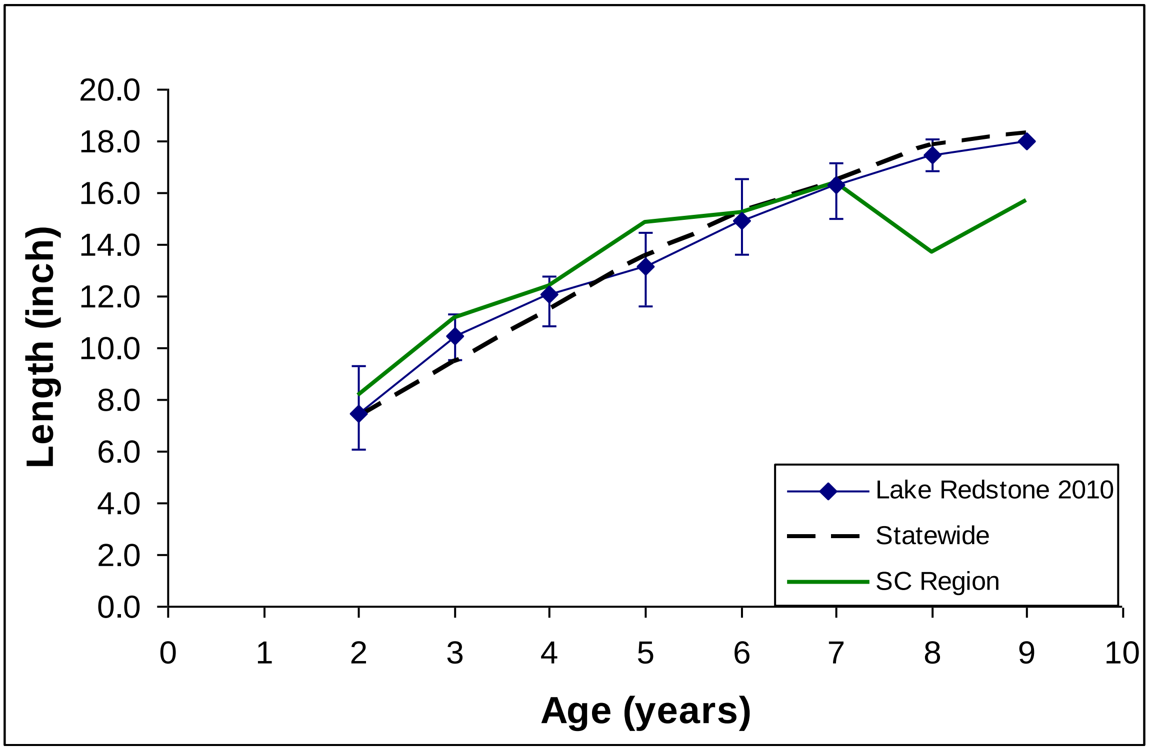

Figure 15. Average smallmouth bass length at age for the south central region, the state, and Lake Redstone, WI 2010. Error bars for Lake Redstone 2010 values represent the range of sizes in the sample.

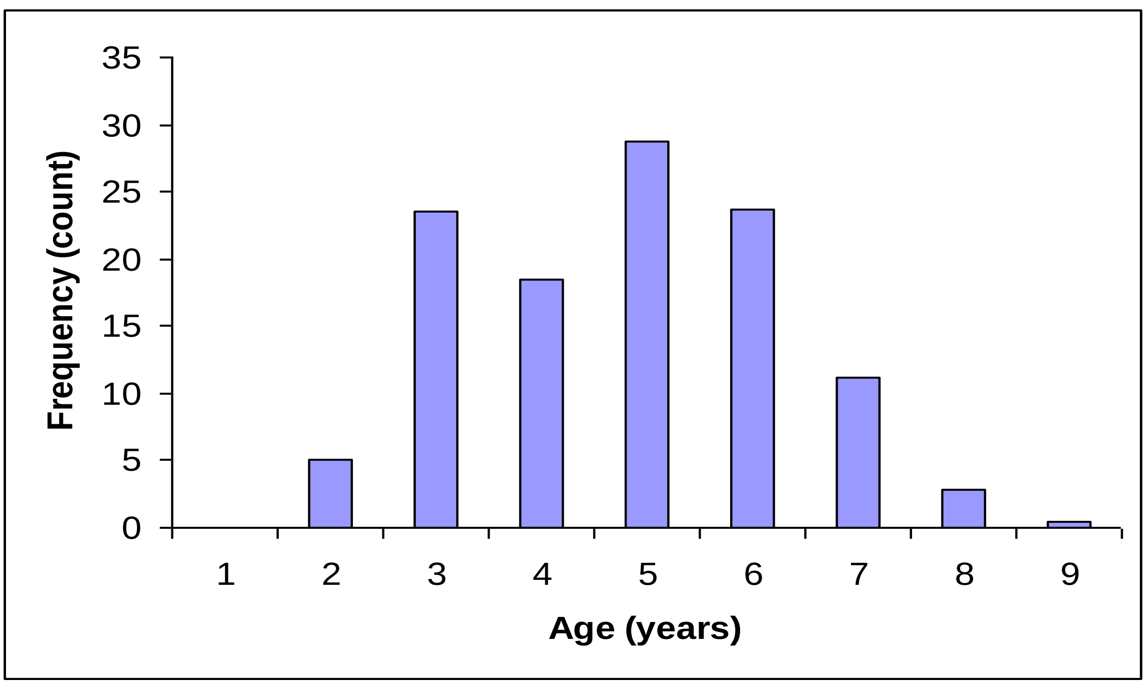

Figure 16. Smallmouth bass age frequency distribution for Lake Redstone, WI 2010.

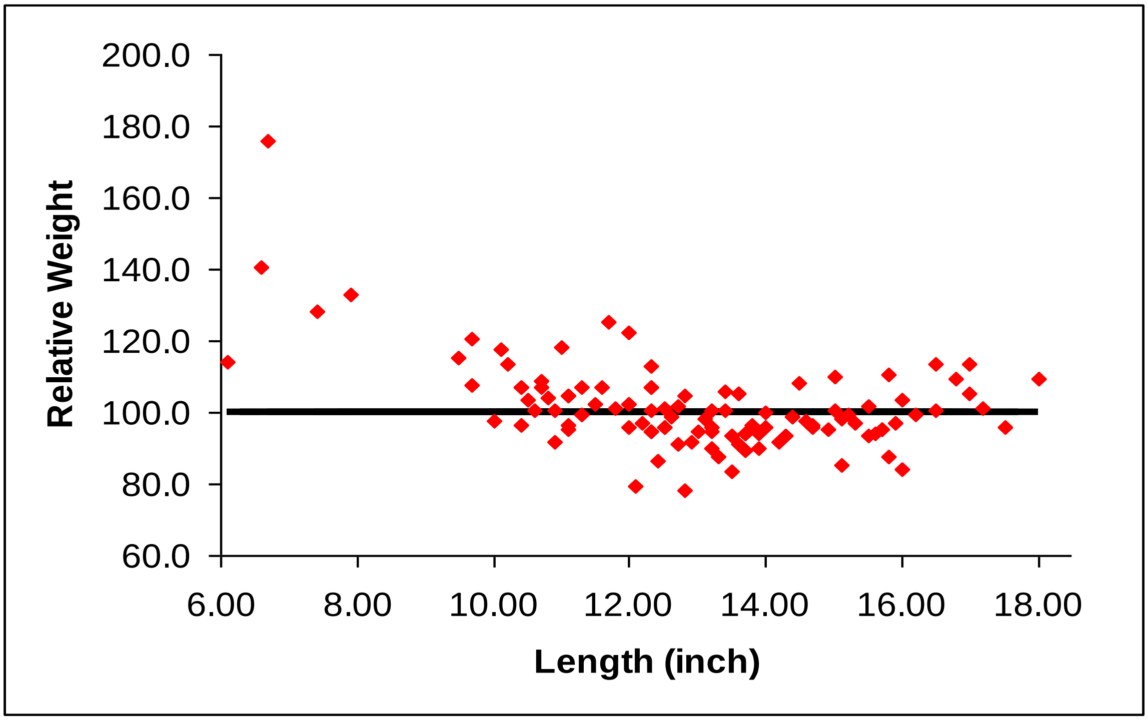

Figure 17. Relative weight of smallmouth bass for Lake Redstone, WI 2010.

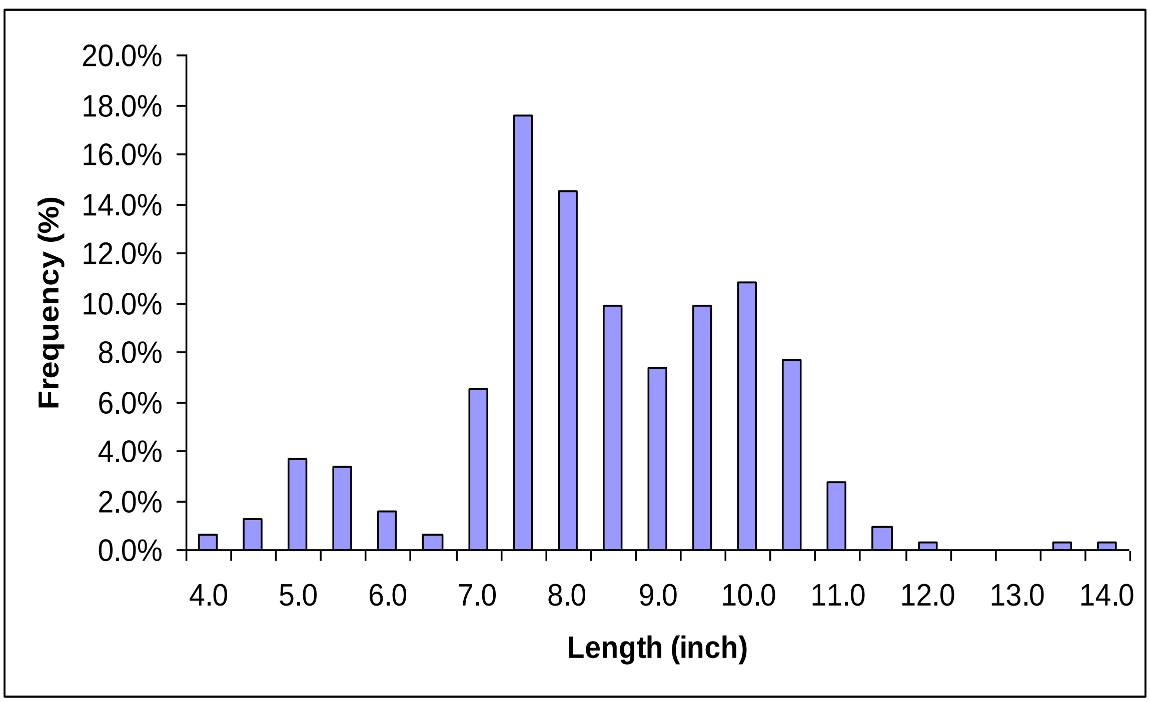

Figure 18. Black crappie length frequency for Lake Redstone, WI, 2010.

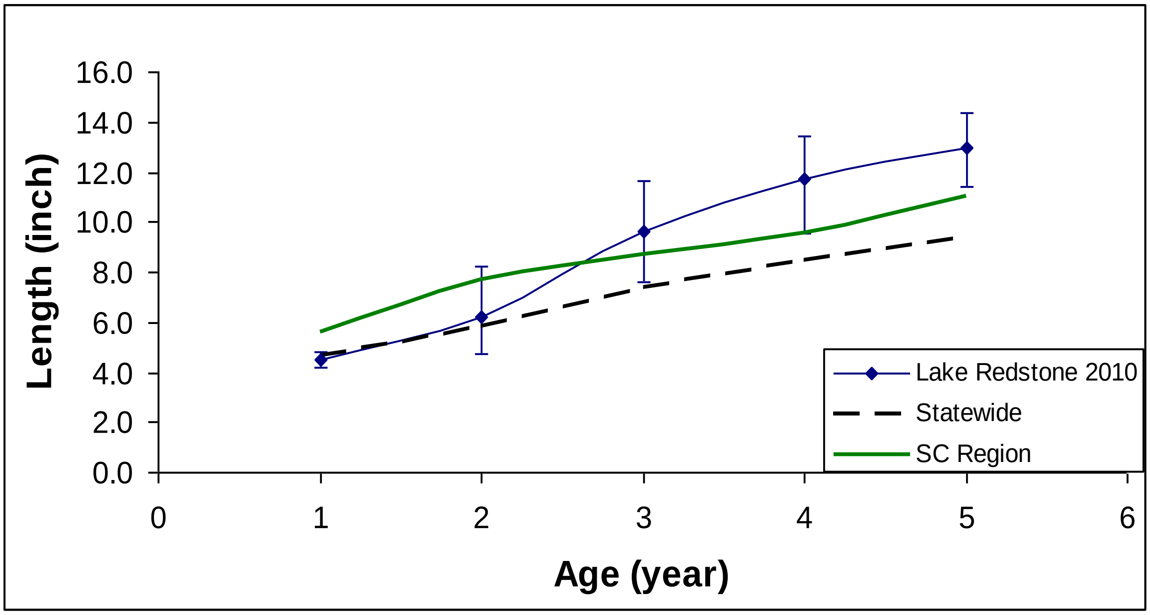

Figure 19. Average black crappie length at age for the south central region, the state, and Lake Redstone, WI 2010. Error bars for Lake Redstone 2010 values represent the range of sizes in the sample.

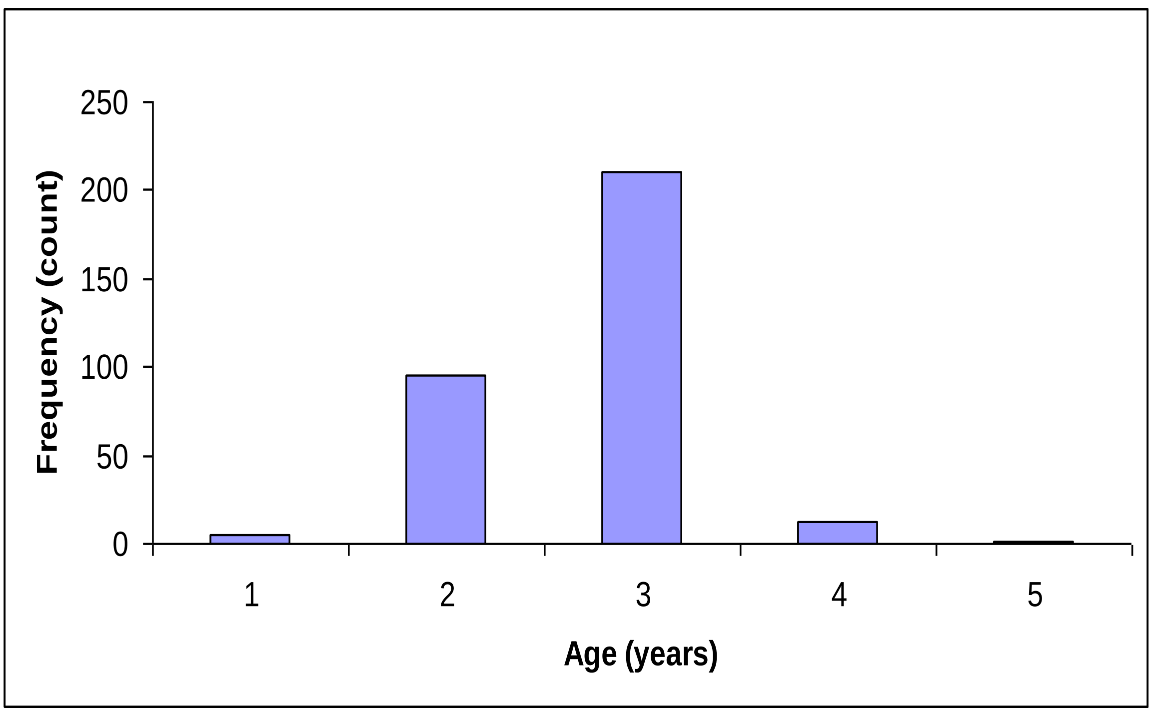

Figure 20. Black crappie age frequency distribution for Lake Redstone, WI 2010.

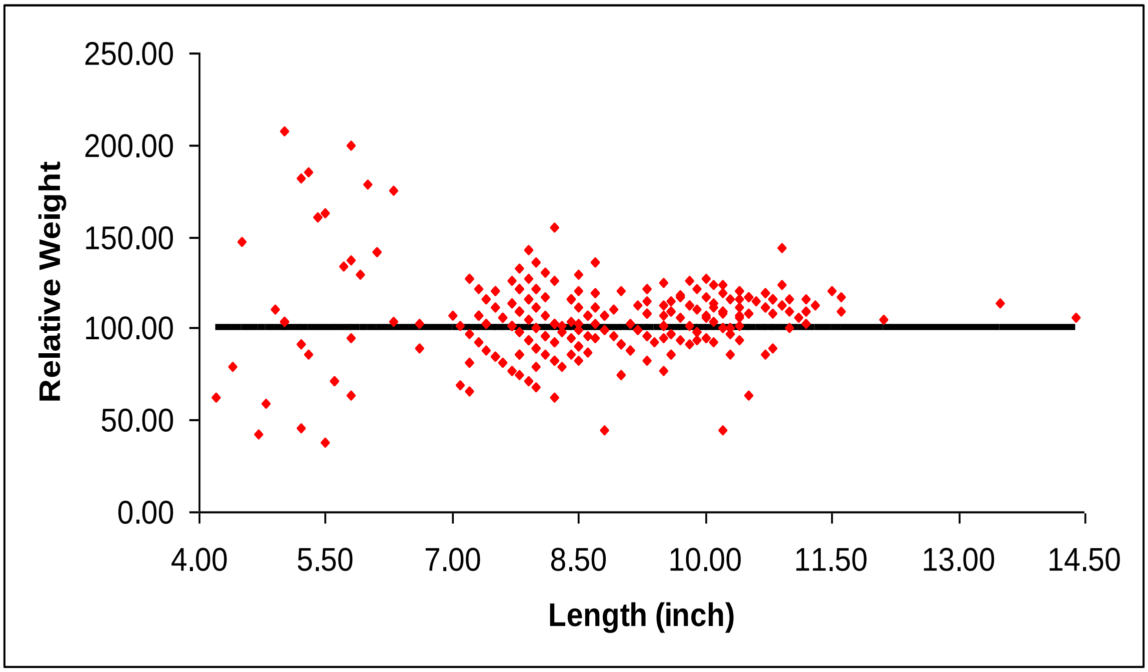

Figure 21. Relative weight of black crappie for Lake Redstone, WI 2010.

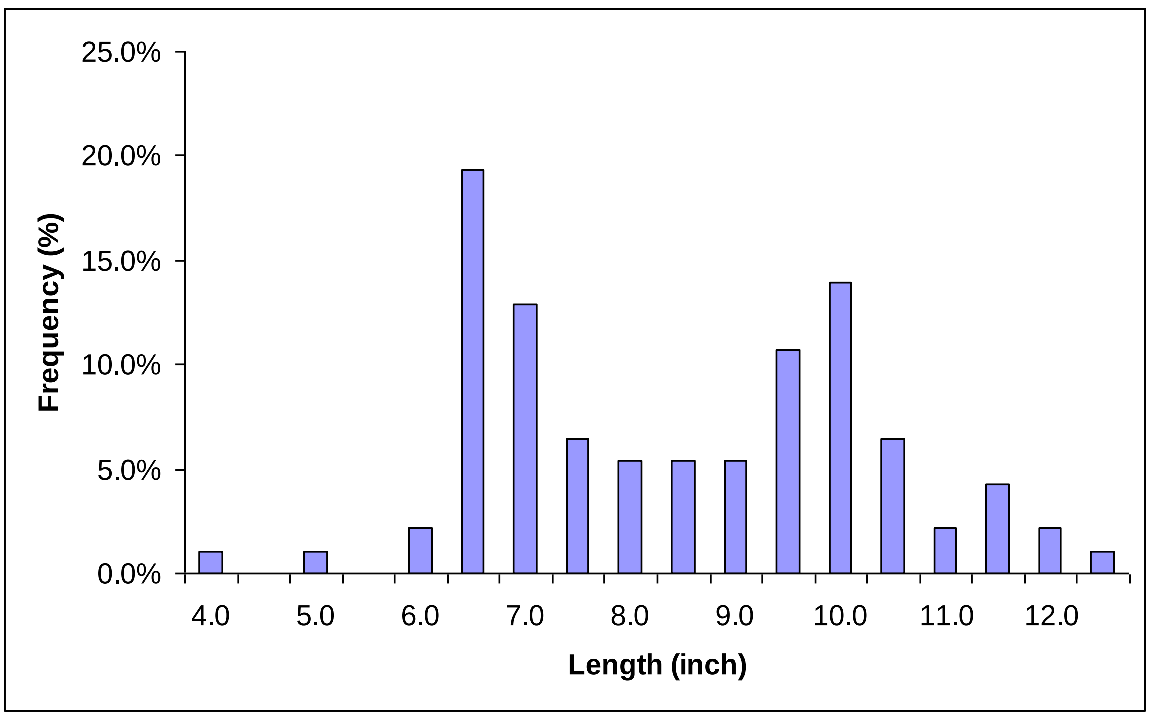

Figure 22. White crappie length frequency for Lake Redstone, WI, 2010.

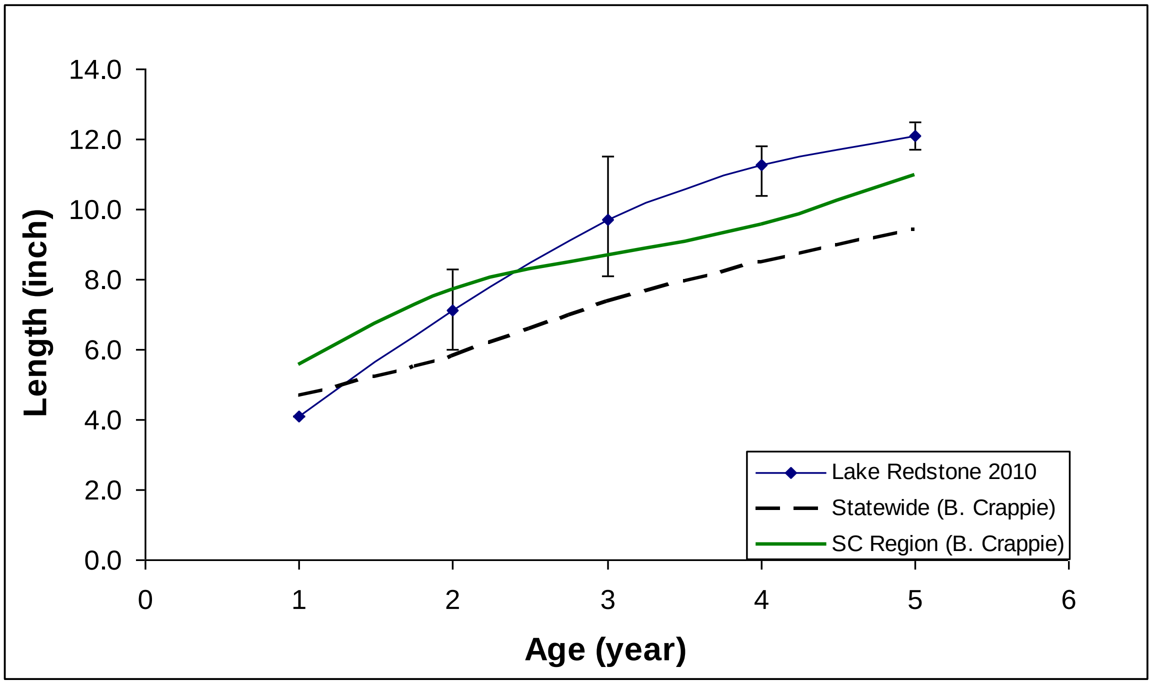

Figure 23. Average white crappie length at age for the south central region, the state, and Lake Redstone, WI 2010. Error bars for Lake Redstone 2010 values represent the range of sizes in the sample.

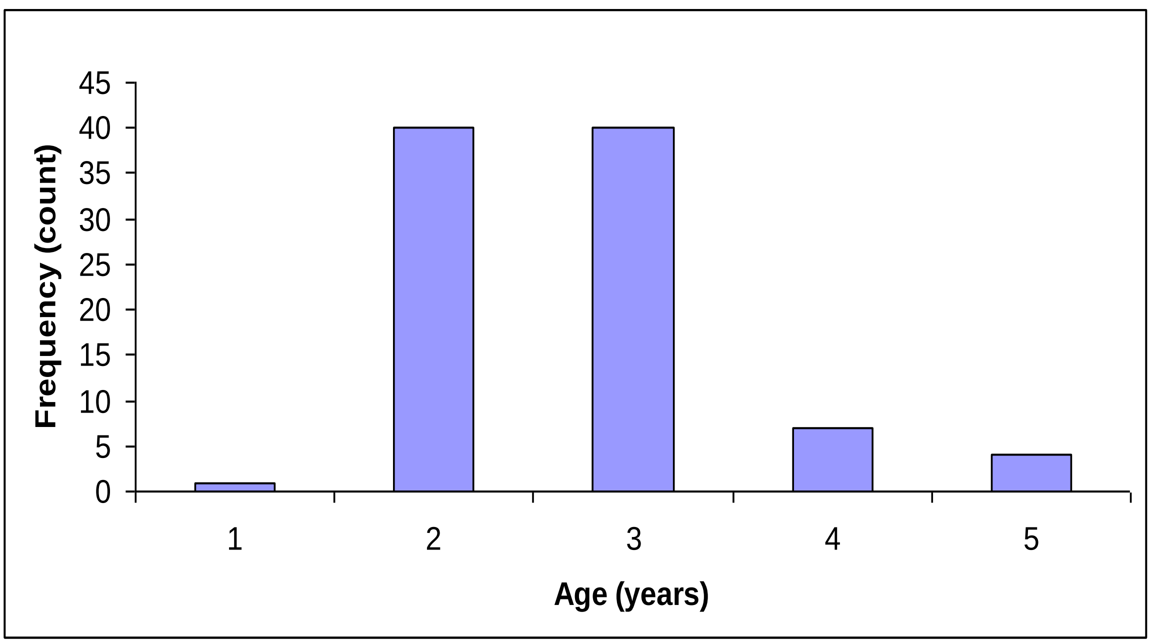

Figure 24. White crappie age frequency distribution for Lake Redstone, WI 2010.

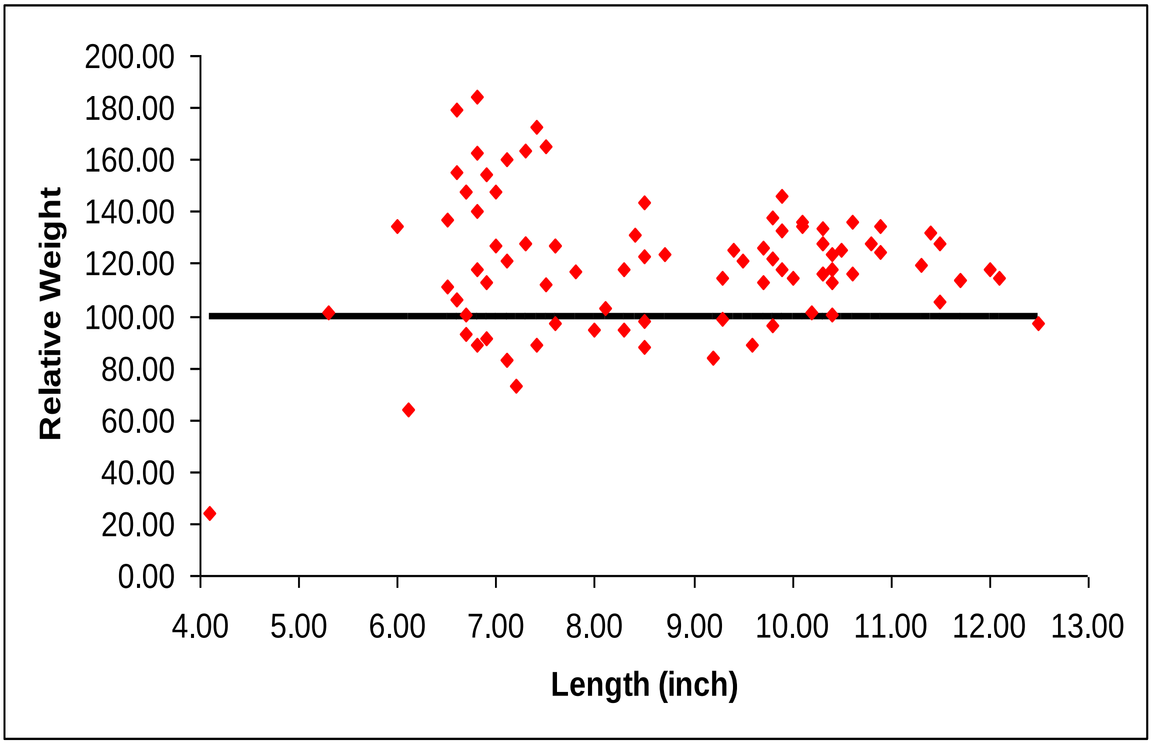

Figure 25. Relative weight of white crappie for Lake Redstone, WI 2010.

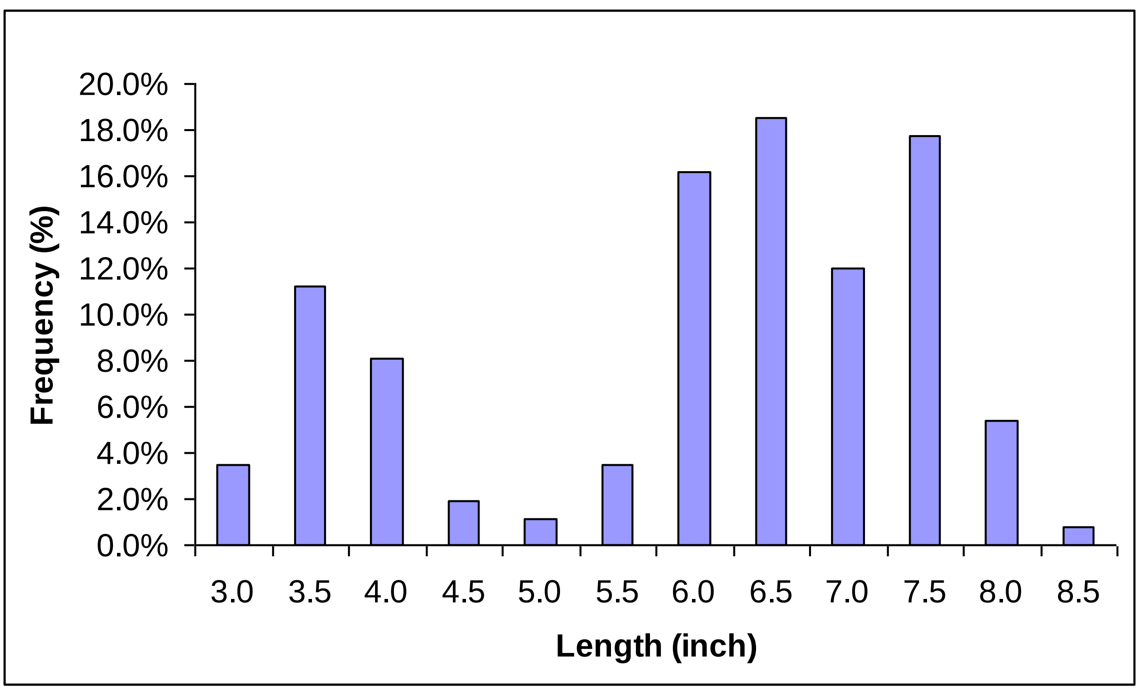

Figure 26. Bluegill length frequency for Lake Redstone, WI, 2010.

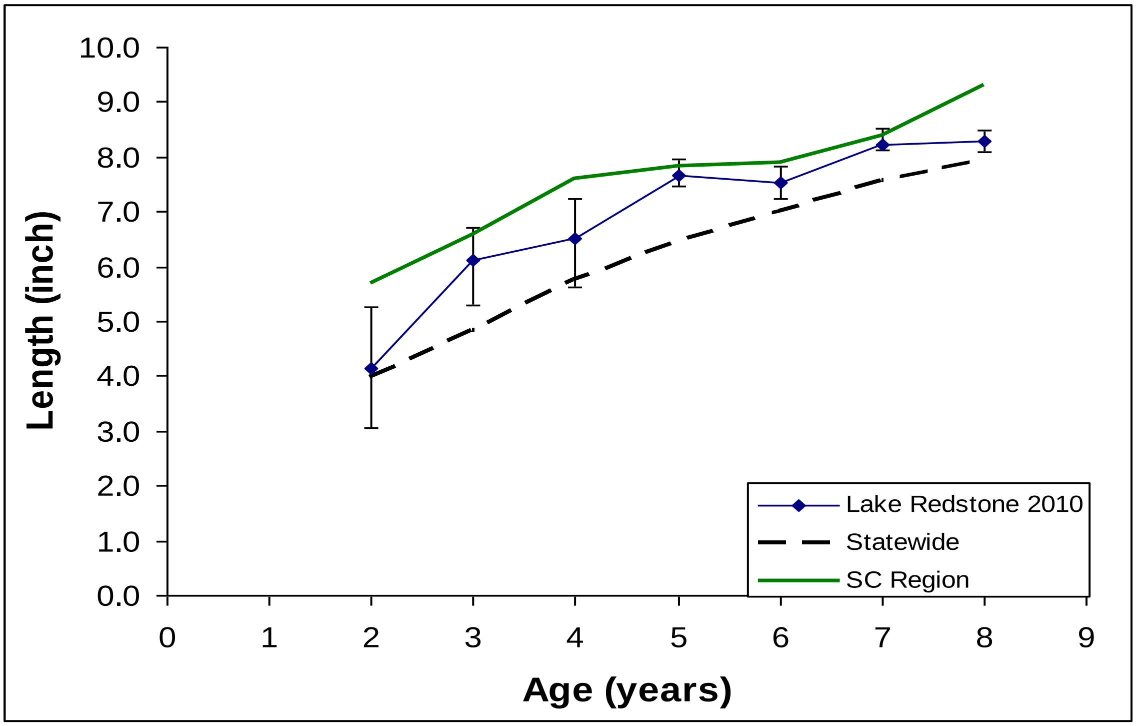

Figure 27. Average bluegill length at age for the south central region, the state, and Lake Redstone, WI 2010. Error bars for Lake Redstone 2010 values represent the range of sizes in the sample.

Figure 28. Bluegill age frequency distribution for Lake Redstone, WI 2010.

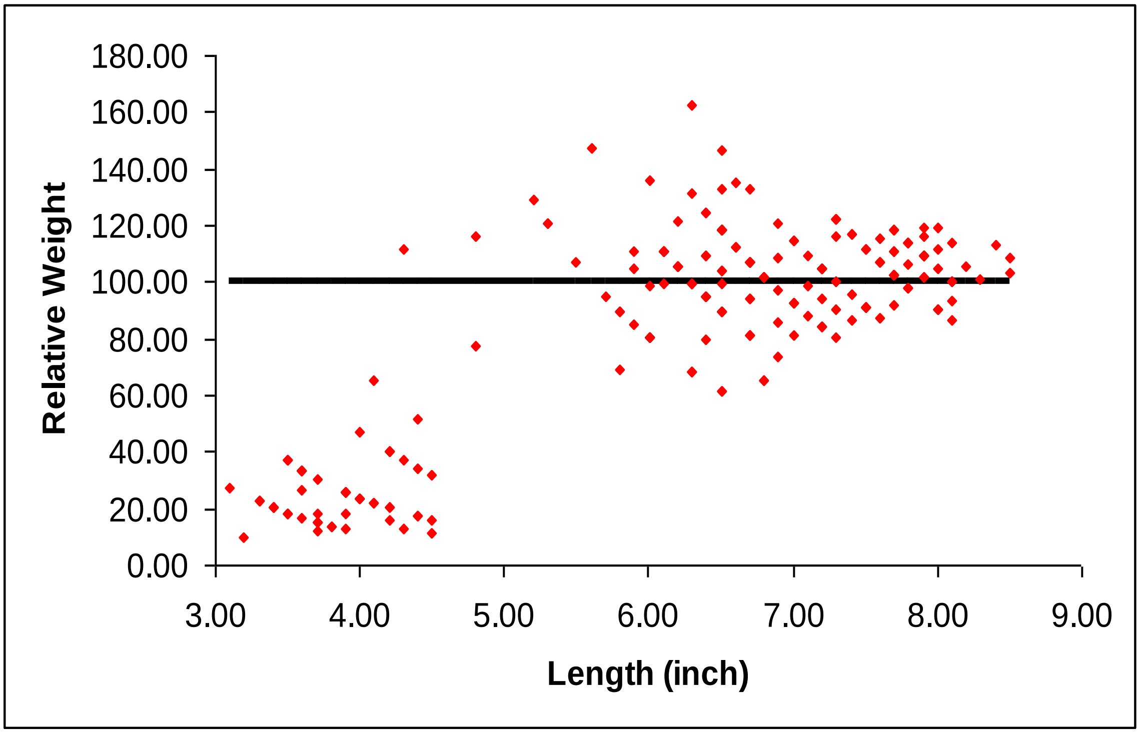

Figure 29. Relative weight of bluegill for Lake Redstone, WI 2010.

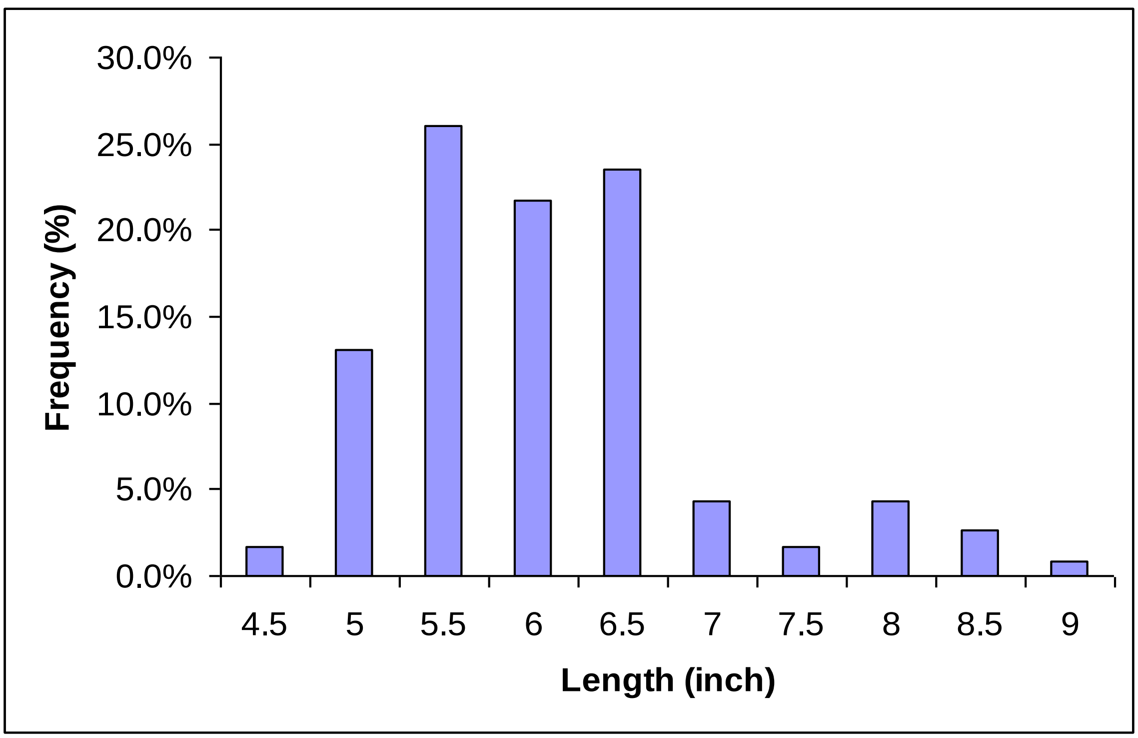

Figure 30. Yellow perch length frequency for Lake Redstone, WI, 2010.