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# Cedar Bluff District Fisheries

Kansas Department of Wildlife and Parks Fisheries Section



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## Notes from the Author

This issue is the second newsletter detailing angling-related happenings in the Cedar Bluff District. The Cedar Bluff District essentially encompasses the majority of Northwest Kansas. See Figure 1 below. The Cedar Bluff District was blessed with ample rainfall during the first half of 2010. Wet weather through the end of June 2010 resulted in many full small lakes, except for Smoky Gardens and Logan State Fishing Lake, which remained dry. Wet weather brought a 5.5-foot water level increase at Cedar Bluff Reservoir. However, dry weather became the rule beginning July 2010 and has prevailed since then. All district waters realized decreased pool elevations due to evaporation and lack of inflow through the latter part of 2010 and into early 2011. Winter dormancy of vegetation allowed groundwater to rebound resulting in increased stream flows. Over the 2010/2011 winter, water levels at Antelope Lake, Ellis City Lake, and Scott State Fishing Lake rebounded to full pool. Water level at Atwood Township Lake improved from 4 feet low at the end of the growing season to 1 foot low currently. Both Sheridan State Fishing Lake and Cedar Bluff Reservoir rely more heavily on surface run-off than do most of the other lakes in the district and did not realize increased pool elevations during the winter.

Timing of water level fluctuations over the past year were near perfect from a fish production standpoint at Cedar Bluff. The timely spring water level rise inundated 862 acres of terrestrial and emergent aquatic vegetation creating excellent nursery habitat and increased nutrient availability, which promoted production of young-of-the-year (YOY) forage and sportfish species. Excellent numbers of young walleye were produced and will likely recruit to larger sizes, forming a strong 2010 year-class that will be of harvestable-sized walleyes in two to three years.

The spring 2010 water level rise resulted in the production of extremely high numbers of YOY black and white crappies, as well. But despite high numbers, recruitment of strong 2010 crappie cohorts to harvestable size is uncertain. Survival of YOY fish beyond their first year of life is often determined by body condition going into their first winter. Given their small size by fall of 2010, it was obvious that most of the crappie could not have preyed upon gizzard shad for much of the 2010 growing season. Therefore, potential exists to establish relatively strong 2010 year-classes of crappie based on high numbers last fall, but much will depend on how many survived the winter. Cedar Bluff black bass populations are likely in the same boat as the crappie in that there is potential for strong year-classes of largemouth, spotted, and smallmouth bass, but good survival of YOY individuals will be key.

Water level and habitat conditions during the 2010 spring were also ideal for the production of YOY gizzard shad, the primary forage fish for most sportfish that inhabit the reservoir. YOY gizzard shad production was the best realized in many years in that the young shad were both numerous and grew slowly, so they were vulnerable to predation by most species and sizes of sportfish.

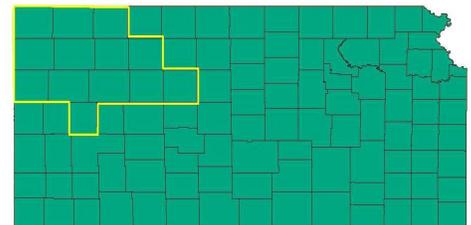


Figure 1

*Notes, continued*

The obvious benefit of the spring water level increase was complemented nicely by the slow water level decrease experienced during the latter half of the 2010 growing season at Cedar Bluff. It may seem that increasing the water level and holding it at a high elevation would be the most beneficial regime for fish production. However, the decreasing water level decreases the volume of the reservoir and reduces the availability of predator escape habitat afforded prey species. Therefore, the excellent production of YOY gizzard shad was complemented by making this valuable forage resource more available to hungry sportfish. Consequently, body condition characterizing most adult and some juvenile sportfish was excellent at Cedar Bluff during 2010.

High YOY gizzard shad availability definitely improved body condition of white bass of all sizes and benefited the 2009 striped bass hybrid cohort immensely. While high forage availability can make fish harder to catch since fish become more selective as to what they will eat, high forage availability is beneficial to the angler in the short run because the fish are in better condition and are “meatier” and in the long run, better growth rates will mean greater availability of larger fish to the anglers in the future.



*An individual from the 2010 walleye cohort*

2010 was a good year district-wide from a fishery standpoint. The conditions realized during the past year improved the fishery quality at many district waters, which should be realized by anglers over the next several years. Although the current weather pattern doesn't look promising in terms of moisture, the fortunate circumstances experienced over the past year should help hold us over until the next wet stretch. There are currently a multitude of good fishing opportunities around the Cedar Bluff District, so take some time to get out and enjoy them. Good luck in the upcoming 2011 fishing season.

## Creel Survey Documents Angler Use and Fish Harvest Patterns at Scott State Fishing Lake

For district fisheries biologists, understanding angler use, harvest, and preference relative to angling at any given lake is critical to sound fish management. To derive angler use information at Scott State Fishing Lake, two creel clerks, conducted random interviews with shoreline and boat anglers between March 1 and October 31, 2010.

During 2010, Scott received a high degree of angler use in terms of anglers per acre, total angling pressure, and angling effort per acre when compared to results for Douglas, Jewell, and Woodson state fishing lakes, which were also surveyed in 2010. The majority (84.7 percent) of angling pressure at Scott was from shoreline anglers. Of all the anglers surveyed, the majority (99.1 percent) hailed from Kansas and lived in or near cities within a 50-mile radius. However, Scott did garner limited out-of-state angler use (0.9 percent), with the majority of the non-residents hailing from Colorado (0.7 percent)



*A view of Scott SFL from the water*

Most Scott anglers (48.8 percent) were nonspecific and preferred catching any fish. However, anglers targeting specific species preferred catching channel catfish most (31.0 percent), white crappie (10.1 percent), rainbow trout (7.5 percent), and walleye (1.0 percent). Despite anglers' preference for particular fish species, white crappie, channel catfish, rainbow trout, and bluegill contributed most to the angler creel in descending order

*Scott Creel Survey, continued*  
of number of fish harvested. It was notable that the Scott white crappie population accounted for the greatest yield in terms of number of fish harvested when compared to other small waters surveyed during 2010. Furthermore, Scott anglers harvested fish at a high rate when compared to other lakes surveyed during 2010. Total number and number of fish harvested per acre were by far highest at Scott, and the corresponding number of fish per acre released was lowest at Scott.



*A nice Scott SFL walleye specimen*

In summary, Scott State Fishing Lake was a valuable fishery resource for the public of western Kansas as it attracted many anglers that exerted much fishing pressure on the lake and was especially used by shoreline anglers. For the most part, anglers that fished the lake targeted channel catfish, white crappie, and rainbow trout. White crappie, channel catfish, and rainbow trout contributed substantially to the angler creel. Scott anglers tended to be harvest minded. Thus focusing management activities on species sought highly for harvest like crappie, catfish, trout, and walleye/saugeye should be the impetus of fisheries management activities.

*Note: Although a quality walleye population currently inhabits Scott State Fishing Lake, saugeye have recently been stocked instead of walleye. Reasons for the change are to establish a walleye-like predator that is better at controlling overly-abundant white crappie and more easily caught by shore anglers.*

**2010 Scott State Fishing Lake Creel Survey Results**

**Angler Use**

Lake Size (acres) 115  
Total No. Anglers Interviewed 1,016  
Calculated No. of Anglers 7,653  
Shoreline Angling Pressure (hours) 18,800  
Boat Angling Pressure (hours) 3,391  
Total Angling Pressure (hours) 22,191  
Mean Trip Length (hours) 2.90  
Mean Angler Satisfaction (1-5) 3.0

**General Angler Catch Summary**

Computed Total Fish Caught 14,238  
Computed Total Lbs. Caught 6,878  
Fish Caught per Angler 1.86  
Lbs. Caught per Angler 0.90  
Total No. Fish Harvested 11,348  
Total Lbs. Harvested 6,119  
Fish Harvested per Angler 1.48  
Lbs. Harvested per Angler 0.80

**Angler Catch Summary by Species**

|                        | <u>Harvested</u> | <u>Released</u> | <u>Angler Preference (%)</u> |
|------------------------|------------------|-----------------|------------------------------|
| <b>Bluegill</b>        |                  |                 | 0.5                          |
| Total No.              | 354              | 639             |                              |
| Total Lbs.             | 92.0             | 95.7            |                              |
| Lbs./Acre              | 0.8              | 0.8             |                              |
| <b>Channel Catfish</b> |                  |                 | 31.0                         |
| Total No.              | 2,379            | 923             |                              |
| Total Lbs.             | 1,498.8          | 239.7           |                              |
| Avg. Weight            | 0.6              | 0.3             |                              |
| <b>Common Carp</b>     |                  |                 | 0.3                          |
| Total No.              | 26               | 140             |                              |
| Total Lbs.             | 149.0            | 13.9            |                              |
| Avg. Weight            | 5.7              | 0.1             |                              |

*Scott Creel Survey, continued*

|                        | <u>Harvested</u> | <u>Released</u> | <u>Angler Preference (%)</u> |
|------------------------|------------------|-----------------|------------------------------|
| <b>Largemouth Bass</b> |                  |                 | 0.7                          |
| Total No.              | 55               | 610             |                              |
| Total Lbs.             | 78.3             | 329.4           |                              |
| Lbs./Acre              | 0.7              | 2.9             |                              |
| <b>Rainbow Trout</b>   |                  |                 | 7.5                          |
| Total No.              | 1,233            | 192             |                              |
| Total Lbs.             | 850.8            | 32.5            |                              |
| Avg. Weight            | 0.7              | 0.2             |                              |
| Lbs./Acre              | 7.4              | 0.3             |                              |
| <b>Walleye</b>         |                  |                 | 1.0                          |
| Total No.              | 73               | 46              |                              |
| Total Lbs.             | 131.8            | 17.1            |                              |
| Avg. Weight            | 1.8              | 0.4             |                              |
| <b>White Crappie</b>   |                  |                 | 10.1                         |
| Total No.              | 7,118            | 227             |                              |
| Total Lbs.             | 3273.8           | 18.1            |                              |
| Avg. Weight            | 0.5              | 0.1             |                              |

### Effects of a 13- to 18-inch Slot Length Limit Imposed on Largemouth Bass at Antelope Lake

In the mid-2000s, depressed growth rates and stockpiling of largemouth bass below the 15-inch minimum length limit was noted at Antelope Lake. In an effort to reduce largemouth stockpiling, a 13- to 18-inch slot length limit was imposed on January 1, 2007.

Typically, minimum length limits, like had previously been in effect for largemouth bass at Antelope Lake, are applied in situations where the population in question is characterized by low rates of recruitment and natural mortality, good growth rates, and high fishing mortality (Wilde 1997). However, as mentioned above, bass growth was less than desired and recruitment and survival of bass was high enough to foster a high bass abundance at Antelope Lake despite angler harvest. Following suspicion that the minimum length limit was not functioning properly, the decision to change the harvest regulation on largemouth bass to a slot length limit was made.

Slot length limits, in contrast to minimum length limits, are applied in situations with populations characterized by high recruitment and slow growth. Slot length limits are expected to increase numbers of fish within the slot, increase growth of smaller fish through reduced abundance resulting from angler harvest, and increase the abundance of fish larger than the slot (Wilde 1997). To facilitate management of the Antelope Lake largemouth bass population, it was necessary to evaluate

the effect that changing harvest regulations had upon population dynamics. Therefore, trends in population dynamics indices sensitive to changes in size structure and growth were monitored.



*A view of Antelope Lake from the boat ramp*

Standard largemouth bass population dynamics data have been collected using the same spring electrofishing protocols since 1996. Given the standard nature of data collection, information from 1996 to the present was used to evaluate the effect of the slot length limit. As indicated above, trends in population dynamics that were sensitive to changes in the abundance of larger fish, such as the percentage of the population 15 inches and larger (RSD  $\geq$  15 inches) and springtime electrofishing catch rate of fish ranging in length from 15 to 20 inches (15-20

*Antelope Largemouth, continued*

inches CPUE) before and after implementation of the slot length limit were compared since the objective of implementing the new harvest regulation was to improve abundance of larger individuals.

Not only was the effect that the new harvest regulation had upon the abundance of larger fish of importance, but reductions to the abundance of smaller fish was judged as a critical change affected by the slot length limit. Thus, trends in metrics such as spring electrofishing catch rates of fish 8 inches and larger (8+ CPUE), spring electrofishing catch rates of fish less than 8 inches (<8" CPUE), spring electrofishing catch rates of fish ranging in length from 8 to 12 inches (8-12 inches CPUE), and spring electrofishing catch rates of fish ranging in length from 12 to 15 inches (12-15 inches CPUE) were assessed to evaluate changes in small fish abundance.

A general underpinning effect of the harvest regulation change was to improve growth of largemouth bass. Scale samples were taken for age and growth analysis from fish captured during standard spring electrofishing samples during 2010. Mean lengths-at-age, in other words the average length of bass in the spring for each year of life, were compared before and after implementation of the slot length limit.

The proximate objectives of changing from a 15-inch minimum length limit to a 13- to 18-inch slot length limit on largemouth bass harvest were to; improve the abundance of larger fish, reduce the abundance of smaller fish, and improve growth. The ultimate objective of the harvest regulation change was to improve overall population size structure for the benefit of angling quality.

*Large Fish Abundance*

Trends of RSD > 15 inches and 15-20 inches CPUE were evaluated to assess the effect of the slot length limit on large fish abundance. 15-20 inches CPUE exhibited a significant increase subsequent to the implementation of the new harvest regulation. But no significant increase in RSD > 15 inches was noted, likely due to the great deal of variability characteristic of this index prior to the implementation of the slot length limit. Given that the particular value ascribed to RSD > 15 inches in any particular year was the result of the ratio of fish 15 inches and greater to all fish 8 inches and larger, it would seem that this metric would be a good indicator of the relative proportion of the population 15 inches and larger. However general sampling variability could have negatively impacted the predictive value of this metric substantially. An expected result of a properly functioning slot length limit was that RSD > 15

inches would increase to a relatively high level and stabilize. Although no statistically significant improvement in RSD > 15 inches was documented, the year after the slot length limit was imposed, this metric increased and stabilized at a relatively high level, providing some degree of evidence that the slot length limit was functioning as intended.

Although, RSD > 15 inches did not strongly point to improved quality of this population corresponding with implementation of the slot length limit, 15-20 inches CPUE did show a strongly significant increase subsequent to implementation of the slot length limit. Therefore, relative abundance of larger fish increased, and to this end, the slot length limit attained a portion of the objectives set forth. See Figure 2.

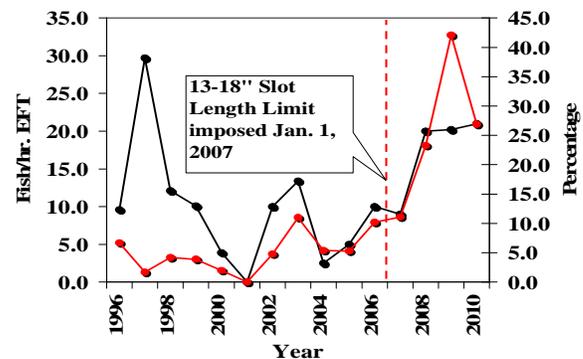


Figure 2. Trends in percentage of the population  $\geq 15$  inches (red) and catch rate of 15-20 inches (black) largemouth bass at Antelope Lake

*Small Fish Abundance*

Not only was increasing the relative abundance of larger fish a desired outcome of altering the length limit, but so too was reducing the relative abundance of smaller fish. Several metrics, 8 inches + CPUE, <8 inches CPUE, 8-12 inches CPUE, and 12-15 inches CPUE were evaluated to assess the effect of the slot length limit on small fish abundance. Strongly significant decreases to 8 inches + CPUE, 8-12 inches CPUE, and 12-15 inches CPUE after implementation of the slot length limit were noted. But, <8 inches CPUE was variable and no significant change in either direction was detected.

Although results of statistical analysis inferred that the decreased 8 inches + CPUE, 8-12 inches CPUE, and 12-15 inches CPUE values corresponded with the implementation of the slot length limit, declining trends for these metrics actually began prior to the implementation of the new harvest regulation. Essentially, the high values obtained during the late 1990s and early 2000s, and the stable, low values obtained after the length limit change made for statistically significant differences between, before and

*Antelope Largemouth, continued*

after values. But because the declining trends started prior to implementation of the slot length limit, it was unlikely that the new harvest regulation was a causative factor for the reduced index values. Although the slot length limit may not have caused the decreased index values the regulation may function to maintain small fish at lower abundance and thus effectively minimize crowding of small fish in the future. See Figure 3.

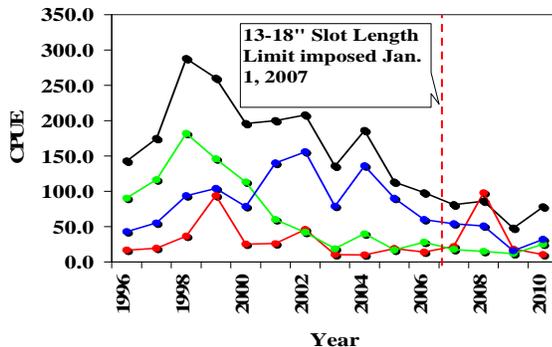


Figure 3. Trends in catch rate of <8 inches (red), 8 inches + (black), 8-12 inches (green), and 12-15 inches (blue) largemouth bass at Antelope Lake

*Growth*

Improved largemouth growth was a desired result of implementing the slot length limit functionally affected by reducing relative abundance of small fish through angler harvest. It was expected that growth would especially improve for length groups that experienced the most reduction in relative abundance (small fish). However, comparison of mean lengths-at-age determined for growth occurring before and after implementation of the slot length limit was contrary to what was expected. Both 8- to 12-inch and 12- to 15-inch fish experienced a marked decrease in relative abundance, and it was expected that growth for bass within these length groups would improve. However, mean lengths-at-age were actually lower for 8- to 12-inch fish after implementation of the slot length limit. Mean lengths-at-age for fish approaching the lower bounds of the slot length limit, which comprise a portion of 12- to 15-inch fish, were similar in value before and after implementation of the slot length limit. It was not until reaching mean lengths-at-age that fell within the protected slot length that mean lengths-at-age showed improvement subsequent to implementation of the slot length limit. In light of the enigmatic age-and-growth results, it was noteworthy that only one year of data representing growth after imposition of the slot length limit was available and thus included in the analysis. Given more time and continued documentation of mean lengths-at-age under the new harvest regulation improved growth may be observed. See Figure 4.

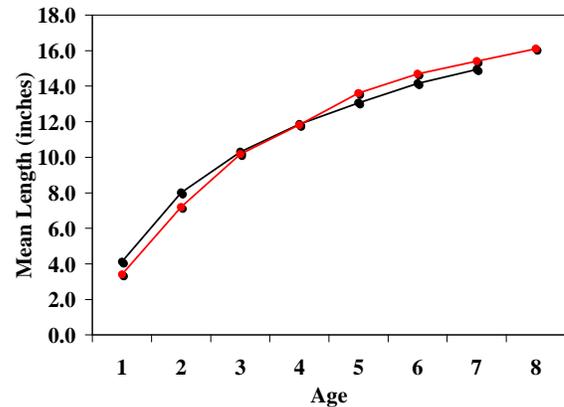


Figure 4. Growth curves for largemouth bass at Antelope Lake before (black) and after (red) implementation of a 13 to 18 inch slot length limit

*Summary*

When many of the metrics used to evaluate the effect of the 13- to 18- inch slot length limit were viewed purely on the basis of statistical significance, it appeared as though the slot length limit functioned optimally in regards to improving relative abundance of 15-inch and larger fish, and decreasing abundance of 8- to 15-inch fish. However, many of the trends that appeared to be significant changes after implementation of the slot length limit actually began prior to the implementation of the new harvest regulation. Therefore, many of the desirable trends in population dynamics were likely the result of factors other than, or in addition to, the slot length limit. Given decreasing trends of small fish abundance it may have been that reduced recruitment rates were responsible for the decline. Furthermore, a creel census conducted during 2007 indicated that anglers did not harvest small bass at a high rate (21 percent), thus reduced recruitment of small fish to larger lengths was primarily attributed to the action of within-lake biotic and/or abiotic factors prevailing over the past decade. Some of the notable changes that occurred over the past decade have been: 1) decline of Eurasian watermilfoil abundance, 2) increased turbidity, 3) introduction of wipers in 2000, and 4) introduction of saugeye in 2001. All of the listed factors could effect largemouth bass recruitment and growth, but no single or combination of factors can be positively isolated as affecting the observed changes. Although the slot length limit may not have caused the observed changes in largemouth population dynamics, the new harvest regulation may help maintain current population dynamics by maintaining reduced abundance of small fish and protecting larger fish from angler harvest such that more fish 15 inches and larger are available.

*Literature Cited:*

1. Wilde, G.R. 1997. Largemouth Bass Fishery Responses to Length Limits. Fisheries 22 vol. 6: 14-23.

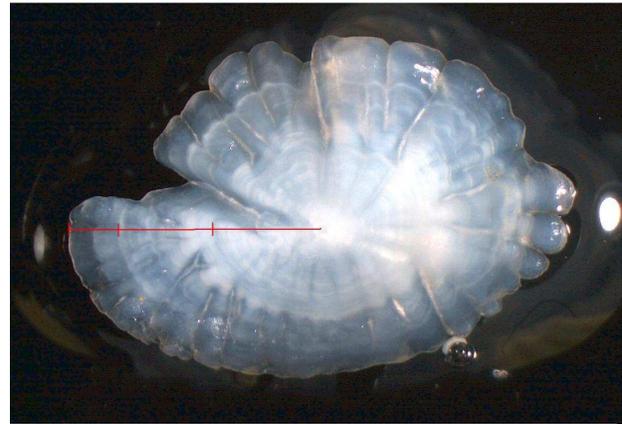
## White Crappie Age-and-Growth Study Conducted at Scott State Fishing Lake Documents Crowded Conditions

White crappies are notoriously prolific. Often in small water bodies, competition among individuals for food resources leads to slow growth and low abundance of large fish. The Scott State Fishing Lake white crappie population has not historically produced a high number of fish 10 inches and larger in any given year. Scott's apparent inability to produce desirable numbers of larger white crappies led to the formulation of the following plausible explanations. Angler harvest could have been limiting, and this was possible based upon 2010 creel census results, as white crappie were harvested at a high rate at Scott (99.3 percent). A second explanation for lack of large white crappie was that most individuals within this population may have suffered slow growth. Completion of the 2010 creel census provided the harvest information needed, but age-and-growth analysis for this population was also necessary to shed more light on factors limiting size structure. Therefore, an age and growth investigation was conducted to provide information critical to the prudent management of this valuable resource.



*A quality white crappie, a typical goal of fisheries managers*

During 2010 fall netting, a total of 54 white crappies ranging in length from 4.3 to 13.1 inches were collected and sagittal otoliths (small bony structure of the inner ear) were extracted for age-and-growth analysis. Otoliths were read in whole view under a dissecting scope equipped with a digital camera such that age determination and measurements could be made from digital photographs.



*An example of an otolith from an Age-2 Scott SFL white crappie*

According to the KDWP Crappie Management Plan, a crappie population that exhibits desirable growth rates should be capable of producing age-2 individuals ranging in length from 8 to 10 inches in fall nets. Based upon 2010 age-and-growth data for Scott white crappie this population met the definition of desirable growth rate in that mean length for age-2 white crappie was 8.5 inches in fall nets. Despite meeting the definition for desirable growth, age-2 Scott crappies narrowly satisfied the definition of good growth. Furthermore, mean lengths for age-3 and age-4 crappie in fall nets were lower than desired when compared to growth documented in other cases.

In general, 2010 fall netting yielded few large fish; no fish larger than 11 inches were captured in trap nets, and fish 10 inches and larger only made up 2.6 percent of all fish sampled. Further evidence pointing to slow growth as a factor limiting the quality of this population was that a great deal of length overlap was observed among age-2, age-3, and age-4 fish which further exemplified stagnation of growth. See Figure 6. Furthermore, comparing Scott crappie growth with the results of Mosher 1985, it was apparent in the case of Lyon State Fishing Lake, that crappie growth can be faster in small lakes than was documented at Scott in 2010. See Figure 7.

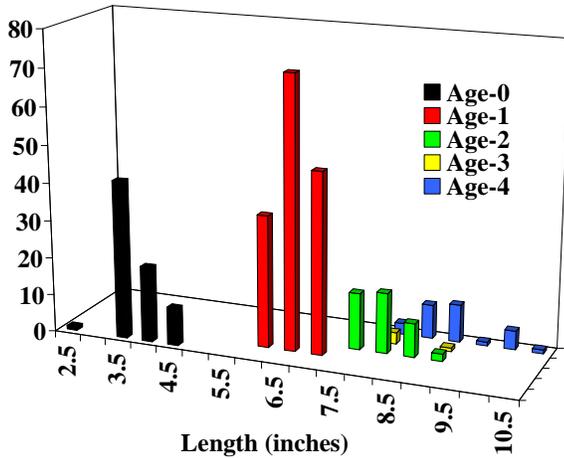


Figure 6. Number of Scott SFL white crappie per 0.5 inch length group by age emphasizing the size overlap of Age-2 and older fish

Taking both angler harvest and crappie age and growth information together, it seemed apparent that a synergistic phenomena may be limiting the quality of the Scott crappie population. First high production and recruitment of crappies beyond age-0 promoted high abundance of fish which resulted in a great deal of competition and ultimately reduced growth. Next, slow growth limited individuals to a length range of 8 to 10 inches for up to three years allowing anglers ample opportunity to harvest the fish and further decreasing the likelihood of fish growing to 10 inches in length and beyond. The capture of a single 13.1 inch long individual in a gill net was a testament to the fact that some individuals could beat the odds and grow to quality sizes, but poor growing conditions and high angler harvest made such fish an exception to the prevailing rule. It is suspected that reducing competition at early life stages may reduce abundance over time, thus improving growth rates and allowing crappie to grow through the fishery at a quicker rate.

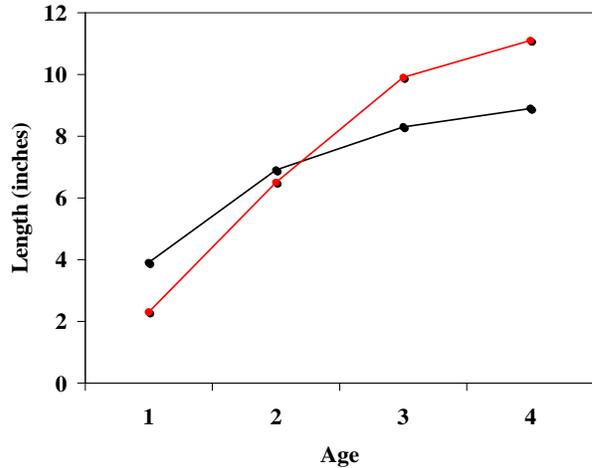


Figure 7. Growth curves comparing white crappie growth at Scott SFL (black) and Lyon SFL (red)

Given prevailing crappie dynamics, saugeye have been stocked in hopes that they will be able to establish higher numbers than walleye have historically been capable of, and thus be able to impart greater predation pressure on young crappies. White crappie population dynamics, especially the relative abundance of larger fish, will be monitored during the near term. And periodic white crappie age and growth analyses will be conducted as the saugeye population establishes in an effort to assess the effectiveness of management activities. Ultimately it is hope that improved crappie quality will be realized as it is very apparent that this species is highly sought after and utilized by Scott State Fishing Lake anglers.

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1. Mosher, T.D. 1985. Assessment Of White Crappie Growth And Survival At Two Kansas State Fishing Lakes. Kansas Fish and Game Commission, Project FW-9-P-2, Final Report, Emporia.