

Fall River/Toronto Fisheries District Newsletter

Making Bigger Better Walleye

Not all fish are created equal. For years, fisheries biologists stocked walleye into Kansas lakes. We've learned a lot about making bigger, better fish over the years. If we just let nature take its course, few Kansas lakes would have fishable populations of walleye. Unlike more northern lakes, Kansas waters don't provide ideal walleye habitat. Nevertheless, as any angler who's landed one of these tasty creatures knows, many Kansas lakes offer anglers abundant walleye or saugeye populations.



Stripping walleye eggs at Hillsdale Reservoir

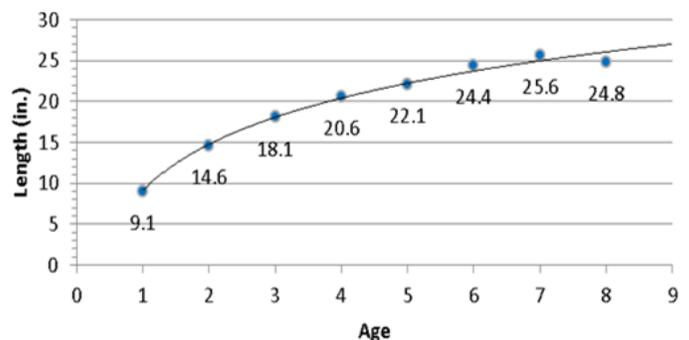
When you consider ideal walleye habitat, picture natural lakes in Minnesota and Canada where the summer water temperature doesn't exceed 86° (the maximum for walleye). By contrast, Kansas Lakes are typically warmer, shallower, windswept, more turbid, and have high flow-through. Even in the historic walleye fishery in Oneida Lake, New York, researchers reported that 99 percent of mortality occurred before walleye reached 3/8-inch (fry) and most of this mortality was attributed to the egg stage. So consider this; in a pristine walleye lake with a stable population, two eggs (one

male and one female) would survive to reproductive size (three or more years old) once every few years.

How does that work? If the population density is neither increasing nor decreasing then there has to be the same number of walleye entering the breeding population as the number of walleye dying (be that from natural causes like old age and disease, or angling mortality). Walleye in Kansas typically die of old age by about seven years but individuals may live as long as 15 years. The average fish would live five years. Female walleye become sexually mature at age three. Walleye will produce about 25,000 eggs per pound, so the average five pound fish will spawn 125,000 eggs.

Here's how the numbers add up. If an average five-year-old, five-pound female walleye spawned 125,000 eggs and one percent survives to 3/8-inch that would be 1,250 fry per spawn. Then two of those 3/8-inch fry have to survive three years to reach reproductive size of 18-inches. Furthermore, those two fish would also have to spawn three times just to keep the population density stable and make the average. An exploitation study at Glen Elder Reservoir showed that anglers harvested 68 percent of legal size walleye each year. It's easy to see why length limits are so important to protect the breeding population.

Mean Length at Age of Walleye in Kansas Reservoirs



In order to maintain walleye populations in Kansas fisheries biologists have found ways to improve on nature. As soon as water temperatures hit 45-50

degrees in the third week of March, fisheries biologists capture spawning walleye in trap nets. They then hand express the eggs and milt into pans and thoroughly mix them together. Fertilized eggs are transported to hatcheries where they will hatch in about eight or nine days in 60 degree warmed water. Hatching success rates can exceed 70 percent in a hatchery setting. You can view the entire process on the 15 minute video at this link: <http://kdwpt.state.ks.us/KDWPT-Info/KS-Outdoors-Today/Friday-March-08-2013>

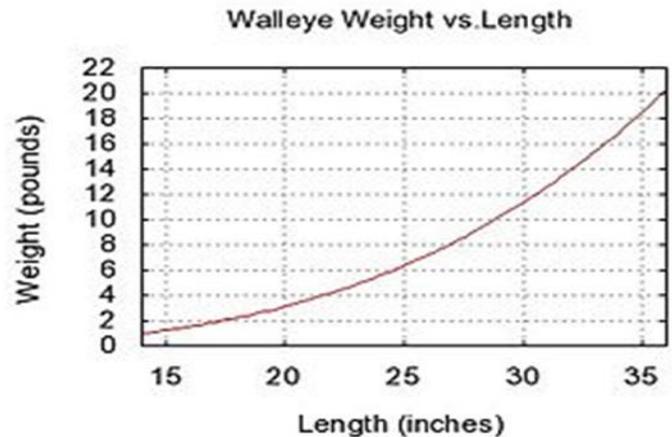
Our 70 percent hatch rate is a vast improvement over the natural one percent. Last year we collected 100 million walleye eggs, and 12 million eggs for hybrid saugeye. Although we stock 1,000 fry per acre in lakes, in many years they don't survive. Harsh spring storms are well documented cause for poor walleye year classes. Heavy wave action not only destroys naturally spawned eggs, but crushes free floating fry onto the rocks. One improvement biologists have made is that we now stock the fry in the upper end of lakes where the water is warmer and there is more zooplankton for them to eat.

Another obstacle walleye must overcome to produce a strong year class is piscivory. White perch are well documented egg eaters. In one study in Lake Erie, 86 percent of captured white perch contained an average of 349 walleye eggs in their stomachs. The collapse of the walleye fishery in Lake Ontario has been blamed, in part, on egg predation by white perch. White perch are native to the Atlantic coast region of North America. However, they were accidentally introduced into Wilson and Cheney Reservoirs in Kansas in 1994 by an unknown source. Since then, anglers have moved them to El Dorado Reservoir, Kingman State Fishing Lake, Lake Afton, Hutchinson Carey Park Pond, Kingman Hoover Pond, Sedgwick Co. Park Lakes, and downstream from these waters. Turnabout is fair play. Although early life stages of walleye are vulnerable to white perch predation, fisheries biologists attempt to control white perch populations by increasing walleye stocking and setting 21-inch length limits and two fish creel limits to increase population density of large predatory walleye.

While white perch are non-natives, high density white crappie populations are also catastrophic on larval walleye. In a study conducted at Glen Elder Reservoir, mortality of larval walleyes resulting from white crappie predation was over 90 percent. There are two ways biologists can produce walleye fisheries in the presence of high density crappie populations. Since crappie populations are cyclic, just like walleye, we can stock walleye in years with weak crappie populations. Alternatively, we can stock larger walleye that are too big to be consumed by crappie. Our hatchery system is currently developing methods to feed walleye larvae to produce larger fish.

Walleyes are creatures of clean, clear, cool water with little flow through; conditions that don't describe most Kansas lakes. Therefore, biologists developed a hybrid walleye or saugeye by crossing a walleye female with a sauger male. Saugeye are ideally suited for these less than ideal walleye lakes. Saugeye don't grow as large as walleye. The world record

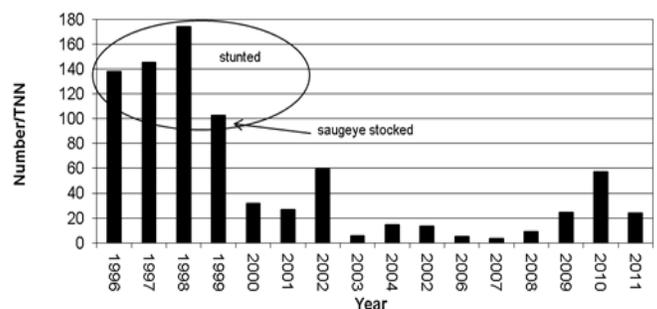
saugeye weighed 15 pounds, 10 ounces. The state record weighed 9 pounds, 13 ounces. By comparison, the world record walleye weighed 20 pounds, five ounces. The largest walleye caught in Kansas weighed 13 pounds three ounces. Saugeye taste the same as walleye.



Historically, most lakes in the Fall River/Toronto Fisheries District were stocked with walleye. Despite good water quality, walleye did not seem to prosper in the lakes and population densities remained low. We discovered that lakes with low hydrologic residence time, especially those less than 365 days, typically had poor walleye populations. All lakes in the district except Lyon SFL were designed by their civil engineers to have a hydrologic residence time of about one year. That means that the volume of the lake flows over the spillway every year. Another way of looking at it is the lakes were designed to fill completely full once every year with average rain fall. The hydrologic residence time of Lyon SFL is 788 days (2.2 years). Lyon SFL had a self-reproducing walleye population that didn't require supplemental stocking.

Stocking of walleye was discontinued in favor of saugeye in high flow-through lakes. Saugeye were first stocked in Kansas lakes in 1988. Recruitment of stocked saugeye has been better than walleye in the Fall River/Toronto Fisheries District. Most lakes now have good fishable populations of saugeye. However they have to be maintained through supplemental stocking. Saugeye were stocked to increase predation on white crappie, add creel diversity, and provide a trophy fish potential.

Olpe City Lake White Crappie Catch per Trap Net Night



Despite annual stocking, saugeye recruitment is still not consistent every year. Recruitment means that stocked fry survive one year and grow to stock size (nine inches for saugeye). There are three factors that influence recruitment: Fry must be stocked into warm zooplankton rich water in the upper end of a lake. If an early spring cold front pushes through, fry survival is low. The higher the small crappie population density is, the lower saugeye recruitment will be.

Therein lays a paradox. Saugeye are often stocked to control crappie populations. Stunted crappie populations have lots of hungry mouths to feed that gobble up small saugeye fry. One way to reduce the number of small crappie, or gizzard shad for that matter, is to establish an adult saugeye population to eat them. As mentioned earlier, our hatchery system is currently developing a larvae diet for walleye and saugeye to grow them to near stock size. Stock size saugeye would not be eaten by small crappie, and would quickly bring a crappie population into balance.

In addition to making hybrid walleye (saugeye) that stay in our high-flow-through lakes and grow better in more turbid waters than walleye, we have recently begun making triploid saugeye. Madison City Lake in the Fall River/Toronto Fisheries District is one of five study lakes selected to test triploids. Triploid fish are sterile, that is they don't reproduce. To produce triploids the fertilized eggs are subjected to 9,500 psi for ten minutes. Triploidy is produced by preventing the second meiotic division of the egg (after the sperm enters the egg). The result is that two sets of chromosomes are contributed by the female and one set by the male. Triploids end up with an extra pair of chromosomes which causes sterility.

We are testing the advantages of sterile triploid saugeye. Initial indications are that triploids are more aggressive at feeding, so they survive better than diploids. More aggressive feeding likely will result in faster growth and bigger fish. Faster growth is likely the result of energy that diploid fish put into making eggs and milt along with energy expended during spawning activity is redirected into mussel development in triploids.

Another benefit of triploid sterility is that they don't pollute either parental genetic strain. It has been documented that walleye, sauger, and saugeye all are capable of reproducing with one another. Behavioral differences are what keep walleye and sauger separate species in the wild. Releasing fertile hybrid saugeye into the wild would likely result in contaminating pure walleye or sauger genetic stocks. While hybrid saugeye are better suited to more turbid high-flow-through lakes, walleye and sauger are ideally adapted and have evolved for their natural environment of the north. Corrupting their genetics would surely reduce their population fitness.

If it weren't for modern technology, we wouldn't be able to quickly tell the difference between triploid and diploid saugeye. It's hard enough to distinguish between walleye and saugeye. To distinguish between diploid and triploid saugeye, we need one drop of blood. We run the blood through a Coulter counter to measure the diameter of the blood cell. A Coulter counter is a

machine that passes particles (in this case red blood cells suspended in an electrolyte solution) through a small hole with a magnetic current on top and bottom. When a red blood cell passes through the hole, it changes the electrical impedance of the magnets. When calibrated, the impedance change not only counts the number of cells that pass through the hole, but the size of the cells. Diploid red blood cells are 7.4 micrometers wide while triploid cells are 8.4 micrometers. The process is so efficient; we test a drop of blood from every saugeye we sample at the study lakes.

Before the advent of the Coulter counter, scientists had to use a high power microscope mounted with an ocular micrometer and search the glass slide for a red blood cell then manually measure it. I personally know how tedious this process was because I published a paper in 1986 on the egg diameter frequencies of gizzard shad collected from Melvern Reservoir. I measured 11,700 eggs for the study. A Coulter counter sure would have made the process easy.



6.61 pound saugeye from Eureka City Lake

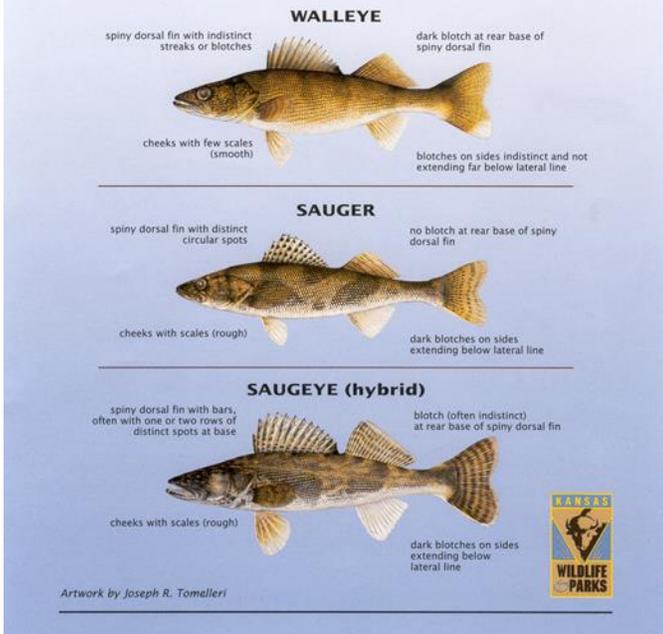
Next time you catch a walleye or saugeye, take a minute to reflect on the science that went into producing that fish. Also remember the next time you get into a good population of preferred size crappie (greater than 10 inches) that there's likely a population of saugeye out there munching on the little ones 365 days a year thinning out the population so the remaining ones have enough to eat and grow. Good fishing doesn't usually just happen by circumstance; it's the culmination of applied scientific knowledge, technology, fishery management, and culture.



Identification of Walleye, Sauger, and Saugeye

The Kansas Department of Wildlife and Parks has experimentally stocked sauger and saugeye (a hybrid of the walleye and sauger) in federal reservoirs where walleye have not flourished. The sauger is native to large rivers like the Kansas and Missouri. Both sauger and saugeye are better adapted to high flow and turbid water than the walleye; saugeye establish fishable populations below impoundments when flushed. Saugeye have also been stocked as an additional predator in small lakes with stunted crappie.

It is important that anglers be able to identify what type of perch (the family of fishes that includes walleye and sauger) they catch because length limits on walleye, sauger, and saugeye can differ in a given body of water. This poster portrays the key characteristics needed to identify these three fish.



COMMON CARP

Stats	2012	2013
Total Catch	47	22
Stock Catch	47	22
Units of Effort	1.17	1.02
Stock CPUE	40	22
SUB-STOCK CPUE	0	0
RSD S-Q (8-15")	0	14
RSD Q-P (15-19")	4	0
RSD P-M (19-25")	87	77
RSD M-T (25-33")	9	9
RSD T+ (≥31")	0	0
PSD	100	86
Mean Wr S-Q (8-15")	.	110
Mean Wr Q-P (15-19")	.	.
Mean Wr P-M (19-25")	78	94
Mean Wr M-T (25-33")	82	95

As a special experimental project, common carp were selectively electrofished in May after the largemouth bass were sampled. A special rubber dip net was used to capture carp to eliminate entanglement with their serrated anal spine. Carp were electrofished after the bass sample was taken to eliminate bias to the bass sample, because if the netter was dipping a large carp, he could potentially miss a bass. Also, the heavy rubber dip net was less effective at dipping bass than the normal fabric net one due to its increased weight and resistance when pulling it through the water.

In 2012, a total of 47 common carp were captured. They averaged 7.49 pounds. All 352 pounds of carp were killed and removed from the lake. In 2013, 22 carp were removed. No small carp were sampled, indicating low recruitment. This was likely due to abundant bass predation and good water quality for the sight feeding bass.

Carp were only in fair condition in 2012 but improved in 2013. Their mean Wr's were low in or below the objective range of 80-100 last year but were high in the range in 2013. It was the objective of this project that by making one lap of the entire lake shoreline and removing all spawning carp that it would enhance the sport fish populations.

Sport fish condition improved significantly in 2013. Bluegill and crappie condition improved 13 percent and 21 percent, respectively. Furthermore, quality, preferred, and memorable size largemouth bass condition improved four percent in 2013 and five percent in 2012 for a total of nine percent. Initially, it appeared that even the limited scope of this carp removal was beneficial to the sport fish population, and the project should be continued for further evaluation.

Howard City Lake Special Project Analysis of Selective Carp Removal

Howard City Lake contained a moderate density of large common carp. Carp were undesirable because they consume resources (food) that more desirable sport fish species could use. Their feeding activity also reduces water quality by stirring up bottom sediments. Furthermore, they eat fish food from the feeder meant for channel catfish and their large size and aggressive feeding behavior intimidates smaller channel catfish and discourages them from utilizing the feeder.



Floor of electrofishing boat filled with common carp.

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