Volume: #4 February 2015

Hooked on Mille Lacs Lake

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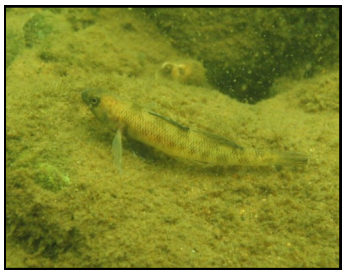

Johnny darters are a native fish that is actually in the perch/ walleye family, and they are pretty common in Mille Lacs Lake. They don't grow much longer than about 3 inches or so, and prefer to live in the rocky areas of the lake. When they spawn, they do so upside down under a rock with females laying only one egg at a time. After fertilization, the male cares for the eggs until hatch and even cleans up eggs with fungus by eating them. These tiny fish are limited to eating some of the smallest benthic invertebrates. While they are not an important diet item for walleye at Mille Lacs, we do see some. (Information from Becker, 1983)

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Greetings

By Rick Bruesewitz
MNDNR Aitkin Area Fisheries Supervisor

Greetings once again Mille Lacs anglers and spearers. This was certainly an exciting fall and winter with great ice conditions, a new spear fishery and a good prospect for a big walleye year class. Expectations for this 2013 year class of walleye are running pretty high, but I want to caution everyone that this does not mean we are out of the woods quite yet. It takes time for this new year class to contribute to the spawning stock. The timing for that event starts a year from this coming spring with some males first reaching maturity. Then by 2017, nearly all males will be mature.

However, for females, first maturity is delayed by about an extra year and takes longer to reach full maturity. In 2017, only a few 2013 year class females will mature, with full maturity by 2019. Since we need to wait until 2017 for even a small portion of the 2013 females to mature, we can't "spend down" our current female spawning stock too much. For that reason, fishing regulations for the coming season are again going to be conservative as we wait for this strong year class to mature. A regulation announcement will be made in March following a meeting with the Mille Lacs Fishery Input Group. Have a great end of winter and good luck with your late ice season!

Bioenergetics

aka: How much of who is eaten by whom?

By Tyler Ahrenstorff
MNDNR Fisheries Research Biologist

Fisheries specialist Brian Beyerl cuts open the stomach of a walleye as part of the diet study on Mille Lacs.

Photo courtesy of Deborah Rose, DNR

Over the last few years, MN DNR researchers have been examining what and how much prey the most abundant predators in Mille Lacs Lake are eating. The reason is because since about the year 2000, the survival rate of young walleye has been declining. One hypothesis for why young walleye survival may be reduced is that predators in the lake could be eating them.

To test this hypothesis we 1) examined what the primary predators in Mille Lacs Lake eat, 2) estimated how much food they consumed, and 3) evaluated how many young walleye they consumed.

We focused on examining diets of walleye, northern pike and smallmouth bass during the summer of 2013 and 2014 because they are the most abundant predators in the lake compared to other species. Our goal was to collect all sizes of these three predators from all areas of the lake during every month of the summer May to October. We also collected some diets in December of 2013 and February of 2014; however, diets did not vary much during the winter months. Fish were collected using gillnets, typically set for about 20 minutes so that non-targeted species could be successfully released. Using these sampling efforts, we collected nearly 3,000 walleye, over 1,000 northern pike and over 500 smallmouth bass diets in 2013 and 2014.

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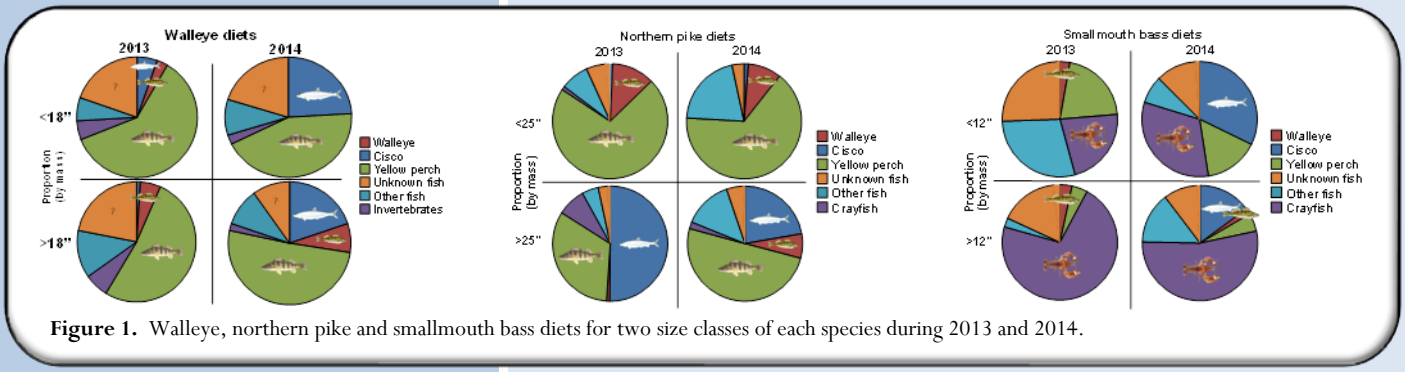


Figure 1. Walleye, northern pike and smallmouth bass diets for two size classes of each species during 2013 and 2014.

Walleye consumed primarily yellow perch and unknown fish in 2013 and 2014 (Figure 1). The majority of these unknown fish were likely yellow perch because larger prey such as young walleye or cisco could usually be identified by scales or bony structures. However, if there was any uncertainty, we called them unknown fish. In 2014, walleye also consumed a higher proportion of cisco (or tullibee), primarily because a strong year class of cisco was produced in 2014. Some young walleye were eaten by adult walleye, particularly by adult fish over 18 inches.

Northern pike diets were dominated by yellow perch in 2013 and 2014. Smaller northern pike (<25 inches) ate some young walleye, while larger northern pike (>25 inches) ate more cisco.

Smallmouth bass ate primarily crayfish; especially smallmouth bass over 12 inches. Smallmouth bass also consumed some fish; typically bottom-dwelling species such as burbot, sculpins and madtoms. In 2014, smallmouth bass consumed cisco as well. Fewer young walleye were eaten by smallmouth bass compared to walleye and northern pike.

We then used bioenergetic modeling to estimate how much food was consumed by walleye, northern pike and smallmouth bass during each year. The models estimate how much food is consumed by accounting for prey species that are consumed, predator growth and water temperatures throughout the year. The bioenergetic models estimated consumption from October 2012 – 2013 and October 2013 – 2014. Of all the food consumed by walleye, northern pike and smallmouth bass during these two years, the largest proportion was consumed by walleye (Figure 2). The primary reason that walleye consumed so much more food is because there were many times more walleye than northern pike and smallmouth bass based on population estimates.

Results from diets and bioenergetics modeling were combined to evaluate

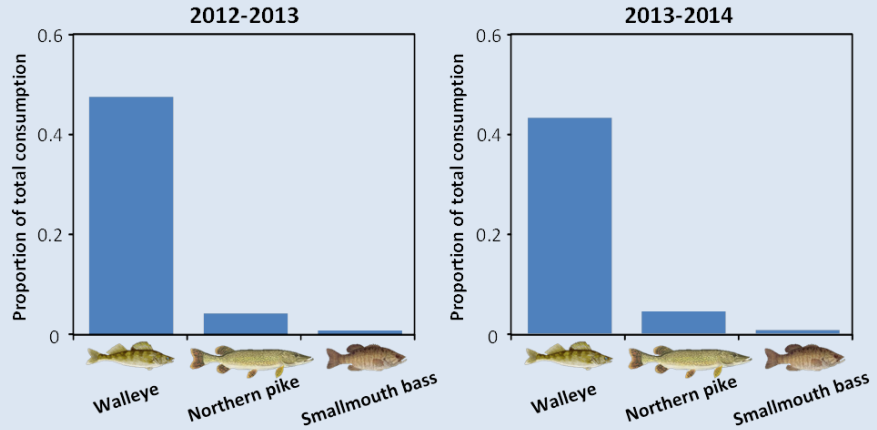


Figure 2. Of all the food consumed by walleye, northern pike and smallmouth bass during the two years of study, walleye consumed the largest proportion during each individual year.

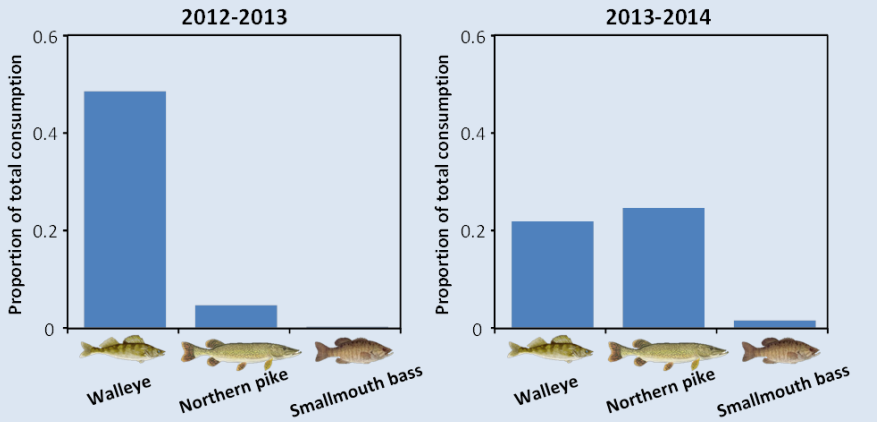


Figure 3. Of all the young walleye consumed by walleye, northern pike and smallmouth bass during the two years of study, walleye consumed the highest proportion in 2012-2013 with walleye and northern pike consuming similar proportions in 2013-2014.

which predator species consumed the most young walleye (Figure 3). From October 2012 – 2013, walleye consumed the most young walleye. From October 2013 – 2014, northern pike consumed slightly more young walleye than adult walleye. Approximately the same amount of young walleye were consumed by adult walleye in 2012 – 2013 compared with the amount that were consumed by both northern pike and walleye in 2013 – 2014.

Although the results of this research indicate that predators in Mille Lacs Lake, such as walleye and northern pike, ate some young walleye in recent years, it remains unclear whether predation on young walleye has been constant over time or is increasing. While we can assume the current level of predation on young walleye is contributing to their reduced survival to some extent, there are likely other factors (e.g. productivity, climate change and invasive species) that could also be playing a role. We hope that undertaking new innovative approaches such as this diet and bioenergetics study will improve our understanding of the complex dynamics in the Mille Lacs fishery, and will eventually lead to a healthier, more sustainable walleye population.

The Winter Bite

By Alisha Hallam
MNDNR Fisheries Specialist

The 2014-2015 winter season on Mille Lacs started off strong! Good, early ice had some people out fishing on Thanksgiving, and by the following weekend, the southern bays were full of dark houses and portables.

This was the first season of winter spearing for pike since 1982, and it attracted a large number of spearers. The action was good and a few spearers left with a fish of a lifetime. As winter progressed, the pike moved out deeper which limited spearing, but anglers still had some luck.

The winter walleye bite was pretty good this season, although the majority of the fish caught were 10-12 inches long with a few larger fish mixed in. Although keepers were hard to come by, most people were pleased with the increase in action from last year.

Yellow perch have been reported to be feeding on insect larvae on the flats. Stay mobile in 28 to 32 feet of water. You may need to do some sorting but there are some jumbos out there.

Tullibee also provided some action with an average size of 14-15 inches. The tullibee bite usually improves later in the winter, so get your smokers ready! Burbot have been biting better this season than in recent years, although nothing like the "good ol' days." If you are not going to eat this very mild flesh, freshwater cod, please let them go. Don't just throw them on the ice.

So how late in the season do you plan on fishing? Late ice can provide some great perch, tullibee and crappie fishing, and don't forget the extended northern pike angling season which runs through March 29th (spearing ended Feb. 22nd). Late ice can bring enjoyable weather, but with that comes deteriorating ice conditions. So good luck and have fun making new memories, but most importantly...BE SAFE!

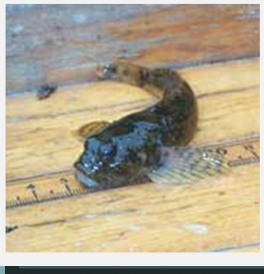


Photo MN DNR

◀ What is that???

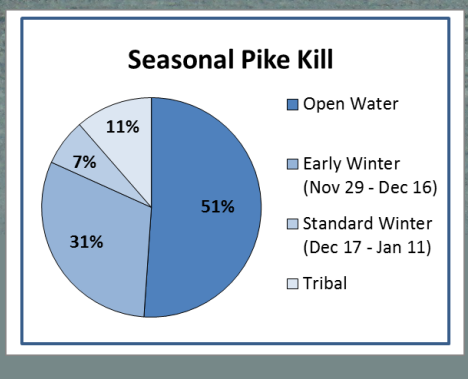
Have you caught something lately and were unsure of what it was? A sculpin may be your mystery fish. They are often mis-identified as round goby, an invasive species in the Great Lakes. Sculpin are native to North America and catching one can be fairly common during the winter bite. These little guys are usually under six inches and have large, flattened heads with a very large mouth and fleshy lips.

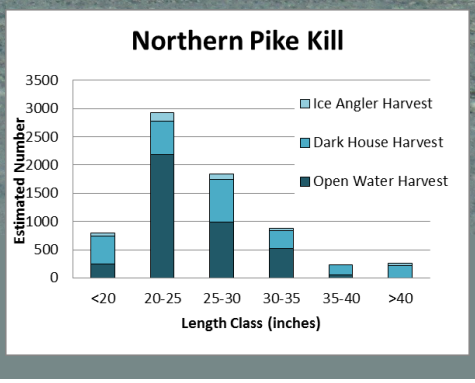
To learn more about this cool fish click here: www.lakesuperiorstreams.org\understanding\mottledsculpin.html

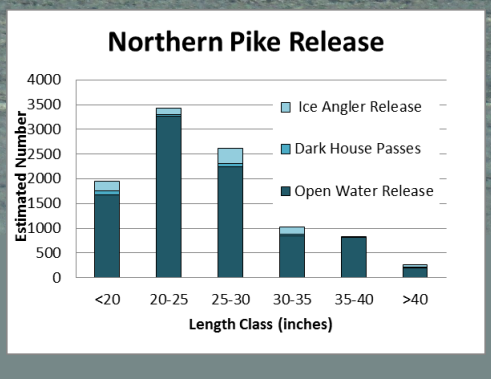
This trophy northern was speared in Garrison Bay. The pike was nearly 42 inches long and had 47 perch in its belly!

Photo courtesy of Greg Erickson

Seasonal pike kill from opener 2014 to January 11, and Length distribution charts of harvested and released northern pike observed by or reported to our creel clerks. *(Both charts representing kill include hooking mortality as well as harvest.)*







Myths and Facts surrounding Mille Lacs

Why would we decide to conduct a survey (sampling) on Mille Lacs rather than a census (complete count) when it just seems like we would obtain better numbers by interviewing every angler?

Myth 5: Fishing pressure and the number and weight of fish caught by recreational anglers in Mille Lacs Lake are simply guesses by the DNR. The DNR can't get accurate numbers because they don't talk to all anglers

Fact 5: How are fishing pressure and catch estimated for Mille Lacs? We conduct a creel survey to estimate pressure and catch by talking to a sample of anglers from all parts of the lake throughout all parts of the day. If we talk to enough anglers, the pressure and catch from the sample we interview can be expanded to estimate pressure and catch for all anglers that use the lake within a defined time period.

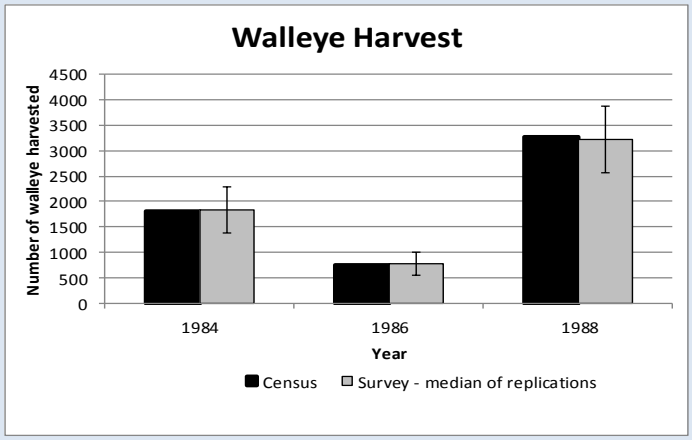
Why would we decide to conduct a survey (sampling) on Mille Lacs rather than a census (complete count) when it just seems like we would obtain better numbers by interviewing every angler?

The need for sampling is obvious in some cases. That trip to a doctor where a portion of a patient's blood is collected in order to determine chemical, lipid or blood count numbers is a form of sampling. Most people understand why we would want to take a small blood sample and not remove the entire 5.5 quarts of blood in the average human body to obtain our blood panel numbers.

The need for sampling on Mille Lacs is a little less obvious, but the main reason is cost. Mille Lacs is a relatively large body of water and to sample every access and the complete shoreline all day, every day would likely require over 200 creel clerks just to collect the data compared to the three we use now. Further, a creel census is simply unnecessary. While the estimates we obtain with the survey are not exact, they are statistically significant. The typical sampling error within the Mille Lacs creel across the years has been about +/- 15%.

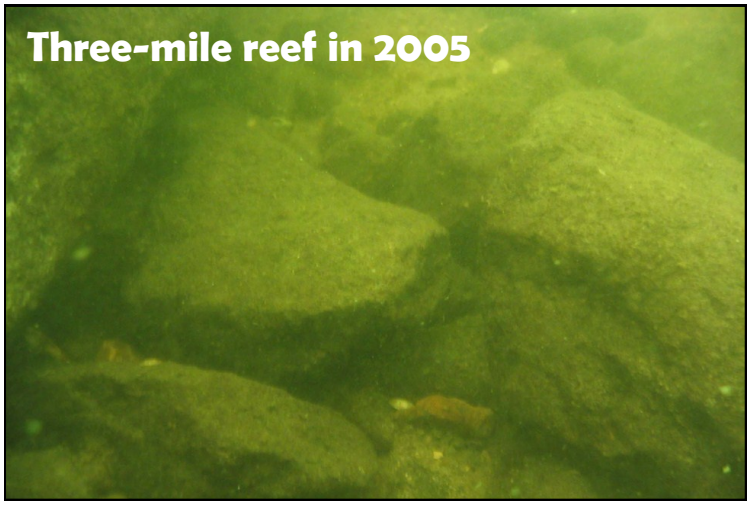
How well does sampling actually estimate a known number? An easy example to examine would be a national general election, which is a census of people who decided to vote. I think most people understand why it's important to count all valid votes in an election, but the first projections of the winner often comes from sampling. It's typical for various news organizations to declare a winner in many of the races, well before all the votes have been tallied, sometimes even before 50% of the votes have been counted. How could they possibly "know" who won before a majority of the votes have been counted? The answer is they have a very strong estimate of who the likely winner will be, which is obtained through sampling likely voters on how they voted or intended to vote. It has been shown that the winner of the presidential election can be reliably predicted by using a properly selected nationwide sample of less than 2,000 people. This doesn't mean they always get a strong estimate within the error of the sample, remember the Bush vs. Gore issue in the 2000 national election where the Florida result was just too close to call with sampling? In most cases though, the projections from sampling indicate a clear winner and the vast majority of projections from various races on election night are usually correct.

We collect the data for the Mille Lacs creel using similar sampling techniques as the election samplers. We are aware that including all types of anglers from all parts of the lake is crucial to getting good estimates. Creel clerks visit different locations randomly to sample all parts of Mille Lacs, where they obtain interviews from all types of anglers (experienced, inexperienced, guides, launches, tournament, etc.). It is also important to get enough interviews. Mille Lacs creel clerks interview an average of about 7,500 anglers



Here is an example where a typical creel survey design was compared to results from a complete census at a lake in Wisconsin. Researchers basically simulated the creel survey by sub-sampling the census data in a manner similar to that of a creel clerk working a 10 hour shift. They did this subsampling 1000 times and found that the median of the survey results were nearly identical to the census, and that over 90% of the time, the confidence limits of the estimates (margin or error) included the census count. Data from Rassmussen et.al. 1998. Transactions of American Fisheries Society 127:469-480.

See **MYTH AND FACT** page 6



Mille Lacs Lake The Problem of ZEEBS

In 2012, the density of zebra mussels in Mille Lacs Lake had grown by about 8 million times since their discovery in 2005

By Tom Jones
MNDNR Fisheries Regional Treaty Coordinator

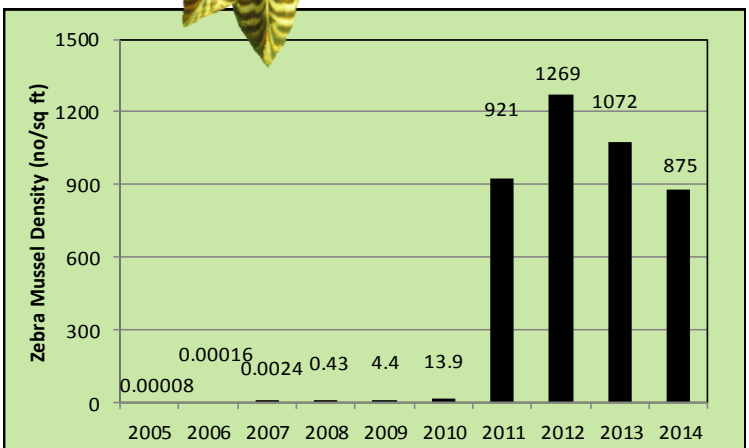
Zebra mussels were first discovered in Mille Lacs Lake in 2005 by DNR staff Tom Jones and Eric Jensen. The two were diving in Mille Lacs documenting different habitat types, when they encountered their first mussel on top of a large boulder near Garrison.

Zebra mussels are native to eastern Europe and were brought to the United States in ballast water of ships from the Caspian Sea. Since then, they have been spread throughout much of Minnesota. The most common method of spreading is likely the accidental moving of adults in vegetation picked up on boat trailers. Moving infested docks between lakes is another common method.

The discovery of zebra mussels in Mille Lacs set off a large search effort of over 60 dives to determine the extent of zebra mussels in the lake. Only three other mussels were found in 2005, one near Myr Mar and two on Agate Reef. Harbors were also searched from shore with underwater cameras to try to find a breeding colony that could be exterminated before mussels became widespread, but no colony was found.

In 2006 established survey routes—called transects were created to obtain density estimates. Two divers swam along a 600 ft line and counted every mussel they could find. In that year, mussels were found at five of twenty locations-all in the northern part of the lake from Garrison to Agate Reef. No southern transects had any mussels.

Since then, zebra mussels have expanded rapidly. By 2008, mussels were found on every transect. By 2009, divers could no longer count all the mussels, so they began counting mussels in one square-foot quadrats every hundred feet. Density increased by a factor of about 30 every year. Maximum average density of 1,269 per square foot was reached in 2012; 8 million times higher than observed just six years earlier. The highest density recorded at a single sampling site was 7,696 per square foot at 3-mile Reef in 2012!



Density of zebra mussels in Mille Lacs Lake since their discovery in 2005. Numbers are zebra mussels per square foot.

Populations of invasive species, like zebra mussels, often increase rapidly and overshoot the maximum sustainable density that can be supported by the habitat they invade. After this peak populations usually fall back and stabilize at some lower density. This seems to be occurring at Mille Lacs where the density in 2014 was 875 per square foot-which is still a lot! No one knows how much lower the density will get. We will just have to wait and see.

Zebra mussels inhabit about 35% of the lake bottom. They live on hard substrates, like rock, but can also live on sand. They

See **Zeebs,** page 6

Reminder:

Last day to spear northern pike on Mille Lacs was February 22nd

MN DNR—Mille Lacs Lake's dark house northern pike spearing season ended at sunset on Sunday, Feb. 22.

Mille Lacs anglers can still keep 10 northern pike with one of those 10 fish longer than 30 inches. Liberalized northern pike regulations were enacted on Mille Lacs to provide additional opportunities to harvest fish and take advantage of the current surplus of pike shorter than 30 inches. Northern pike spearing was opened this winter for the first time since the winter of 1982-83.

The new, liberalized regulations are experimental and enacted for only one year at a time. The DNR will evaluate the impacts of the northern pike regulations at the end of the ice fishing season. If there appear to be conservation concerns, necessary adjustments will be made.

For complete regulations, follow the Mille Lacs regulations link.

MYTHS AND FACTS, continued

each year. The large number of interviews from a good mix of angler types and locations allows us to expand results from the sample to all anglers.

The actual design and calculations of the creel survey are a little complicated. If you want to learn more, you can contact the Aitkin Area Fisheries Office. The take home message is that the creel numbers we report are unbiased estimates based on a rigorous statistical design accepted by fisheries and wildlife biologists around the world. Due to the number of interviews the creel clerks collect on an annual basis, the creel estimates tend to be relatively robust to any reported inaccuracies, but please try your best to remember your catch (species, numbers and length) when fishing Mille Lacs, because you never know when you may meet a creel clerk at the end of your fishing trip.

Steve Lawrence, Aitkin Area Creel Clerk, explains regulations to anglers visiting the lake.

Zeebs, continued

Zebra mussels use siphons to filter algae out of water. The 2012 density of zebra mussels in Mille Lacs filtered the entire lake every one to three days.

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are usually found attached to harder objects, such as pieces of wood, lost fishing tackle native mussels, and even other zebra mussels. Softer mud will not support these mussels.

There is currently no way to remove zebra mussels from a lake once they are established, although researchers are looking into this. The effects of zebra mussels are many. Zebra mussels can clog water intakes, become nuisances to swimmers because of their sharp shells, change the quality of bottom habitats because densities can be very high, destroy native mussel populations, alter water chemistry, refocus nutrients to the bottom of the lake (a process called benthification) so that some bottom organisms are favored more than others, and filter small algae out of the water, leading to clearer water and changes in plant communities. Although many of these effects are being observed in Mille Lacs, water clarity has not shown an increasing trend with increased zebra mussels.

http://www.dnr.state.mn.us/invasives/preventspread_watercraft.html