Glenwood Area Fisheries Newsletter

2022-2023

Winterkill: Boom and Bust Fisheries

Common carp line the shores following winterkill on Lightning.

Winterkill is a term used to describe a fish die-off in winter because dissolved oxygen was not sufficient for fish to survive. Shallow, productive lakes are those most vulnerable to winterkill. Heavy snow can limit the sunlight reaching aquatic plants in some area lakes, reducing the amount of oxygen created by photosynthesis. Additionally, if vegetation dies from lack of sunlight, the plants start to decompose, which uses oxygen.

Fish such as bullhead are more tolerant of these low dissolved oxygen conditions than gamefish such as bass, crappies and walleye. Reoccurring winterkill may lead to lakes dominated by rough fish. However, if a winterkill is severe enough, quick restocking of gamefishes can restore a fish community and fishing opportunity. During these conditions, there are abundant resources available, so gamefish numbers can increase rapidly and fish grow quickly. In many cases, these lakes have our highest walleye catch rates a few years following a winterkill event.

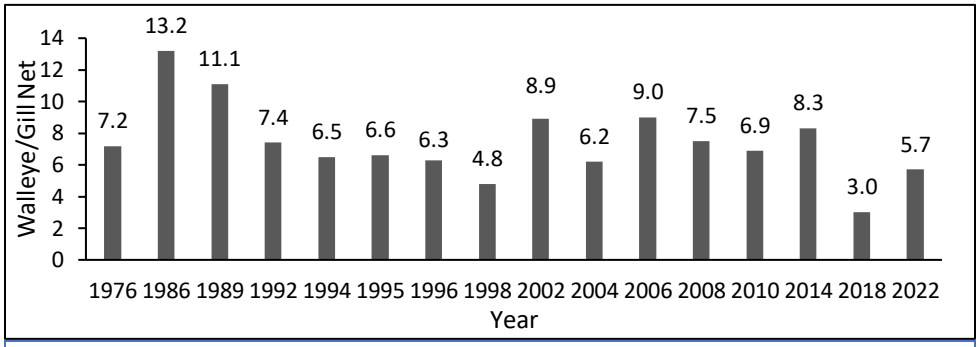
The winter of 2022-2023 will be remembered for its snow, well over 7 feet of it across the state. As one of the snowiest winters on record it was the perfect recipe for winterkill to occur. The combination of a long period of ice cover and thick snow on lakes significantly increases the chances of winterkill. During the winter months fisheries staff monitor lakes that have been prone to winterkill in the past using a dissolved oxygen meter. If dissolved oxygen drops below 3 parts per million there is a chance that at least a partial winterkill has taken place. In those instances we conduct a survey soon after ice out and determine the extent of the winterkill so re-stocking can take place as needed (see table below). If a species was absent during our winterkill survey, adults of that species were stocked prior to spawning so they could reproduce in the winterkill lake. If another winterkill event doesn't take place, look for good fishing on these lakes in a couple years!

Lake	County	Winterkill Severity	Species Stocked
Ann	Pope	None	N/A
Charlotte	Stevens	Severe	walleye*, yellow perch
Gilbert	Douglas	Severe	black crappie, bluegill, largemouth bass, walleye*
Hattie	Stevens	Severe	walleye*, yellow perch
Johanna	Pope	None	N/A
Lightning	Grant	Severe	walleye*
Long	Stevens	Partial	walleye*
Lower Elk	Grant	Severe	walleye*, yellow perch
Nelson	Pope	Severe	black crappie, bluegill, largemouth bass
Thompson	Grant	None	N/A
Westport	Pope	Partial	walleye*

*Lakes where winterkill assessments took place, severity of winterkill and species stocked. Spawning adults were stocked unless otherwise noted. *Indicates fry were stocked.*

Waska Walleye: On the Move?

For over 20 years the Glenwood Fisheries Office has heard a rumor from anglers that 'all the walleye are leaving Lake Minnewaska and going to Lake Emily'. While it is obvious that not all the walleye are leaving an 8,000 acre lake through a 10 foot wide stream, the idea that a substantial number of walleyes are leaving Lake Minnewaska through Outlet Creek seems pretty widespread. Some anglers point to removal of the carp trap grates on Outlet Creek and declines in the Lake Minnewaska walleye population as a "cause and effect" relationship. That if we only re-installed the grates, the walleye fishing would return to the glory days of the 1980s. Other anglers refer to a telemetry study conducted in the 1990s by staff from our office that tracked walleye movements as evidence that the fish are all leaving. Yet those that have spent time on the lake over the last several decades can see that the changes that have occurred on Lake Minnewaska since 1980 far exceed the placement and removal of grates in the outlet.



Walleye gill net catch on Lake Minnewaska from 1976 to 2022.

In the realm of fish populations fluctuating in a large, natural lake, the walleye population in Lake Minnewaska has been surprisingly stable, especially when considering the lake is subject to so many human and natural disturbances. A brief period in the 1980s saw remarkable walleye recruitment, subsequent high abundance, and exceptional walleye fishing. However, both prior to and after this period, the overall abundance has varied much less, with fluctuations being driven by variability in the strength of individual walleye year classes. Angling success has likely been more variable, as the best fishing often occurs when large year classes of 3-4 year old walleye become available. So while the adult population may change less, many continuous years of poor survival in juvenile walleye can lead to extended periods of poor fishing, and when fishing is poor, all of us look for reasons why. That's exactly what happened in the 1990s when anglers began reporting lower walleye fishing success. The Minnewaska Lake Association and Viking Sportsmen Inc. teamed up with the MN DNR to help fund the previously mentioned walleye telemetry study, which aimed to determine the spawning locations of walleye within Lake Minnewaska.

In the study, 20 walleye were implanted with radio transmitters and their movements were tracked over the spring seasons of 1995 and 1996. An attempt was made to determine if emigration of walleye was occurring by tracking not only within Lake Minnewaska but also Pelican Lake, Lake Emily and Outlet Creek from its origin at Lake Minnewaska to the mouth at Lake Emily. Over the course of this study no walleye were detected in any of these other systems. However, several walleye spent at least some time in Shallow Pond, likely attracted to the warm water and flow. In addition, six walleye were harvested during the study, all within Lake Minnewaska and all of these tags were recovered, some being implanted into new fish. However, an angler reportedly did catch a single tagged walleye on Lake Emily. When staff attempted to recover the tag from the angler, the angler could not locate the tag, nor could they produce the number on the tag, so the claim could not be verified. Regardless, a single fish moving out of the system several years after tagging is not significant, or cause for concern. Walleye will migrate and are attracted to flowing water, especially to spawn, but they tend to move upstream (like the case of Shallow Pond), not downstream. It is more likely that walleye would be swimming upstream from Lake Emily to Minnewaska than in the opposite direction. While some limited migration is probably occurring between these systems, it isn't significant and let me explain why.

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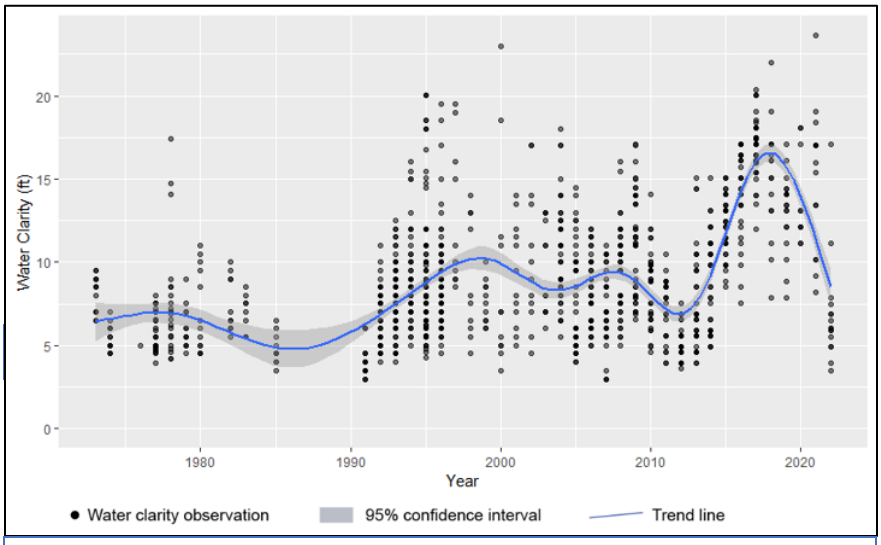
In June 2022, both Lake Minnewaska and Emily were surveyed, providing a perfect case study to examine this claim. Each lake is quite different and because of this so are their respective walleye populations. Lake Emily has a maximum depth of only 6 feet and a much higher nutrient input than Minnewaska, which has a maximum depth of 32 feet. Shallow, productive and turbid lakes tend to have the highest walleye populations (think of Upper Red Lake), so Lake Emily tends to have a higher walleye density than Lake Minnewaska. Lake Emily has averaged 16 walleye per gill net since 1995, while Minnewaska has averaged 6.7 walleye per gill net over this same time. This is a function of Lake Emily being more conducive to walleye, not a sign of downstream migration. In addition, walleye grow much faster in Lake Emily, with age-3 fish averaging 18.1 inches during the 2022 survey, compared to 14.9 inches in Minnewaska. If a significant number of walleye were moving from Minnewaska to Emily we would see a large number of fish with much slower growth rates showing up in Lake Emily surveys, which we don't observe.

Another compelling fact is that the large year classes of walleye in each lake do not align. Digging deeper into the fish survey results from 2022 the largest year class sampled in Lake Emily (65% of walleyes sampled) was from 2020, when no walleye fry stocking took place in either lake, meaning it has substantial natural reproduction. In contrast, in Lake Minnewaska the largest year class of walleyes was from 2019, which constituted 45% of the walleyes sampled, and no walleye were sampled from the 2020 year class. If there was a significant amount of migration between these systems, then both the large year classes and absent year classes should coincide during the same years in both systems, showing the possibility of mixing between the two lakes. However, this is not the case and there is little to no overlap, suggesting that these two lakes are functioning as independent systems. While this is just one example, a history of survey results show that large year classes of walleye exist independently in both systems.

While it is definitely possible for walleye to make the over 10 mile trek downstream from Lake Minnewaska to Emily, few fish are making the journey or we would have pretty clear evidence of this. The data does not support the claim that a large number of walleye are moving between these two systems. A very small number could be but not enough to affect the fishing in either system. So then what? What could explain periods of poor walleye fishing in Lake Minnewaska, especially the most recent stretch from about 2015 through 2020?

Recently the lake has undergone some drastic changes. Following the invasion of zebra mussels in Lake Minnewaska in 2011, water clarity increased drastically and chlorophyll levels dropped. Chlorophyll is a measure of the amount of algae in the water, and that microscopic algae can give water a green color, but also makes up the base of the food web, feeding all the tiny zooplankton in the water that fish consume. Algae suspended in the water is a case of Goldilocks and the Three Bears. Too much algae can cause the water to become extremely green and unpleasant, making water quality conditions unsuitable for fish and even unsafe for humans and pets. Too little algae makes the water extremely clear and can limit the base of the food web, decreasing fish growth and abundance. But just the right amount gives the food web a great base to flourish, yet provides great water clarity and quality for fish to thrive and people to recreate.



Water clarity for Lake Minnewaska, displaying an increase after zebra mussels were discovered in 2011, before peaking in 2017.

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Zebra mussels do such a good job filtering the water, that they can remove a lot of algae from the water column, potentially limiting growth and survival of young fishes. Especially fish like walleye, which are adapted to living in darker water. Historically, large year classes of walleye from natural reproduction or fry stocking have maintained great walleye fishing in Lake Minnewaska. In general, these large year classes have become less frequent over the years, but became non-existent for a period following zebra mussel invasion from 2014 through 2018.

Now, for some good news. After the initial drastic expansion of zebra mussels and the increase in water clarity, zebra mussel numbers appear to be declining or more so, moderating from their peak abundance. This has also been observed in lower water clarity, and slightly greener water in the spring. It's also been seen by near record levels of young walleye observed from the 2019 and 2022 year classes. These big year classes are the types of year classes that really drive a fishery and increase angler catch rates. Better reports from walleye anglers are becoming more common in the last few years. It was even reported in the Minnewaska Lake Association Newsletter that "the spring of 2022 was one of the best for walleye fishing in my memory." With the hopeful addition of the strong 2022 year class, we should see better walleye fishing reports over the coming years as well. I hope that I have made a compelling argument to dispel the rumor and alleviate any concerns. Don't worry, there is not a mass exodus of walleye from Lake Minnewaska!

Fish Diets: What Are They Eating?

Gastric lavage being performed on a muskie to collect diet samples.

Lake Miltona was included in a fish diet study that began in 2019 and included 10 lakes from across the state. Researchers were examining the diets of largemouth bass, northern pike and walleye, with an emphasis on muskies. They wanted to determine what fish were consuming and if they were competing with each other. They collected fish in spring, summer and fall and used a technique called gastric lavage, the pumping of water into the stomach to cause regurgitation, to collect stomach contents (see photo at left).

What they observed statewide is that walleye and northern pike had extremely similar diets, mainly consisting of small perch and sunfish, and therefore the two species are directly competing with each other (88% diet overlap in Miltona). Largemouth bass diets were primarily crayfish and invertebrates, having almost no competition with any other species. The most important diet items for muskies were suckers and perch, having only a slight overlap with other species (up to 23% with walleye in Miltona). As muskies grew in size so did the importance of suckers in their diet. In the 368 muskie diets examined, only three walleye were observed, accounting for less than 0.07% of the total diet importance in muskies. However, some very interesting diet items were observed in Lake Miltona, including bowfin (dogfish), bullheads, muskrats and a ring-billed gull!

A muskrat found in the stomach of a Lake Miltona muskie.

Osakis Creel Survey: Analysis Complete

I want to start by thanking everyone who participated in the Osakis Creel survey! This survey began in December 2020 and concluded October 2021, nearly 10 months long. Over 3,000 anglers were interviewed during this time regarding the fish they caught and harvested, as well as fisheries management related questions. In addition, the total number of anglers across the entire lake was counted twice during each shift. This data was then used to estimate a lot of useful information such as the amount of fishing pressure, total catch and harvest of each species, evaluation of regulations and much more! For example, anglers spent an estimated 281,843 hours fishing Lake Osakis during that time. And while open water fishing pressure has decreased, the winter fishing pressure is five times higher than that of the last creel survey from 2002 to 2003. In addition, an estimated 357,442 sunfish were caught and 71,918 of those were harvested, averaging 7.8 inches. Before the sunfish bag limit was reduced to 10 fish on March 1, 2021 25% of anglers targeting sunfish harvested over 10 sunfish. All of this information will be useful in evaluating regulations and our management strategies in the future. To the right you will find some of the largest fish of each species harvested (not released) and measured by our creel clerks on Lake Osakis! Larger lengths were reported for released fish of many species such as walleye (30 inches), largemouth bass (22 inches) and smallmouth bass (19.5 inches). Currently, a similar survey is taking place on Lake Minnewaska which will conclude in October 2023.

Species	Length (inches)
Black Crappie	15.6
Largemouth Bass	18.5
Northern Pike	37.3
Smallmouth Bass	18.8
Sunfish	10.2
Walleye	27.4
Yellow Perch	9.8

Longest fish of selected species harvested during the Lake Osakis creel survey.

Record Fish: Additional Catch and Release Species

The Glenwood Area is home to three state record fish by weight! Our claim to fame is two of three record bullhead species! These include black (3 lbs. 13 oz.) and yellow bullhead (3 lbs. 10 oz.), as well as rock bass (2 lbs. 0 oz.). We hope to claim more records in the coming years with the addition of new catch-and-release species. Currently, there are only four species recognized for catch-and-release records by length in Minnesota, which include flathead catfish, muskellunge, lake sturgeon and northern pike. However, six species will be added each year beginning in 2024 (see below). Anglers who believe they may have caught a record fish can submit an application using the guidelines here.

Year	Catch and Release Record Species					
2024	Blue Sucker	Bowfin	Channel Catfish	Freshwater Drum	Shovelnose Sturgeon	Tiger Muskellunge
2025	Bigmouth Buffalo	Lake Trout	Largemouth Bass	Rainbow Trout	Smallmouth Bass	Smallmouth Buffalo
2026	Brook Trout	Brown Trout	Longnose Gar	Sauger	Shortnose Gar	Walleye

Regulation Review: Maple, Agnes and Henry

Several lakes with special regulations are up for review in the fall of 2023. This includes Maple Lake, which currently has a daily limit of five crappie, with a minimum size of 10 inches. In addition, in lakes Agnes and Henry all bass from 12 to 20 inches must be immediately released, with only one over 20 inches allowed in possession. Sampling will take place this summer and fall to acquire more data to evaluate the effectiveness of these special regulations. A public input meeting will be held this fall where anglers can give their feedback on whether they support or oppose the current regulations. More details on the date and location of the meeting will be forthcoming. However, we welcome comments at any time by phone or email.

Special regulation signs for lakes Agnes, Henry and Maple.

Walleye Stocking and Fall Assessments: 2022 Was A Good Year!

In the Glenwood Area, 2022 was a good year for walleye production. We were able to get all of the walleye eggs needed to make our quota in a short amount of time, and our hatchery had excellent hatch rates, allowing us to produce 32.6 million fry. Almost 20 million of those fry were stocked directly into area lakes, while the remaining fry were stocked into rearing ponds. These natural ponds are used to raise walleye to around 5 to 8 inches in the fall before they are netted out and stocked into lakes. We rely on winterkill to clean out our rearing ponds of other fish, reducing competition and predation. The hard winter of 2021-2022 made for many clean ponds and good fingerling production. For more information about how we choose what to stock read the articles titled '*Walleye Stocking: Fry or Fingerling?'* in the 2019-2020 and 2021-2022 Newsletters.

Lake	Number
Agnes	61,000
Amelia	188,500
Andrew	662,000
Charlotte	692,000
Chippewa	826,500
Devils	82,000
Emily	1,155,500
Gilchrist	209,330
Grants	64,000
Henry	92,000
Ida	875,500
Johanna	700,000
Latoka	269,000
Lightning	541,000
Malmedal	199,500
Mary	1,644,000
Miltona	1,830,000
Minnewaska	3,291,000
Mustinka Flowage	91,000
Nelson	267,000
Osakis	3,389,000
Page	340,000
Reno	1,317,757
Smith	364,000
Villard	541,000
Westport	203,000
Total	19,895,587

Number of walleye fry stocked in 2022.

Fisheries staff also conduct fall electrofishing on nine lakes each fall before any fingerling stocking takes place to evaluate fry stocking and natural reproduction. We do this to determine how well walleye fry that hatched in spring have survived and made it to fall, what we call young-of-year (YOY) fish. We use this as an index to estimate how many walleye should be recruiting into harvestable size fish in the coming years. This has taken place since the early 1990s, so we have many years of data and 2022 was a good year! After poor recruitment in many lakes recently, 2022 had very strong numbers. For example, Lake Reno had 102 YOY walleye per hour of electrofishing, this is the highest survey since 1996. Lake Minnewaska had 73 YOY walleye per hour, which is the second highest survey ever, second only to 2019 (76 YOY per hour). Strong years of walleye YOY production in our area seem to be correlated to run off and high water in April and May, bringing more nutrients into lakes for the production of phytoplankton and zooplankton (which young walleye feed on). With the long winter and large snow pack, 2023 should be another good year!

Lake	Number	Pounds
Aaron*	5,205	347
Brophy	2,510	165
Burgen	1,504	98
Burgen*	450	50
Carlos	14,627	600
Cowdry*	2,220	111
Darling	9,362	556
Darling*	3,000	200
Elk	3,762	218
Freeborn*	2,400	120
Geneva	8,850	295
Geneva*	2,700	225
Indian	1,610	70
Latoka*	2,690	269
Le Homme Dieu	13,359	883
Linka	1,150	50
Little Chippewa*	2,220	148
Lobster*	8,664	412
Long (Douglas Co.)*	3,015	201
Louise	2,783	121
Maple	14,178	833
Mill	6,860	399
Miltona	30,844	1,381
Miltona*	30,000	1,000
Mina	5,070	316
Minnewaska*	40,000	2,000
Moses*	5,205	347
Osakis*	11,250	750
Oscar	19,170	1,241
Pocket	1,785	225
Pomme de Terre*	8,000	400
Red Rock*	6,000	200
Signalness	1,794	84
Stowe	13,365	779
Union	1,311	57
Victoria*	1,310	131
Victoria	4,238	131
Whiskey	500	50
Whiskey*	1,095	73
Total	294,056	15,536

*Number of walleye fingerlings stocked in 2022. *Indicates fish purchased and stocked by private citizens or sporting groups.*

Aquatic Invasive Species

Aquatic invasive species (AIS) continue to be a problem statewide. Over 60% of our public waters within the Glenwood Fish Management Area contain at least one AIS. Aquatic invasive species are moved from infested to non-infested waters by anglers, boaters, and lake shore owners and can adversely affect lakes and fish populations. To avoid spreading AIS, lake users are required to remove all aquatic plants or animals from their watercraft and drain all water from their boat and motor before leaving the access. If you suspect an infestation of an invasive species in a lake, save a specimen and report it to a local natural resource office.

Zebra mussels attached to a boat lift.

In 2022, five new lakes in the Glenwood Area were confirmed to contain zebra mussels. These include Agnes, Crooked, Henry, Red Rock and Smith lakes. Eurasian watermilfoil was also documented in Lake Geneva for the first time. For a full list of lakes see the infested waters list. Additional information on AIS can be found on the DNR website (https://www.dnr.state.mn.us/invasives/ais/index.html).

Lake Surveys

Lake surveys are the primary tool for guiding fish management. Our standard lake survey consists of trap nets, gill nets and electrofishing. Electrofishing is conducted in the spring to target bass, while gill nets sample offshore fish (e.g. walleye, northern pike and yellow perch) and trap nets sample near shore panfish (e.g. bluegill and black crappie). Nets are checked and moved daily for about a week on each lake. Nets are placed in the same locations within a lake each year, and surveying over many years allows us to track trends in fish populations. Survey information can be accessed by going to https://www.dnr.state.mn.us/lakefind/index.html and typing in the lake of interest.

Standard Lake Surveys 2022

The following lakes were sampled in 2022:

Aaron	Brophy	Moses
Oscar	Pocket	South Union
Emily	Johanna	Minnewaska
Reno	Lower Elk	Osakis
Pelican (Pope Co.)		

Standard Lake Surveys 2023

The following lakes will be sampled in 2023:

Agnes	Barrett	Gilchrist
Grove	Henry	Ida
Linka	Louise	Miltona
Moon	Page	Perkins
Pomme de Terre		

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