

## **Lake Michigan Salmon and Trout Fishery Frequently Asked Questions**

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### **1. How are fisheries management decisions made for the Great Lakes?**

Individual state or provincial agencies are responsible for managing fisheries within their state boundaries and each jurisdiction has their own decision making process. However, all states and provinces that border a Great Lake are signatory to the [Joint Strategic Plan for Management of Great Lakes Fisheries](#) and have collaboratively developed [Fish Community Objectives](#) for each of the Great Lakes through their individual Lake Committees.

Management agencies work together through the Lake Committee process to assure that Great Lake management actions are communicated and discussed among the state and provincial jurisdictions. The [Lake Michigan Committee](#) (LMC) has the following members on it: one representative from each state (Michigan, Wisconsin, Illinois, and Indiana) and one representative from the Chippewa-Ottawa Resource Authority.

### **2. How were the 2013 Chinook salmon stocking cuts determined?**

The LMC, comprised of state and tribal natural resource agencies in the Lake Michigan basin, facilitated a [structured decision making process](#) that involved input and expertise from diverse stakeholders, pertinent scientific information and modeling, and a comprehensive evaluation component to discuss and determine a stocking management and evaluation plan.

- A core stakeholder group consisting of angling group representatives from Illinois, Indiana, Wisconsin and Michigan was formed in 2011 to provide the LMC with lakewide stakeholder goals and objectives and stocking options based on historic and current survey information and population level modeling efforts.
- The LMC and stakeholder group reviewed 26 stocking options to meet stakeholder and agency lake-wide goals. Based on their input, the LMC recommended further review of 4 stocking options in 2012.
- These options were reviewed by the Lake Michigan Fisheries Forum and by other stakeholder groups.
- Based on the input received, the LMC decided to reduce Chinook salmon stocking lake-wide by 50% and adopted a feedback policy where increases or decreases in stocking numbers are directly related to a biological index comparing predator and prey abundances. The LMC will use a three year average weight of age-3 female Chinook salmon returning to the Strawberry Creek weir in Wisconsin. If the three year average weight of an age-3 female Chinook salmon is below 15.4 lbs then addition reductions in stocking should be considered and if it is above 19.8 lbs then an increase in stocking should be considered. Stocking numbers would not change if the three year average weight is between 15.4 and 19.8 lbs.

### **3. How does Wisconsin DNR make Chinook salmon stocking decisions?**

Wisconsin DNR works with stakeholders and the other agencies on Lake Michigan to balance salmon and trout stockings with the prey populations in the lake. For the 2013 reductions, the DNR met and worked with stakeholders from 2011 to 2013 to balance Chinook salmon and

other predator stockings with a declining prey base and increasing levels of salmon natural reproduction, and to determine how stocked fish should be distributed along the lake shore.

Salmon are highly migratory so stocking location has little impact on spring and summer fisheries, but mature salmon return to their original stocking location to spawn and this can affect local fall fisheries. We heard loud and clear the importance of the fall fisheries to the local economies and local fishing opportunities. The [revised strategy](#) allocates 75% of the Chinook salmon equally among most counties and 25% differentially among most counties based on 3 measures of September and October fishing: number of charter boat trips, total hours of directed angler effort for Chinook salmon, and Chinook salmon harvest rate. Generally the strategy applies to each county, but stocking locations in Door, Marinette and Oconto counties are handled differently to fairly account for a large stocking to maintain the spawning run at the Strawberry Creek weir in southern Door Co, and for the presence of other fisheries in Green Bay. Based on stakeholder input, the initial proposal was modified to reduce stocking at Strawberry Creek from 175,000 to 120,000 with the difference being distributed among other stocking locations. Also northern Door County received a separate allocation of 30,000 fish rather than be combined with Marinette and Oconto counties. The allocation formula is calculated every year and stocking numbers are adjusted accordingly. When our current study of coded wire tag returns is completed in 2016 or if we get substantially new information we will revisit the strategy with our stakeholders.

#### **4. What is our current stocking strategy meant to accomplish?**

The current stocking strategy is meant to maintain a diverse fishery with tributary, nearshore, and offshore opportunities while maintaining a sustainable predator prey balance by controlling Chinook salmon stocking levels to match the available alewife numbers.

#### **5. Why is the DNR managing for less salmon in Lake Michigan?**

DNR recognizes that salmon populations are highly stressed because alewives, their primary prey, have been continuing to decline since the mid-1990s. Alewives are declining because they are being out-competed by zebra and quagga mussels. Zebra and quagga mussels invaded the Great Lakes in the mid-1990s and consume substantial amounts of plankton leaving less for the alewife to eat. Also, high stocking rates by state agencies responsible for managing Lake Michigan in the early 1990s and unprecedented and largely unknown high Chinook salmon natural reproduction rates led to large salmon populations. This large salmon population led to very high predation on an already unstable alewife population. The combination of increased salmon predation and the competition from zebra and quagga mussels has squeezed the alewife population from the top and bottom. A similar situation in Lake Huron was probably the driving force behind the salmon crash observed in Lake Huron in the mid-2000s which is something Lake Michigan agencies are trying to avoid.

#### **6. Chinook salmon stocking was cut by 50% lakewide (30% in Wisconsin waters) in 2013. Will further Chinook salmon stocking cuts take place in 2016?**

Lake Michigan Chinook salmon stocking levels will remain the same as in 2015, meaning no further cuts will take place in 2016.

## Chinook Salmon Allocation Strategy

County	Total stocking number per county in 2016
Kenosha	76,387
Racine	75,952
Milwaukee	83,797
Ozaukee	89,538
Sheboygan	85,580
Manitowoc	84,894
Kewaunee	94,304
Southern Door - Strawberry Creek	120,000
Northern Door	30,000
Oconto/Marinette	67,803
TOTAL	808,255

### **7. The State of Michigan took a larger percentage (67%) than the other states. Why?**

Michigan took a larger cut because natural reproduction is occurring in many Michigan Rivers and Michigan has large runs based entirely on natural reproduction. There is very little Chinook salmon natural reproduction in rivers in Wisconsin, Illinois and Indiana.

### **8. As recent as 2013 and 2014, there seemed to be fewer, but larger, Chinook salmon in Lake Michigan. Did the 2013 stocking cuts cause this?**

No, most of the Chinook caught by anglers in 2013 were age-3 fish from the 2010 year class. The reason anglers observed fewer, but larger fish is based on the survival of Chinook salmon year classes as a result of the alewife year class production in the same year. In 2010, there was a large year class of alewife produced which increased Chinook salmon survival and numbers for that year class substantially. In 2011, however, the alewife production was very low resulting in a low number of 2011 salmon and still a high number of 2010 (age-1 Chinook). This pattern played out in 2012 with a record high number of age-2 Chinook salmon in the fishery, but not huge in size. In 2013, the remaining Chinook salmon from the 2010 year class (e.g., the fish that didn't mature and die in 2011 or 2012) had an abundant supply of food and little competition from other salmon year classes resulting in lower catch rates but bigger fish.

### **9. In 2015, most Chinook salmon harvested were a bit smaller but healthy. If the Chinook salmon have enough to eat and are growing OK, shouldn't we consider increased stocking rates?**

One of the driving forces contributing to the short and long term sustainability of the Chinook salmon fishery is a balanced predator prey relationship. We know Chinook salmon feed primarily on alewives. We also know that in a healthy alewife population, we would expect to see a large number of age classes. Building on the explanation in #5 above, we estimate the 2012 alewife year class was slightly above average and that the 2013, 2014 and 2015 alewife year classes were well below average. These poor year-classes have resulted in lower catch rates the past three years and suggest that the survivability of small Chinook salmon has been low due to reduced forage in the lake.

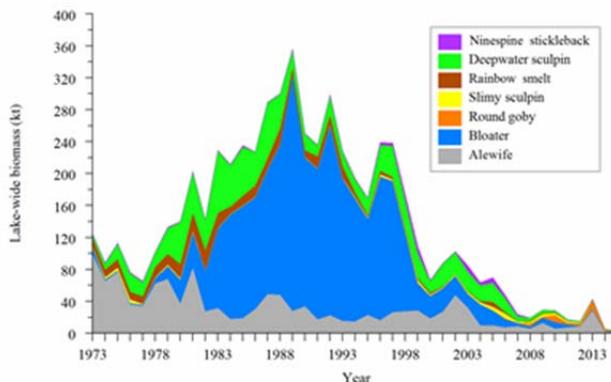
In 2007 management agencies observed nine different alewife age-classes in the lake, while in 2015 only six age-classes were observed and the vast majority of them were young fish (less than age 5). Fewer age classes and large alewives were also observed prior to the alewife collapse, and subsequent Chinook salmon collapse in Lake Huron. Additional stocking of Chinook salmon in Lake Michigan would increase predator prey unbalance and risk a potential fishery collapse at this time.

### 10. Will Lake Michigan follow Lake Huron?

DNR biologists do not want Lake Michigan to follow the same path as Lake Huron. That is why DNR fisheries staff worked with other state agencies and Lake Michigan anglers to reduce annual stocking levels from 7 million to 2.5 million Chinook salmon through coordinated lakewide stocking cuts in 1999, 2006 and 2013. These reduced stocking levels have helped to decrease the predation pressure on alewife by salmon.

### 11. What are the results of the 2015 prey fish trawl surveys used to detect alewives?

Based on preliminary analysis, yearling and older (YAO) alewife biomass in Lake Michigan decreased by about 70% between 2014 and 2015, according to the bottom trawl survey. The 2015 value for alewife was the record low for the time series (0.5 kt) and overall biomass (4.0 kt) was also a record low and the age distribution of alewives remained truncated with no alewife exceeding an age of 6.



**Estimated lake-wide (i.e., 5-114 m depth region) biomass of prey fishes in Lake Michigan, 1973-2015.**

**12. I mark a lot of baitfish on my fish finder/graph, so why are all the surveys saying there are not many bait fish in the lake?**

The surveys are a comprehensive assessment of the prey fish community using consistent techniques applied at representative locations throughout the entire lake. Anglers typically target a relatively small area of Lake Michigan and often where both baitfish and predator fish are concentrated, whereas surveys conducted by natural resource agencies target representative locations throughout the lake to get a statistically valid depiction of the entire prey fish community. While we certainly have alewives in Lake Michigan, we also have enough warning signs that their population is in decline and unstable; thus leading to concerns about the long-term sustainability of the Chinook salmon fishery.

Dave Warner from USGS is collecting information from anglers on bait fish that they are seeing on the sonar screens. He hopes to use this information to augment his analysis of the prey fish population. If you are interested in participating, please follow these instructions.

- 1) Send an email to Dave at [dmwarner@usgs.gov](mailto:dmwarner@usgs.gov)
- 2) In the email, include the following information
  - a. Name
  - b. Date
  - c. Latitude and longitude if not shown in picture
  - d. Bottom depth if not shown on screen in picture
  - e. Picture of bait ball on fish finder screen

A very preliminary map is under development that will show the observations from anglers.

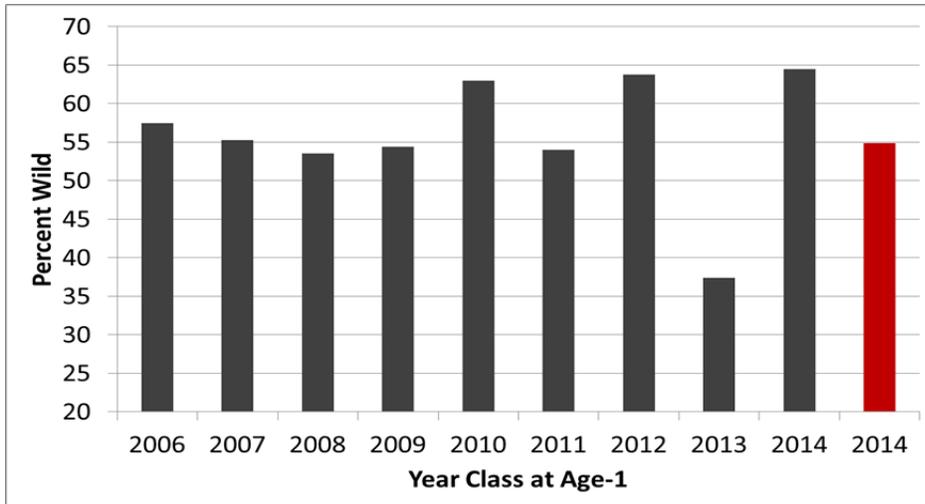
<https://dmwarnerusgsglsc.shinyapps.io/wheresthebait/>

**13. Why can't we stock alewives to increase their abundance?**

Stocking alewives is logistically and economically unfeasible due to the number of fish needed to stock to have any impact in a water body the size of Lake Michigan. Recent analysis found that it would take 282 hatcheries the size of the Wild Rose State Fish Hatchery to produce an "average" alewife year-class.

**14. How many wild Chinook salmon are in Lake Michigan?**

Recent studies show that more than 50% of the Chinook salmon in Lake Michigan are of wild origin and in some years it may run as high as 64%. The majority of wild Chinook salmon in Lake Michigan are thought to be produced in Michigan streams.



**Percent wild recruitment of Chinook Salmon 2006–2014 year classes**

### **15. How are Chinook salmon numbers estimated?**

Chinook salmon numbers are estimated by combining angler catch rates, weir returns, and biological data in a lakewide stock assessment model. The model includes inputs for both the number of salmon stocked and the number of wild salmon produced (estimated independently via [marking studies such as OTC and coded wire tag mass-marking](#)). Based on the number of salmon inputted into the model, estimates of growth, maturation, and survival are produced to track the number of salmon over time.

### **16. What about the other predators?**

In addition to Chinook salmon, the Lake Michigan fishery is supplemented by stockings of brown trout, coho salmon, steelhead, and lake trout. Although the primary prey for Chinook salmon is alewives, the other predators have a much more diverse diet. Since the invasion of zebra and quagga mussels (filter feeding mussels), the round goby has established abundant populations in the Great Lakes. Round gobies are able to consume mussels and can spawn multiple times in a single season. In Lake Michigan specifically, the abundance of round gobies has skyrocketed, and they are now being eaten by almost every predator, except Chinook salmon. Therefore, reductions in stocking levels for other predators may not be as effective for reducing alewife consumption.

### **17. How abundant are the gobies in Lake Michigan?**

It has been suggested that they are the top prey species in Lake Michigan today and may have reached levels comparable to alewives when they were at their peak levels in the 1960s and 1970s. However, the absolute abundance of gobies is hard to estimate because of their patchy distribution (they prefer rocky habitats), their reproductive strategy (they spawn multiple times in a year), and because their mortality rates are very high (the population of gobies changes substantially throughout the year). What we do know is that they are being consumed at a high rate by most of the other predators.

**18. Why won't Chinook salmon eat gobies?**

Chinook salmon are biologically adapted to feed on open-water prey such as alewives. They are not, however, adapted to feed on the bottom.

**19. Why don't we stock other species such as Atlantic salmon?**

Atlantic salmon are currently being stocked in Lake Huron, and have not created a significant fishery to date. We currently do not have adequate hatchery space to start an Atlantic salmon program. Additionally, Atlantic salmon also feed on alewives, and would contribute to their continued decline that has already been observed.

**20. What is the DNR doing (other than stocking cuts) to assure the sustainability of the Lake Michigan fishery?**

The DNR is working and will continue to work with stakeholders on a variety of initiatives to ensure the long-term sustainability of the salmon and trout fishery in Lake Michigan. Some of these initiatives may include expanded use of net pens, predatory bird hazing, increasing steelhead production, non-Chinook fish purchase from private hatcheries, changes to the number per species that Wisconsin currently stocks, etc.

**21. How are Wisconsin and other states determining stocking rates?**

Among the outcomes of past meetings has been the introduction of a new framework for understanding the interaction of chinook salmon on their favorite prey, the alewife. The predator/prey ratio now serves as the main tool by which agencies determine the stocking levels needed to maintain a sustainable forage base into the future. This ratio and other parameters are evaluated on a yearly basis and changes in stocking levels both up and down are considered by the LMC during the summer.

The predator/prey ratio analysis is based on a very simple concept of predator/prey balance, but incorporates detailed datasets and analytical approaches (e.g., modeling) that help account for some of Lake Michigan's complexity. The primary indicator used in the predator/prey ratio analysis is a ratio of total lake-wide biomass of chinook salmon ( $\geq$  age 1) / total lake-wide biomass of alewives ( $\geq$  age 1). Associated target and upper limit reference points and projections have also been developed to provide additional insight and guidance for management decisions. The chinook salmon / alewife ratio itself is pretty simple to interpret (i.e., a high ratio suggests too many predators with few prey, while a low ratio suggests too few predators with abundant prey), but it's important to acknowledge that the underlying methods are very comprehensive.

**22. Will fish other than Chinook be considered in the stocking cuts, such as lake trout?**

Yes, all species currently stocked in Wisconsin waters will be evaluated including their current stocking numbers. If warranted and vetted through the stakeholder process, changes to any species, including lake trout, will be considered as we move forward.

**23. What are the biological repercussions if Wisconsin decides not to cut our salmon stocking levels?**

All available data that agencies have collected to date indicate an imbalance in the predator prey ratio. This is largely driven by the failure of alewives to produce average year-classes of fish since 2012. If agencies do not reduce predation pressure on the population of alewives that are left in the lake, we risk collapsing the alewife population and creating a situation very similar to Lake Huron where the alewife collapse was followed by the collapse of the Chinook fishery.

**24. What are the odds of “crashing” the alewife population if we maintain existing stocking levels?**

While an exact number has not been calculated based on available information the odds are “high” that we will crash the alewife population if stocking numbers remain at current levels. This directly threatens the current Chinook fishery.

**25. What is DNR’s plan if the salmon fishery collapses like it did in Lake Huron?**

Working with the other agencies on the lake, we are proactively making decisions to insure to the greatest extent possible that we will continue to have a solid salmon and trout fishery into the future. By making Chinook salmon reductions in 2017, we hope to sustain the fishery for years to come. If the lake can no longer support a high energy demanding fish like Chinook salmon, the Department will engage our stakeholders to determine the best species mix for Wisconsin anglers.

**26. The Wisconsin Lake Michigan fishery is an economic resource for stakeholders and these stocking cuts will cause some businesses to go out of business?**

The DNR acknowledges that the commercial and [charter industries](#) of Lake Michigan provide a huge economic boost to the state. The strategy used by the Department over the last 30 years has acknowledged that fact and made appropriate decisions to insure the long-term sustainability of the fishery. Stocking reductions in the past have allowed the fishery to be maintained and grow so that stakeholders could reap the benefits from this fishery. Unfortunately, the drastic decline in food for alewives from filter feeding mussels has resulted in reductions of Chinook salmon in 2013 and possibly in 2017 in order to sustain the fishery into the future. The goal of the stocking cuts is to maintain the economic health of the fishery.

**27. Why doesn’t Wisconsin refresh the genetics of Lake Michigan salmon by bringing in eggs from the west coast?**

Wisconsin and other states have vigorously worked over the last 40 years to ensure the long-term health of our salmon and trout programs. When bacterial kidney disease (BKD) hit in the late 1980s, agencies took a proactive approach to solve this outbreak and by the early 1990s, BKD outbreaks were no longer occurring. BKD can be transmitted in fish eggs and can be quite devastating in a hatchery facility. This was one example that could have had severe consequences in the Chinook fishery. Salmon and trout from the West Coast have diseases that are currently not found in the Great Lakes including Infectious Hematopoietic Necrosis Virus (IHNV), *Myxobolus cerebralis* parasite (whirling disease), *Kudoa thyrssites* (a parasite that

destroys the fillet). If we bring in eggs from the West coast we risk bringing in these pathogens and jeopardize the long-term sustainability of our salmon and trout program.

### **28. Why did Wisconsin initiate a salmon and trout stocking reduction in 2016?**

We did not initiate a salmon and trout stocking reduction in 2016. The target [stocking numbers](#) for salmon and trout in 2016 were the same as they were for 2015, 2014, 2013, and 2012. The projected differences in stocking numbers from 2015 to 2016 are a factor of normal hatchery production variation. The projected 2016 stocking numbers are based on conservative estimates that will likely change due to the availability of fingerling fish this coming fall.

### **29. What is the timeline, and how can I get involved in the decision-making process for assessing future management options for the Lake Michigan fishery?**

The Department has three meetings scheduled to engage stakeholders on how best to manage the fishery into the future. These meetings are shown below.

Lakeshore Technical College  
Centennial Hall – West, 1290 North Ave., Cleveland, WI 53015  
Wisconsin DNR Fisheries Meeting  
Monday, June 27<sup>th</sup>  
6 to 8 pm

Brown County Library  
Auditorium  
515 Pine Street, Green Bay, WI 54301  
Wisconsin DNR Fisheries Meeting  
Wednesday, June 29<sup>th</sup>  
6 to 8 pm

UWM-SFS  
600 E. Greenfield Avenue, Milwaukee, WI 53204  
Ballroom  
Wisconsin DNR Fisheries Meeting  
Thursday, June 30<sup>th</sup>  
6 to 8 pm

In addition, there will be a [Lake Michigan Fisheries Forum](#) meeting in August to discuss the comments and work on a final plan for 2017 and beyond. In order to stay involved and get information on upcoming meetings subscribe to our Lake Michigan web page. Follow the instructions below.

- 1) Navigate to <http://dnr.wi.gov/topic/Fishing/lakemichigan/index.html>
- 2) On the right hand side of the page, locate the red envelope and click on the subscribe link
- 3) Enter your email address

- 4) When we have information, meeting announcements, press releases, etc. we will notify everyone that has subscribed to this page.