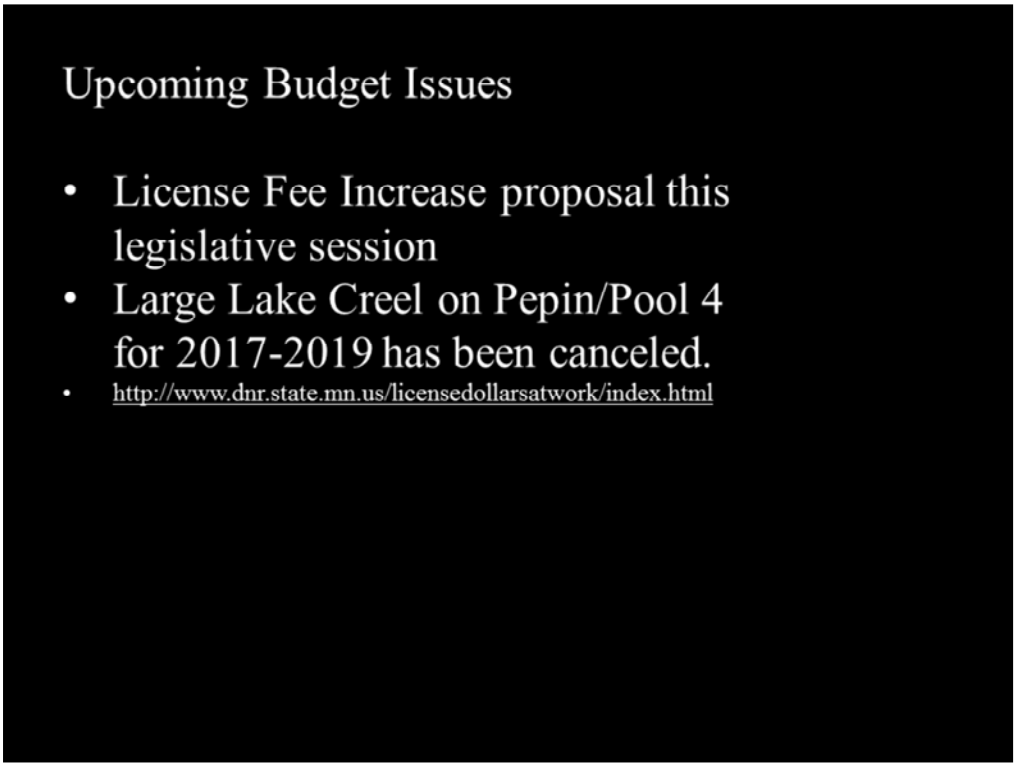
This picture shows surgical implantation of an acoustic transmitter into a Paddlefish on Lake Pepin. We currently have a study that will ultimately include 25 Lake Sturgeon and 25 Paddlefish that each carry an acoustic transmitter with a 10 yr battery life. These transmitters emit an ultrasonic coded “ping” (similar to the sound made by a depthfinder) approximately every 3 minutes. This “ping” is heard and recorded by listening stations “receivers” located up and down the length of the Mississippi River system operated by a number of state and federal agencies. The range of the receivers can be limited by boat and depthfinder based noise, and by turbulent water, but in general is around 1-2 miles in Lake Pepin.

Though we are unable to use this acoustic data from this study to specifically pinpoint a fishes location we can determine large scale movement around Lake Pepin, into and out of tributaries (spawning runs etc), and up and down river including movements through locks and dams. These receivers are also far more cost effective than manual tracking by biologists because they can be deployed for a year or more recording potentially millions of data points 24 hours a day 365 days a year in multiple locations at the same time.

Currently the MN DNR IT services group is developing a database that will allow easy visualization of the complicated movement of these large river species, but early data shows that some of the Paddlefish make movements from Lake Pepin to

the St. Croix River in little over a day, and they can move from our upper station in Pool 4 near Evert's resort to our station near LaCupolis at the foot of the lake in a single day as well. Not to be out done a number of our Lake Sturgeon have made movements up the Chippewa River to a USFWS receiver located at Eau Claire, WI.

In the spring of 2017 we hope to complete the tagging of our study fish (we currently have ~17 of each species out of our goal of 25) including fish from the area below LD3 to determine if we have some Lake Sturgeon that spend all or most of their time in that habitat (one indication from our Lake Sturgeon tags reported by anglers), or if the reason most of our tag returns come from that area is simply due to higher angling pressure using appropriate gear in that area.

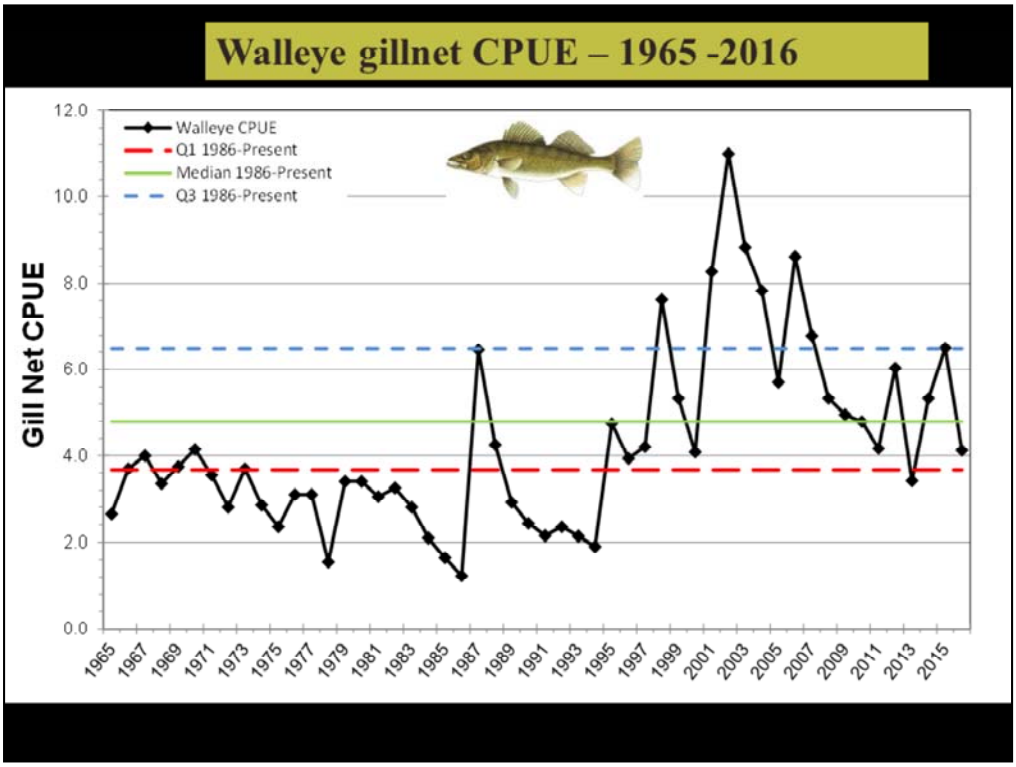


Kevin Stauffer (Area Supervisor Lake City Fisheries) presented a number of slide explaining the reasons that the DNR is seeking a number of license fee increases in the 2017 legislative session.

More information about proposed fee increases and the reasoning behind the decision to pursue fee increases can be found at the URL listed in the slide above and here below.

http://www.dnr.state.mn.us/licensedollarsatwork/index.html

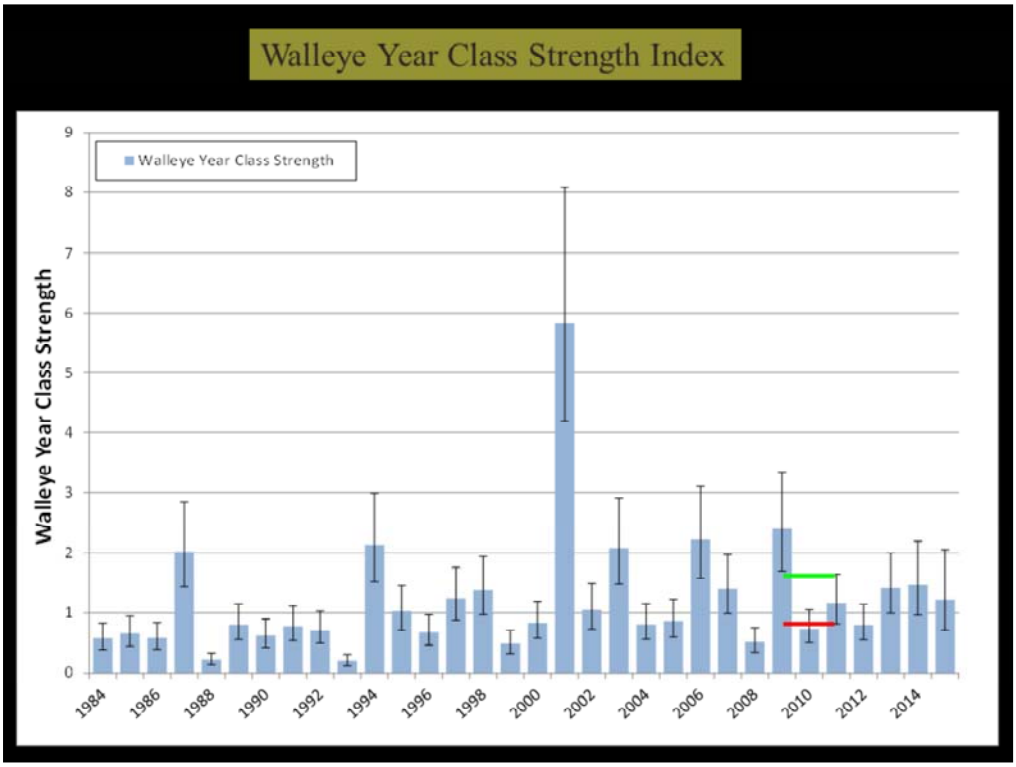
One specific example of a budgetary impact on the work out of the Lake City Fisheries office is the cancellation of our Large Lake Creel that would have started in the fall of 2017 and run until the fall of 2019.



Catch per Unit Effort (CPUE) represents the average number of fish captured per net. Annually as part of the large lake survey 24 gill nets are set for ~24 hour periods in the first week of October. These gillnets provide a cross section look at the adult populations of some of the most popular gamefish in our lakes (Walleye, Sauger, Yellow Perch, etc). It should be noted that some gamefish like Largemouth and Smallmouth Bass are poorly sampled using this type of gear.

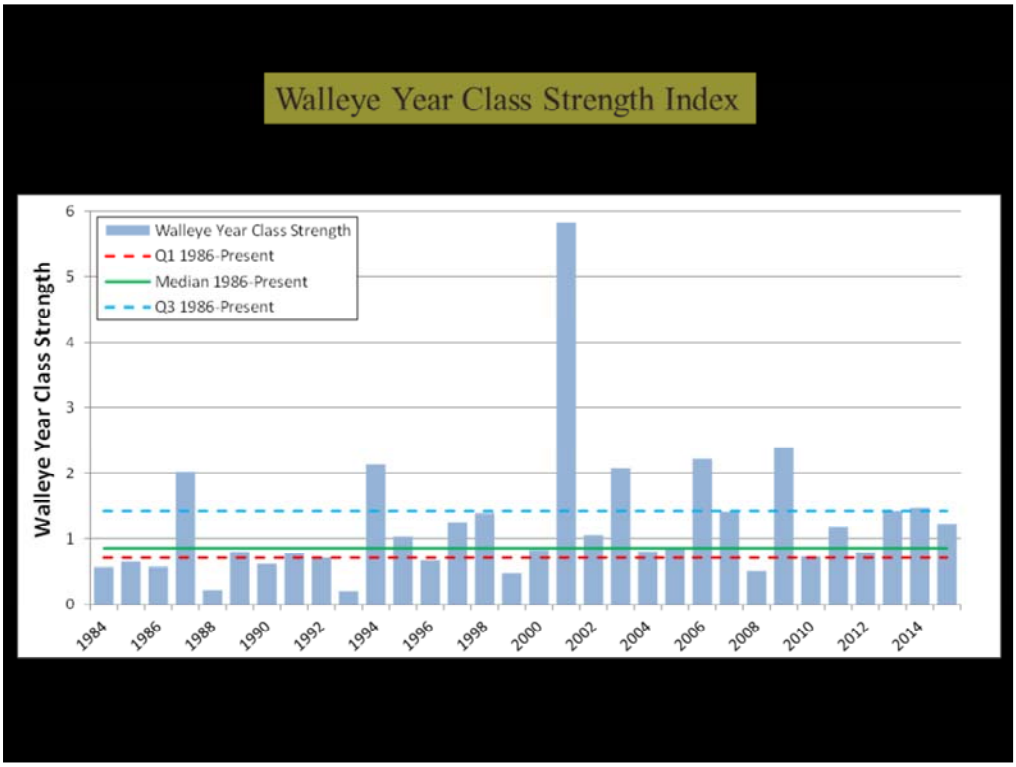
This figure shows that while Lake Pepin's walleye population is down from historic highs driven by the incredibly strong 2001 year class it is between long term (1986-Present) 1st quartile and median.

Note: As I have mentioned in these presentations many times before when interpreting these figures the most important thing to consider is trends. Individual values are meaningful, but can be influenced by conditions like water temperature or in the case of Lake Pepin flow/water level. In the case of the 2016 gill net results almost all species showed a decline in number and the overall number of fish captured was 37% lower than in 2015. While it is possible that all species experienced a drop in population in 2016 that is unlikely. It is much more likely that flow and vegetation compromised a number of net sets by making them more visible to fish reducing numbers across the board. We do our best to minimize these types of problems, but biology (especially in rivers) can throw some wicked curveballs. Despite these difficulties the redundant nature of our sampling allows us to generate good size structure and year class information.

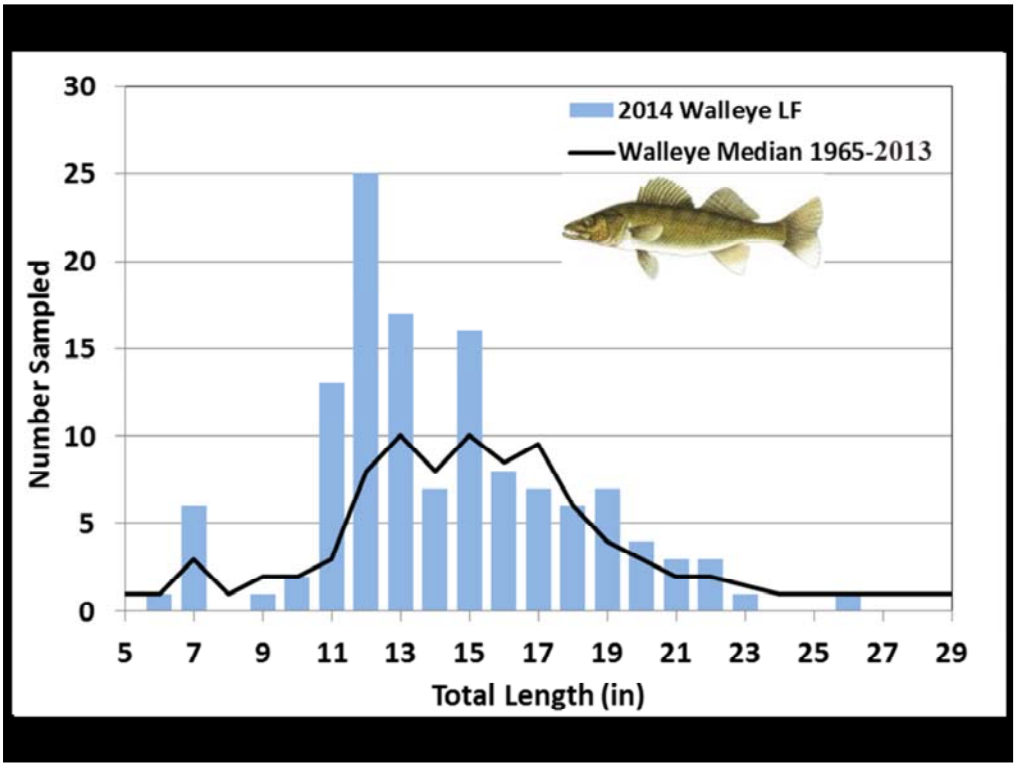


The large lake program in MN is attempting to standardize estimates of year class strength across lakes which has led to a new (for those of you who have become used to my YCSI figures in the last several years) way of displaying the year class strength estimate data. The Dots represent the estimate of year class strength and the ends of the line represent statistical boundaries for that estimate. If you draw two horizontal lines from the tips (upper and lower) of a points lines and they cross another points as the green line from 2007 crosses the 2006 line then we cannot say that they are statistically different. If however the line does not cross another points lines like the red line above from 2007 which does not cross the lines from 2008 point we can then say that those two year class strengths were statistically different. Based on the methods used here an average year class should be approximately 1.0 on the y-axis. By the nature of the calculations the larger the estimate of year class the larger the statistical boundary for that estimate, thus the longest line is associated with the 2001 year class.

Note: The estimate of year class strength relies on 3 years of catch data, so the last two estimates will typically have longer lines above and below them because they are estimates with only partial data. In this case I would expect the lines to tighten up around the 2014 and 2015 year class estimates as we gather more data in the coming years.



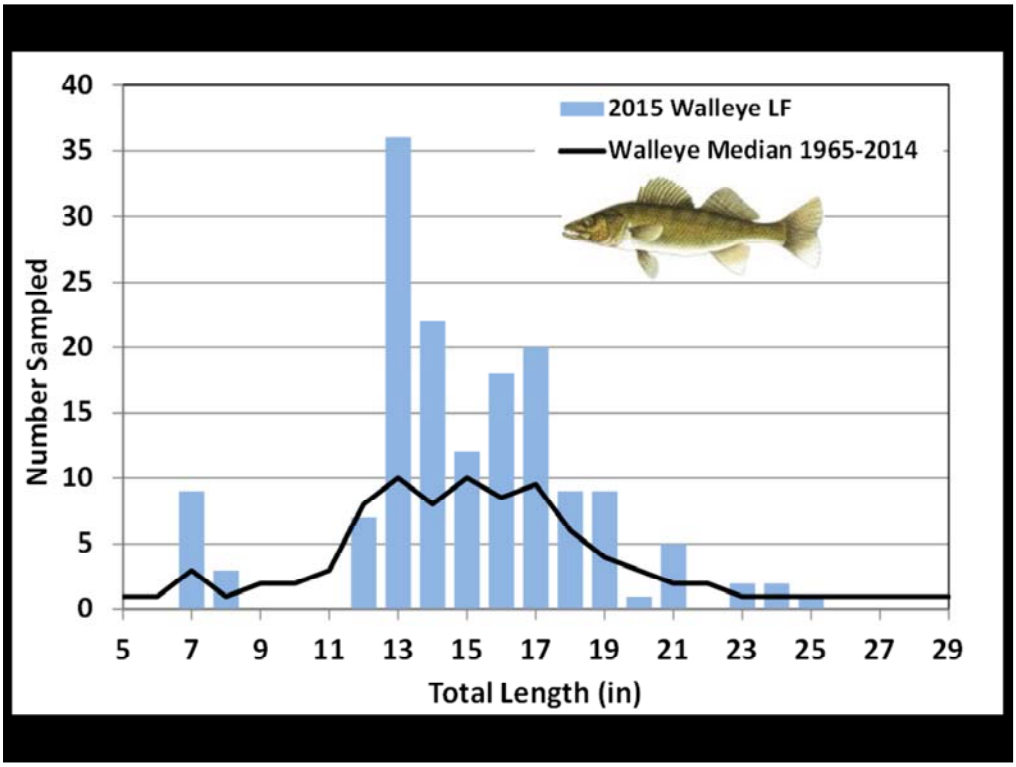
Shows the same information as the previous slide with the familiar quartiles that have been used to describe year classes as strong (above the dashed blue line), average (between the dashed blue and dashed red lines), or weak (below the dashed red lines) in recent years.



This slide represents the number of Walleyes from each 1 inch size group that was captured in the 2014 gillnets (blue bars) and the long term median for the same information from 1965-2013 represented by the black line.

As you can see the 2013 year class is represented here primarily by the 11-13 inch range and seems to be over performing the long term median as indicated in the YCSI slide. Also the 19-22" fish are present in higher than average numbers due primarily to the 2009 year class.

Note: This Slide is a carry over from the 2014 sampling season to be used as a comparison with the next several slides to visualize the movement of a strong 2013 year class through the size structure.

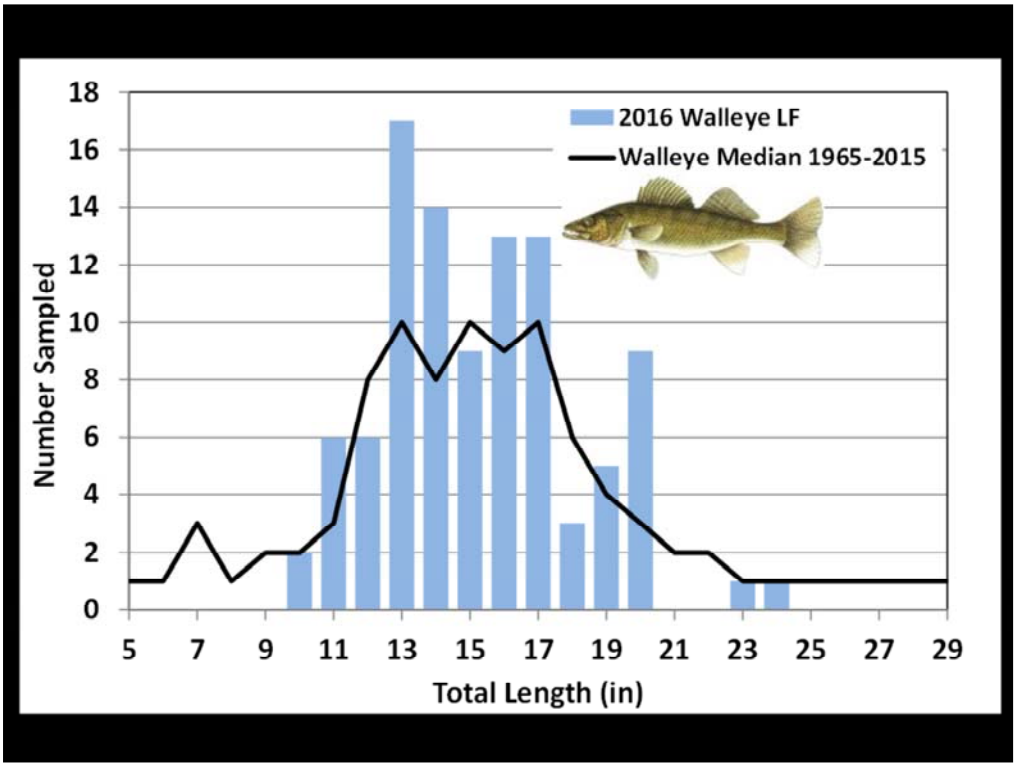


This slide represents the number of Walleyes from each 1 inch size group that was captured in the 2015 gillnets (blue bars) and the long term median for the same information from 1965-2014 represented by the black line.

As you can see the 2013 year class is represented here primarily by the 15-18 inch range (mean length for females ~ 17” mean length for males ~ 16”) and seems to be over performing the long term median as indicated in the YCSI slide.

The high peak at 13” are age-1 Walleyes from 2014 and the fish at 7-8” were Age-0 (YOY) fish from 2015.

Note: This Slide is a carry over from the 2014 and 2015 sampling seasons to be used as a comparison to visualize the movement of a strong 2013 year class through the size structure.



This slide represents the number of Walleyes from each 1 inch size group that was captured in the 2016 gillnets (blue bars) and the long term median for the same information from 1965-2014 represented by the black line.

As you can see the 2013 year class is represented here primarily by the 17-20 inch range (mean length for females ~ 20” mean length for males ~ 17”) and seems to be over performing the long term median as indicated in the YCSI slide.

The high peak at 13” are age-1 Walleyes from 2015. See next slide for length at age data.

Length Group	Sample size	Subsample size	Age										
			0	1	2	3	4	5	6	7	8	9	10
10.0 - 10.9	2	2		2									
11.0 - 11.9	6	6		5	1								
12.0 - 12.9	6	6		6									
13.0 - 13.9	17	17		14	2	1							
14.0 - 14.9	14	14		9	4	1							
15.0 - 15.9	9	9			8	1							
16.0 - 16.9	13	13		1	11	1							
17.0 - 17.9	13	13			8	4		1					
18.0 - 18.9	3	3				2				1			
19.0 - 19.9	5	5				3			1	1			
20.0 - 20.9	9	9			1	5		3					
21.0 - 21.9	0	0											
22.0 - 22.9	0	0											
23.0 - 23.9	1	1						1					
24.0 - 24.9	1	1							1				
25.0 - 25.9	0	0											
26.0 - 26.9	0	0											
Totals	99	99	0	37	35	18	0	5	2	2	0	0	0
Percent			0.0	37.4	35.4	18.2	0.0	5.1	2.0	2.0	0.0	0.0	0.0
	Mean Length (in)			13.2	16.1	18.3		20.4	21.9	19.0			
	Standard Deviation			1.34	1.59	2.03		1.89	2.95	0.58			
	Minimum Length (in)			10.0	11.9	13.9		17.7	19.8	18.6			
	Maximum Length (in)			17.0	21.0	20.9		23.0	24.0	19.4			

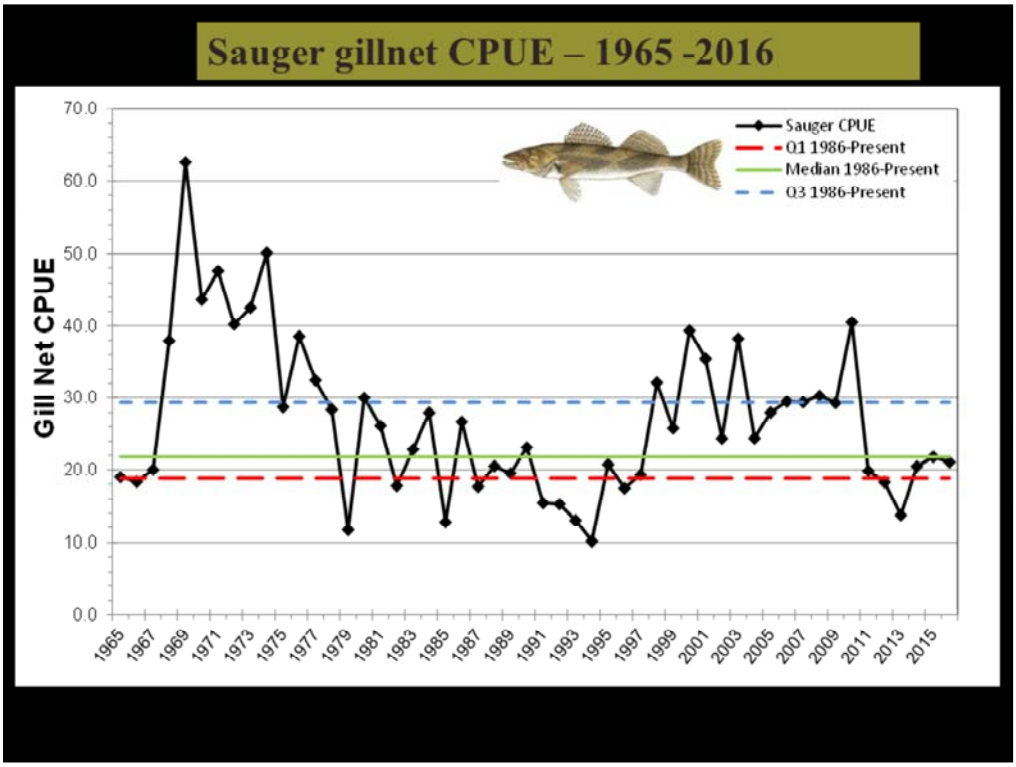
* Unable to age fish in this group.

This is an Age-Length Frequency table that shows how many Walleye of each age group were captured in the gillnets in 2016 by one inch increments. For example there were 37 Age-1 Walleye (hatched in 2015) that were between 10.0 and 17.0 inches in length. The sample size column represents the total number of Walleye sampled from that length group in the gill nets in 2016. The subsample size column represents the number of fish for each size group that I aged by removing a bone called an otolith (ear stone) from inside the fish's head. This bone can then be cracked in half, toasted over a candle flame, and looked at under a microscope where the heat from the candle causes distinct light and dark annual rings to emerge much like those found on a cross section of a tree. When all of the fish in a size group are not aged the unaged fish are proportionally distributed across the represented ages indicated by those fish that were aged.

One important thing to note when looking at Age-Length Frequencies, particularly for Lake Pepin, is the speed at which the fish, Walleyes in this case, are growing. This growth is much faster than most other bodies of water in Minnesota when combined with what is also a relatively short lifespan (typically <10 years in Lake Pepin and potentially >20 in the northern lakes in MN) and represents some interesting management and regulation challenges.

Our efforts to identify strong year classes of Walleye and Sauger in particular start in their first year of life when we monitor their numbers and growth from July (seining), through August (trawling), October (gill netting), and into November (nighttime electrofishing). Our most accurate estimates of the years reproduction come during November when many hours of electrofishing are done on cold nights to capture and count young of year (YOY) Walleye and Sauger. The early freeze up of Lake Pepin in November of 2014 prevented us from getting a complete sample of young of the year Walleye or Sauger in 2014, and high water during the winter flood of 2015 prevented us from collecting data that year.

The 2016 data is presented above. Low water levels during the typical Walleye spawning period in 2016 likely led to the poor production noted above. By contrast the Sauger numbers seemed to be relatively good indicating that the conditions they prefer to use for spawning may have been present in 2016.

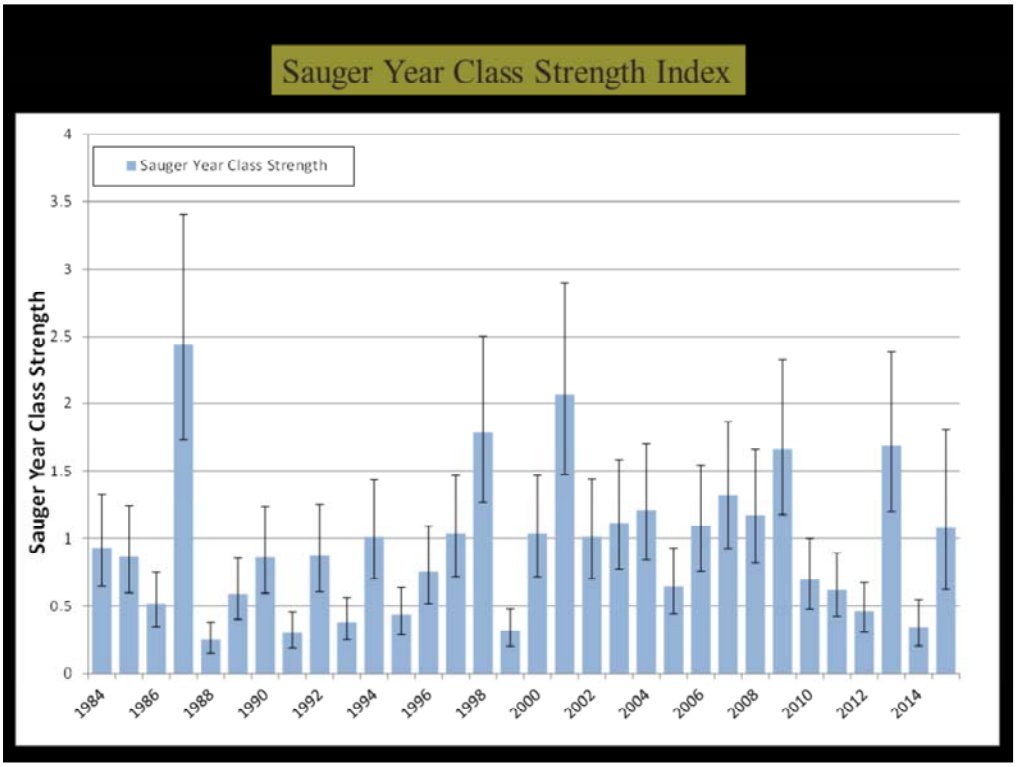


See Slide 2 for more complete description of this type of figure.

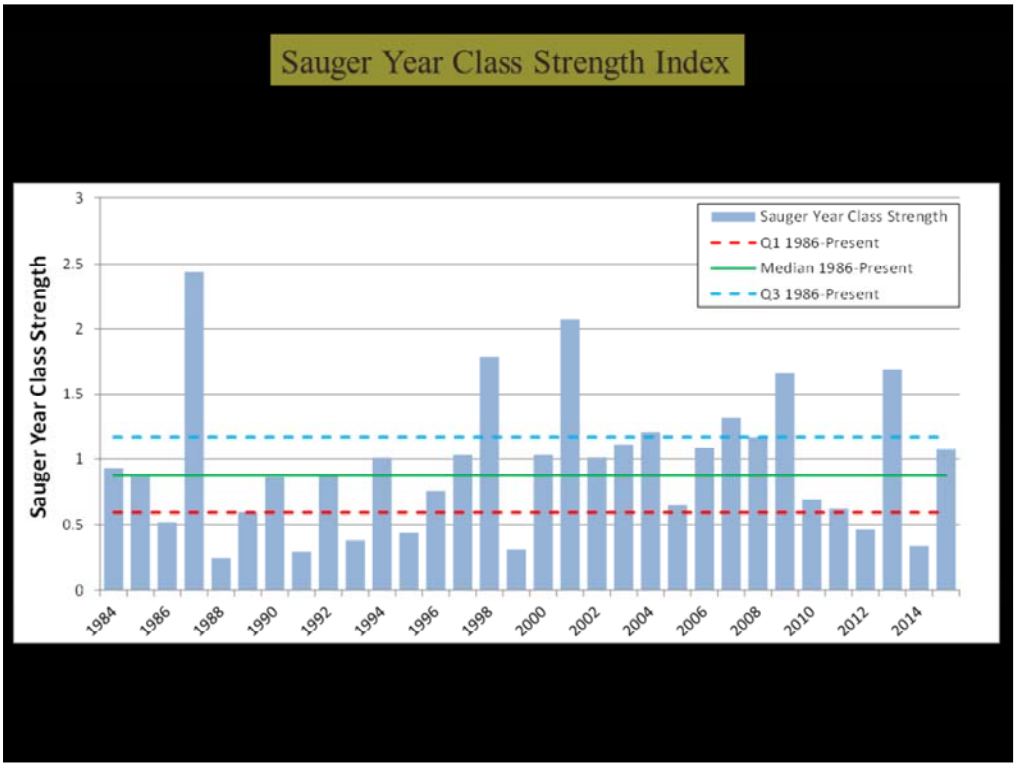
This figure shows that Lake Pepin's Sauger population is down from recent high levels driven by the incredibly strong 2001 year class and a series of strong year classes in the late 2000s.

While the catch number has fallen to below the median for the 1986-Present dataset it remains high compared to most other lakes in MN. The dramatic drop between 2010 and 2011 remains a bit of a mystery, but may be partially due to high water and open dams allowing fish populations to freely move around the river system (This assertion was supported by Xcel Energy sampling which showed dramatic increases in catch rate for Sauger and Walleye in lower Pool 3 in 2011 indicating likely upstream migration). Regardless, the relatively low YCSI for Sauger in 2010, 2011, and 2012 have not produced an abundance of surplus fish to rapidly increase net catch, but the apparently strong year-class of Sauger in 2013 bumped the 2014 net catches up by more than 25% from 2013.

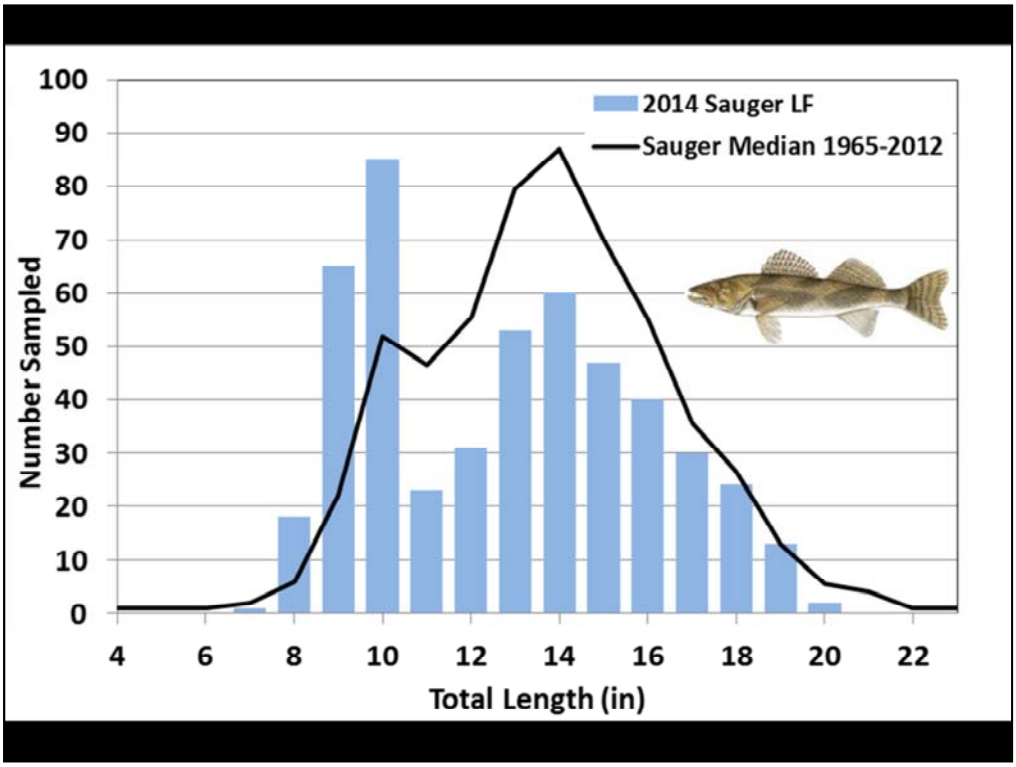
The 2016 net catches confirm that 2013 produced a strong Sauger year class. Though numbers did not go up in 2016 like I thought they did they dropped less than those of other species during what appears to have been a poor netting year.



See Slide 4 for more description



Shows the same information as the previous slide with the familiar quartiles that have been used to describe year classes as strong (above the dashed blue line), average (between the dashed blue and dashed red lines), or weak (below the dashed red lines) in recent years.

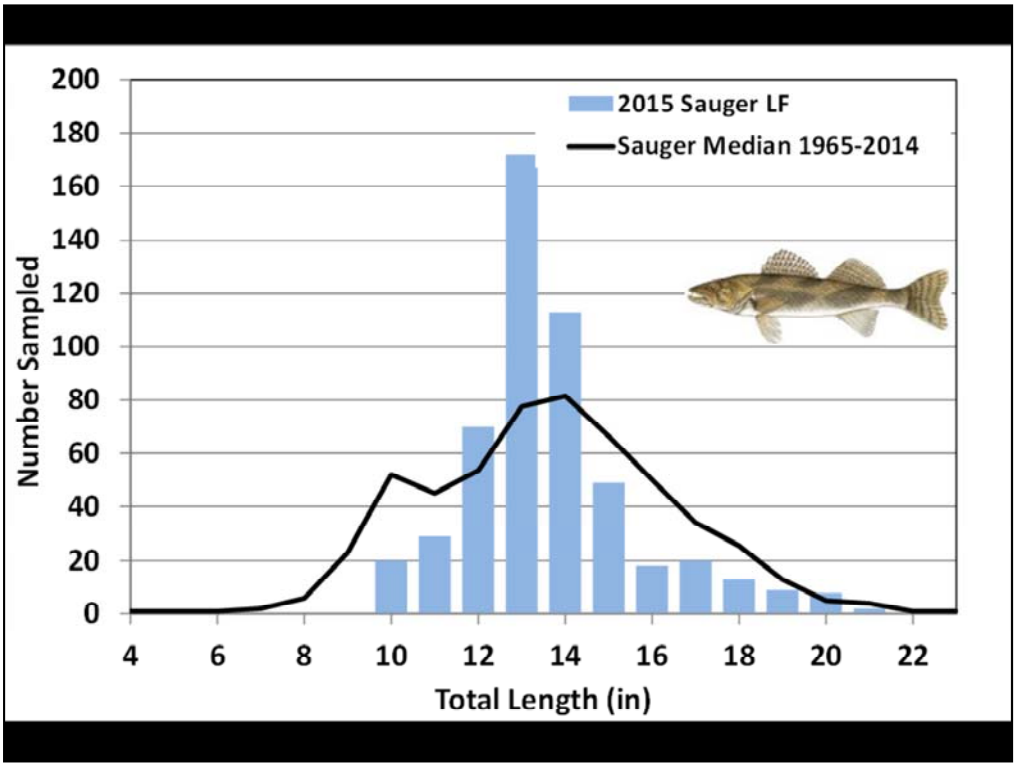


See Slide 6 for a more complete description of this figure.

The Sauger catch in 2014 clearly shows the good production of Sauger in 2013 (8”-10”) as well as the general underrepresentation of the previous three years of production. Unlike the past year or two however the larger size classes of Sauger (18”+) though not abundant, are once again available to anglers.

Because Sauger often don’t fully recruit to our gillnets until Age 2 we will likely see the peaks in the 9 and 10 inch columns go up next year during the 2015 netting as they recruit more fully to the gear as Age-2 fish.

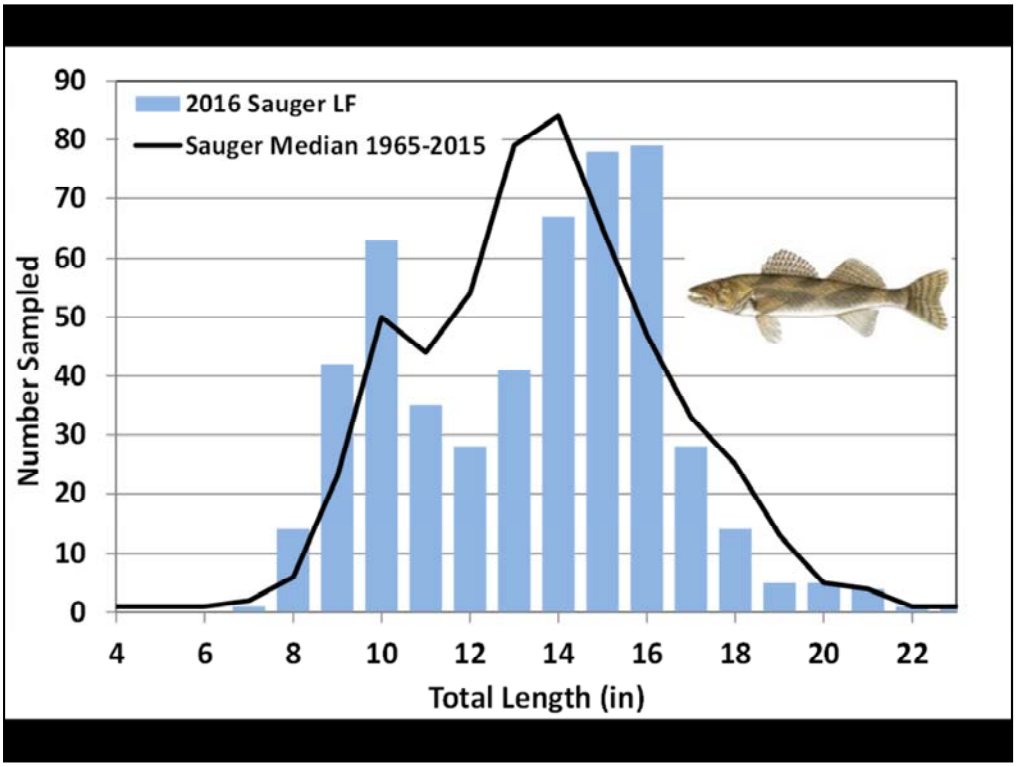
Note: This Slide is a carry over from the 2014 sampling season to be used as a comparison with the next slide to visualize the movement of a strong 2013 year class through the size structure.



This slide represents the number of Sauger from each 1 inch size group that was captured in the 2015 gillnets (blue bars) and the long term median for the same information from 1965-2014 represented by the black line.

As you can see the 2013 year class is represented here primarily by the 12-15 inch range (mean length for females ~ 14” mean length for males ~ 13”) and are clearly over performing the long term median as indicated in the YCSI slide. Also the 20” fish are present in slightly higher than average for the first time in several years.

Comparing this slide to the previous one will clearly show the progression of the 2013 year class. Read my notes from last year and note that the scale on the y-axis doubles between the two slides.



This slide represents the number of Sauger from each 1 inch size group that was captured in the 2016 gillnets (blue bars) and the long term median for the same information from 1965-2015 represented by the black line.

The 2013 year class is represented here primarily by the 12-19 inch range (mean length for females ~ 16” mean length for males ~ 14”).

Comparing this slide to the previous one will clearly show the progression of the 2013 year class. Read my notes from last year and note that the scale on the y-axis which doubled from 2014-2015 returns to its original size in 2016 as the2013 year class passes its peak capture age.

Length Group	Sample size	Subsample size	Age 0	1	2	3	4	5	6	7	8	9	10
7.0 - 7.9	1	1	1										
8.0 - 8.9	14	14		14									
9.0 - 9.9	42	39		42									
10.0 - 10.9	63	41		60	3								
11.0 - 11.9	35	32		22	11	2							
12.0 - 12.9	28	23		5	15	9							
13.0 - 13.9	41	24			22	19							
14.0 - 14.9	67	33		2	10	53	2						
15.0 - 15.9	78	34			2	71	2		2				
16.0 - 16.9	79	37				68	2	6	2				
17.0 - 17.9	28	22				19	3	4		3			
18.0 - 18.9	14	14				2	5	3	3	1			
19.0 - 19.9	5	5					1			3	1		
20.0 - 20.9	5	5						1		3	1		
21.0 - 21.9	4	4								3		1	
22.0 - 22.9	1	1								1			
23.0 - 23.9	1	1					1						
24.0 - 24.9	0	0											
25.0 - 25.9	0	0											
26.0 - 26.9	0	0											
Totals	506	330	1	145	63	243	16	14	7	14	2	1	0
Percent			0.2	28.6	12.5	48.0	3.2	2.8	1.5	2.7	0.4	0.2	0.0
	Mean Length (in)		7.8	10.2	12.9	15.4	18.0	17.8	17.8	20.0	19.7	21.3	
	Standard Deviation			1.00	1.07	1.48	2.24	1.14	1.36	1.50	0.58		
	Minimum Length (in)		7.8	8.5	10.5	11.9	14.7	16.1	16.0	17.4	19.3	21.3	
	Maximum Length (in)		7.8	14.0	15.1	18.7	23.5	20.0	19.0	22.2	20.1	21.3	

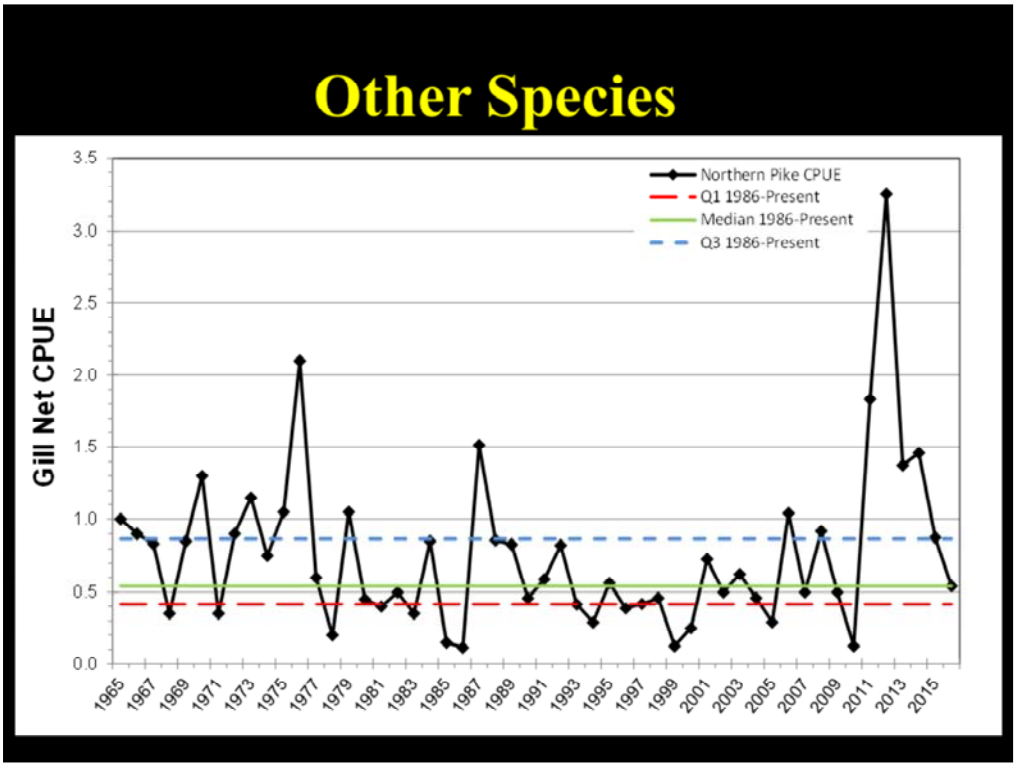
* Unable to age fish in this group.

See Slide 5 for a more complete explanation of this figure.

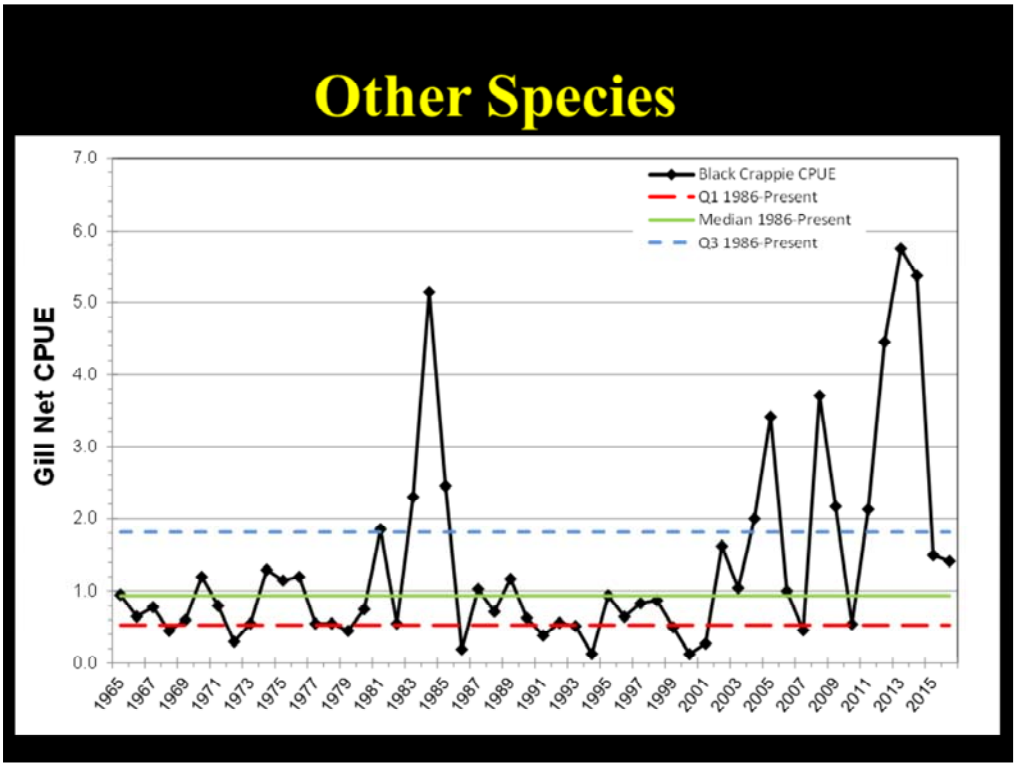
I have often told groups that Lake Pepin Sauger rarely live longer than 10 years (particularly females) and this year we only made it to Age-9.

Our efforts to identify strong year classes of Walleye and Sauger in particular start in their first year of life when we monitor their numbers and growth from July (seining), through August (trawling), October (gill netting), and into November (nighttime electrofishing). Our most accurate estimates of the years reproduction come during November when many hours of electrofishing are done on cold nights to capture and count young of year (YOY) Walleye and Sauger. The early freeze up of Lake Pepin in November of 2014 prevented us from getting a complete sample of young of the year Walleye or Sauger in 2014, and high water during the winter flood of 2015 prevented us from collecting data that year.

The 2016 data is presented above. Low water levels during the typical Walleye spawning period in 2016 likely led to the poor production noted above. By contrast the Sauger numbers seemed to be relatively good indicating that the conditions they prefer to use for spawning may have been present in 2016. Note that low catch of YOY Sauger (which are smaller than YOY Walleye) in the gillnets (GN) is normal. We typically only see high numbers here if a very abundant year class is produced.

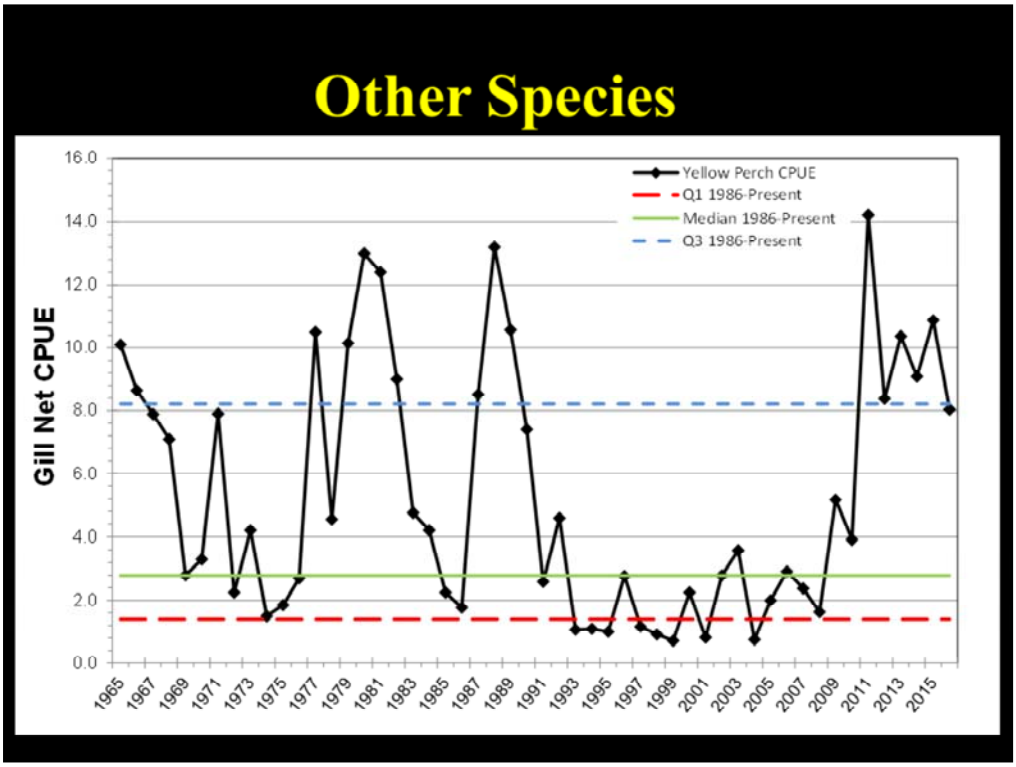


Northern Pike gill net catch history showing the recent increase in Northern Pike population likely as a result of increased water clarity and submerged aquatic vegetation. Rates returned to the long term mean in 2016, but many large fish remain in the system.

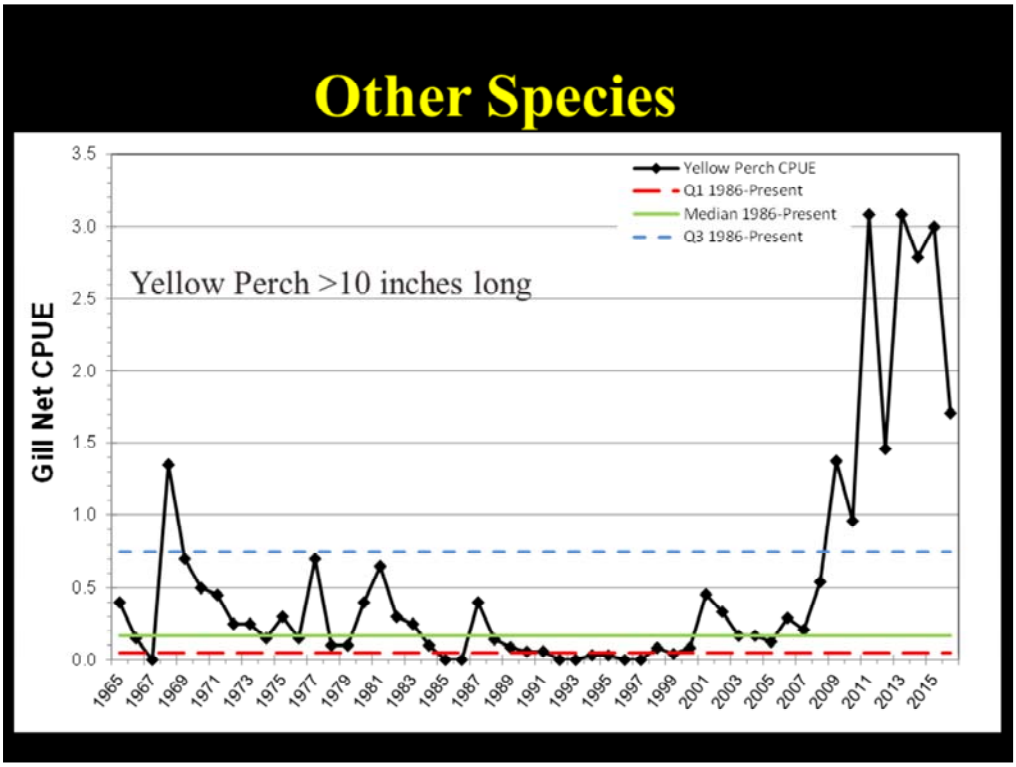


Black Crappie gill net catch history showing the recent increase in Black Crappie population likely as a result of increased water clarity and submerged aquatic vegetation combined with the last three years of record breaking or near record breaking Black Crappie year-classes in Lake Pepin.

Fewer YOY Black Crappie in the gill nets in 2016 led to a continued lower overall catch rates, but there are still good numbers of crappies in the system. Many of the peaks in the graph above come from high numbers of YOY crappie that wedge easily in the nets unlike the deep bodied adults, so often the peak years in the figure above represent good reproduction as opposed to high numbers of catchable fish that would be represented by a similar graph of Walleye catch.



Yellow Perch gill net catch history showing the recent increase in Yellow Perch population likely as a result of increased water clarity and submerged aquatic vegetation needed for perch reproduction.



Gill net catch of Yellow Perch >10” showing the recent and unprecedented increase in the population of large Yellow Perch.

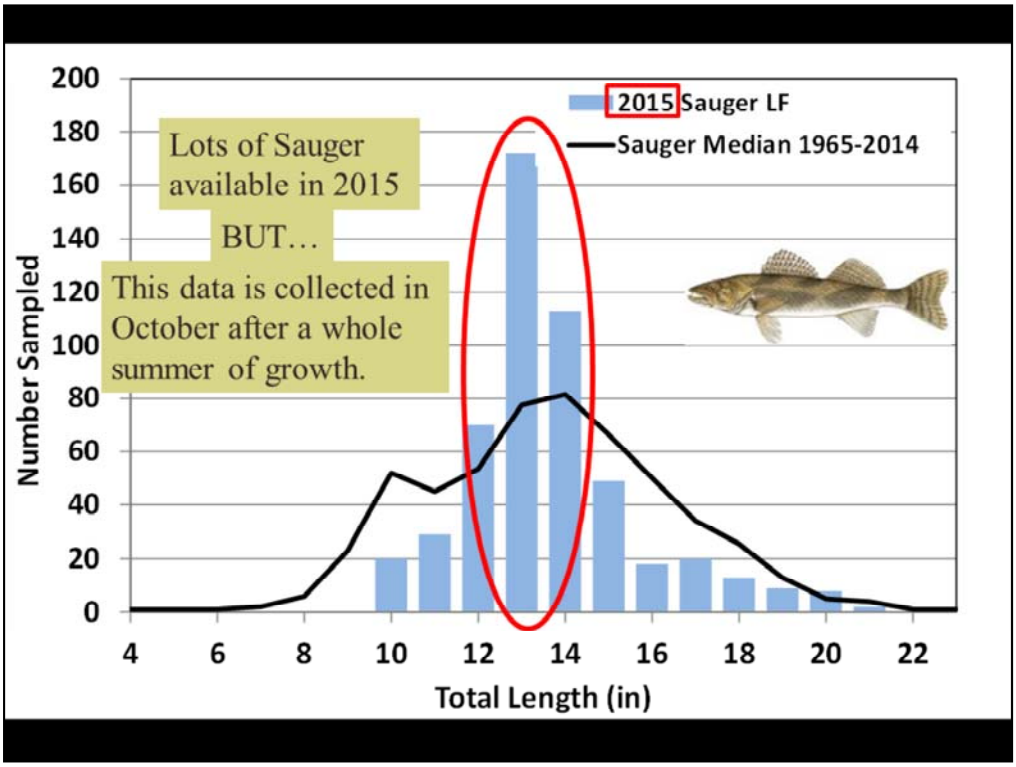
Group Questions

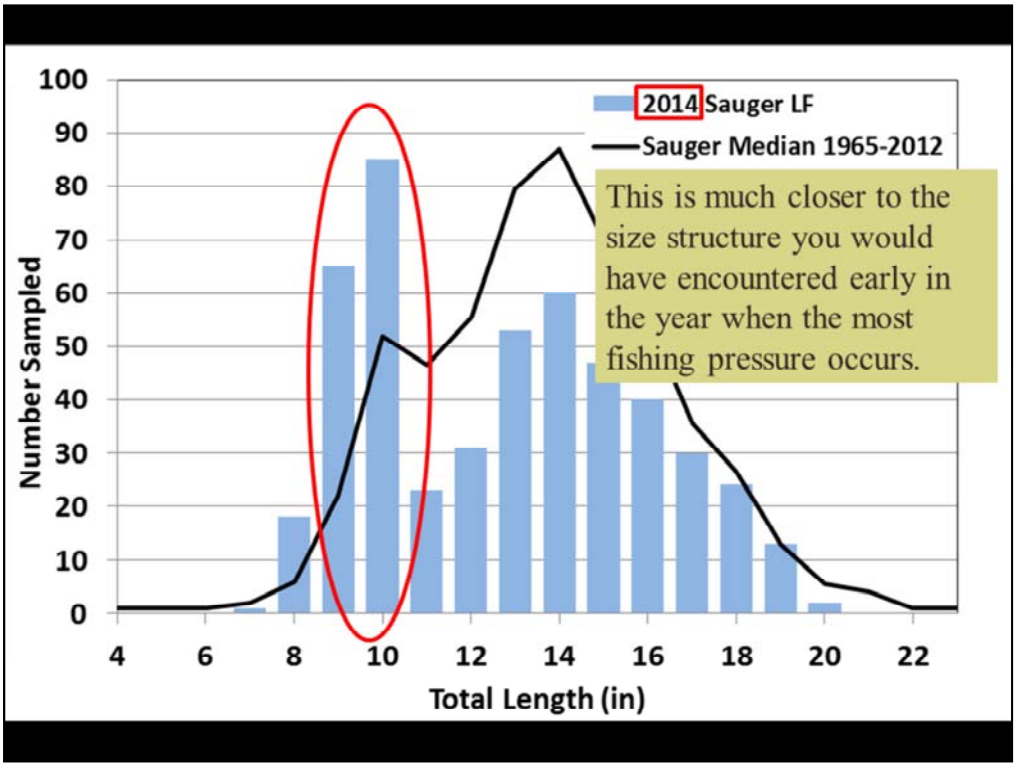
1. In 2015 Sauger seemed to be nonexistent based on fishing, but in 2016 lots of Sauger showed up in angler's nets. Why such a rebound? Where were they in 2015?
2. Out of state bait. It seems that bait such as shiners that are certified are allowed to cross borders in other states, but not MN. I watched a legislation session on this about 2 years ago with a southern bait supplier testifying and the state representatives seemed positive to allowing this.
3. What have you heard or can confirm with talk of dredging and island making at the "Bay City Flats"?
4. Any information on reducing the sedimentation into Lake Pepin?

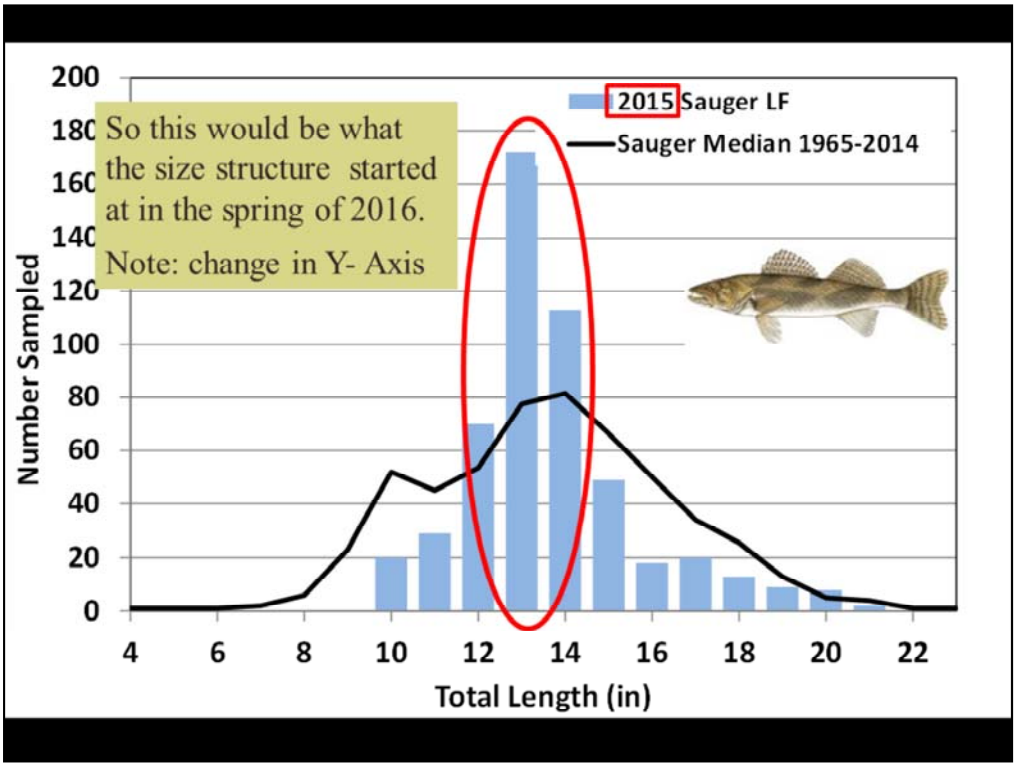
Group Questions

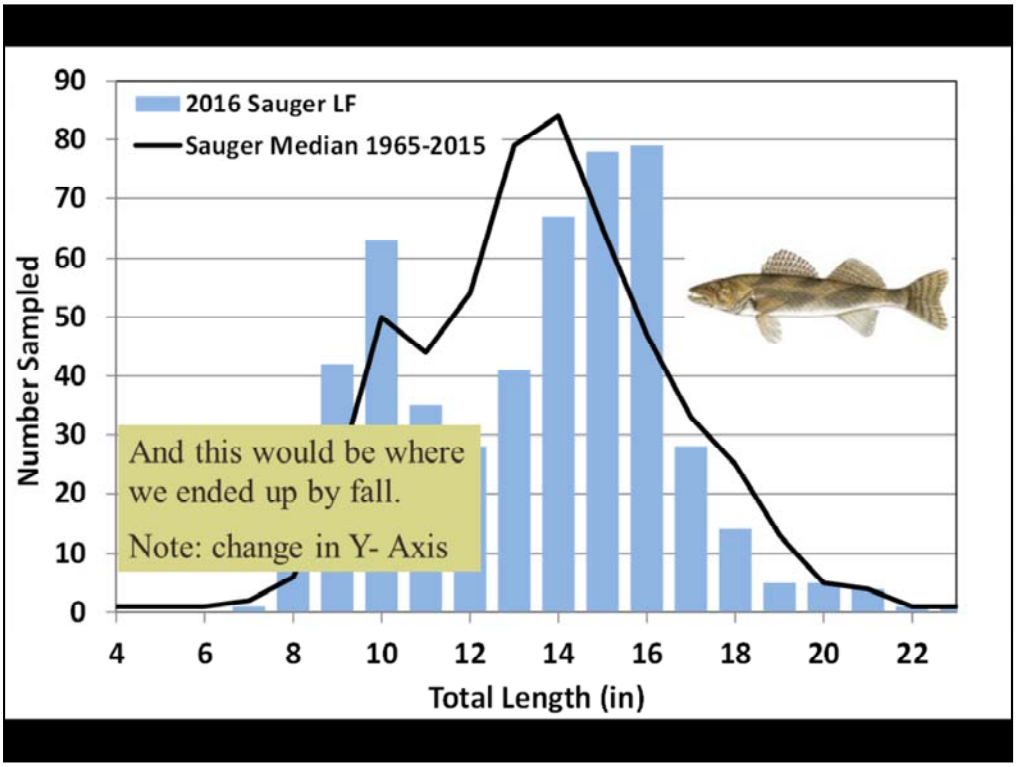
1. In 2015 Sauger seemed to be nonexistent based on fishing, but in 2016 lots of Sauger showed up in angler's nets. Why such a rebound? Where were they in 2015?

- Several possible drivers.
  1. Perception


Lots of Sauger available in 2015
BUT…
This data is collected in October after a whole summer of growth.
2015 Sauger LF
Sauger Median 1965-2014
Number Sampled
Total Length (in)
0
20
40
60
80
100
120
140
160
180
200
4
6
8
10
12
14
16
18
20
22


2014 Sauger LF
Sauger Median 1965-2012
This is much closer to the size structure you would have encountered early in the year when the most fishing pressure occurs.
Number Sampled
Total Length (in)
0
10
20
30
40
50
60
70
80
90
100
4
6
8
10
12
14
16
18
20
22


So this would be what the size structure started at in the spring of 2016.
Note: change in Y- Axis
2015 Sauger LF
Sauger Median 1965-2014
Number Sampled
Total Length (in)
200
180
160
140
120
100
80
60
40
20
0
4
6
8
10
12
14
16
18
20
22


2016 Sauger LF
Sauger Median 1965-2015
Number Sampled
Total Length (in)
0
10
20
30
40
50
60
70
80
90
4
6
8
10
12
14
16
18
20
22
And this would be where we ended up by fall.
Note: change in Y- Axis

Group Questions

1. **In 2015 Sauger seemed to be nonexistent based on fishing, but in 2016 lots of Sauger showed up in angler's nets. Why such a rebound? Where were they in 2015?**

- **Several possible drivers.**
  1. **Perception**
     - **Fish where there and being caught, but due to size where not remembered and/or considered in the question (no fish or no keepers?).**
  2. **High baitfish populations**

Year		2012	2013	2014	2015	2016	1986-2015
# Hauls		38	45	37	54	16	4,451
Emerald Shiner	N	240	610	10,112	23,776	624	337,338
	Mean	6.32	13.56	273.30	440.30	39.00	75.79
Logperch	N	88	176	131	537	52	10,543
	Mean	2.32	3.91	3.54	9.94	3.25	2.37
Mimic Shiner	N	4	0	4	364	0	1,454
	Mean	0.11	0.00	0.11	6.74	0.00	0.33
Spotfin Shiner	N	192	120	24	513	68	11,494
	Mean	5.05	2.67	0.65	9.50	4.25	2.58
Spottail Shiner	N	178	1,115	336	3,499	431	15,785
	Mean	4.68	24.78	9.08	64.80	26.94	3.55
Yellow Perch	N	43	12	7	25	13	366
	Mean	1.13	0.27	0.19	0.46	0.81	0.08

2015 highest ever for Emerald Shiner, Mimic Shiner, and Spottail Shiner 2nd highest for Spotfin Shiner

Group Questions

1. In 2015 Sauger seemed to be nonexistent based on fishing, but in 2016 lots of Sauger showed up in angler's nets. Why such a rebound? Where were they in 2015?

- Several possible drivers.
  1. Perception
     - Fish where there and being caught, but due to size where not remembered and/or considered in the question (no fish or no keepers?).
  2. High baitfish populations
     - Lots of minnows and shiners (several records).
     - Not many YOY Gizzard Shad
  3. Despite the data Sauger numbers were actually down, but unmeasured.
     - Always needs to be considered, BUT…
     - Data following the strong 2013 Sauger year class in multiple gears over multiple years makes this unlikely.

Group Questions

2. **Out of state bait. It seems that bait such as shiners that are certified are allowed to cross borders in other states, but not MN. I watched a legislation session on this about 2 years ago with a southern bait supplier testifying and the state representatives seemed positive to allowing this.**

Rules

- Individual bait import is illegal.
- Commercial bait import is illegal with the exception of "tested" bait being imported for later export.
- We used to allow import of bait to be used to feed hatchery stock. That stopped in 2013.

If there a specific question regarding this that we can help you get an answer for please let me know.

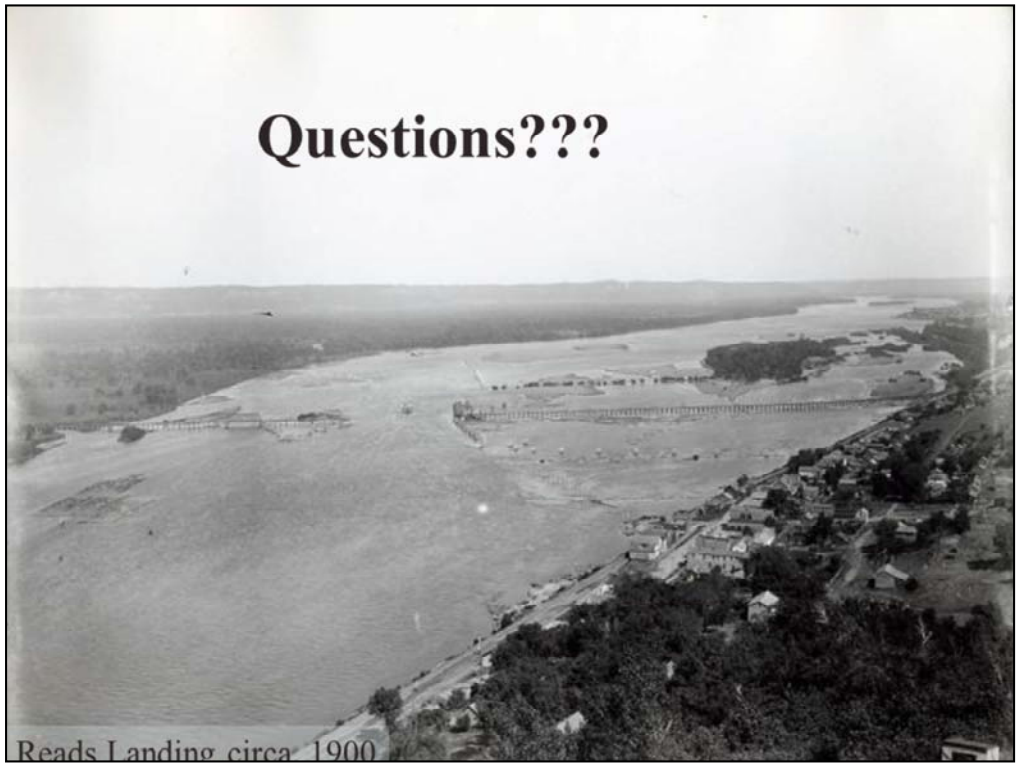
Group Questions

3. What have you heard or can confirm with talk of dredging and island making at the "Bay City Flats"?
   - Corps of Engineers is conducting a feasibility study (~$50,000) that may be done yet this year.
   - Proposed islands would lie entirely in WI
   - Many interagency hurdles likely before any project could even be designed
4. Any information on reducing the sedimentation into Lake Pepin?
   - Continued focus on Minnesota River basin
   - Recommend watching presentations (~ 1 hour) by:

   Shawn Schottler, St. Croix Watershed Research Center, Science Museum of MN

   "Does Drainage Create More Erosive Rivers?"

   https://www.youtube.com/watch?v=2xf7j1kO3yY



Feel free to contact me using the info below if you have any questions about the information presented here or Lake Pepin/Pool 4 in general and I will do my best to get them answered for you.

Thanks again,

Nick

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