Lake Michigan Informational Meeting
June 2017
Meeting Outline

600 – 610  Welcome and introduction
610 – 630  Update on actions from 2016
  » Stocking locations / numbers
  » Acclimation net pens
  » Chinook salmon net pens
  » Lake Trout regulations
  » Kettle Moraine Fish Hatchery status
  » Skamania Steelhead update
  » Fisheries Forum Communications Team

630 – 715  Current status of the fishery
  » Status of prey fish
  » Predator Prey Ratio
  » Auxiliary indicators

715 – 730  Break
730 – 810  Questions / Comments / Suggestions
810 – 830  Next Steps
Lake Michigan Stakeholder Involvement

- WDNR along with stakeholders increased involvement in the issues via
  - Information
    - LMFF meetings
    - Additional meetings (Lake trout and brown trout)
    - Press releases and Gov delivery notices
    - LMFF Communications Team
    - Separate meetings with Sport Fishing Clubs
Lake Michigan Stakeholder Involvement

• WDNR listened to stakeholders and developed new or expanding initiatives in 2016 and 2017 including
  – Lake trout stocking reductions
  – Lake Trout emergency regulation change
  – Stocking site review
  – Acclimation net pens
  – Chinook salmon net pens
  – Skamania re-introduction
Collaborative Plan for the Future

• Maintain collaborative efforts
• Continue to develop new initiatives
• Identify a two-year stocking plan
  – No major stocking changes are anticipated
Lake Michigan Ecosystem

• Two major themes
  – How much risk are stakeholders willing to tolerate in terms of managing the fishery and the ratio between predators and prey
  – Lake Michigan Ecosystem is complex and changing on a yearly basis. We need to evaluate the entirety of information and not solely focus on the information that fits our desire for the system.
Risk Assessment

Dow Jones Industrial Average

2000 - 2016

Year
Risk Assessment

Strawberry Creek Weir, WI
Average Weight of Age-3+ Female Chinook

Average Weight (Pounds)

Year

Observe a wide variety of metrics

- PPR
- Forage fish biomass
- Alewife YOY production
- Age 3+ weight of female chinook salmon
- Chinook salmon catch per hour
- And others
FISHERIES MANAGEMENT ……………. we make fishing better
Lake Michigan Salmon and Trout harvest and effort from 1969 to 2016

Chinook
Rainbow
Brown
Brook
Coho
Lake
Effort

Number harvested

Angler hours

Lake Michigan Salmon and Trout harvest and effort from 1969 to 2016
## Salmon and trout stocking strategy

<table>
<thead>
<tr>
<th>Species</th>
<th>2016 Actual numbers stocked</th>
<th>2017 Actual and Projected stocking numbers</th>
<th>2018 Projected stocking numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook salmon</td>
<td>812,270</td>
<td>810,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Coho salmon</td>
<td>457,884</td>
<td>452,867</td>
<td>TBD</td>
</tr>
<tr>
<td>Lake trout</td>
<td>712,377</td>
<td>300,000</td>
<td>TBD</td>
</tr>
<tr>
<td>Steelhead</td>
<td>269,512</td>
<td>303,271</td>
<td>TBD</td>
</tr>
<tr>
<td>Brown trout</td>
<td>1,020,582</td>
<td>356,000</td>
<td>TBD</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>3,272,625</strong></td>
<td><strong>2,267,137</strong></td>
<td><strong>TBD</strong></td>
</tr>
</tbody>
</table>
Net pen usage
Acclimation net pens

- WDNR in cooperation with stakeholders and sport fishing clubs agreed to allow all salmon and trout to be kept in acclimation pens for up to 36 hours

<table>
<thead>
<tr>
<th>Location</th>
<th>Species</th>
<th>Date</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gills Rock</td>
<td>Chinook</td>
<td>May 3</td>
<td>14,995</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>Chinook</td>
<td>May 8-9</td>
<td>43,461</td>
</tr>
<tr>
<td></td>
<td>Chinook</td>
<td>May 9-10</td>
<td>42,571</td>
</tr>
<tr>
<td>Racine</td>
<td>Coho</td>
<td>Mar 28</td>
<td>22,338</td>
</tr>
<tr>
<td></td>
<td>Coho</td>
<td>Mar 29</td>
<td>22,467</td>
</tr>
<tr>
<td></td>
<td>Coho</td>
<td>Apr 4</td>
<td>22,244</td>
</tr>
<tr>
<td></td>
<td>Coho</td>
<td>Apr 5</td>
<td>9,383</td>
</tr>
<tr>
<td></td>
<td>Brown</td>
<td>Apr 5</td>
<td>9,376</td>
</tr>
</tbody>
</table>
Chinook Salmon net pens

- WDNR in cooperation with stakeholders and sport fishing clubs agreed to expand the use and allow additional locations for these net pens.

<table>
<thead>
<tr>
<th>Location</th>
<th>Dates</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marinette</td>
<td>May 1-14</td>
<td>12,430</td>
</tr>
<tr>
<td>Gills Rock</td>
<td>May 3-17</td>
<td>15,000</td>
</tr>
<tr>
<td>Kewaunee</td>
<td>Apr 26-May 12</td>
<td>22,999</td>
</tr>
<tr>
<td>Port Washington</td>
<td>May 2-16</td>
<td>43,618</td>
</tr>
<tr>
<td>Racine</td>
<td>Apr 26-May 10</td>
<td>31,300</td>
</tr>
<tr>
<td>Kenosha</td>
<td>May 1-15</td>
<td>38,758</td>
</tr>
</tbody>
</table>
Lake Trout season and bag limits

- Emergency rule was in place on April 15, 2017
  - Open year round
  - 5 lake trout per person per day
  - Retained the closed area on the mid-lake reef

- It will be extended twice in 2017 which means it should be in place until December 31, 2017

- A meeting to discuss both the emergency rule and a permanent rule is set for June 22, 2017 at SFS-GLRF, 600 E. Greenfield Avenue, Milwaukee, WI 53204
Lake Michigan Fisheries Forum Communications Team

• Established in late 2016
• Purpose: Provide feedback, aid in disseminating messages
• Conference calls, meet as needed
• Now has 14 members
Lake Michigan Fisheries Forum Communications Team

Website: 15.7 million visits each year

GovDelivery: 889,113 subscribers

Facebook: 88,855 fans

Twitter: 18,500 followers
Skamania Steelhead

• Spawned 164,000 eggs in Indiana for rearing at KMS in January 2017
  o Hatching was at 93%
  o Current inventory is 90,000 fish
  o Stocking quota is 70,000

• First stocking events will be in the Kewaunee and Root River during spring of 2018
Skamania Steelhead

- We anticipate that Wisconsin broodstock will be available to donate gametes for rearing at about the time the new KMS hatchery nears completion.
Kettle Moraine Springs State Fish Hatchery

Failed raceway at KMS with loss of 5,000 fish.

KMS progress to date

- Completed Groundwater study
  - Water yield estimates are up 1,700 gpm at peak fish production

- A-E firm has drafted a preliminary design study for DNR/DOA review

- One deep sandstone well is currently producing water for fish production
Kettle Moraine Springs State Fish Hatchery

Proposed Project Implementation Plan

- Preliminary Design May-October 2017
- Final Design October 2017- March 2018
- Commence Construction June 2018
- Complete Construction November 2019
Current Status of Preyfish in Lake Michigan

Dave Warner
Bo Bunnell
Chuck Madenjian
Randy Claramunt
Dale Hanson
Kevin Donner
<table>
<thead>
<tr>
<th></th>
<th>Bottom trawl survey</th>
<th>Acoustic/mid-water trawl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of day</td>
<td>Day</td>
<td>Night</td>
</tr>
<tr>
<td># trawls</td>
<td>~69</td>
<td>~68</td>
</tr>
<tr>
<td>Water column sampled</td>
<td>Bottom ~1.4 m</td>
<td>From 1 m off bottom to ~2 m below the vessel</td>
</tr>
<tr>
<td>Bathymetry sampled</td>
<td>9-110 m</td>
<td>6-240 m</td>
</tr>
<tr>
<td>Common species</td>
<td>Alewife, Bloater, Rainbow Smelt</td>
<td>Cisco, emerald shiner</td>
</tr>
<tr>
<td>Unique species</td>
<td>Gobies, sculpins, perch, burbot</td>
<td></td>
</tr>
</tbody>
</table>
Acoustic Density of Alewife

![Graph showing biomass density and numeric density of adult and YOY alewife over years from 1992 to 2012.]
Young-of-the-year Alewife Distribution, 2016
Change in Yearling and older Alewife Distribution
Lakewide Survey Results
Context

• Are survey results always identical?
  – No.
  – Need both surveys to develop an adequate picture
  – Both surveys are used in stock assessment modeling
Survey Results Context

• Are species results always identical?
  • No, but this is expected
• Do surveys tell us the same thing in general?
  • Yes – prey fish biomass is at or near all time low
Total Biomass Density, Bottom Trawl Survey
Conclusions

• Lakewide surveys indicate low biomass of prey fish
  – Bottom trawl all-time low
  – Acoustic 4th lowest

• Recent period (2010-2016) marked by single strong year class, six relatively weak ones

• Adult alewife have become more coastal
Updates for the Predator/Prey Ratio Analysis

Salmonid Working Group:
- Nick Legler (WI DNR, chair)
- Jory Jonas, Mark Tonello (MI DNR)
- Brian Breidert, Ben Dickinson (IN DNR)
- Steve Robillard (IL DNR)
- Greg Wright (CORA)
- Dave Warner, Chuck Madenjian (USGS)
- Mark Holey, Chuck Bronte, Matt Kornis, Rob Elliott (USFWS)
- Richard Clark (QFC, MSU)
- Iyob Tsehaye (WI DNR)

Key Collaborations:
- Great Lakes Fishery Commission
- Lake Michigan Committee
- Planktivore Working Group
- USFWS Mass Marking Program
- Several agencies & personal provided input, data, etc.
- Randy Claramunt
Predator/Prey Ratio Analysis
Statistical Catch at Age Model (SCAA)

Number stocked
Number wild
Angler hours
Angler harvest
Harvest age composition

Chinook SCAA

Abundance by age for Chinook salmon

Weir age composition
Weight-at-age at harvest / spawn
Weight-at-age at annulus formation
Standard weight of 35 inch Chinook

Biomass
Lake-wide Predator Biomass

- Chinook

Biomass (kg)

- 2000-2013
- 1980’s
- 2000-2013

2016 Model
- Chinook
- Lake Trout
- Rainbow Trout
- Brown Trout
- Coho

2000-2013
Lake-wide Predator Biomass

- **2016 Model**
  - Lake-wide Predator Biomass
  - Chinook
  - Lake Trout

2000-2013
Lake-wide Predator Biomass

- Chinook
- Lake Trout
- Rainbow Trout

Biomass (kg)
Lake-wide Predator Biomass

Chinook   Lake Trout   Rainbow Trout   Brown Trout

Biomass (kg) vs. Year


2016 Model
Lake-wide Predator Biomass

- Chinook
- Lake Trout
- Rainbow Trout
- Brown Trout
- Coho

Biomass (kg)
Predator Consumption Estimates

How much are these predators eating?

- Chinook
- Lake Trout
- Rainbow Trout
- Brown Trout
- Coho
Predator Consumption Estimates

Chinook salmon are a major consumer of prey fish.
Consumption of Fish Prey

Consumption of fish prey by Chinook salmon
Consumption of fish prey by all other salmonids combined (i.e., rainbow trout, lake trout, brown trout, Coho)
Consumption of **Alewife**

Consumption of alewife

**Chinook salmon**

Consumption of alewife by all other salmonids combined (i.e., rainbow trout, lake trout, brown trout, Coho)
Predator/Prey Ratio Analysis

[Image of predator and prey]
Statistical Catch at Age Model (SCAA)

Alewife abundance (trawl, hydro-acoustic)

Weight-at-age for prey / alewife proportion by age (trawl)

Abundance by age for Alewife

Biomass by age for Alewife

Number of salmon & trout stocked

Predator abundance

Total consumption by predators
Total Alewife (Age1+) Biomass

Biomass (kt)


2016 Model
Predator / Prey Ratio
Chinook/Alewife Ratio
(last year’s results, to 2015)

Lake Huron’s average ratio 5 years prior to collapse (2003) ≈ 0.11
Lake Ontario’s average & relatively stable ratio 1989-2005 ≈ 0.065
Chinook-Alewife Biomass Ratio (PPR)

- 2015 Model
- 2016 Model
- Target
- Limit

last year’s results (2015) vs. this year’s results (2016)
Chinook Biomass by Run Year

2016 Model run
2015 Model run
Alewife Biomass by Run Year

- 2016 Model run
- 2015 Model run

78 kt
37 kt
What do these recent results mean?

- Positive & encouraging…
- But, alewife biomass remains at a record low…
- And, PPR remains above target
A quick & hypothetical comment on interpreting the PPR ‘target’ (0.05)

\[
\frac{14,744,683 \text{ kgs Chinook salmon (like in 2013)}}{294,893,662 \text{ kgs Alewife (hypothetical)}} = 0.05
\]

\[
\frac{3,980,384 \text{ kgs Chinook salmon (like in 2015)}}{79,607,686 \text{ kgs Alewife (hypothetical)}} = 0.05
\]
Auxiliary Indicators
Updated with 2016 Data

• Average weight of age 3 female Chinook salmon
• Standard weight of 35 inch Chinook salmon
• Catch-per-hour for Chinook salmon from charter boats
• Additional indicators available in handout:
  – Lake-wide sport harvested weight (% composition by species)
  – Age structure of the alewife population
Average Weight of Age 3 Female Chinook Salmon from Fall Spawning Surveys
2016 Samples Sizes for Calculating Average Weight of Age 3 Female Chinook (from fall spawning surveys)

<table>
<thead>
<tr>
<th>Location / Weir</th>
<th>Number of Age 3 Female Chinooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boardman, MI</td>
<td>18</td>
</tr>
<tr>
<td>Little Manistee, MI</td>
<td>19</td>
</tr>
<tr>
<td>Medusa Creek, MI</td>
<td>21</td>
</tr>
<tr>
<td>Harbors, IL</td>
<td>38</td>
</tr>
<tr>
<td>Root Weir, WI</td>
<td>54</td>
</tr>
<tr>
<td>BAFF Weir, WI</td>
<td>142</td>
</tr>
<tr>
<td>Strawberry Creek, WI</td>
<td>926</td>
</tr>
</tbody>
</table>

total = 1,218
2016 Average Weights of Age 3 Female Chinook Salmon per Location

- Michigan: 13.8 lbs
- Michigan: 12.7 lbs
- Michigan: 12.6 lbs
- Illinois: 14.2 lbs
- Wisconsin: 15.4 lbs
- Wisconsin: 16.5 lbs
- Wisconsin: 19.0 lbs

Location / Weir:
- Boardman, MI
- Little Manistee, MI
- Medusa Creek, MI
- Harbors, IL
- Root Weir, WI
- BAFF Weir, WI
- Strawberry Creek, WI
Average Weight of Age 3 Female Chinook

2016 = 18.1 pounds

Avg = 15.4 lbs

All states combined


Bordman, MI
Strawberry Creek, WI

Little Manistee, MI
Harbors, IL

Medusa, MI
BAFF & Root, WI (2016 only)
Average Weight of Age 3 Female Chinook

Above average & relatively high weights (18-19 lbs.)

1990 & 1996

2013 & 2016

Avg = 15.4 lbs

Bordman, MI
Strawberry Creek, WI
Little Manistee, MI Harbors, IL
Medusa, MI BAFF & Root, WI (2016 only)
Average Weight of Age 3 Female Chinook

Bordman, MI
Strawberry Creek, WI
Little Manistee, MI
HARBORS, IL
Medusa, MI
BAFF & Root, WI (2016 only)

11 of past 13 years (since 2004) < average

Avg = 15.4 lbs
Standard Weight of 35 inch Chinook Salmon

- Creel & head hunter fish
- Sampled from anglers during midsummer, from July 1 to August 15
Simplified Example of a Standard Weight Calculation

Standard Weight is about 17 lbs.
Standard Weight of 35 inch Chinook (samples size for 2016)

Creel = 947
Head hunters = 5,685
Total = 6,632
Standard Weight of 35 inch Chinook

Y axis = weight (lbs.)
X axis = length (in.)

IN Head Hunters

IL DNR Creel

MI DNR Creel

WI DNR Creel

IL Head Hunters

MI Head Hunters

WI Head Hunters

FISHERIES MANAGEMENT................................ we make fishing better
Standard Weight of 35 inch Chinook

All states combined
Avg. = 17.1 lbs.
2016 = 17.2 lbs.
Standard Weight of 35 inch Chinook

All states combined

Avg. = 17.1 lbs.

2016 = 17.2 lbs.
2011 = 18.4 lbs.
2013 = 17.8 lbs.
2012 = 14.5 lbs. = lowest on record

2011, 2013
2012
2016
Auxiliary Indicators
Updated with 2016 Data

• Average weight of age 3 female Chinook salmon
• Standard weight of 35 inch Chinook salmon
• Catch-per-hour for Chinook salmon from charter boats

Additional indicators available in handout:
  – Lake-wide sport harvested weight (% composition by species)
  – Age structure of the alewife population
Targeted Harvest of Chinook Salmon by Charter Boats

Targeted Salmonine Effort by Charter Boat Anglers
Targeted Chinook Salmon (CHS) Harvest per Hour by Charter Boat Anglers

Avg. = 0.16 CHS per hour
Targeted **Harvest** of Chinook salmon (CHS) by Charter Boat Anglers
Targeted Salmonine **Effort** by Charter Boat Anglers
Summary

• Chinook salmon biomass has been relatively low the past 3 years, down from an all time high in 2013.
  – stocking, wild recruitment, post stocking survival, fish growth/size?

• Alewife biomass continues to decline, & reached an all time low in 2016 after declining for 5 consecutive years.
  – top down (predation) & bottom up (mussels)

• Recent PPR values have improved (compared to last year’s model runs) but remain above target.
Summary

• Several auxiliary indicators support recent PPR results.
  – Particularly, Chinook salmon weights were relatively low the past 13 years (except for 2013 & 2016).
  – These patterns in fish size could be largely attributed to low alewife biomass.
  – Collectively, the intent of the PPR & auxiliary indicators is to provide information to help guide future fisheries management decisions, and to help create and sustain a balanced and diverse fishery for Lake Michigan.
Comments

• Increase stocking
  – What species should we increase and what species should we decrease?

• Stocking levels are about right

• Decrease stocking
  – What species should we decrease?

• All stocking numbers are converted to chinook salmon equivalents
Questions / Comments
How can I get involved?

- **Trailered boats/shore anglers** – provide trip info to creel clerks; let them measure your catch
- **Moored boats** – complete and return your 2 week survey
- **All** – participate in [Sea Grant Great Lakes Angler Diary](https://www.seagrant.org/angler-diary): provide catch info, submit bait ball images, and take stomach samples
Information from the GL Angler Diary will help
1) Determine % wild chinook salmon
2) Provide qualitative information on location of bait
3) Provide qualitative information on stomach contents of salmonids
<table>
<thead>
<tr>
<th>Drop off sites – heads/stomachs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baileys Harbor</strong></td>
</tr>
<tr>
<td>Town Marina</td>
</tr>
<tr>
<td>8132 Hwy 57</td>
</tr>
<tr>
<td><strong>Kenosha</strong></td>
</tr>
<tr>
<td>Boat House Pub &amp; Eatery</td>
</tr>
<tr>
<td>4917 7th Avenue</td>
</tr>
<tr>
<td><strong>Milwaukee</strong></td>
</tr>
<tr>
<td>A&amp;K Feed, Seed, &amp; Bait</td>
</tr>
<tr>
<td>1616 Shore Drive</td>
</tr>
<tr>
<td>McKinley Marina</td>
</tr>
<tr>
<td>Fish Cleaning Station</td>
</tr>
<tr>
<td>1750 N Lincoln Mem Drive</td>
</tr>
<tr>
<td><strong>Peshtigo</strong></td>
</tr>
<tr>
<td>Shell Gas Station</td>
</tr>
<tr>
<td>815 French Street</td>
</tr>
<tr>
<td><strong>Racine</strong></td>
</tr>
<tr>
<td>Kortendick Ace</td>
</tr>
<tr>
<td>3806 Douglas Avenue</td>
</tr>
<tr>
<td><strong>Sturgeon Bay</strong></td>
</tr>
<tr>
<td>Howie’s Tackle</td>
</tr>
<tr>
<td>1309 Green Bay Road</td>
</tr>
<tr>
<td><strong>Two Rivers</strong></td>
</tr>
<tr>
<td>Seagull Sports</td>
</tr>
<tr>
<td>1400 Lake Street</td>
</tr>
<tr>
<td>228 N Franklin</td>
</tr>
</tbody>
</table>
Next Steps

• Complete June 7 and 8 information meetings

• Collect comments the next 30 days via
  – mail Brad Eggold, 600 E. Greenfield Ave, Milwaukee, WI 53204
  – email (dnrlakemichiganplan@wisconsin.gov)

• Convene Lake Michigan Fisheries Forum Meeting late August or early September

• Comment period after LMFF meeting – 21 days

• Final decision by October 15, 2017