An Approach to Developing Mercury-Based Consumption Advice for Select Species of Lake Superior Fish: 2020 Update

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Background

In 2016, GLIFWC Environmental Biologist, Sara Moses, issued a memo describing an investigation into the feasibility of developing mercury-based fish consumption advisory maps for six Lake Superior species of interest to our member tribes. The current report serves to update those advisories with additional years of fish mercury data, develop advisories for two additional species, and formalize the process and results into a GLIFWC Administrative Report. This report describes the development of mercury-based fish consumption advice for eight species by U.S. management unit in Lake Superior.

It should be noted that the current study examined only mercury in these eight species. In many cases, Lake Superior fish have levels of other contaminants that are high enough to warrant more restrictive consumption advisories than those based on mercury alone. For example, Lake Superior advisories for lake trout and siscowet are typically triggered by PCBs and toxaphene; for whitefish by PCBs, dioxins, and toxaphene; and for white sucker and shorthead redhorse by toxaphene. For the species in this study, mercury is most often the contaminant that limits consumption for only three species: burbot, walleye, and cisco. Therefore, consumption advice for Lake Superior fish should not be based on mercury concentrations alone. In order to develop comprehensive consumption advice, each species would need to be tested for mercury as well as these other contaminants, consumption advice based on each individual contaminant developed, and the most conservative consumption advice of the group applied to each species. The current analysis for mercury represents a first step in this process.

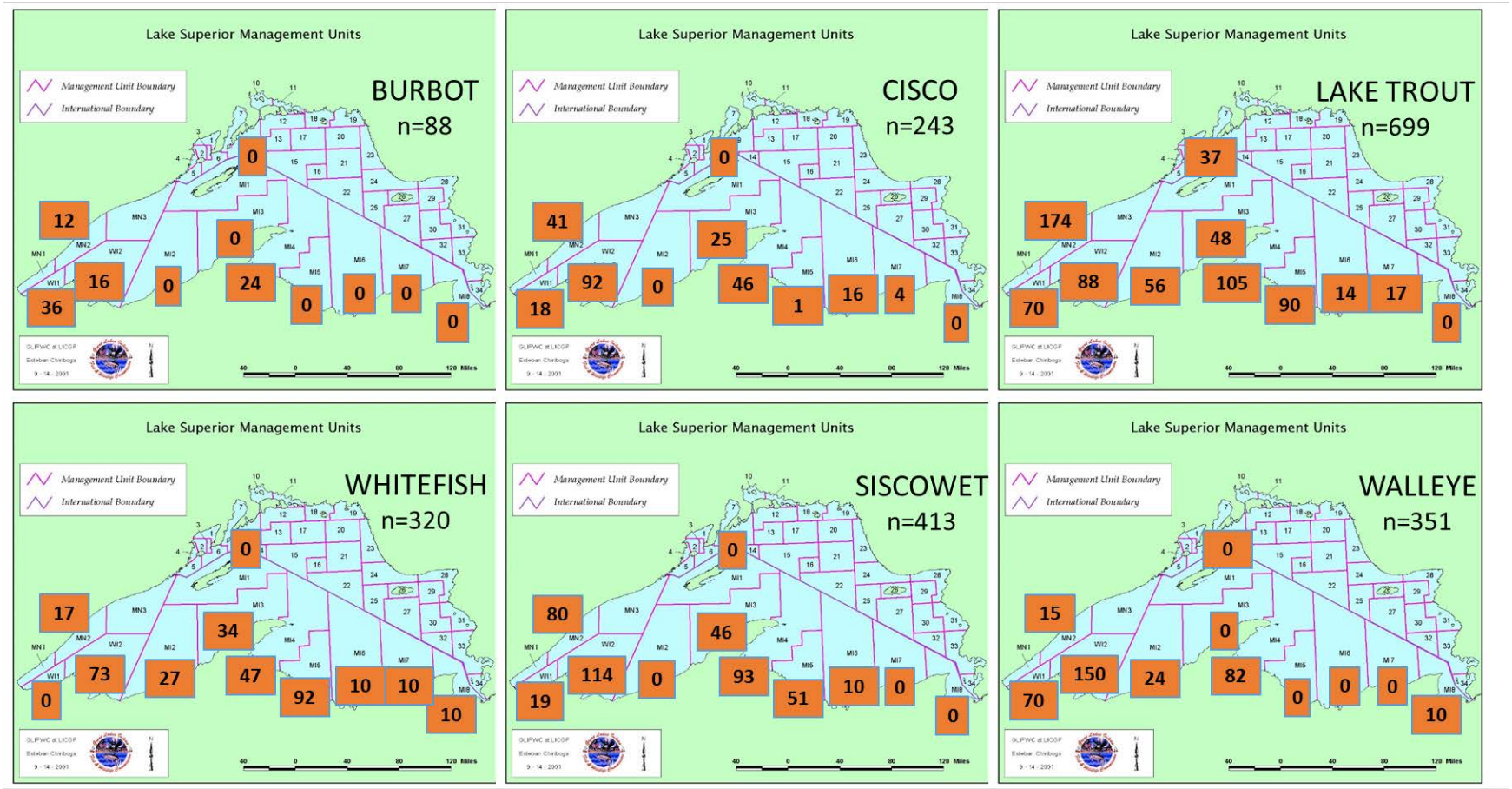
Lake Superior Mercury Database: Creation and Characteristics

Eight Lake Superior species of interest were identified by GLIFWC's member tribes for mercury testing. The original 2016 consumption advisory development included burbot, cisco, lake trout, whitefish, siscowet, and walleye. The 2020 update includes two new species that were identified as important subsistence resources by our member tribes: white sucker and shorthead redhorse. A mercury database was created for each fish species. Records in the database included GLIFWC and state agency (WI, MI, and MN) mercury samples for these eight species for all years data was available. Samples had to be skin-on or skin-off muscle samples that included information on fish length and Lake Superior fisheries management unit from which the fish were collected. The one exception was that due to smaller sample sizes and lack of management unit information, Minnesota samples were included regardless of the ability to identify the management unit from which they were collected. All MN management units (MN-1, MN-2, and MN-3) have been combined into a single management unit ("MN") for the subsequent analyses.

The entire database consisted of 2,160 samples for the eight species, with sample sizes for individual species ranging from 16 for shorthead redhorse to 699 for lake trout (Table 1, Figure 1). Histograms were generated for each species showing length and sample year distribution by management unit (Appendices A and B, respectively). These distributions could in part explain differences in mercury concentrations observed among management units for a given species and are therefore important to consider within the context of this analysis.

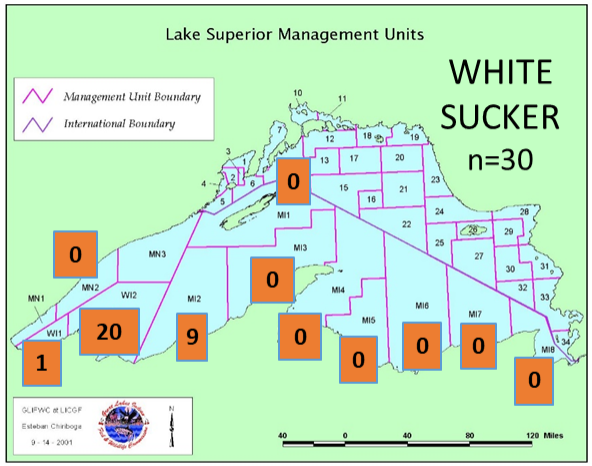
Table 1: Number of Lake Superior fish mercury samples included for analysis by species and fisheries management unit

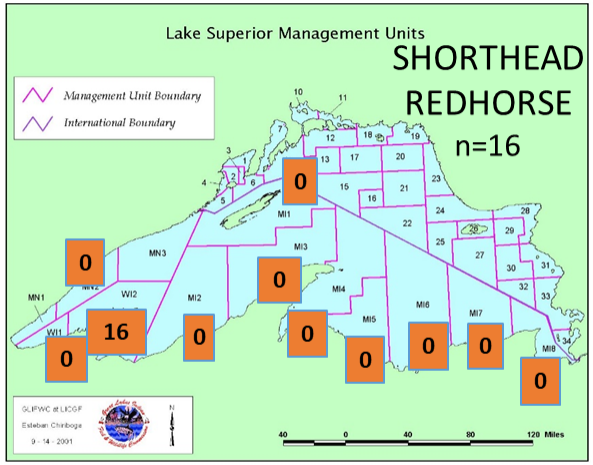
	Lake Superior Fisheries Management Unit											
Species	**MN**	**MI-1**	**MI-2**	**MI-3**	**MI-4**	**MI-5**	**MI-6**	**MI-7**	**MI-8**	**WI-1**	**WI-2**	**All**
Burbot	12	0	0	0	24	0	0	0	0	36	16	**88**
Cisco	41	0	0	25	46	1	16	4	0	18	92	**243**
Lake Trout	174	37	56	48	105	90	14	17	0	70	88	**699**
Whitefish	17	0	27	34	47	92	10	10	10	0	73	**320**
Siscowet	80	0	0	46	93	51	10	0	0	19	114	**413**
Walleye	15	0	24	0	82	0	0	0	10	70	150	**351**
White Sucker	0	0	9	0	0	0	0	0	0	1	20	**30**
Shorthead Redhorse	0	0	0	0	0	0	0	0	0	0	16	**16**
TOTAL	**339**	**37**	**116**	**153**	**397**	**234**	**50**	**31**	**20**	**214**	**569**	**2,160**



* Minnesota Management Units (MN-1, MN-2, and MN-3) have been combined due to lack of information on which units samples from this part of Lake Superior were collected from.

Figure 1: Number of Lake Superior fish mercury samples per U.S. fisheries management unit for eight Lake Superior species (GLIFWC and state data, all years) CONTINUED ON NEXT PAGE





* Minnesota Management Units (MN-1, MN-2, and MN-3) have been combined due to lack of information on which units samples from this part of Lake Superior were collected from.

Figure 1 (Continued): Number of Lake Superior fish mercury samples per U.S. fisheries management unit for eight Lake Superior species (GLIFWC and state data, all years)

Methods for Developing Mercury-Based Consumption Advice

The methods used for creating GLIFWC's mercury-based inland walleye consumption advice is described in detail in Madsen *et al.* (2008). Consumption advice was developed for the Lake Superior species in the current analysis following the same methodology with minor modifications. Each Lake Superior management unit was analyzed as if it were an individual lake, with the exception of MN-1, MN-2, and MN-3, which were combined into a single "MN" management unit. Advice was developed if at least four fish of a given species had been tested for mercury within the management unit. Consumption advice was developed based on predicted mercury concentrations in fish using five meal frequency categories.

Separate advice was developed for the general (men 15 years or older and women beyond childbearing age) and sensitive populations (children under 15 years old and women of childbearing age). Simple linear regressions were created for mercury concentration versus fish length. Unlike the methodology for inland walleye, not all Lake Superior species were normalized to a 20-inch fish. The method for determining the normalization length for each species is described in the following section of this report (*Choosing Fish Length for Mercury Concentration Normalization*). If the range of fish lengths was less than 5 inches or if the regression slope was not greater than zero, consumption advice was based on mercury concentration without regard for fish length. In either case, 1-sided upper 75% confidence bounds were used to determine consumption advice for the general population and 1-sided upper 75% prediction bounds were used for the sensitive population. The mercury-length regressions, showing the 1-sided upper 75% confidence and prediction bounds, for each species by Lake Superior management unit are shown in Appendix C.

The reference dose (RfD) of 0.3µg/kg/day implemented by the EPA in 1985 was used as the basis for mercury concentration and meal frequency advice for the general population. The EPA's 1995 RfD of 0.1µg/kg/day, revised to incorporate neurodevelopmental toxicity and the effects of *in utero* mercury exposure, was used to develop advice for the sensitive population. The resulting fish mercury concentration ranges for each meal frequency category for the general and sensitive populations are shown in Table 2.

Table 2: Maximum number of meals per month that can be eaten of a fish of a given mercury concentration without exceeding established reference doses (assumptions: meal size =227g, body weight = 70kg)

	Fish Mercury Concentration (µg/g)*	
Number of Meals per Month	**General Population**	**Sensitive Population**
8	0-0.35	0-0.12
4	>0.35 – 0.70	>0.12 – 0.23
2	>0.70 – 1.41	>0.23 – 0.47
1	>1.41 – 2.81	>0.47 – 0.94
0	>2.81	>0.94

*As defined here by the 1-sided upper 75% confidence and prediction bounds for a length-normalized fish, as described above.

Choosing Fish Length for Mercury Concentration Normalization

Normalizing fish mercury concentrations to a specified fish length is required for developing consumption advice because mercury concentrations increase with increasing fish length. Unlike the methodology for inland walleye, not all Lake Superior species were normalized to a 20-inch fish. The normalized fish length for each species was based on a number of factors, including available commercial harvest fish size data (Mattes, 2019), size distribution of fish with mercury database, and fish lengths utilized in state (MN, WI, and MI) fish consumption advisories (Table 3).

Table 3: Fish length information utilized for selecting fish normalization length for developing mercury-based consumption advice for eight Lake Superior species*

Species	Lengths in Database (in.)	Commercial Harvest Mean Length (in.)	Fish Length Used for State Consumption Advisories (in.)			Fish Normalization Length Chosen (in.)
			Michigan	Wisconsin	Minnesota	
Burbot	Mean: 20.4 Median: 21.1 Range: 12.1-30.2	N/A	<18” >18”	None specified	None specified	20
Cisco	Mean: 14.4 Median: 14.4 Range: 7.4-25.4	N/A	None specified	None specified	None specified	15
Lake Trout	Mean: 25.2 Median: 25.0 Range: 13.8-39.8	MI-2: 20.8 MI-3: 21.7 MI-4: 20.3 MI-5: 23.7	<24 24-28 >28	<22 >22-39 >39	<22 22-39 >39	24
Whitefish	Mean: 20.9 Median: 20.5 Range: 12.6-29.9	MI-2: 18.7 MI-3: 19.5 MI-4: 20.4 MI-5: 21.5	None specified	None specified	None specified	20
Siscowet	Mean: 21.1 Median: 20.6 Range: 12.3-35.1	N/A	None specified	<29 >29	<29 >29	20
Walleye	Mean: 20.9 Median: 21.1 Range: 9.8-29.6	N/A	None specified	None specified	None specified	20
White Sucker	Mean: 17.8 Median: 18.6 Range: 13.7-20.8	N/A	None specified	None specified	None specified	20
Shorthead Redhorse	Mean: 18.0 Median: 18.0 Range: 14.8-24.7	N/A	None specified	None Specified	None specified	20

*Also see Appendix A for histograms of sample size by length category for each species by management unit.

Consumption Advice by Species and Management Unit

In general, the mercury trends for these eight species are cisco/whitefish < white sucker/shorthead redhorse < lake trout/burbot < siscowet/walleye (Table 4, Figure 2). Mercury-based consumption advice for each species by management unit for the general and sensitive populations appears below (Tables 5 and 6). Each species, and its resulting mercury map, is discussed in detail. There does not appear to be any consistent pattern of mercury levels across species by management unit.

Table 4: Mercury concentrations (wet weight) in fillets from eight Lake Superior fish species (all data; no length normalization)

Species	Number of Samples	Mercury Concentration (µg/g)		
		Mean	Median	Range
Burbot	88	0.263	0.231	0.051 – 0.860
Cisco	243	0.072	0.064	0.005 – 0.219
Lake Trout	699	0.272	0.200	0.030 – 1.16
Whitefish	320	0.068	0.060	0.007 – 0.520
Siscowet	413	0.414	0.360	0.020 – 1.14
Walleye	351	0.393	0.297	0.069 – 1.63
White Sucker	30	0.137	0.108	0.053 – 0.5
Shorthead Redhorse	16	0.159	0.151	0.083 – 0.271

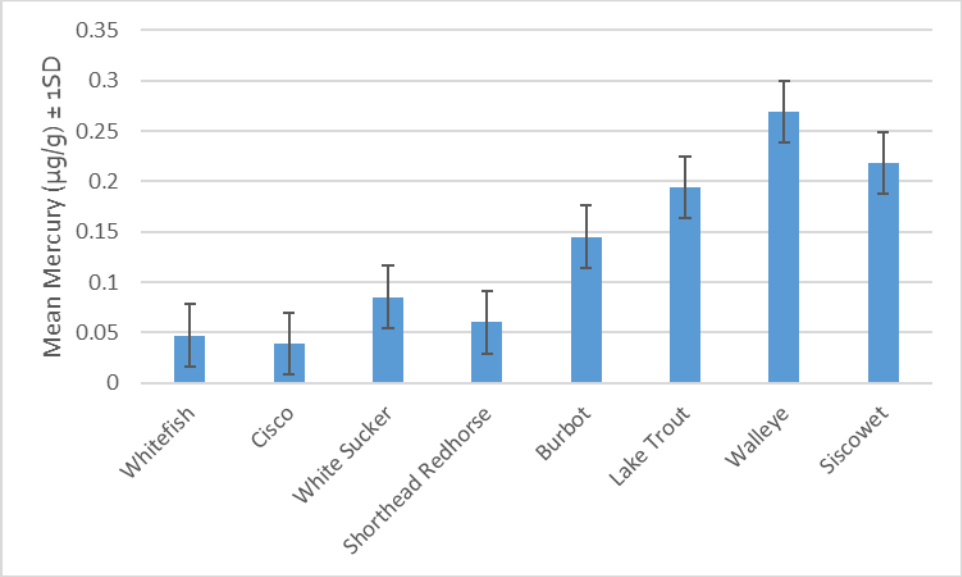


Figure 2: Mean mercury concentration (± 1 standard deviation) in fillets of eight Lake Superior fish species (all data; no length normalization)

Table 5: Mercury-based consumption advice (meals per month) for all species by management unit for the general population* [Color-codes correspond to those on GLIFWC's Mercury Maps]

	Burbot	Cisco	Lake Trout	Whitefish	Siscowet	Walleye	White Sucker	Shorthead Redhorse
MN	4	8	8	8	4	4	N/A	N/A
WI-1	8	8	8	N/A	4	4	N/A	N/A
WI-2	8	8	8	8	8	8	8	8
MI-1	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A
MI-2	N/A	N/A	8	8	N/A	8	4	N/A
MI-3	N/A	8	8	8	4	N/A	N/A	N/A
MI-4	8	8	8	8	8	8	N/A	N/A
MI-5	N/A	N/A	8	8	8	N/A	N/A	N/A
MI-6	N/A	8	8	8	4	N/A	N/A	N/A
MI-7	N/A	8	8	8	N/A	N/A	N/A	N/A
MI-8	N/A	N/A	N/A	8	N/A	4	N/A	N/A

* This table SHOULD NOT be used as a consumption recommendation for these species. This advice was only generated based on mercury risk. In general, Lake Superior species contain contaminants other than mercury that are at levels of greater concern and result in more conservative consumption advisories.

Table 6: Mercury-based consumption advice (meals per month) for all species by management unit for the sensitive population* [Color-codes correspond to those on GLIFWC's Mercury Maps]

	Burbot	Cisco	Lake Trout	Whitefish	Siscowet	Walleye	White Sucker	Shorthead Redhorse
MN	1	8	2	4	1	1	N/A	N/A
WI-1	2	8	2	N/A	1	1	N/A	N/A
WI-2	4	8	2	8	1	2	4	4
MI-1	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
MI-2	N/A	N/A	2	8	N/A	2	1	N/A
MI-3	N/A	8	2	8	1	N/A	N/A	N/A
MI-4	2	4	2	4	2	2	N/A	N/A
MI-5	N/A	N/A	2	8	2	N/A	N/A	N/A
MI-6	N/A	8	4	8	2	N/A	N/A	N/A
MI-7	N/A	4	2	8	N/A	N/A	N/A	N/A
MI-8	N/A	N/A	N/A	8	N/A	1	N/A	N/A

* This table SHOULD NOT be used as a consumption recommendation for these species. This advice was only generated based on mercury risk. In general, Lake Superior species contain contaminants other than mercury that are at levels of greater concern and result in more conservative consumption advisories.

Burbot

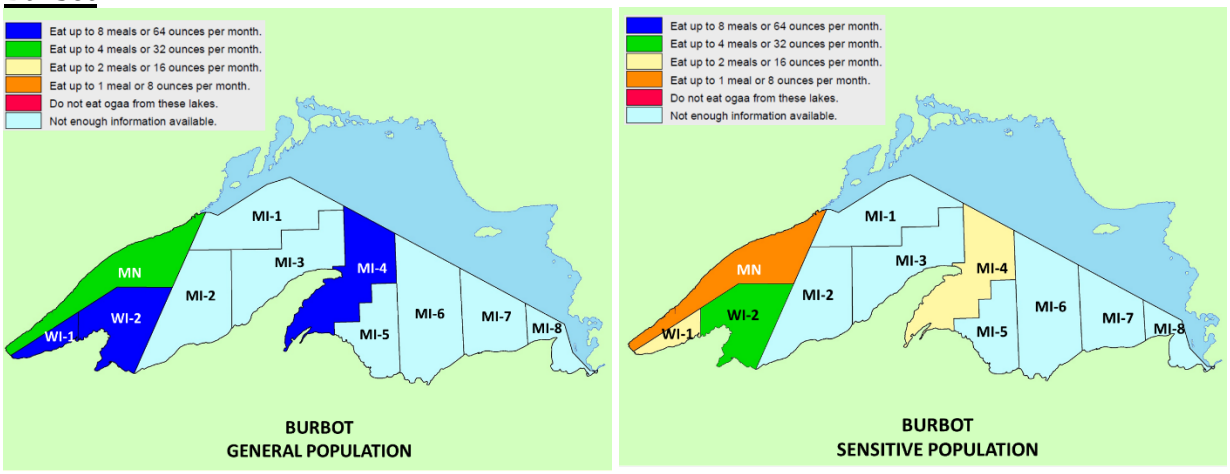


Figure 3. Mercury-based consumption advice (meals per month) for burbot by management unit for the general and sensitive populations

There was somewhat limited burbot mercury data available for analysis (*n*=88), therefore mercury-based consumption advice could only be developed for four of the 11 Lake Superior management units. Mercury levels in this species were variable across management units, resulting in consumption advice of 4 to 8 meals per month for the general population and 1 to 4 meals per month for the sensitive population. The observed variability may be due to the small sample sizes of only 12 to 26 fish per unit. This is supported in part by the fact that the unit with the smallest sample size (MN; *n*=12) is also the unit with the most conservative consumption advice. Neither fish size (Appendix A) nor sampling year (Appendix B) distributions had patterns that could explain the variability in the mercury concentrations among the management units. More mercury data on Lake Superior burbot would need to be collected to determine if a unit-specific consumption advisory would be warranted for this species.

State issued consumption advice for Lake Superior burbot is somewhat variable and is typically triggered by mercury concentrations. Minnesota does not offer advice for burbot. Wisconsin recommends up to 4 meals per month for the both the sensitive and general populations (all sizes). The Michigan Department of Health recommends a maximum of 4 meals per month for burbot under 18 inches and 2 meals per month for fish over 18 inches. Michigan advice is not split into general and sensitive population recommendations and is applicable to everyone.

Cisco

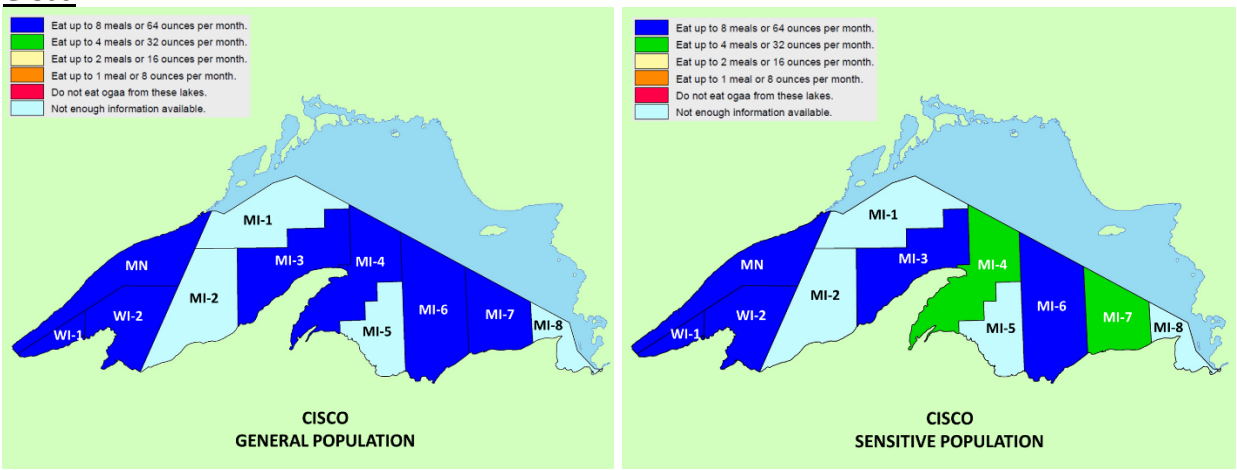


Figure 4. Mercury-based consumption advice (meals per month) for cisco by management unit for the general and sensitive populations

Mercury-based consumption advice for cisco was developed for seven of the 11 Lake Superior management units. In general, mercury levels in this species were low among the species tested, leading to a consumption maximum of 8 meals per month across units for the general population and 4 or 8 meals per month for the sensitive population. Although cisco fell within two different advice categories for the sensitive population, there was little variation in mercury levels among the management units. Both units that have a maximum consumption rate of 4 meals per month for the sensitive population actually had fish mercury concentrations close to the threshold for the 8 meals per month category. Therefore, there is no substantial evidence that management unit specific consumption advice is warranted for cisco in Lake Superior.

State consumption advisories for cisco are typically triggered by mercury. Consumption advice for Lake Superior cisco issued by the Wisconsin Department of Natural Resources is 1 meal per week for the sensitive population and unrestricted consumption for the general population. The Minnesota Department of Health is unrestricted consumption for the general population and 4 meals per month for the sensitive population. The Michigan Department of Community Health recommends up to 8 meals per month for the entire population.

Lake Trout

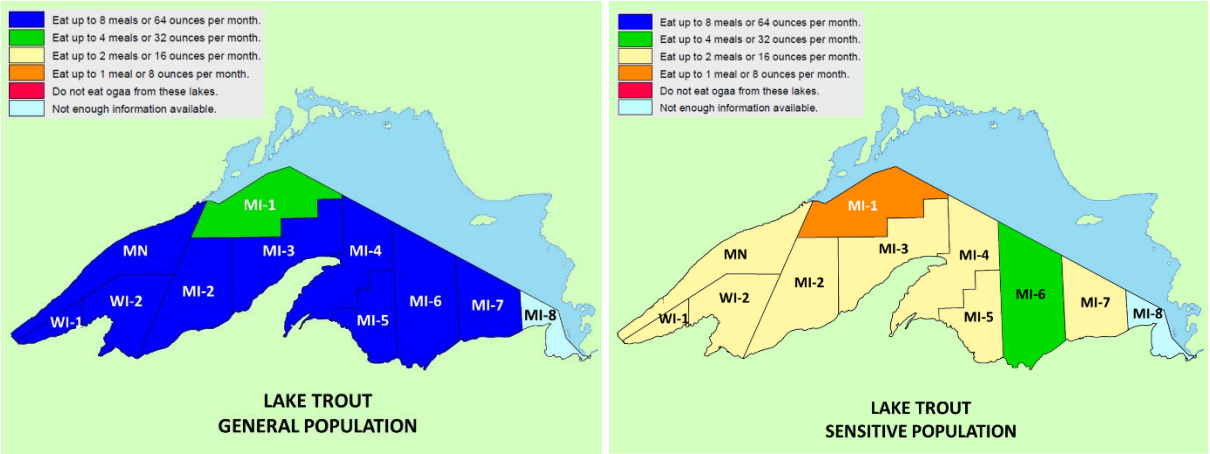


Figure 5. Mercury-based consumption advice (meals per month) for lake trout by management unit for the general and sensitive populations

Lake trout had the most available mercury data (*n*=699) of the eight species studied. Mercury-based consumption advice for lake trout was developed for ten of the eleven Lake Superior management units. In general, mercury levels in this species were moderate among the species tested. All management units resulted in the same consumption maximum (8 meals per month for the general population and 2 meals per month for the sensitive population) with the exceptions of MI-1, which had slightly more conservative rate (4 meals per month for the general population and 1 meal per month for the sensitive population) and MI-4, which was less restrictive (4 meals per month) for the sensitive population. MI-1 and MI-6 had relatively low sample numbers (n=37 and n=14, respectively), which may have contributed to the more conservative advisories in these units. The majority of the samples from MI-1 (27 of 37 samples) were collected between 1989 and 1992 (see B4), potentially impacting the mercury levels in the database relative to the other management units where a smaller proportion of the samples were collected in these "early" years, when mercury levels tended to be higher in fish overall. Overall, there is no substantial evidence that management unit specific consumption advice is warranted for lake trout in Lake Superior.

Wisconsin and Minnesota recommend for both the sensitive and general populations consumption of up to 1 meal per week for lake trout up to 22", once per month for lake trout 22-39", and do not eat for lake trout over 39". Michigan recommends for all populations up to 2 meals per month of lake trout under 24", 1 meal per month for lake trout 24-28" and 6 meals per year for lake trout over 28". This is more restrictive than the consumption advice developed here because it is triggered by the presence of PCBs and/or toxaphene rather than mercury.

Whitefish

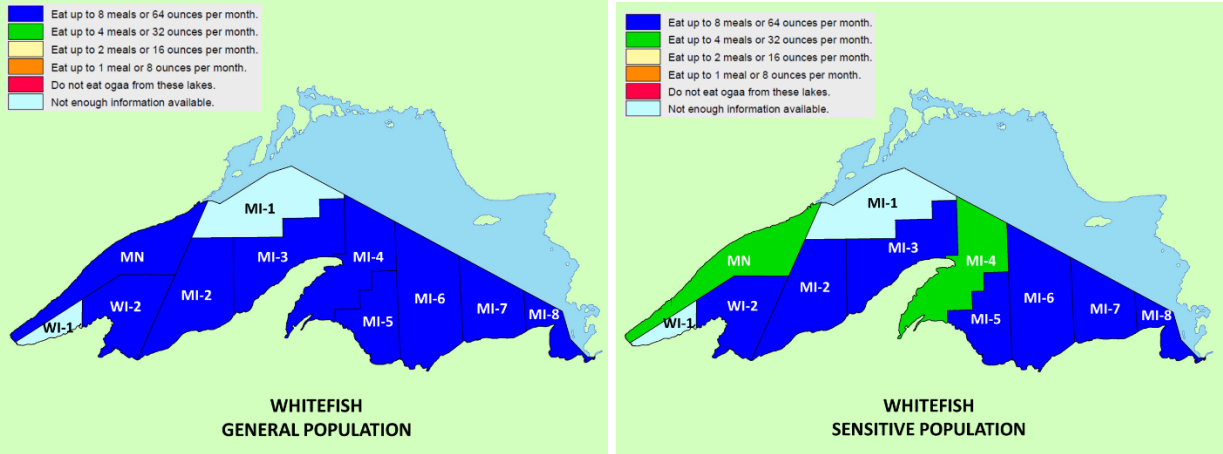


Figure 6. Mercury-based consumption advice (meals per month) for whitefish by management unit for the general and sensitive populations

Mercury-based consumption advice for whitefish was developed for nine of the 11 Lake Superior management units. In general, mercury levels in this species were low relative to other species tested, leading to a consumption maximum of 8 meals per month across units for the general and sensitive population except in MN and MI-4 where the maximum is 4 meals per month for the sensitive population. Although whitefish fell within two different advice categories for the sensitive population, there was little variation in mercury levels among the management units. Both units that have a maximum consumption rate of 4 meals per month for the sensitive population actually had fish mercury concentrations close to the threshold for the 8 meals per month category. As a result of the consistency in whitefish mercury concentrations across units, the development of management unit specific consumption advice does not appear to be warranted.

Wisconsin and Minnesota recommend consumption of up to 1 meal per week of Lake Superior whitefish for the entire population. Michigan recommends a maximum of 2 meals per month for all populations. The states' advice is more restrictive than the consumption advice developed here because it is triggered by the presence of PCBs, dioxins, and/or toxaphene rather than mercury.

Siscowet

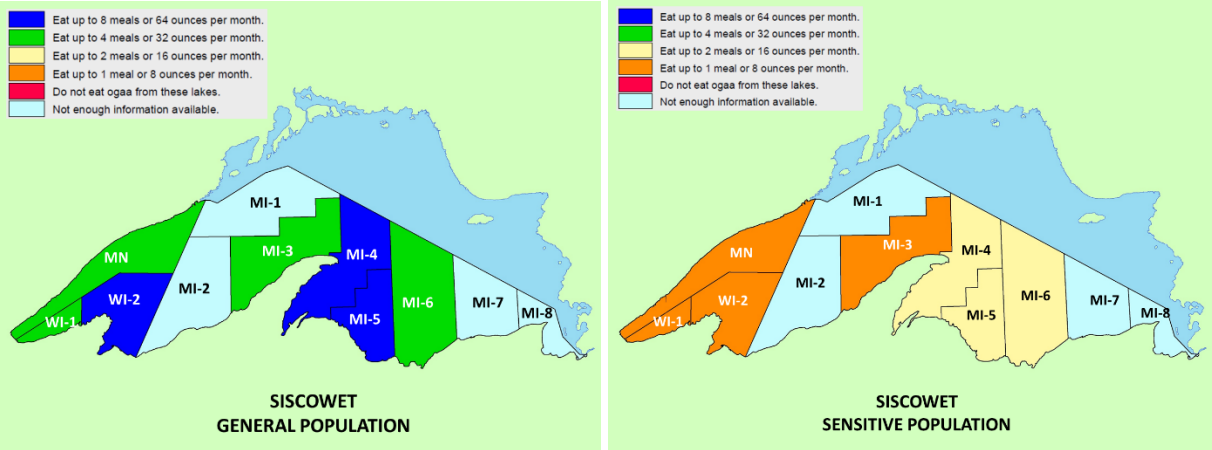


Figure 7. Mercury-based consumption advice (meals per month) for siscowet by management unit for the general and sensitive populations

Mercury-based consumption advice for siscowet was developed for seven of the 11 Lake Superior management units. In general, mercury levels in this species were high relative to the other species in the study. Advice for the general population was up to either 4 or 8 meals per month. For the sensitive population, consumption advice was up to 1 or 2 meals per month, depending on unit. Although siscowet fell within two different advice categories for both the general and sensitive population, there was only minor variation in mercury levels among the management units. All seven units were very close to the threshold between the advice categories. Therefore, there is no substantial evidence that management unit specific consumption advice is warranted for siscowet in Lake Superior.

Wisconsin and Minnesota advise consumption of up to one meal per month for siscowet up to 29" and do not eat for siscowet over 29" for both the general and sensitive populations. Michigan advises "limited" consumption of all size siscowet for all populations, meaning no consumption by the sensitive population and only 1 to 2 servings per year for the general population. As with whitefish and lake trout, the state advice for siscowet is more conservative than the advice developed here because it is triggered by levels of contaminants other than mercury (PCBs and/or toxaphene).

Walleye

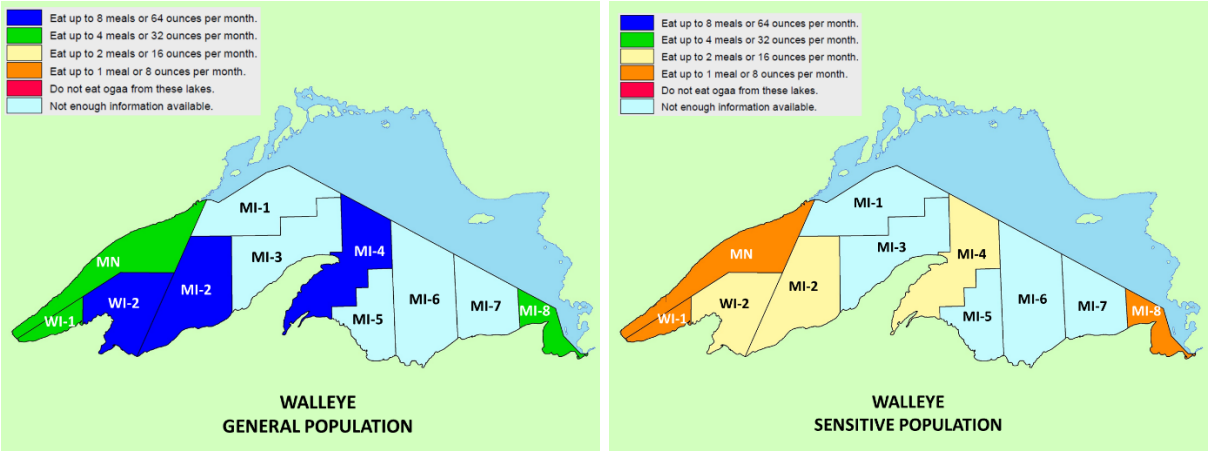


Figure 8. Mercury-based consumption advice (meals per month) for walleye by management unit for the general and sensitive populations

Mercury-based consumption advice for walleye was developed for six of the 11 Lake Superior management units. In general, mercury levels in this species were high relative to the other species in the study. Advice for the general population was up to either 4 or 8 meals per month. For the sensitive population, consumption advice was up to 1 or 2 meals per month, depending on unit. Although walleye fell within two different advice categories for the both the general and sensitive populations, there was only minor variation in mercury levels among the management units. Fish mercury concentrations in all six units were close to the threshold between the advice categories. Therefore, there was no substantial evidence that management unit specific consumption advice would be warranted for walleye in Lake Superior.

Wisconsin state issued consumption advice for walleye (any size) is up to 1 meal per week for the general population and 1 meal per month for the sensitive population. Michigan recommends 2 meals per month for the entire population. Minnesota does not issue consumption advice for Lake Superior walleye. State advisories for walleye are generally triggered by mercury, rather than by other contaminants such as PCBs. Therefore, as expected, the mercury-based consumption advice developed above is similar to that issued by the states.

White Sucker

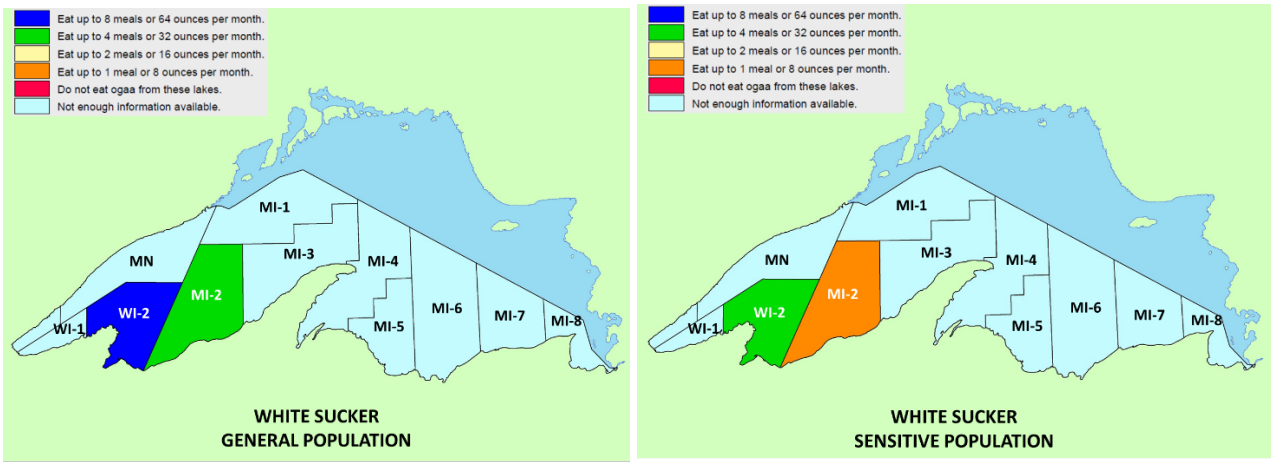


Figure 9. Mercury-based consumption advice (meals per month) for white sucker by management unit for the general and sensitive populations

Mercury-based consumption advice for white sucker could only be developed for two Lake Superior management units due to very small sample sizes. In general, mercury levels in this species were moderate relative to the other species in the study. Consumption advice was up to either 4 or 8 meals per month for the general population and 1 or 4 meals per month for the sensitive population. It is not surprising that the advice was considerably different between the two management units for which it was developed. Sample sizes were extremely low (n=20 and n=9 for WI-2 and MI-2, respectively). Further, the samples are from very different time periods. All WI-2 samples were collected in 2019 and all MI-2 samples in 1985. As mercury levels have declined in fish region-wide since the 1980's, the samples from WI-2 would be expected to have lower mercury and less restrictive consumption advice, as was seen. Significantly more data would need to be collected to determine if any management unit-specific consumption advice was necessary.

Only Michigan issues state consumption for Lake Superior sucker species. They recommend up to 2 meals per month of suckers (any size) for all populations, noting that toxaphene is the contaminant that triggers their consumption advisory.

Shorthead Redhorse

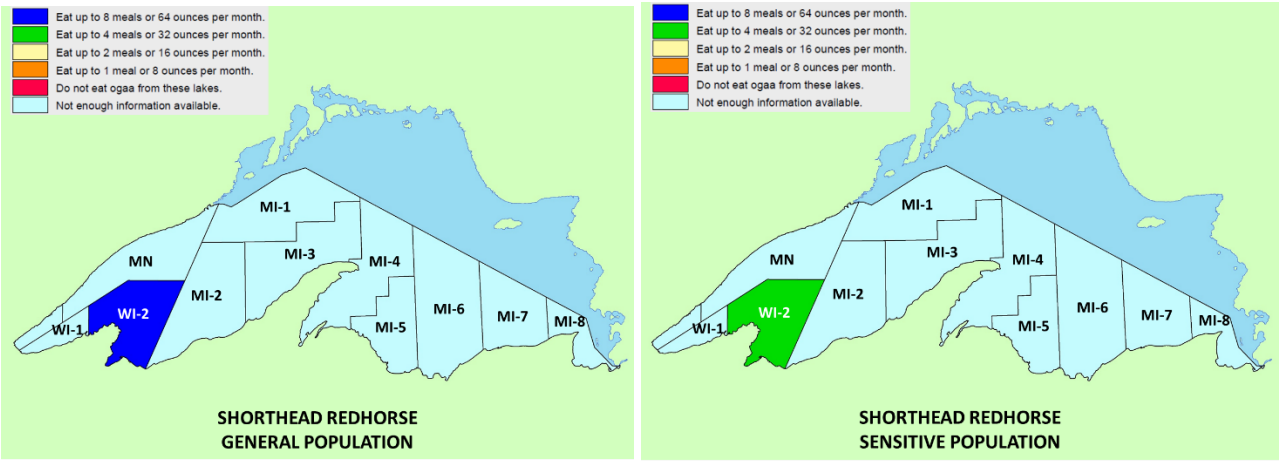


Figure 10. Mercury-based consumption advice (meals per month) for shorthead redhorse by management unit for the general and sensitive populations

Mercury-based consumption advice for shorthead redhorse could only be developed for one Lake Superior management units due to very small sample sizes. The only samples available were the 16 collected and tested by GLIFWC in 2019. In general, mercury levels in this species were moderate relative to the other species in the study. Consumption advice was up to 8 meals per month for the general population and 4 meals per month for the sensitive population. Significantly more data would need to be collected to determine if any management unit-specific consumption advice was necessary.

Only Michigan issues state consumption for Lake Superior sucker species. They recommend up to 2 meals per month of suckers (any size) for all populations, noting that toxaphene is the contaminant that triggers their consumption advisory.

Recommendation for Lake Superior Mercury Maps

For five of the eight species examined (cisco, lake trout, whitefish, siscowet, walleye), there was not enough variation in mercury levels and thus consumption advice among Lake Superior management units to justify issuing unit-specific consumption advice within the lake. Because there is limited data available for burbot, white sucker, and shorthead redhorse, substantially more data would need to be collected to determine any need for unit-specific advisories. As these species were specifically chosen by our member tribes (burbot by the Keweenaw Bay Indian Community and suckers by Bad River) due to known consumption in the community, this is a data gap that may warrant further fish collections and mercury testing.

Mercury testing should continue annually in Lake Superior fish as mercury remains a contaminant of concern that impacts the ability of tribal members to consume fish at desired rates and fully exercise their treaty rights to do so. Annual testing also remains necessary as mercury temporal trends in Lake Superior fish are not simple or one-directional. Based on the results of the current study, it does not seem necessary to collect mercury data in fish across all management units as fish mercury levels within a species appear to be relatively uniform across the lake.

It must also be considered that the current study only examined mercury in these eight species. In many cases, Lake Superior fish have levels of other contaminants that are high enough to lead to more restrictive consumption advisories than those based on mercury alone. Lake Superior advisories for lake trout and siscowet are typically triggered by PCBs and toxaphene; for whitefish by PCBs, dioxins, and toxaphene; and for white sucker and shorthead redhorse by toxaphene. For the species in this study, mercury is most often the contaminant that limits consumption for only three species: burbot, walleye, and cisco. In order to develop comprehensive consumption advice, each species would need to be tested for mercury and other contaminants, consumption advice based on each individual contaminant developed, and the most conservative consumption advice applied to each species.

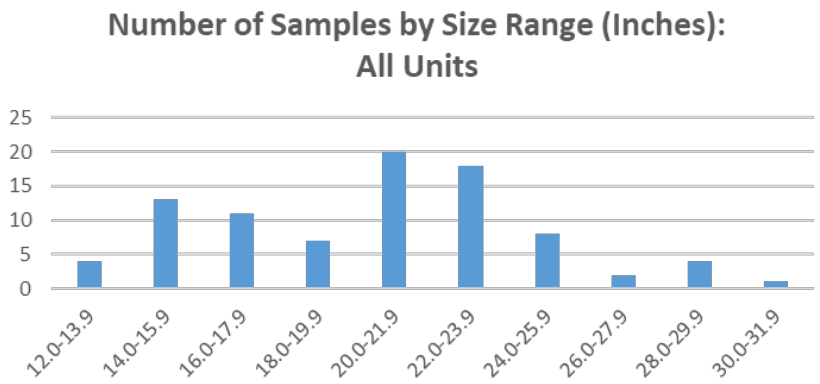
Literature Cited

Madsen ER, DeWeese AD, Kmiecik NE, Foran JA, Chiriboga ED. 2008. Methods to develop consumption advice for methylmercury-contaminated walleye harvested by Ojibwe tribes in the 1837 and 1842 ceded territories of Michigan, Minnesota, and Wisconsin, USA. *Integrated Environmental Assessment and Management* 4(1): 118-24.

Mattes WP. 2019. Biological and Commercial Catch Statistics from the Ojibwe Inter-Tribal Gill Net Fishery within Michigan Waters of Lake Superior during 2017. GLIFWC Administrative Report 19-17.

APPENDIX A

Database Fish Length Distributions by Management Unit


Number of Samples by Size Range (Inches):
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20
15
10
5
0
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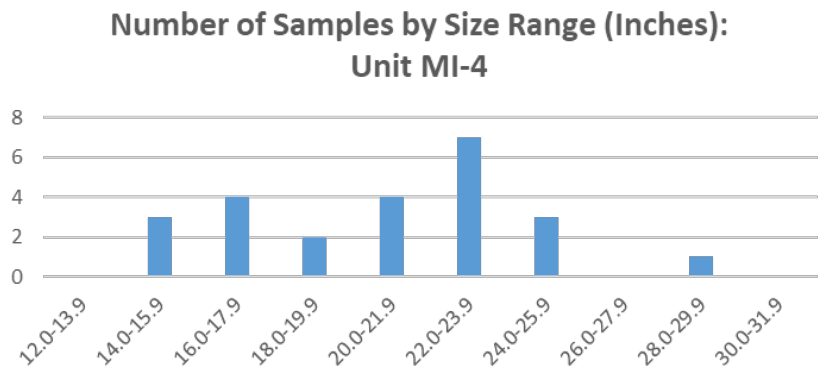
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9


Number of Samples by Size Range (Inches):
Unit MI-4
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6
4
2
0
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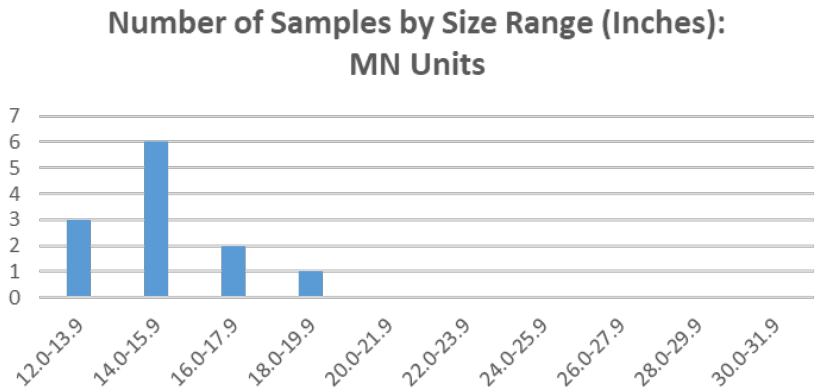
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9


Number of Samples by Size Range (Inches):
MN Units
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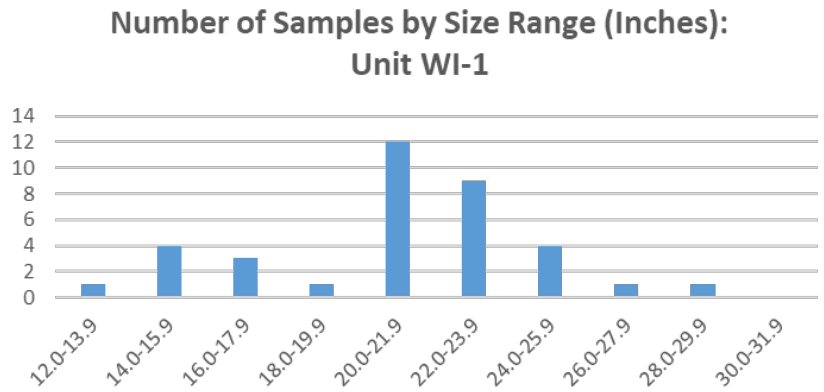
6
5
4
3
2
1
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9


Number of Samples by Size Range (Inches):
Unit WI-1
14
12
10
8
6
4
2
0
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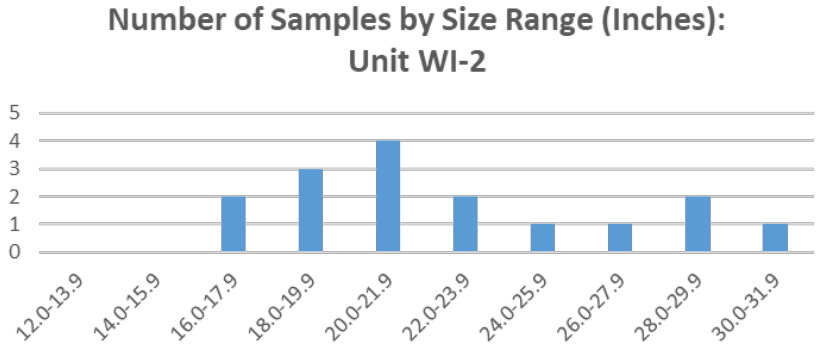
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9


Number of Samples by Size Range (Inches):
Unit WI-2
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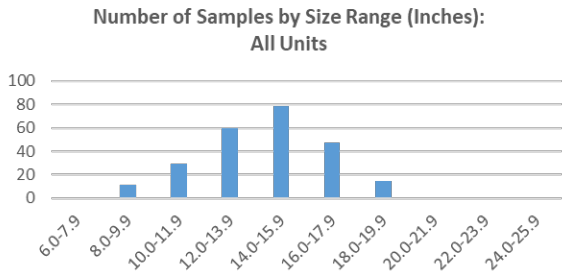
4
3
2
1
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9

BURBOT


Number of Samples by Size Range (Inches):
All Units
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40
20
0
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8.0-9.9
10.0-11.9
12.0-13.9
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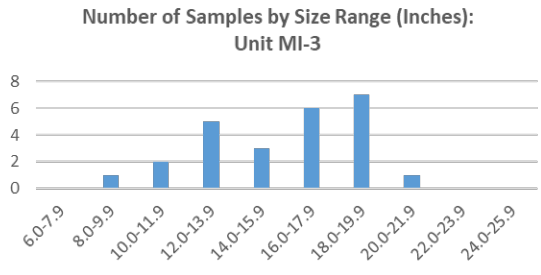
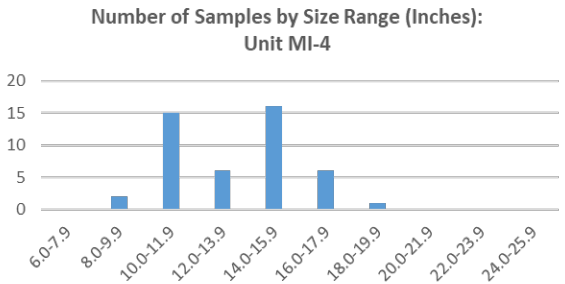
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9


Number of Samples by Size Range (Inches):
Unit MI-3
8
6
4
2
0
6.0-7.9
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9


Number of Samples by Size Range (Inches):
Unit MI-4
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15
10
5
0
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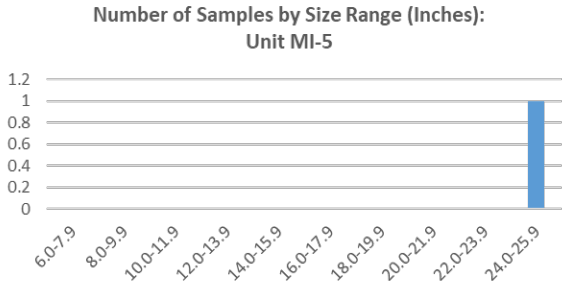
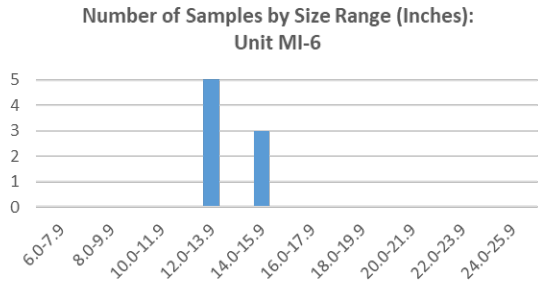
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9


Number of Samples by Size Range (Inches):
Unit MI-5
1.2
1
0.8
0.6
0.4
0.2
0
6.0-7.9
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9


Number of Samples by Size Range (Inches):
Unit MI-6
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4
3
2
1
0
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8.0-9.9
10.0-11.9
12.0-13.9
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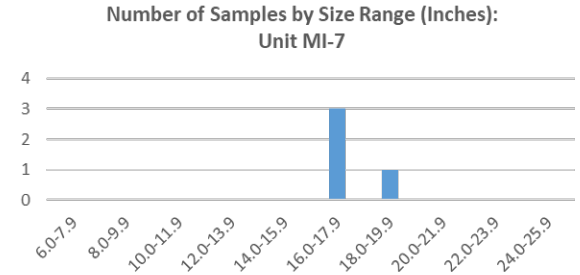
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9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Unit MI-7
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3
2
1
0
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8.0-9.9
10.0-11.9
12.0-13.9
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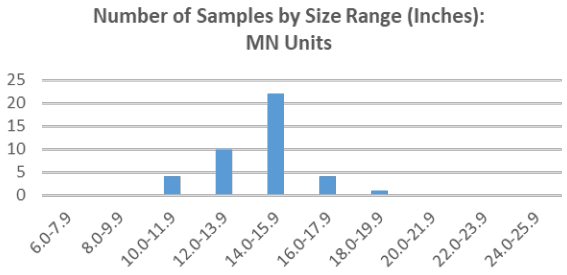
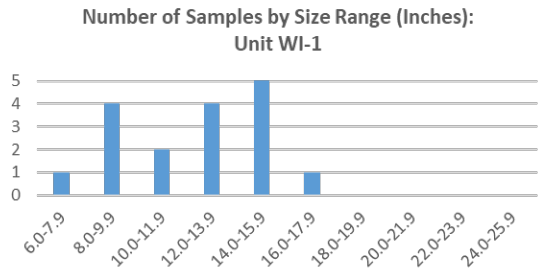
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9


Number of Samples by Size Range (Inches):
MN Units
25
20
15
10
5
0
6.0-7.9
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9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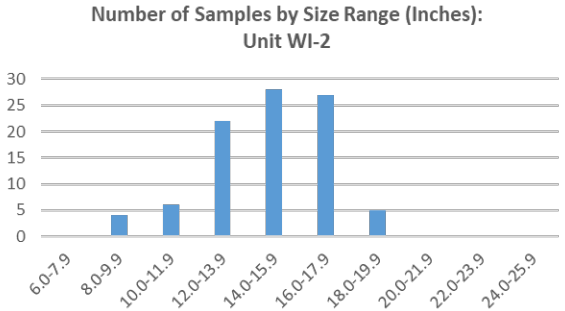
Unit WI-1
5
4
3
2
1
0
6.0-7.9
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9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Unit WI-2
30
25
20
15
10
5
0
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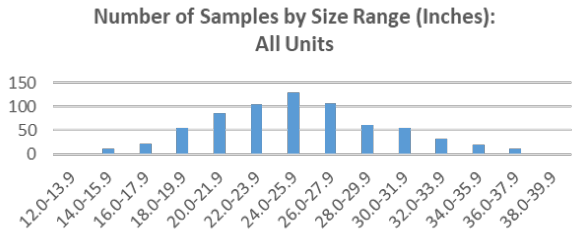
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9

CISCO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All Units
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50
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16.0-17.9
18.0-19.9
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22.0-23.9
24.0-25.9
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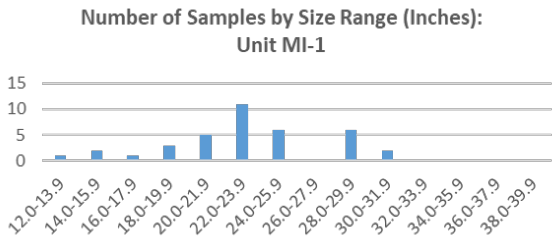
34.0-35.9
36.0-37.9
38.0-39.9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Unit MI-1
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10
5
0
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14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
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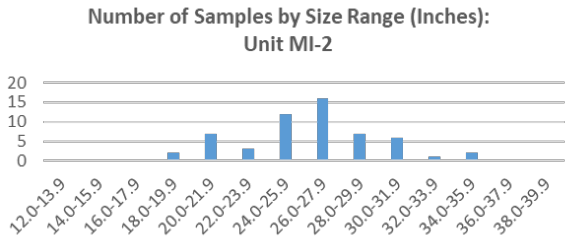
32.0-33.9
34.0-35.9
36.0-37.9
38.0-39.9


Number of Samples by Size Range (Inches):
Unit MI-2
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15
10
5
0
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14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
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32.0-33.9
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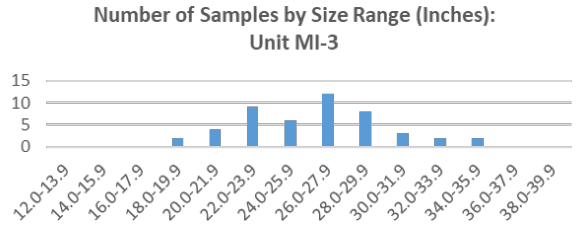
36.0-37.9
38.0-39.9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Unit MI-3
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10
5
0
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14.0-15.9
16.0-17.9
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20.0-21.9
22.0-23.9
24.0-25.9
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36.0-37.9
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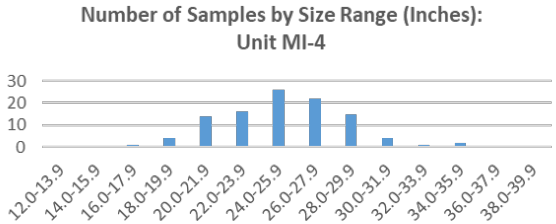
Number of Samples by Size Range (Inches):
Unit MI-4
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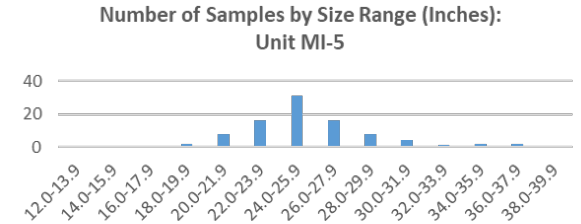
20
10
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9
36.0-37.9
38.0-39.9


Number of Samples by Size Range (Inches):
Unit MI-5
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20
0
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14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
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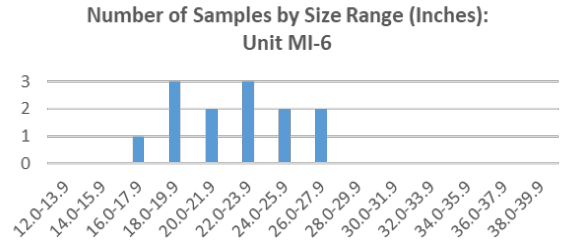
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Unit MI-6
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2
1
0
12.0-13.9
14.0-15.9
16.0-17.9
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20.0-21.9
22.0-23.9
24.0-25.9
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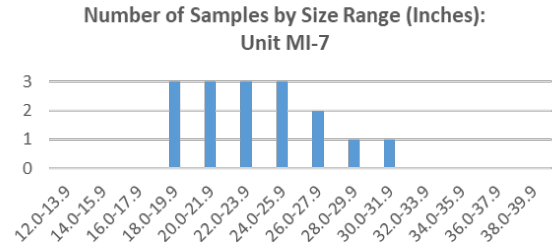
38.0-39.9


Number of Samples by Size Range (Inches):
Unit MI-7
3
2
1
0
12.0-13.9
14.0-15.9
16.0-17.9
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22.0-23.9
24.0-25.9
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34.0-35.9
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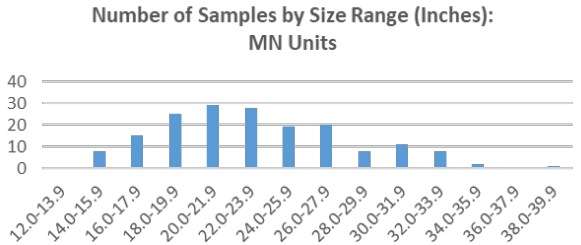
38.0-39.9


Number of Samples by Size Range (Inches):
MN Units
40
30
20
10
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
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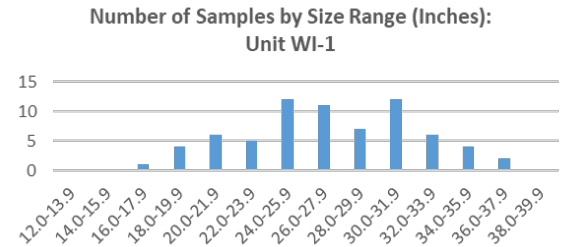
30.0-31.9
32.0-33.9
34.0-35.9
36.0-37.9
38.0-39.9


Number of Samples by Size Range (Inches):
Unit WI-1
15
10
5
0
12.0-13.9
14.0-15.9
16.0-17.9
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20.0-21.9
22.0-23.9
24.0-25.9
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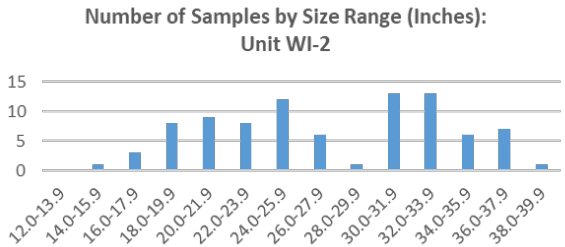
38.0-39.9


Number of Samples by Size Range (Inches):
Unit WI-2
15
10
5
0
12.0-13.9
14.0-15.9
16.0-17.9
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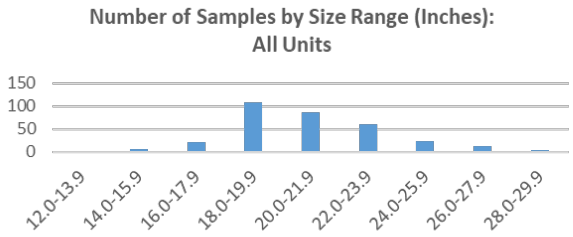
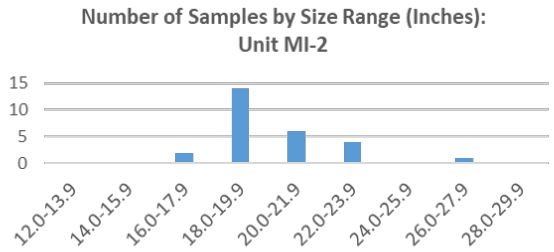
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9
36.0-37.9
38.0-39.9

LAKE TROUT


Number of Samples by Size Range (Inches):
All Units
150
100
50
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9


Number of Samples by Size Range (Inches):
Unit MI-2
15
10
5
0
12.0-13.9
14.0-15.9
16.0-17.9
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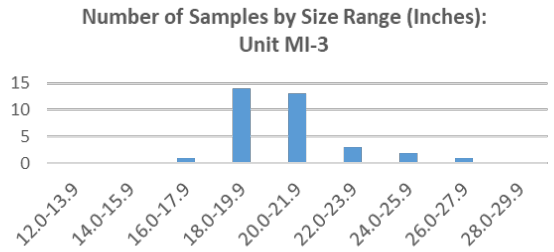
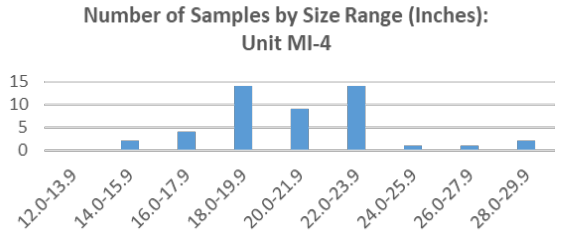
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9


Number of Samples by Size Range (Inches):
Unit MI-3
15
10
5
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9


Number of Samples by Size Range (Inches):
Unit MI-4
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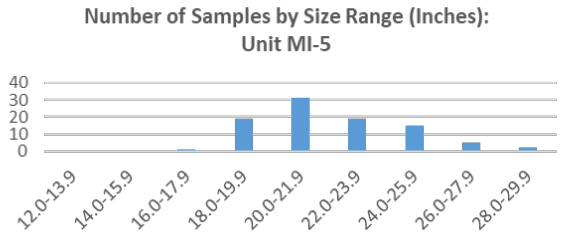
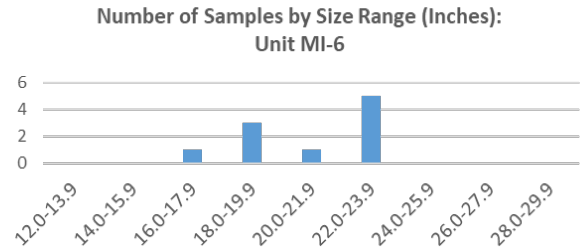
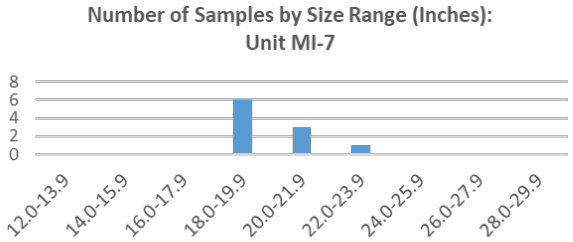
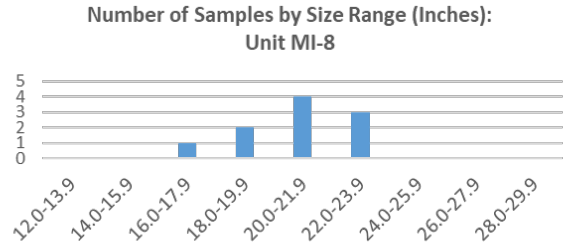
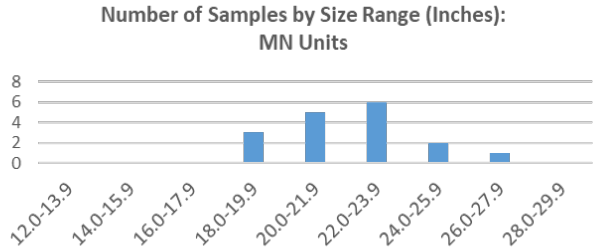
10
5
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

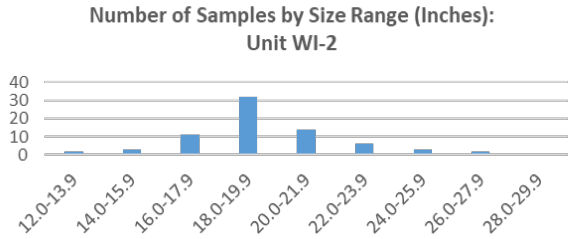

Number of Samples by Size Range (Inches):
Unit MI-5
40
30
20
10
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9


Number of Samples by Size Range (Inches):
Unit MI-6
6
4
2
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

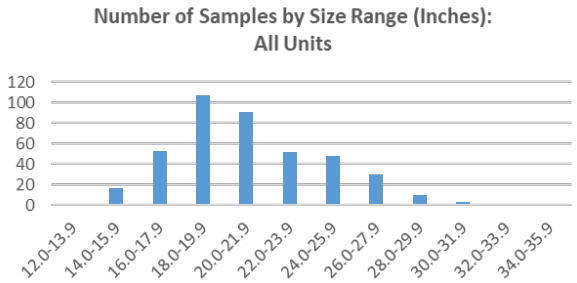

Number of Samples by Size Range (Inches):
Unit MI-7
8
6
4
2
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

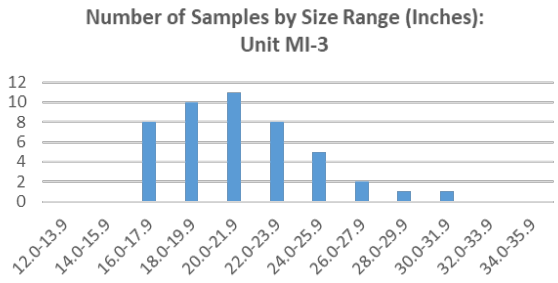

Number of Samples by Size Range (Inches):
Unit MI-8
5
4
3
2
1
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

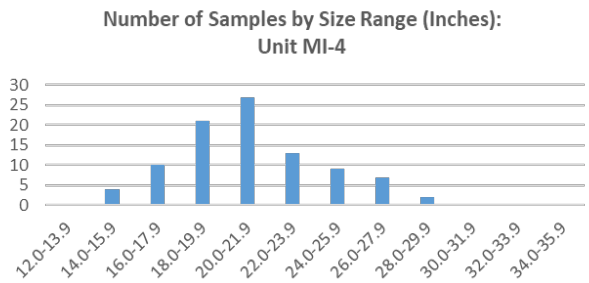

Number of Samples by Size Range (Inches):
MN Units
8
6
4
2
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

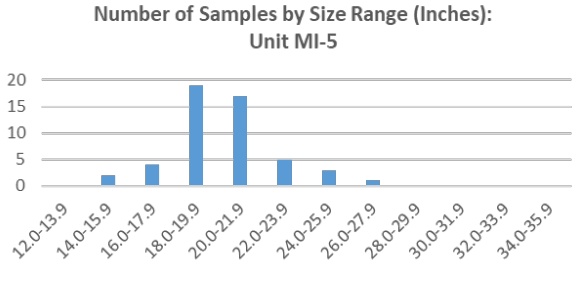

Number of Samples by Size Range (Inches):
Unit WI-2
40
30
20
10
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

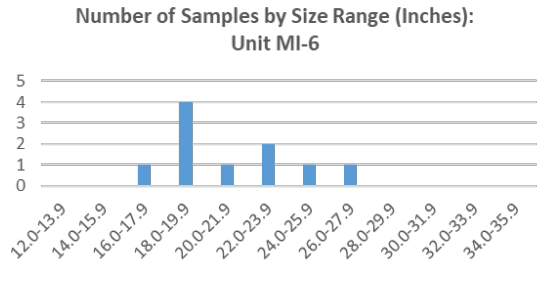
WHITEFISH

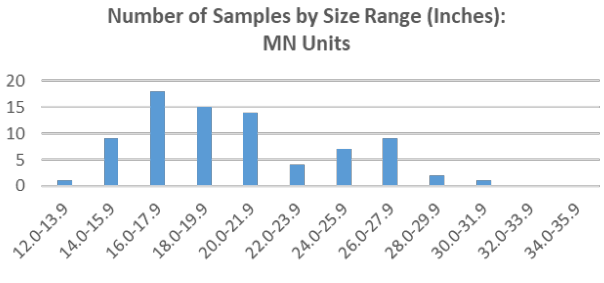

Number of Samples by Size Range (Inches):
All Units
120
100
80
60
40
20
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9

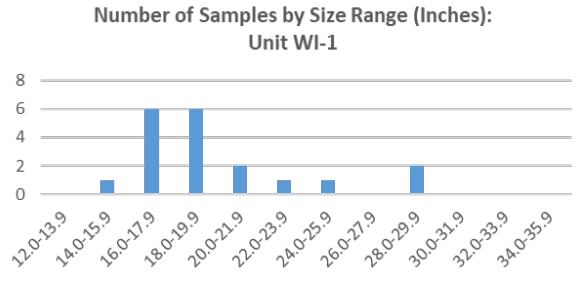

Number of Samples by Size Range (Inches):
Unit MI-3
12
10
8
6
4
2
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9

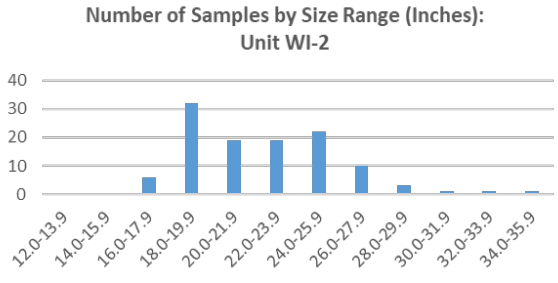

Number of Samples by Size Range (Inches):
Unit MI-4
30
25
20
15
10
5
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9


Number of Samples by Size Range (Inches):
Unit MI-5
20
15
10
5
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9

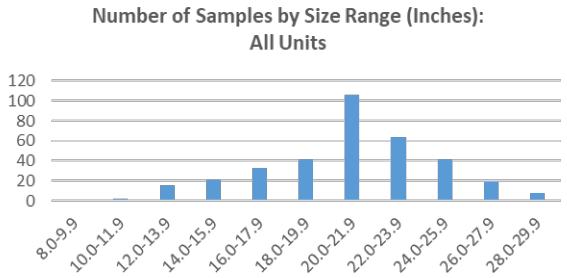

Number of Samples by Size Range (Inches):
Unit MI-6
5
4
3
2
1
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9

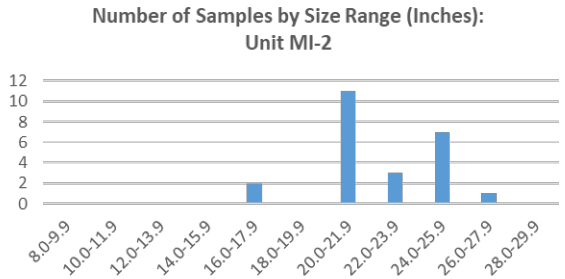

Number of Samples by Size Range (Inches):
MN Units
20
15
10
5
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9

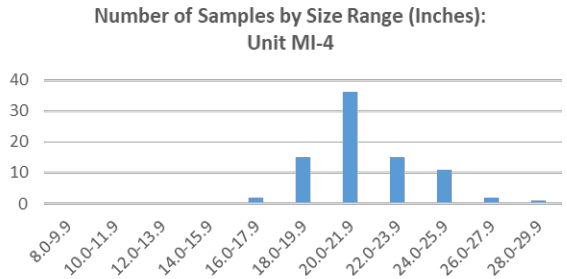

Number of Samples by Size Range (Inches):
Unit WI-1
8
6
4
2
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9

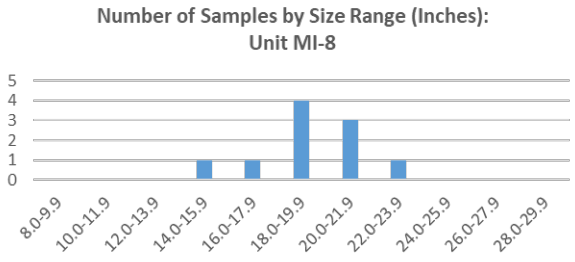

Number of Samples by Size Range (Inches):
Unit WI-2
40
30
20
10
0
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9
30.0-31.9
32.0-33.9
34.0-35.9

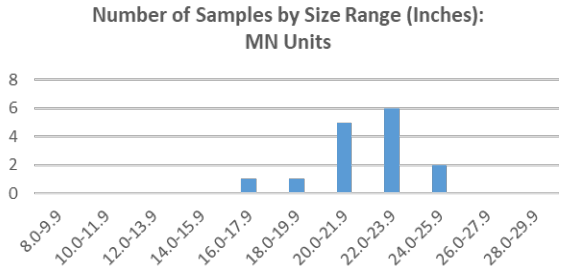
SISCOWET

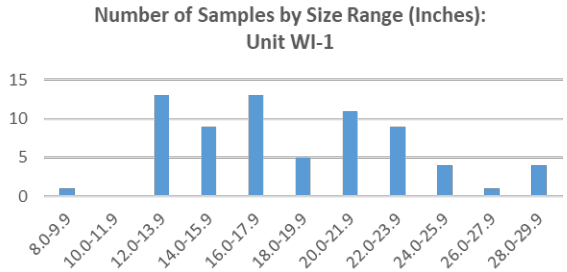

Number of Samples by Size Range (Inches):
All Units
120
100
80
60
40
20
0
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

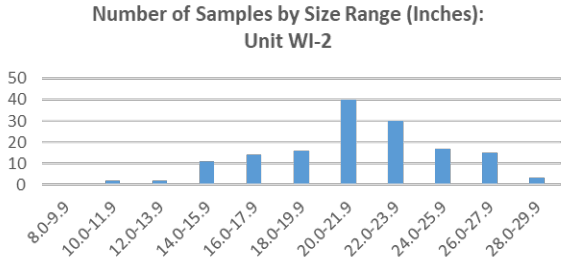

Number of Samples by Size Range (Inches):
Unit MI-2
12
10
8
6
4
2
0
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9


Number of Samples by Size Range (Inches):
Unit MI-4
40
30
20
10
0
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

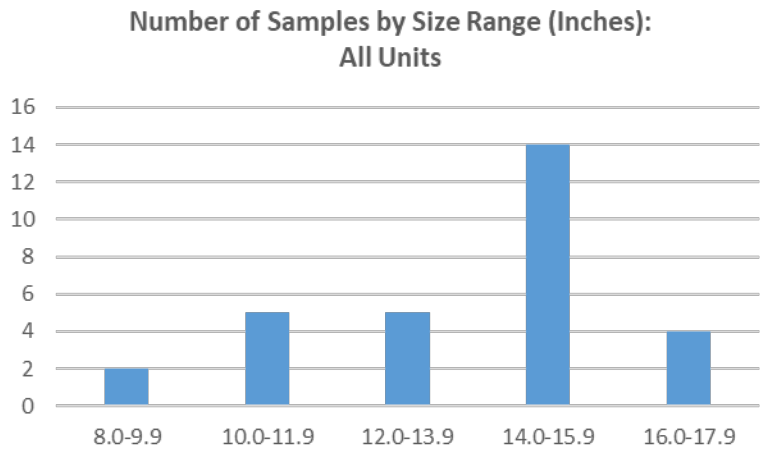

Number of Samples by Size Range (Inches):
Unit MI-8
5
4
3
2
1
0
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

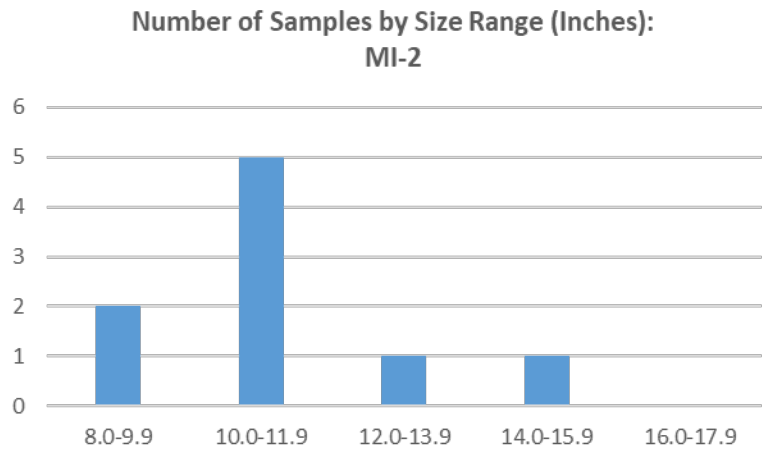

Number of Samples by Size Range (Inches):
MN Units
8
6
4
2
0
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

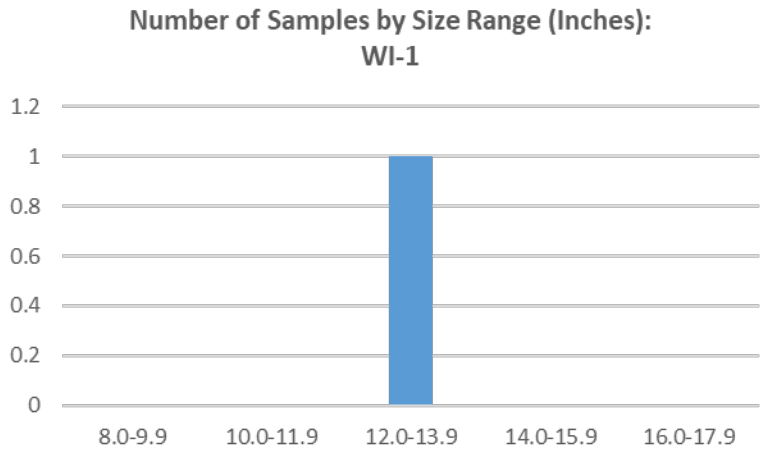

Number of Samples by Size Range (Inches):
Unit WI-1
15
10
5
0
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

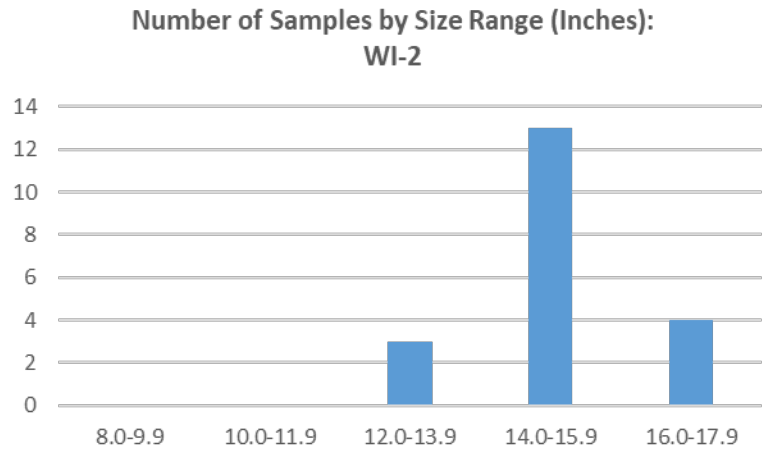

Number of Samples by Size Range (Inches):
Unit WI-2
50
40
30
20
10
0
8.0-9.9
10.0-11.9
12.0-13.9
14.0-15.9
16.0-17.9
18.0-19.9
20.0-21.9
22.0-23.9
24.0-25.9
26.0-27.9
28.0-29.9

WALLEYE

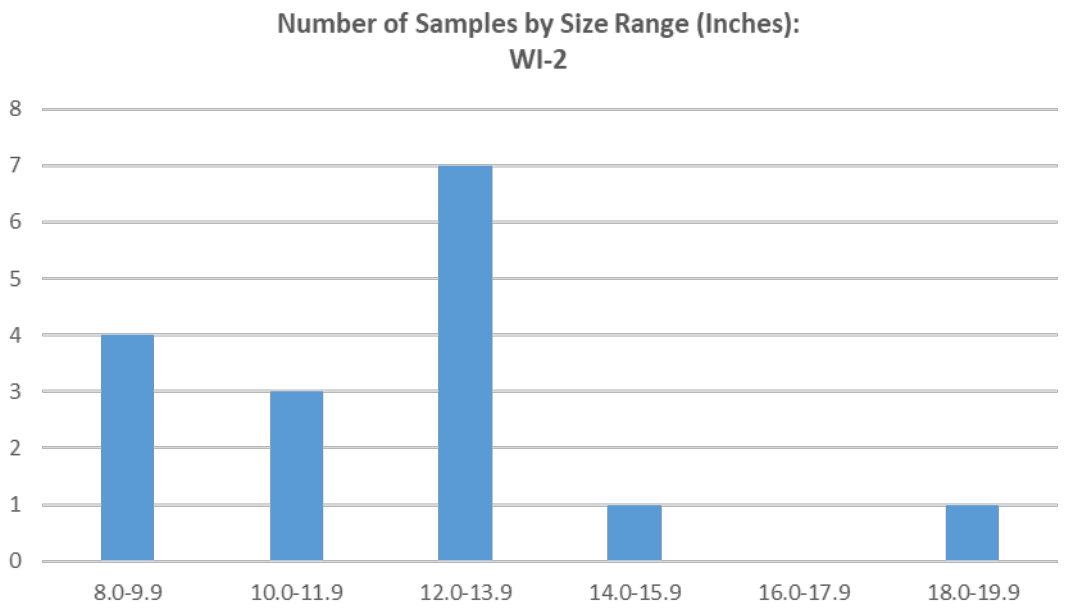








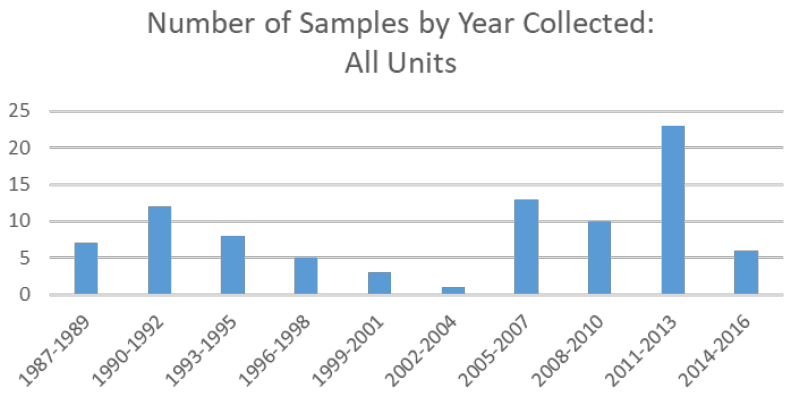
WHITE SUCKER

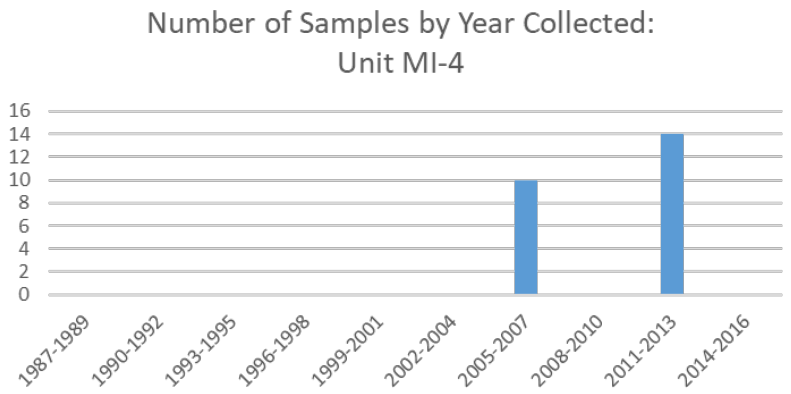


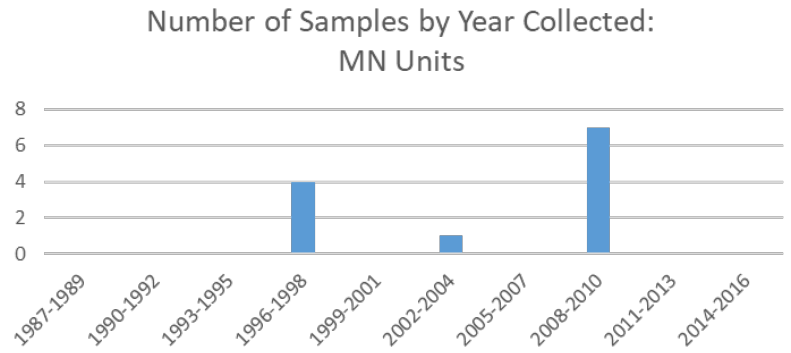
SHORTHEAD REDHORSE

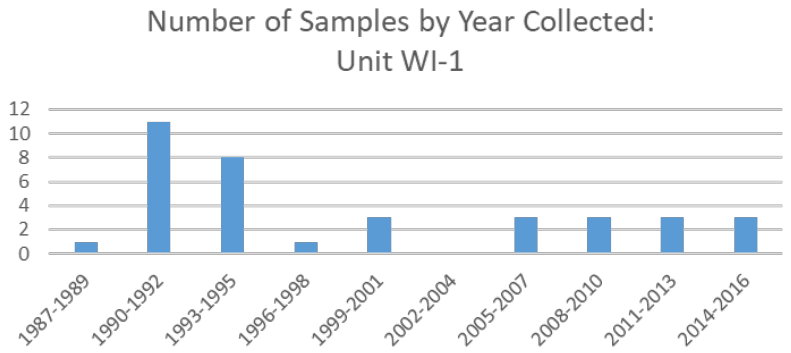
APPENDIX B

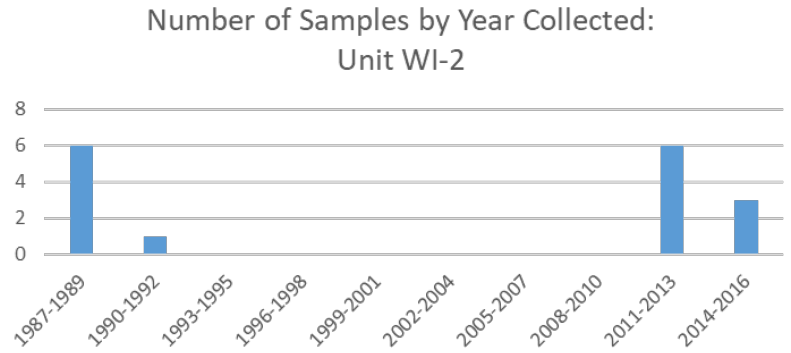
Database Collection Year Distributions by Management Unit


Number of Samples by Year Collected:
All Units
25
20
15
10
5
0
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016

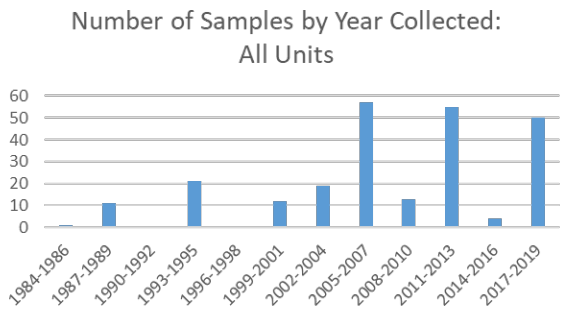

Number of Samples by Year Collected:
Unit MI-4
16
14
12
10
8
6
4
2
0
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016

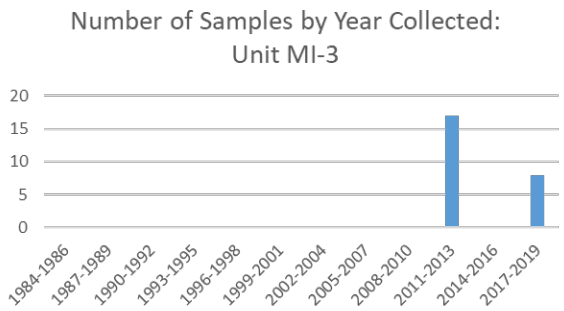

Number of Samples by Year Collected:
MN Units
8
6
4
2
0
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016

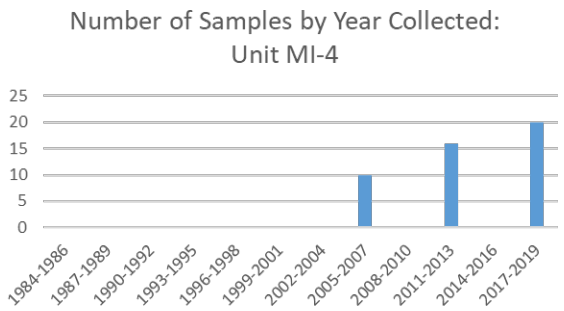

Number of Samples by Year Collected:
Unit WI-1
12
10
8
6
4
2
0
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016

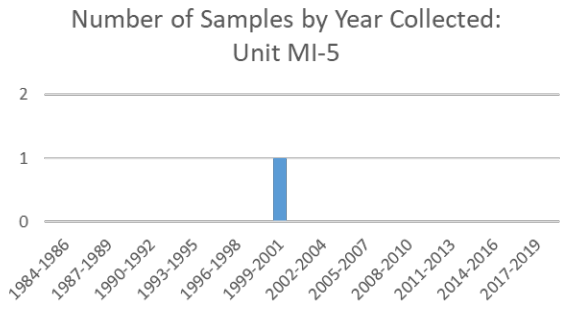

Number of Samples by Year Collected:
Unit WI-2
8
6
4
2
0
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016

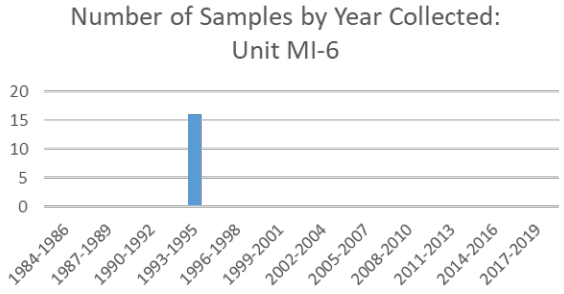
BURBOT


Number of Samples by Year Collected:
All Units
60
50
40
30
20
10
0
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019


Number of Samples by Year Collected:
Unit MI-3
20
15
10
5
0
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019


Number of Samples by Year Collected:
Unit MI-4
25
20
15
10
5
0
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019


Number of Samples by Year Collected:
Unit MI-5
2
1
0
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019


Number of Samples by Year Collected:
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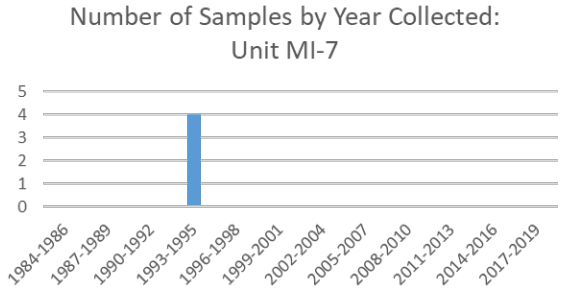
Number of Samples by Year Collected:
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3
2
1
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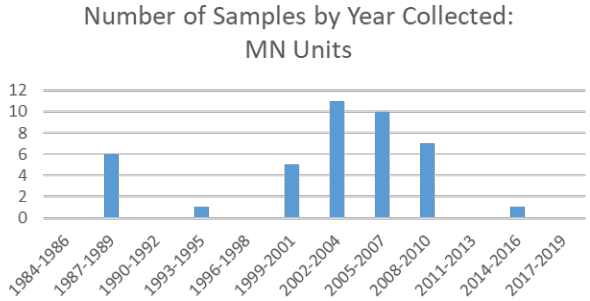
Number of Samples by Year Collected:
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8
6
4
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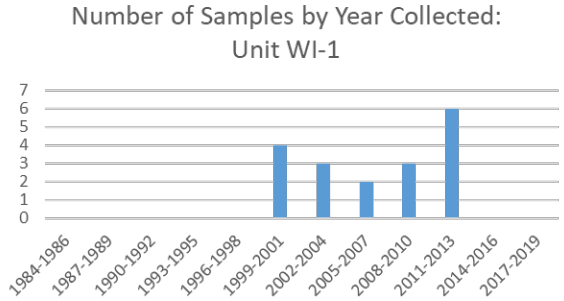
Number of Samples by Year Collected:
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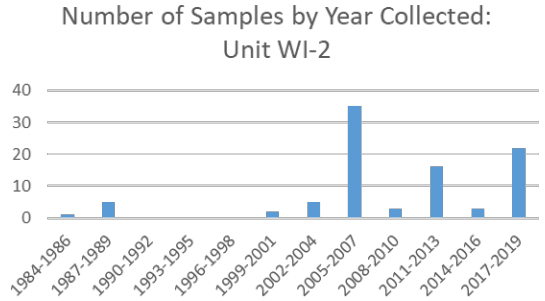
Number of Samples by Year Collected:
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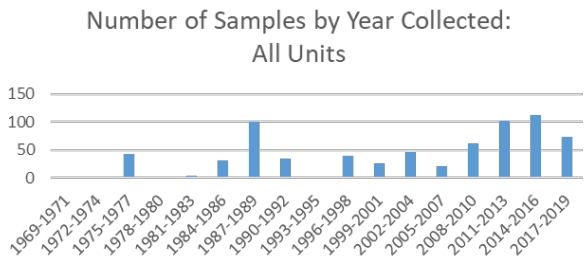
Number of Samples by Year Collected:
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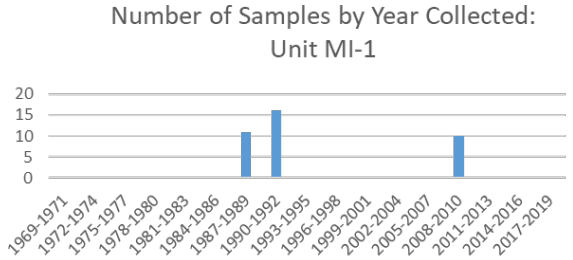
Number of Samples by Year Collected:
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1972-1974
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1978-1980
1981-1983
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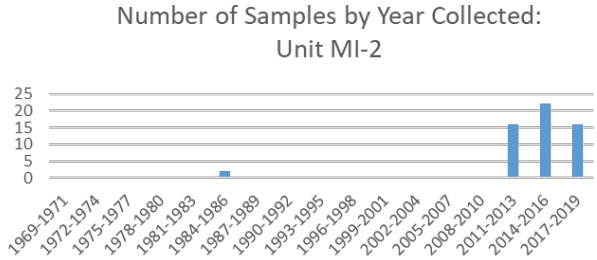
Number of Samples by Year Collected:
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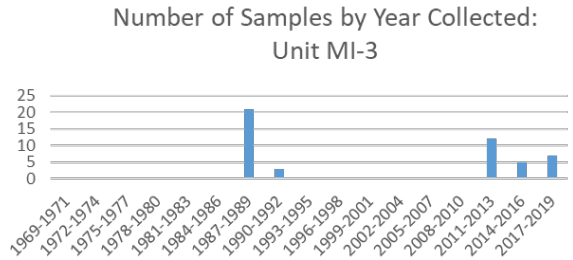
Number of Samples by Year Collected:
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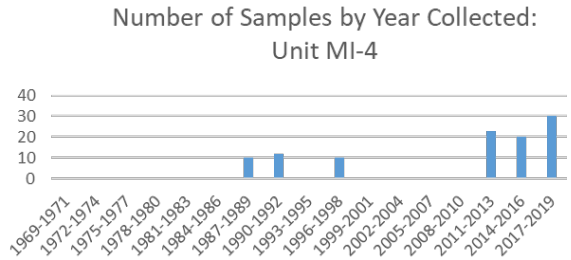
Number of Samples by Year Collected:
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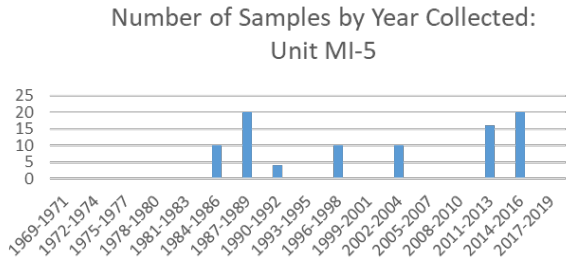
Number of Samples by Year Collected:
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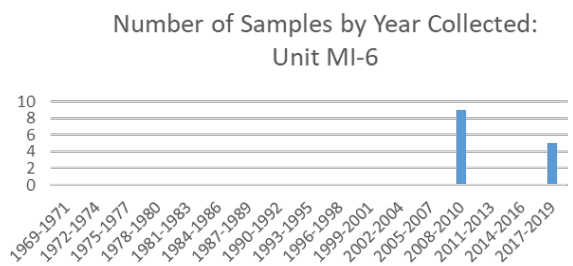
Number of Samples by Year Collected:
Unit MI-6
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8
6
4
2
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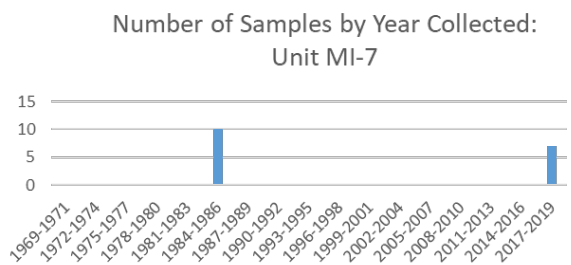
Number of Samples by Year Collected:
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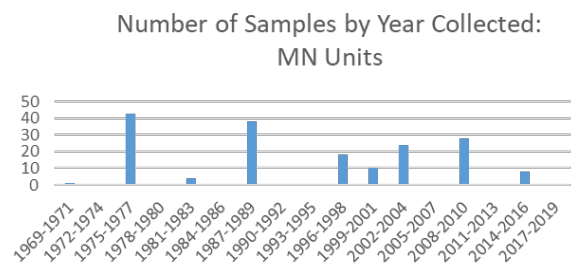
Number of Samples by Year Collected:
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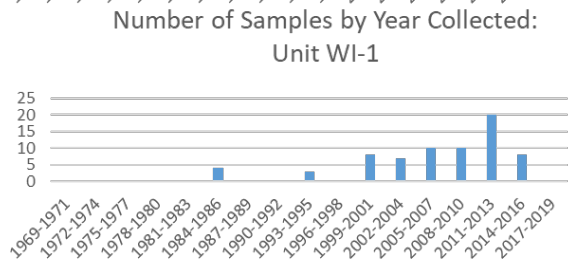
Number of Samples by Year Collected:
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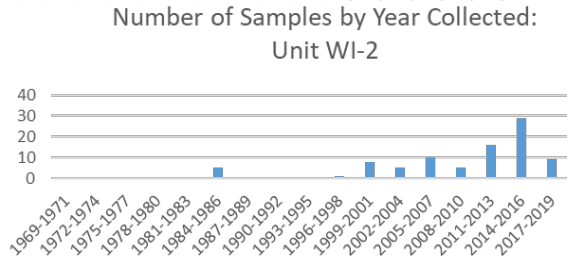
Number of Samples by Year Collected:
Unit WI-2
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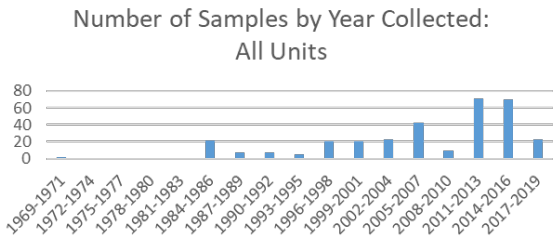
Number of Samples by Year Collected:
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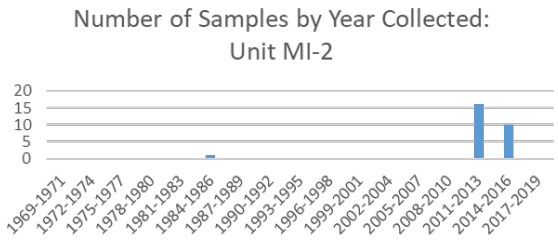
Number of Samples by Year Collected:
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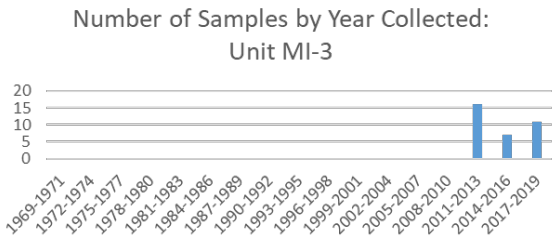
Number of Samples by Year Collected:
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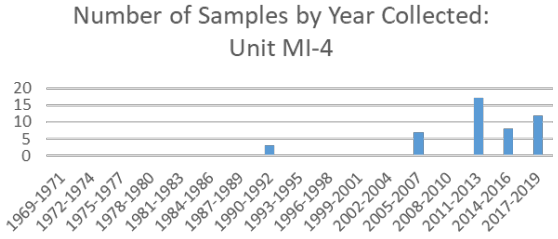
Number of Samples by Year Collected:
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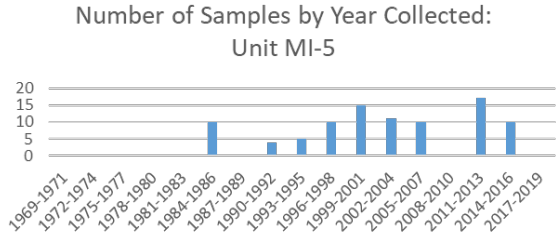
Number of Samples by Year Collected:
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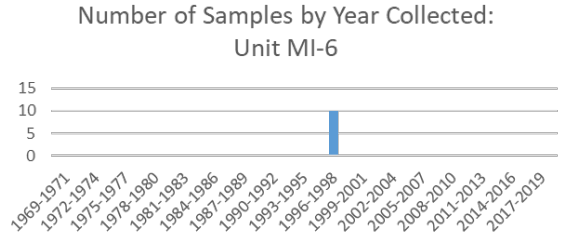
Number of Samples by Year Collected:
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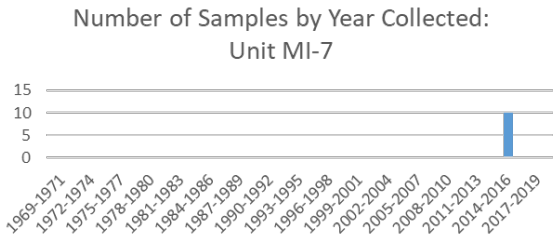
Number of Samples by Year Collected:
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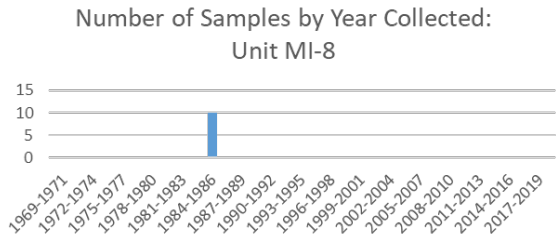
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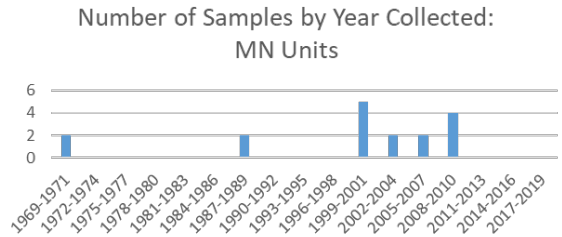
Number of Samples by Year Collected:
MN Units
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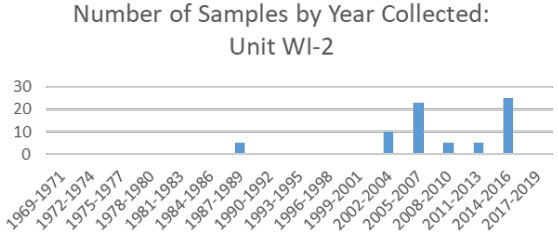
Number of Samples by Year Collected:
Unit WI-2
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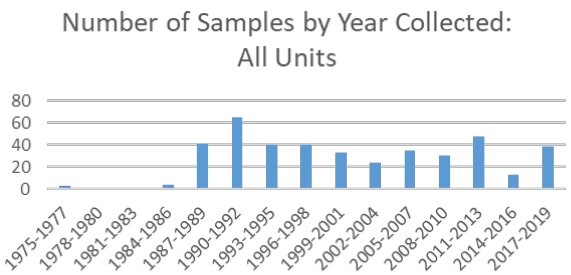
Number of Samples by Year Collected:
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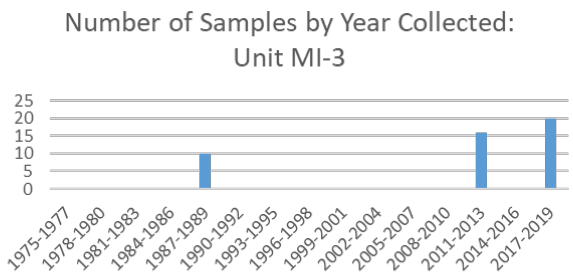
Number of Samples by Year Collected:
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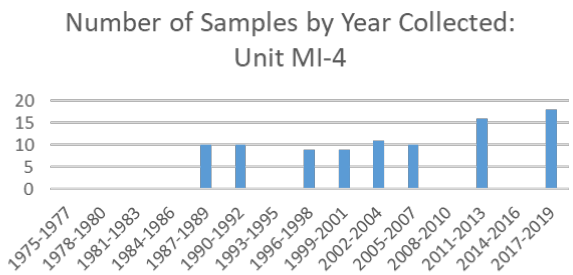
Number of Samples by Year Collected:
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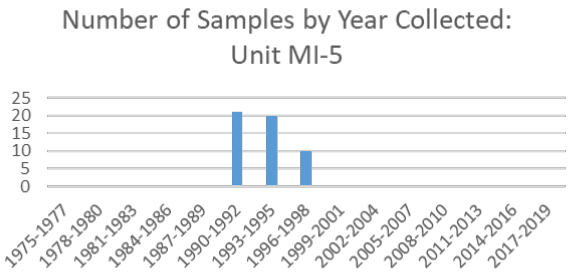
Number of Samples by Year Collected:
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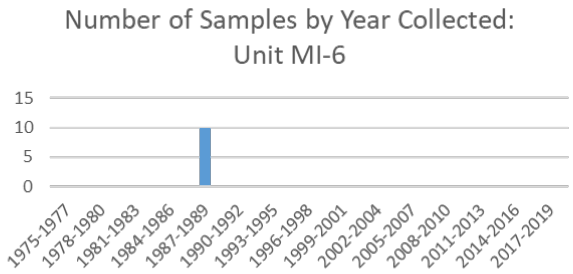
Number of Samples by Year Collected:
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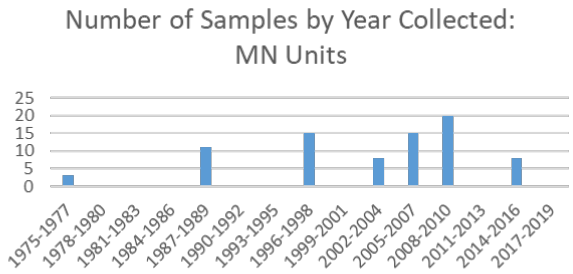
Number of Samples by Year Collected:
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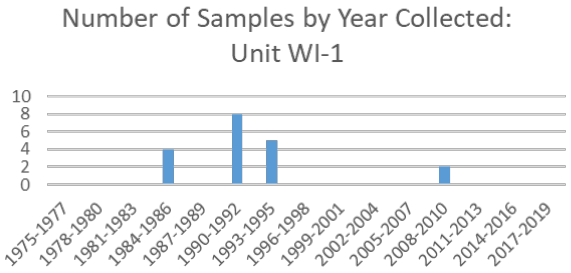
Number of Samples by Year Collected:
Unit WI-1
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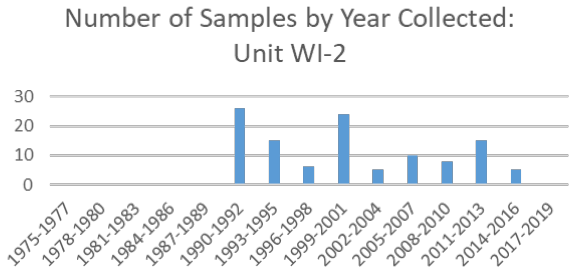
Number of Samples by Year Collected:
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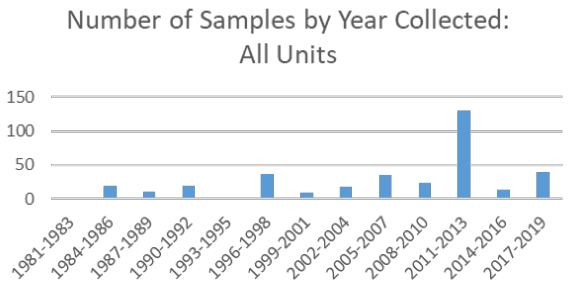
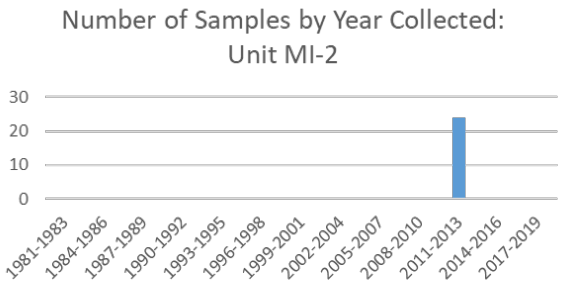
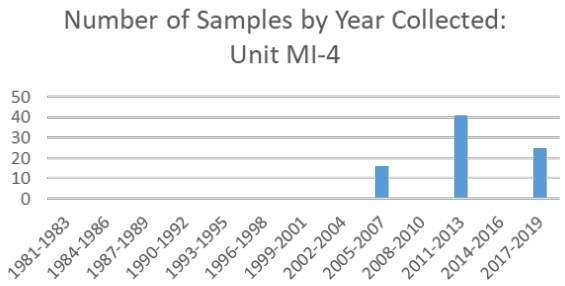
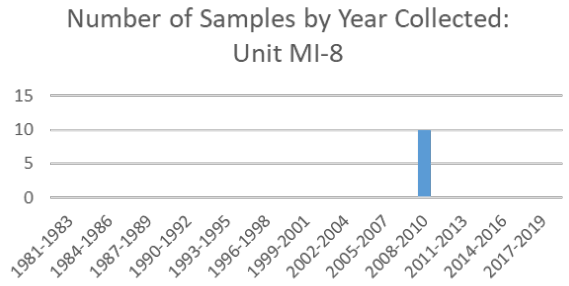
2017-2019

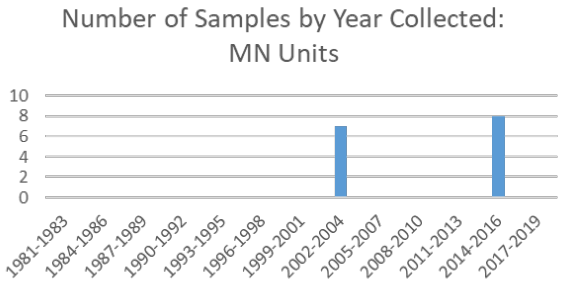
SISCOWET

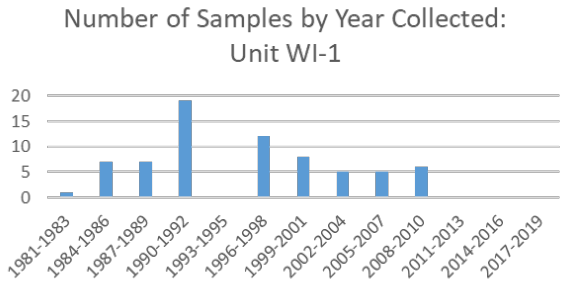

Number of Samples by Year Collected:
All Units
150
100
50
0
1981-1983
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019

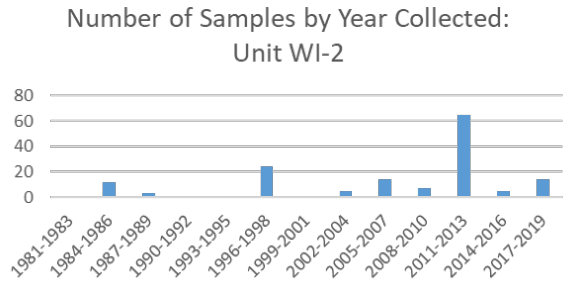

Number of Samples by Year Collected:
Unit MI-2
30
20
10
0
1981-1983
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019


Number of Samples by Year Collected:
Unit MI-4
50
40
30
20
10
0
1981-1983
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019

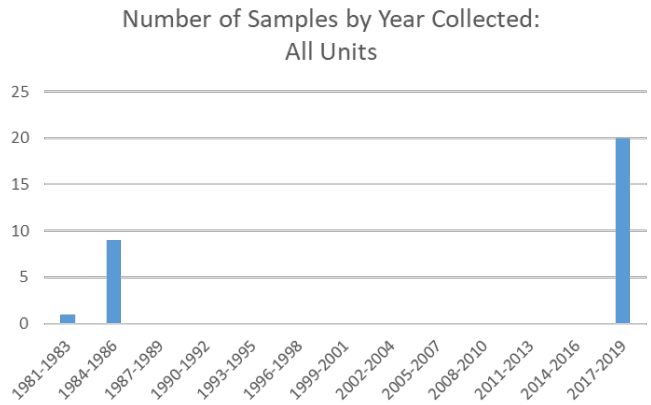

Number of Samples by Year Collected:
Unit MI-8
15
10
5
0
1981-1983
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019

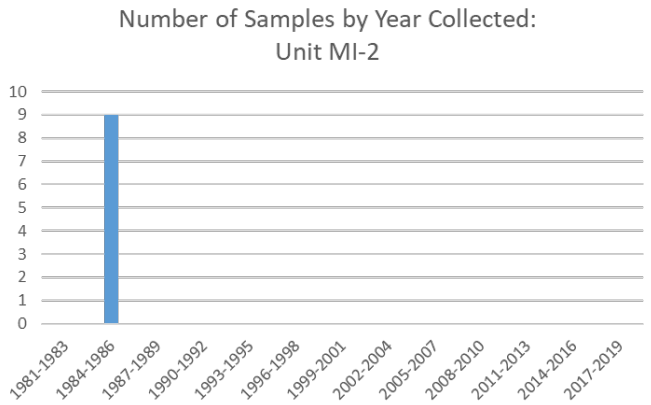

Number of Samples by Year Collected:
MN Units
10
8
6
4
2
0
1981-1983
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019

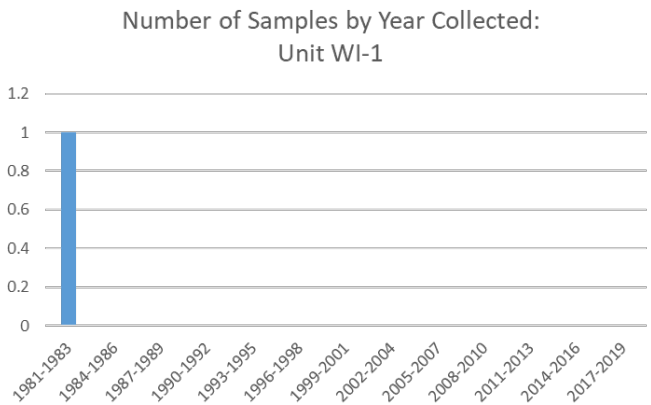

Number of Samples by Year Collected:
Unit WI-1
20
15
10
5
0
1981-1983
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019

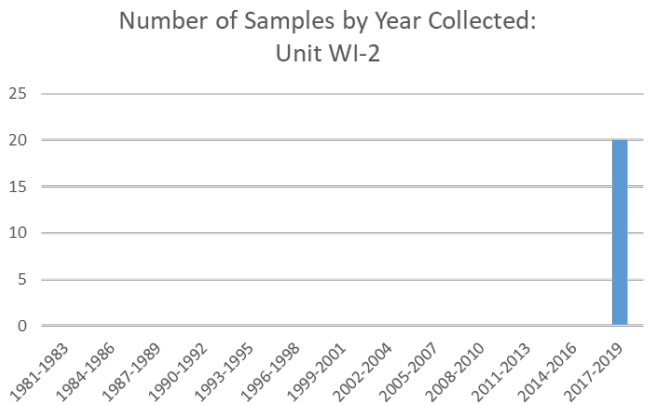

Number of Samples by Year Collected:
Unit WI-2
80
60
40
20
0
1981-1983
1984-1986
1987-1989
1990-1992
1993-1995
1996-1998
1999-2001
2002-2004
2005-2007
2008-2010
2011-2013
2014-2016
2017-2019

WALLEYE

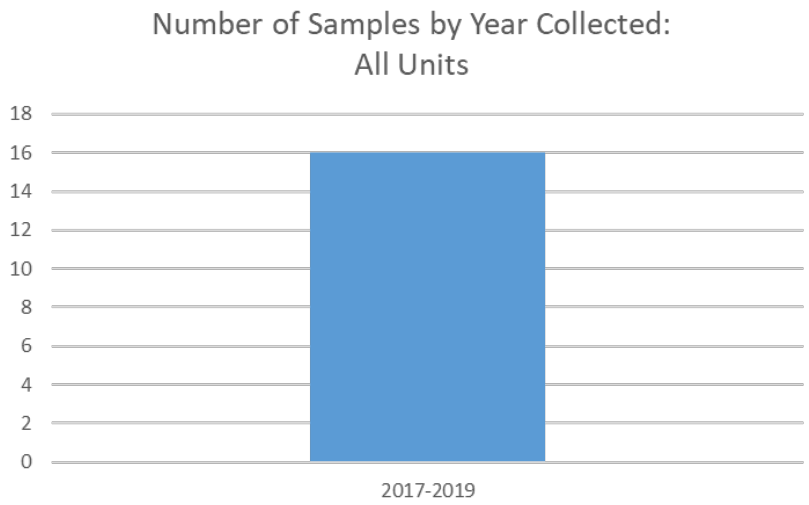


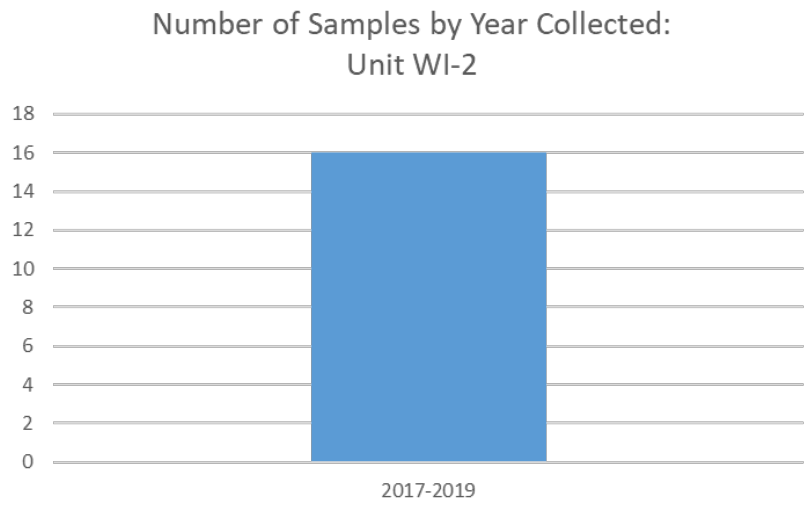






WHITE SUCKER

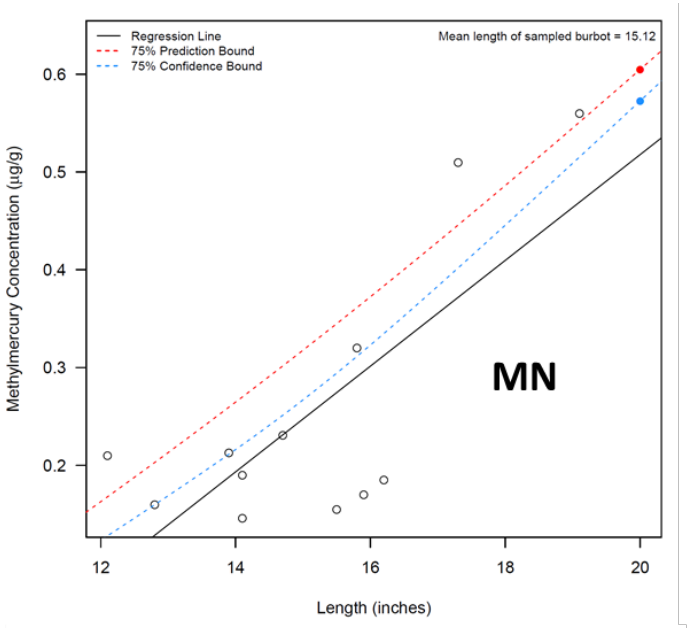


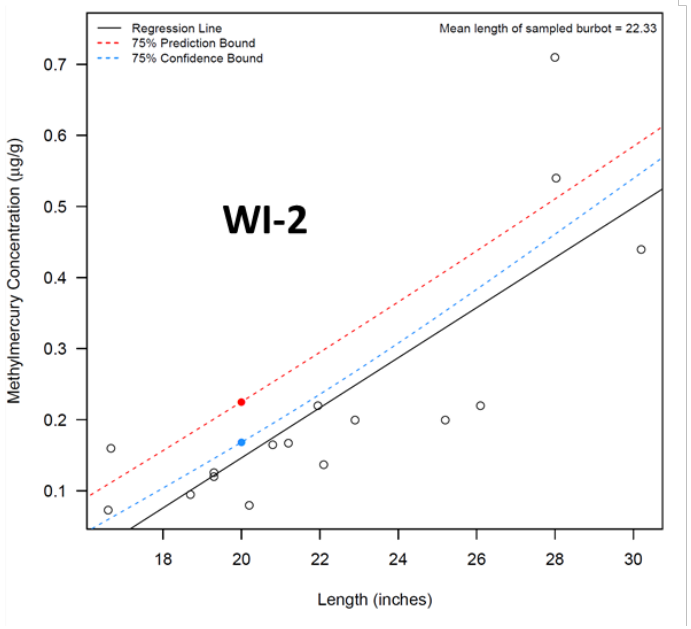


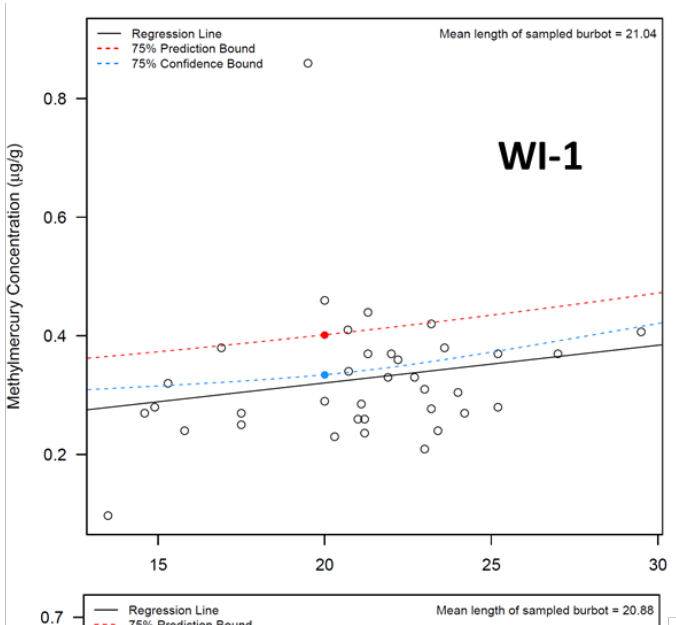
SHORTHEAD REDHORSE

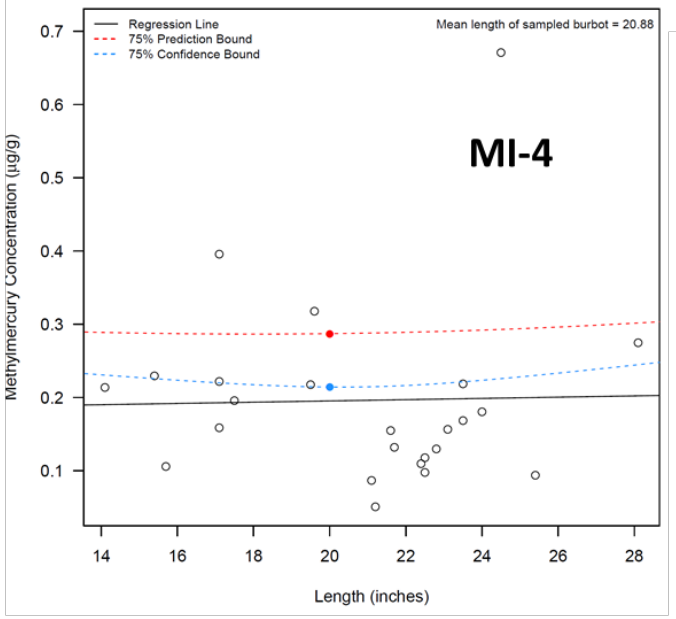
APPENDIX C

Mercury vs. Length Regressions for Eight Species by Lake Superior Management Unit

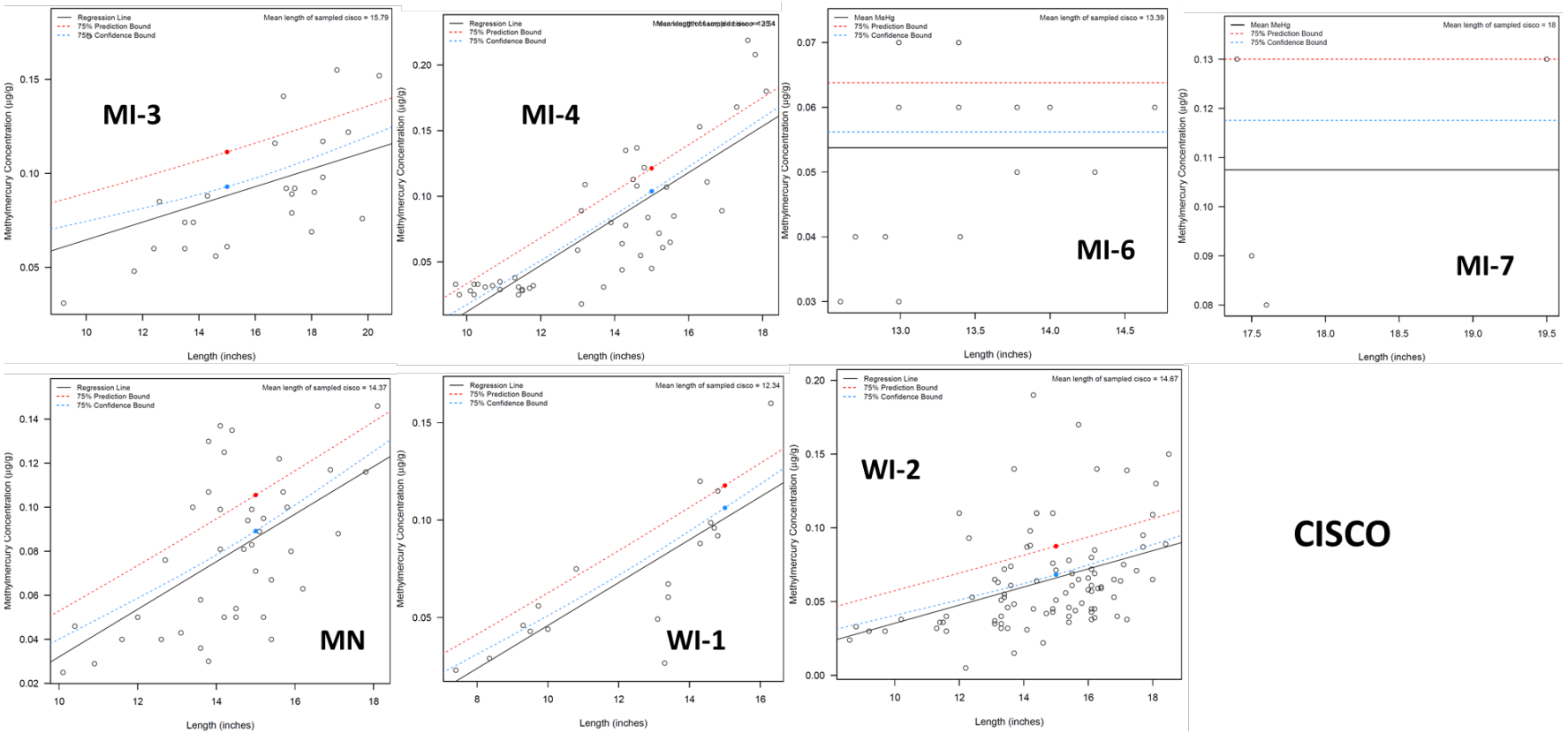

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled burbot = 15.12
MN
Methylmercury Concentration (µg/g)
Length (inches)

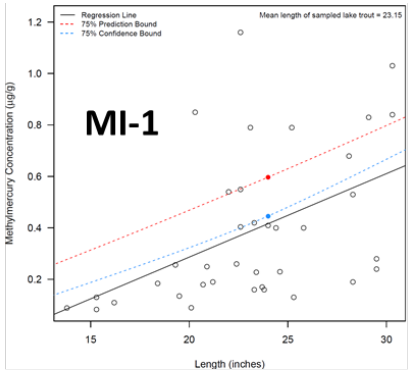

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled burbot = 22.33
WI-2
Methylmercury Concentration (µg/g)
Length (inches)

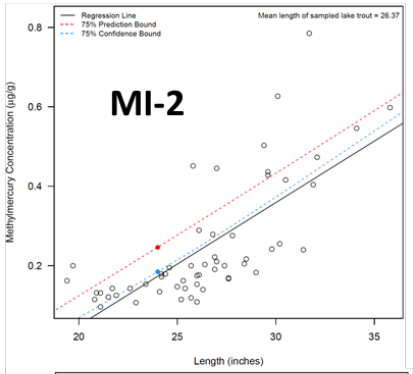

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled burbot = 21.04
WI-1
Methylmercury Concentration (µg/g)

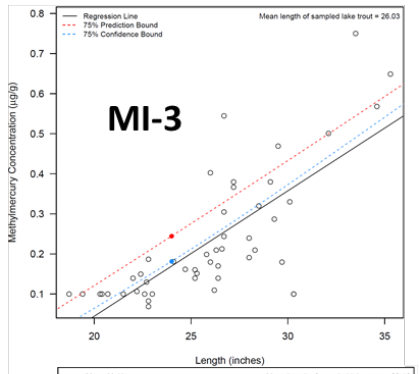

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled burbot = 20.88
MI-4
Methylmercury Concentration (µg/g)
Length (inches)

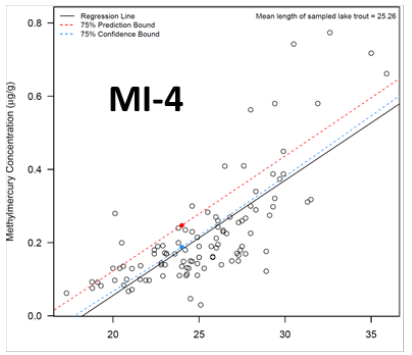
BURBOT

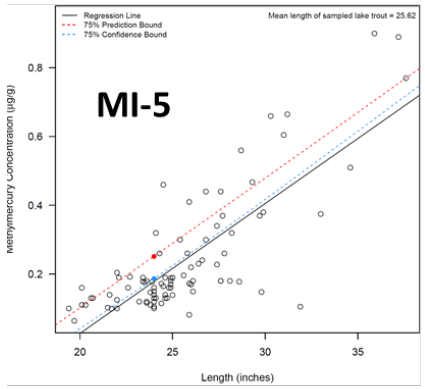

MI-3
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled cisco = 15.79
Methylmercury Concentration (µg/g)
Length (inches)
MI-4
Regression Line
75% Prediction Bound
75% Confidence Bound
Methylmercury Concentration (µg/g)
Length (inches)
MI-6
Mean MeHg
75% Prediction Bound
75% Confidence Bound
Mean length of sampled cisco = 13.39
Methylmercury Concentration (µg/g)
Length (inches)
MI-7
Mean MeHg
75% Prediction Bound
75% Confidence Bound
Mean length of sampled cisco = 18
Methylmercury Concentration (µg/g)
Length (inches)
MN
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled cisco = 14.37
Methylmercury Concentration (µg/g)
Length (inches)
WI-1
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled cisco = 12.34
Methylmercury Concentration (µg/g)
Length (inches)
WI-2
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled cisco = 14.67
Methylmercury Concentration (µg/g)
Length (inches)
CISCO

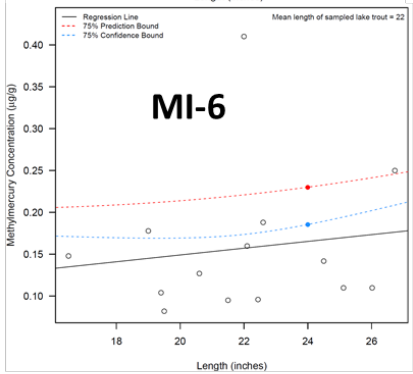

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 23.15
MI-1
Methylmercury Concentration (µg/g)
Length (inches)

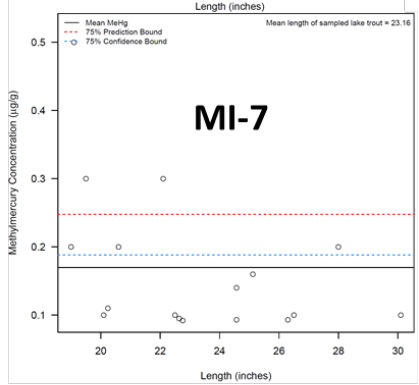

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 26.37
MI-2
Methylmercury Concentration (µg/g)
Length (inches)


Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 26.03
MI-3
Methylmercury Concentration (µg/g)
Length (inches)

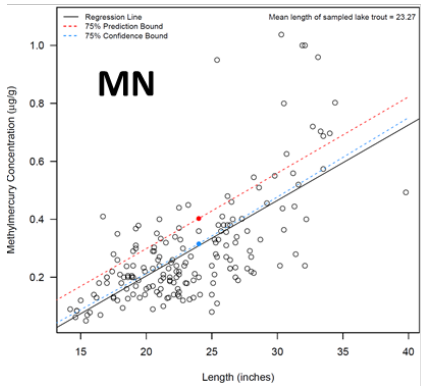

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 25.26
MI-4
Methylmercury Concentration (µg/g)

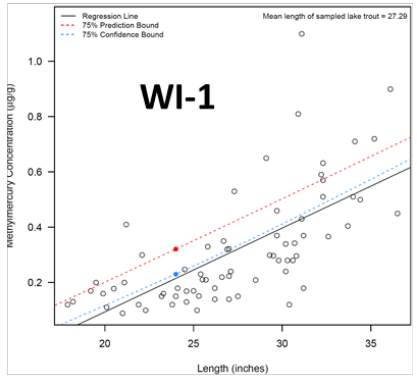

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 25.62
MI-5
Length (inches)

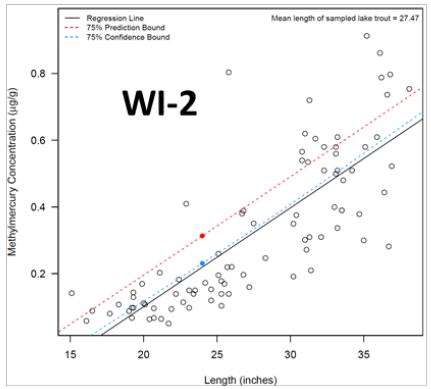

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 22
MI-6
Methylmercury Concentration (µg/g)
Length (inches)

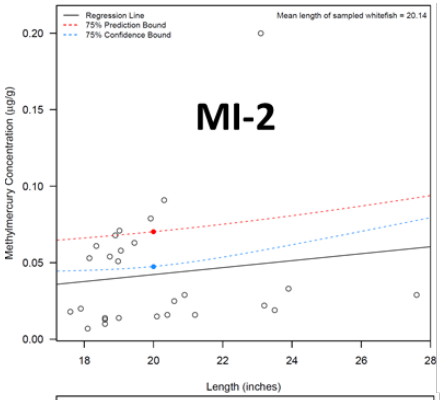

Mean MeHg
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 23.16
MI-7
Methylmercury Concentration (µg/g)
Length (inches)

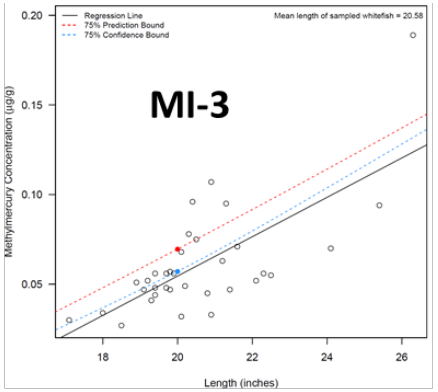
LAKE TROUT

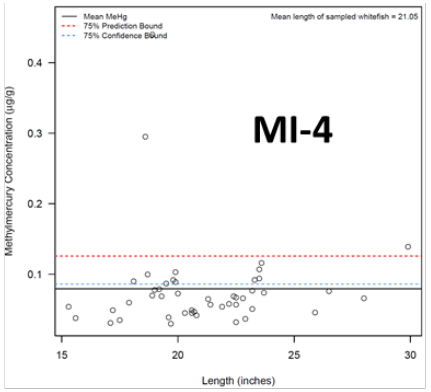

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 23.27
MN
Methylmercury Concentration (µg/g)
Length (inches)

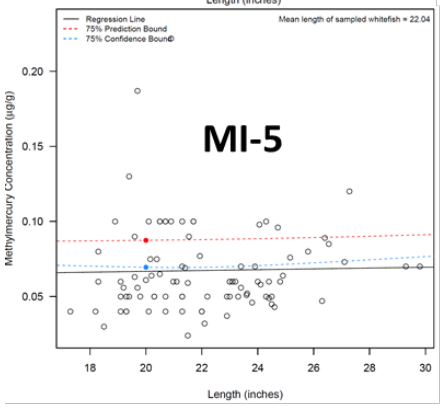

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 27.29
WI-1
Length (inches)

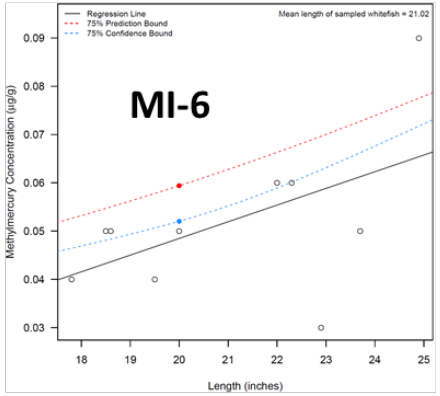

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled lake trout = 27.47
WI-2
Methylmercury Concentration (µg/g)
Length (inches)

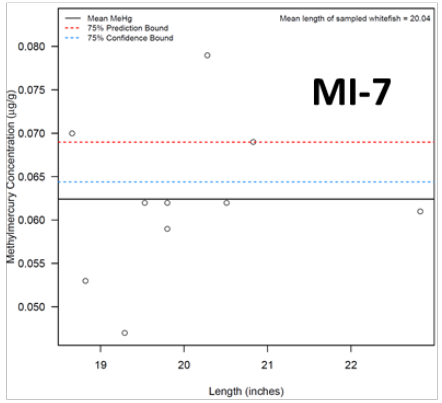

MI-2
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 20.14
Methylmercury Concentration (µg/g)
Length (inches)


MI-3
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 20.58
Methylmercury Concentration (µg/g)
Length (inches)

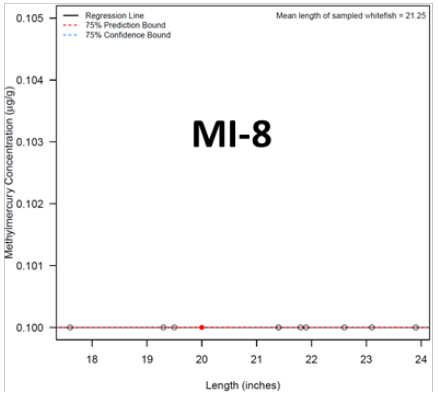

MI-4
Mean MeHg
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 21.05
Methylmercury Concentration (µg/g)
Length (inches)

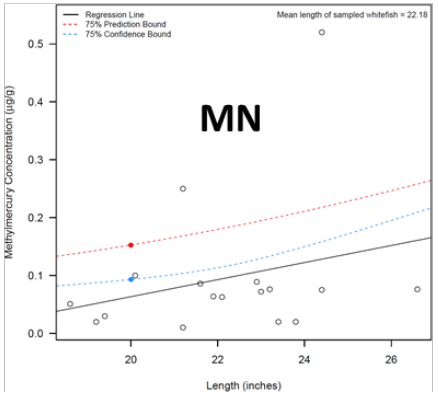

MI-5
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 22.04
Methylmercury Concentration (µg/g)
Length (inches)

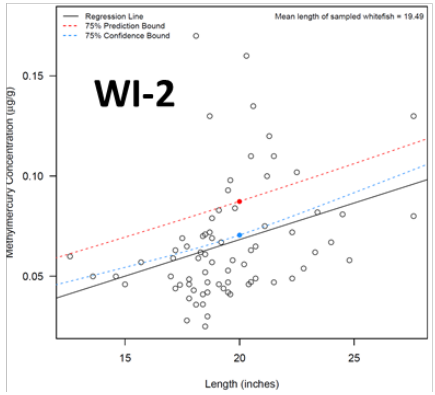

MI-6
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 21.02
Methylmercury Concentration (µg/g)
Length (inches)

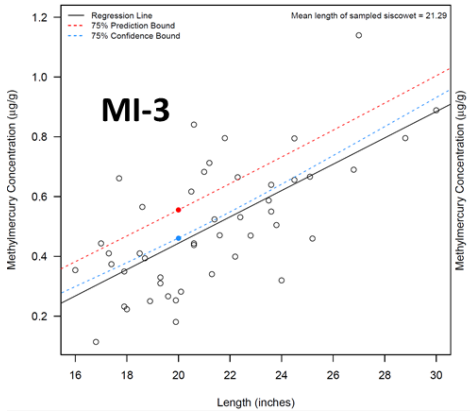

MI-7
Mean MeHg
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 20.04
Methylmercury Concentration (µg/g)
Length (inches)

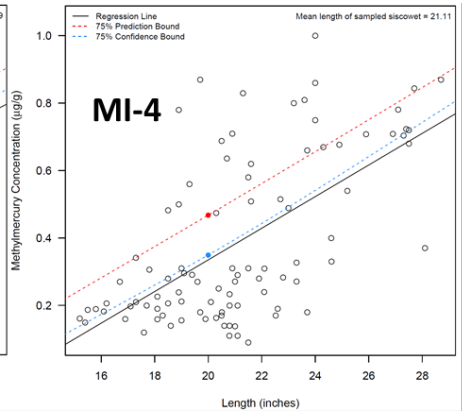
WHITEFISH

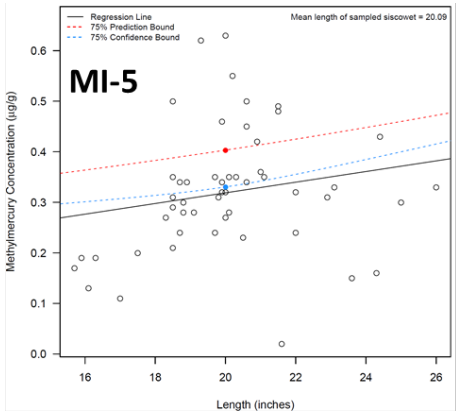

MI-8
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 21.25
Methylmercury Concentration (µg/g)
Length (inches)

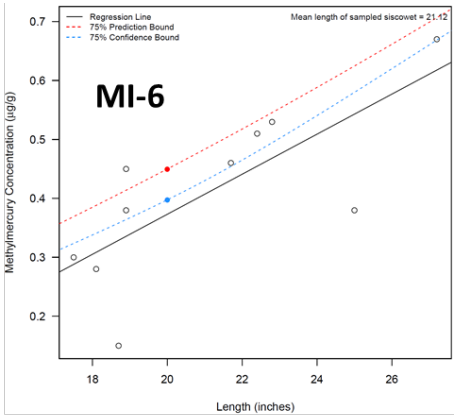

MN
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 22.18
Methylmercury Concentration (µg/g)
Length (inches)

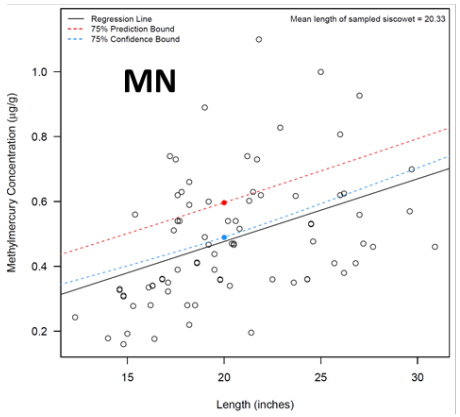

WI-2
Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled whitefish = 19.49
Methylmercury Concentration (µg/g)
Length (inches)

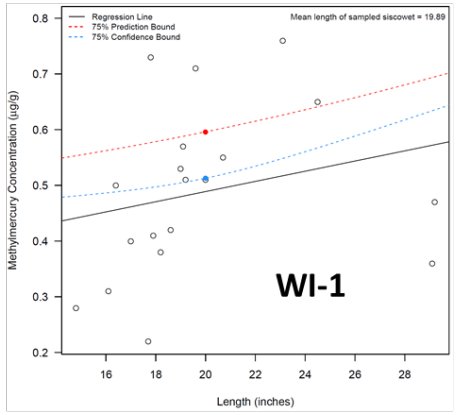

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled siscowet = 21.29
MI-3
Methylmercury Concentration (µg/g)
Length (inches)

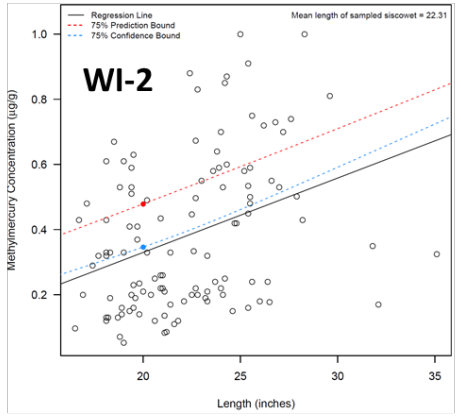

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled siscowet = 21.11
MI-4
Methylmercury Concentration (µg/g)
Length (inches)


Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled siscowet = 20.09
MI-5
Methylmercury Concentration (µg/g)
Length (inches)

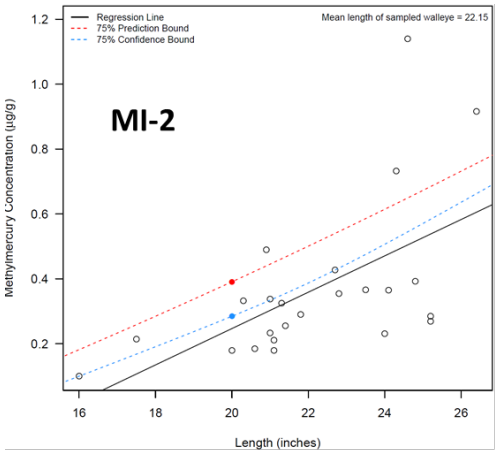

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled siscowet = 21.12
MI-6
Methylmercury Concentration (µg/g)
Length (inches)

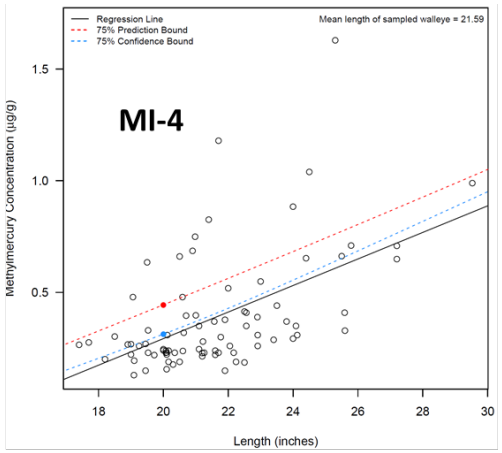

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled siscowet = 20.33
MN
Methylmercury Concentration (µg/g)
Length (inches)

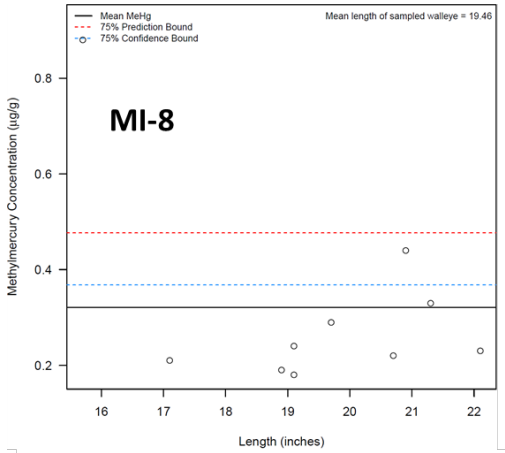

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled siscowet = 19.89
WI-1
Methylmercury Concentration (µg/g)
Length (inches)


Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled siscowet = 22.31
WI-2
Methylmercury Concentration (µg/g)
Length (inches)

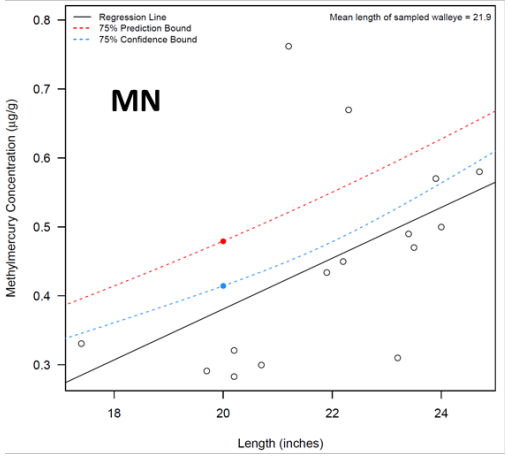
SISCOWET

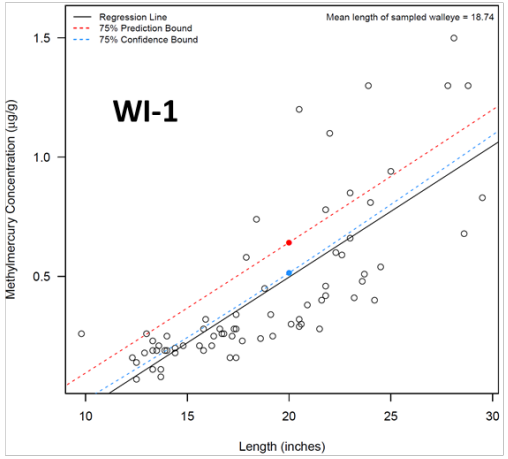

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled walleye = 22.15
MI-2
Methylmercury Concentration (µg/g)
Length (inches)

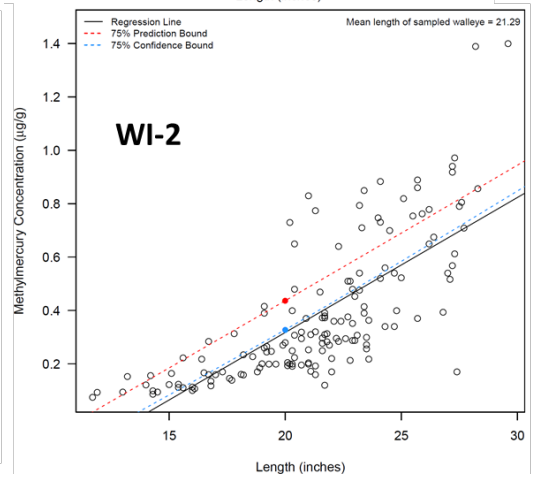

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled walleye = 21.59
MI-4
Methylmercury Concentration (µg/g)
Length (inches)

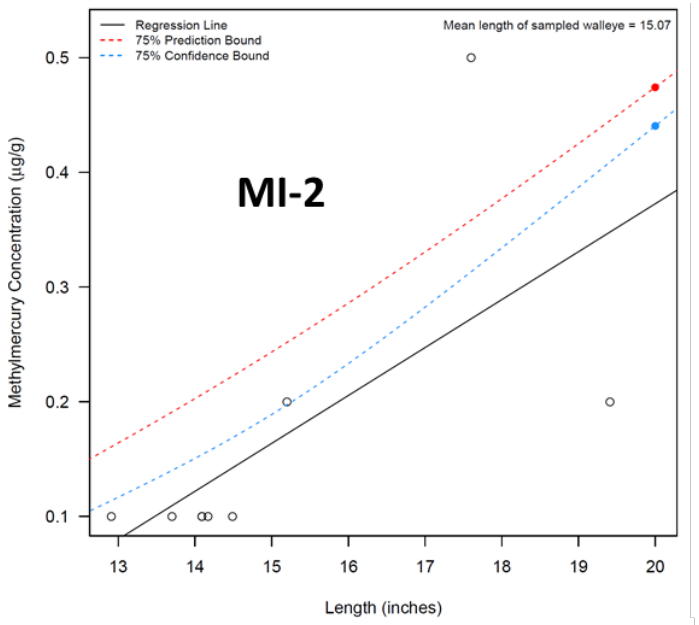

Mean MeHg
75% Prediction Bound
75% Confidence Bound
Mean length of sampled walleye = 19.46
MI-8
Methylmercury Concentration (µg/g)
Length (inches)

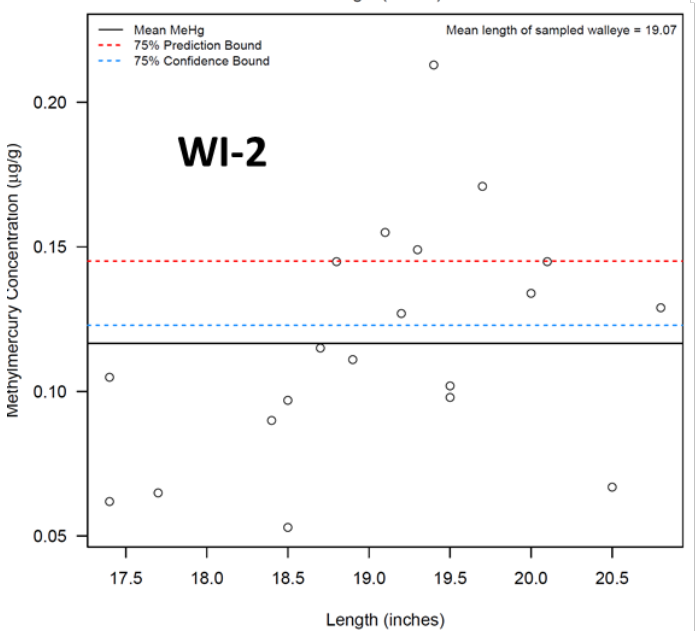
WALLEYE


Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled walleye = 21.9
MN
Methylmercury Concentration (µg/g)
Length (inches)

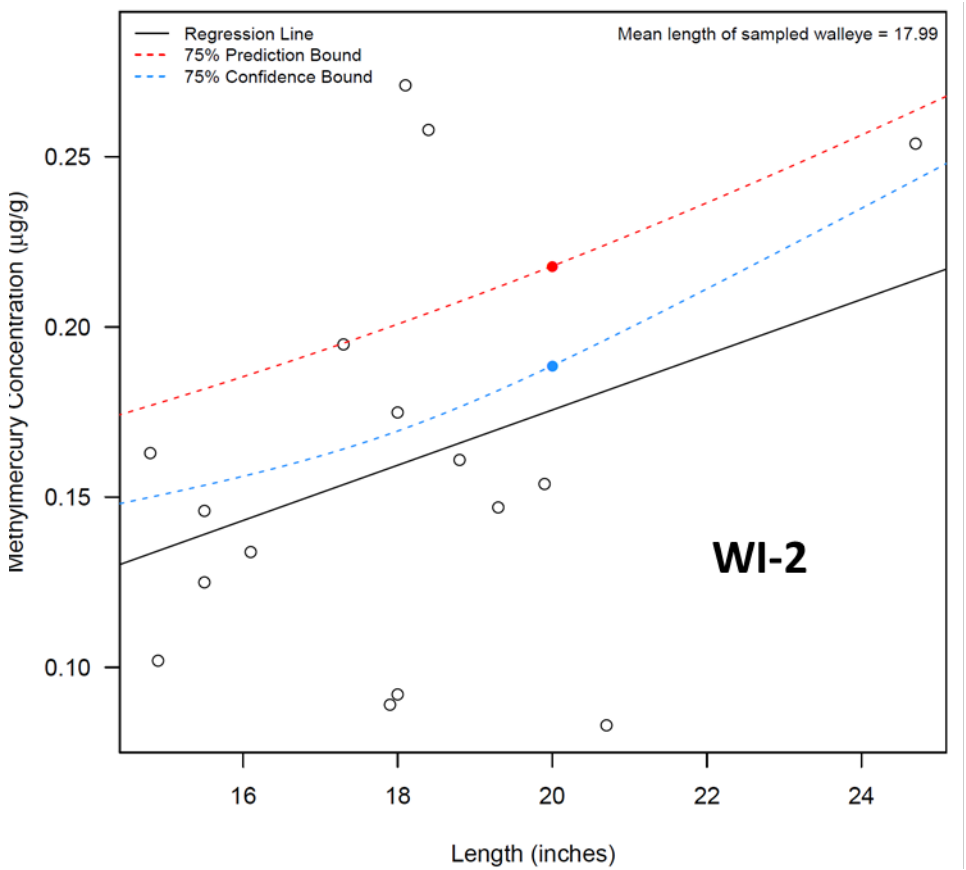

Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled walleye = 18.74
WI-1
Methylmercury Concentration (µg/g)
Length (inches)


Regression Line
75% Prediction Bound
75% Confidence Bound
Mean length of sampled walleye = 21.29
WI-2
Methylmercury Concentration (µg/g)
Length (inches)





WHITE SUCKER



SHORTHEAD REDHORSE