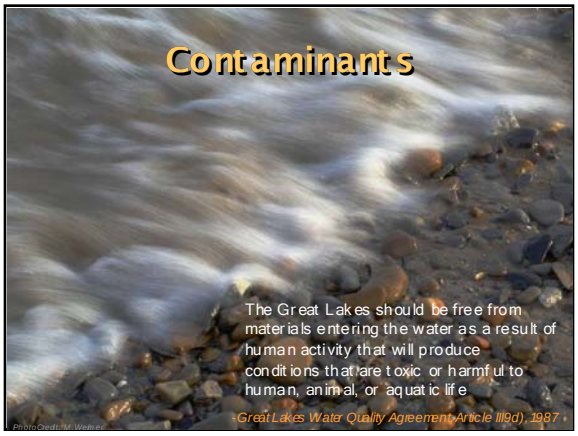
Good Morning, Bonjour.

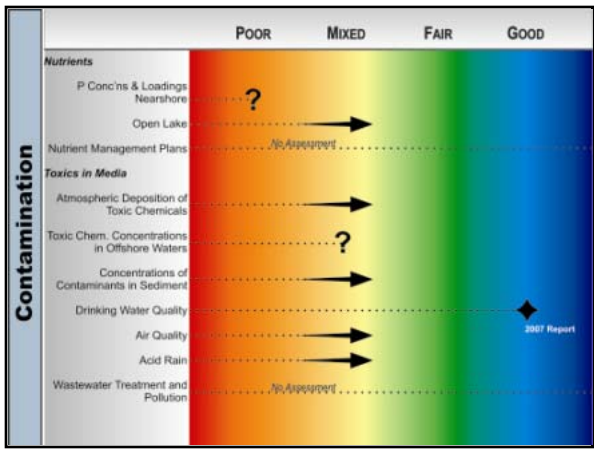
You've all had your coffee this morning….and you may need it…but I hope not.



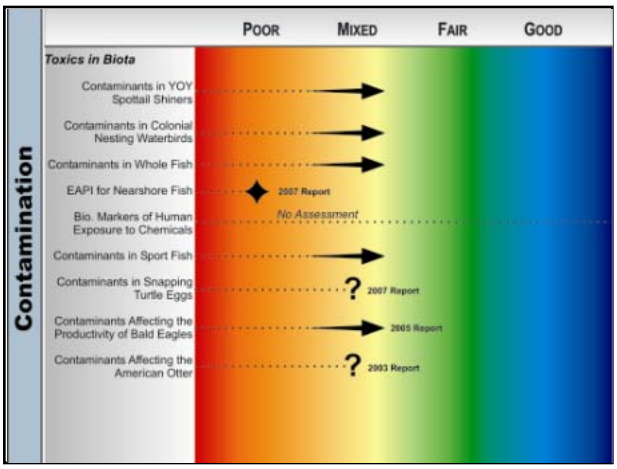
Beginning with a review of indicators characterizing contaminants,

Great Lakes Nearshore waters are rated **poor**, while **Offshore** environments are **mixed**;

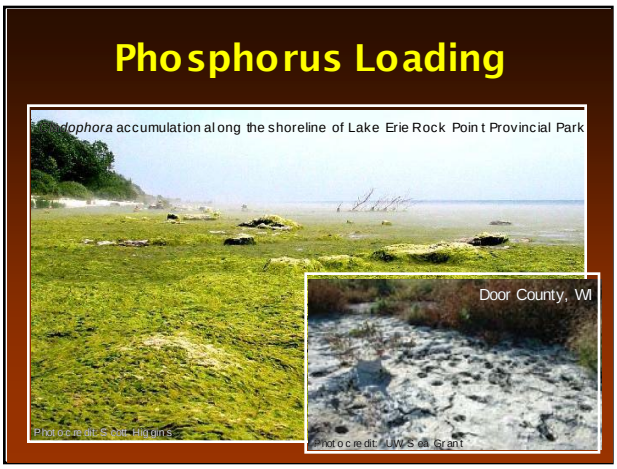
Reasons for the overall mixed status of these media are due to spatial variability, contaminants of interest, and differences in lake ecosystems.



Overall status of contaminants in biota, water, sediments, and air is **mixed** and **improving**; although some trends are declining at a much slower rate than they were 15-20 years ago.



The status of contaminants in fish and wildlife populations is **mixed** with an overall **improving trend**.

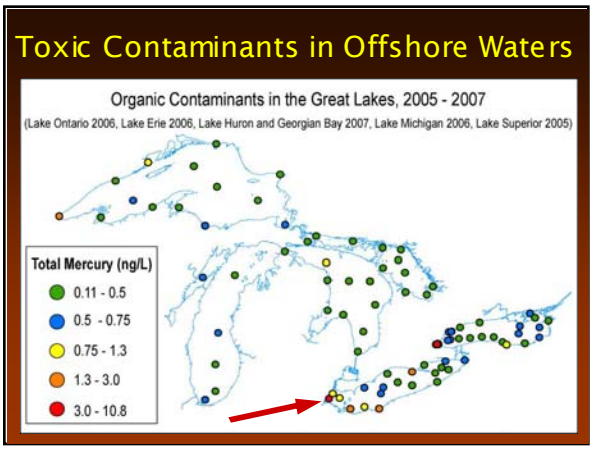


Although strong efforts to reduce phosphorus loadings have reduced concentrations **overall**, high concentrations still occur locally from anthropogenic sources.

Nearshore environments are **poor** due to an increasing proportion of **available** phosphorus that is produced by mussel beds. The nutrients essentially fertilize algae to the point where nuisance levels are reached.

The impacts of acid rain are most evident in localized areas of the northern and eastern Great Lakes.

There has been a significant reduction associated with sulphate deposition since 1990 that can be directly attributed to reduced emissions in both countries as a result of the **Acid Rain Program in the U.S**. and the **Canada-wide Acid Rain Strategy**.



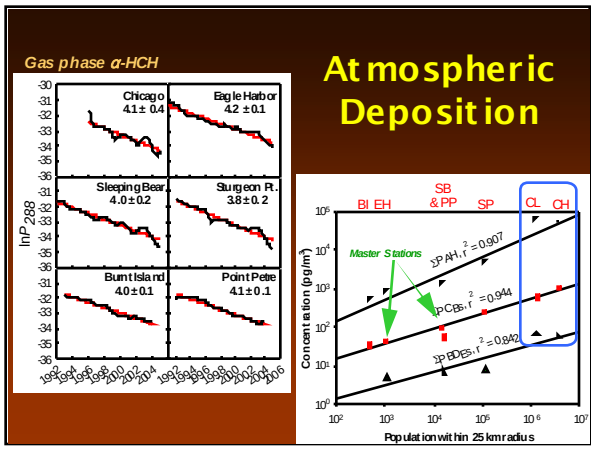
Contaminant concentrations in offshore waters are **low** and **many are declining.**

Compounds such as PCBs and DDT show spatial patterns that indicate higher concentrations near **historical, localized sources**.

As can be seen on the map- Mercury concentrations are low overall, and generally below the Great Lakes Initiative criterion of 1.3 ng/L.

<**click for animation arrow>**

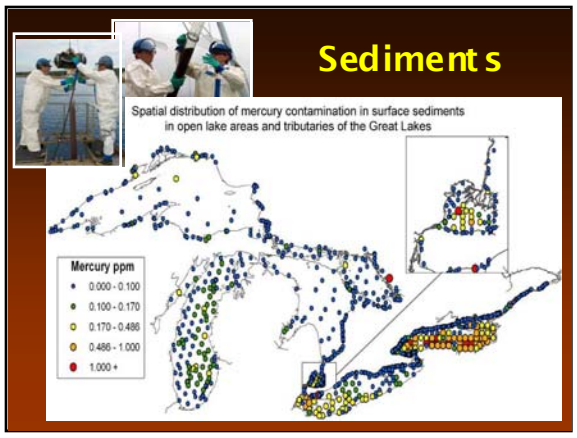
We are seeing the highest concentrations of Mercury in the western basin of Lake Erie.



Levels of banned organochlorine pesticides are generally decreasing and **spatially**, levels of persistent bioaccumulative toxics, PBTs, in air tend to be lower over Lakes Superior and Huron, but may be much higher in urban area "hotspots" – seen on the right.

<click for animation>

Levels of PCBs at urban sites like Cleveland and Chicago are about ten and fifteen times higher, respectively, than at the remote master stations at Eagle Harbor and Sleeping Bear Dunes.



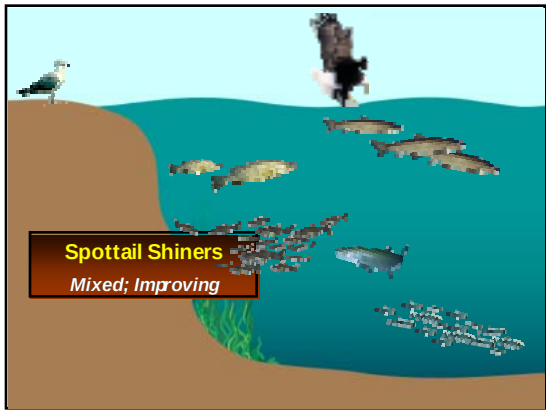
Overall status for sediments is **mixed**, with an **undetermined** trend

We have seen significant declines over the past several decades due to successful management actions. We can see this in Lake Erie -the concentration of total PCBs in surficial bottom sediments has declined three-fold from the lakewide average concentration.

As far as Mercury, sediment concentrations are generally quite low, however, localized areas of contaminated sediment may continue to act as sources by influencing intra-lake mixing and deposition of existing sediment inventories.

Contaminants in fish and wildlife populations will be characterized as we work up the food chain …"

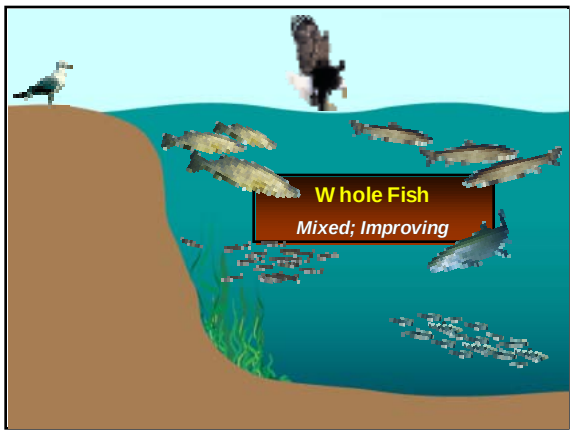
Beginning with the indicator for **contaminants in forage fish populations**….."



The juvenile spottail shiner was originally selected as the principal biomonitor for several reasons, including it's important linkage to higher trophic levels and its **presence** throughout the Great Lakes.

However, spottail shiners are not as abundant as they once were, and can be difficult to collect. In the updated indicator, bluntnose minnow and emerald shiners have also been included..

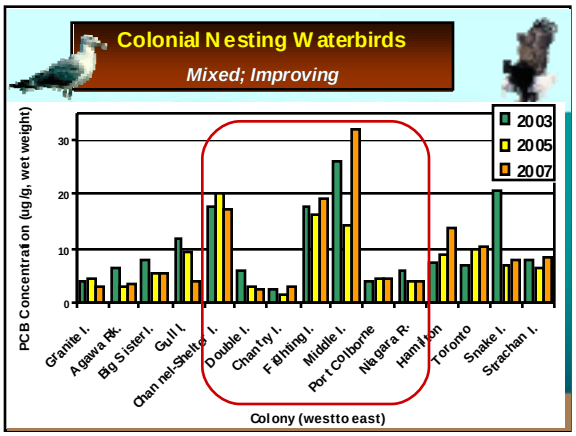
Although levels of PCBs and DDT in shiners have declined, both remain elevated at some sites.



Lake Trout and Walleye were chosen for monitoring of whole fish because of their status as a top predator in the food chain, and contaminants such as PCBs, Mercury, and DDT in these species have generally declined since the late 70s.

Toxaphene and My-rex continue to be monitored throughout the basin.

Toxaphene is found in larger concentrations in whole fish in Lake Superior due to its cold temperatures and long retention time, while **My-rex** is of most concern in Lake Ontario due to historic sources near the Niagara River.

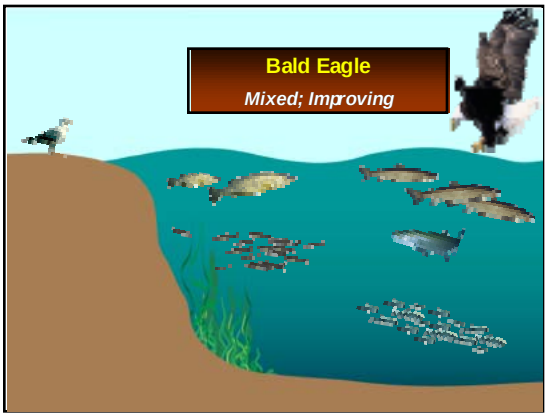


Colonial waterbirds bioaccumulate contaminants to the greatest concentration of any trophic level organism.

Overall, most contaminants in gull eggs have declined 90% or more since the **Herring Gull Egg Monitoring program** began in 1974.

<click for animation>

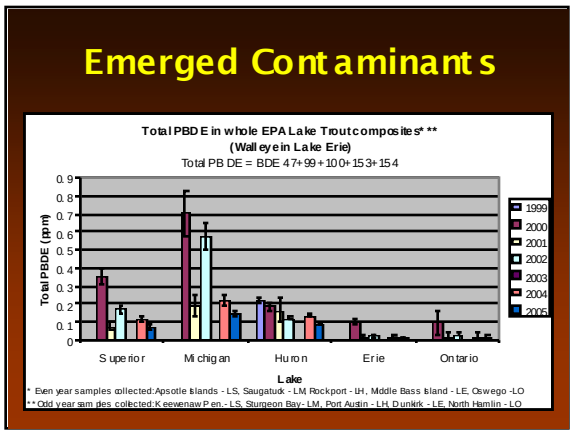
Spatially, there is great variation in concentrations **between** and **among** monitor sites within the same lake. Especially in Lakes Huron and Erie, circled here. Note also that annual fluctuations are part of current contaminant patterns.



High levels of persistent contaminants in bald eagles continue to be a concern, although PCBs and DDT continue to decline.

In Lake Superior, the National Park Service **Great Lakes Inventory and Monitoring Network** sampled bald eagle **nestlings** in 2006 and 2007.

Active DDT was found in 3 of 10 nestlings on Lake Superior but only one of 26 nestlings from inland areas. PBDEs were found in all nestlings sampled, and data suggest a near doubling of the concentrations along the south shore of Lake Superior over the last five years.



Chemicals of emerging concern have been at the fore front of many different studies recently, including EPA's participation in the **Pilot Study of Pharmaceuticals in Fish Tissue** and **Environment Canada's study of food web biomagnification of HBCD isomers in Lake Ontario**.

PBDEs (shown here), have been added to fish monitoring programs across the border. Data and information collected through these programs are provided to audiences such as public and industry…and in the case of **Great Lakes Chemical,** they used this information to **voluntarily** phase out the **more toxic** Penta and Octa formulations of PBDEs.

In direct response to this elimination, concentrations in fish promptly decreased.

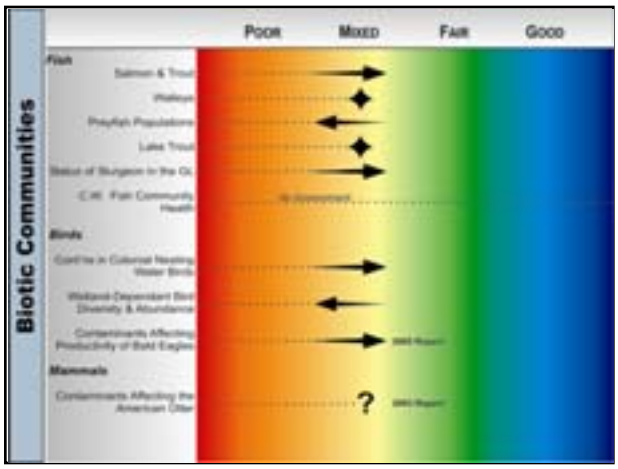
In-use pesticides, personal care products and medicines also pose serious threats to the Great Lakes…and many of these compounds are coming directly from our homes.

Endocrine disruptor chemicals enter waterways from various effluents. They interfere with normal hormone functions that may lead to reproductive or immune problems in fish and wildlife.

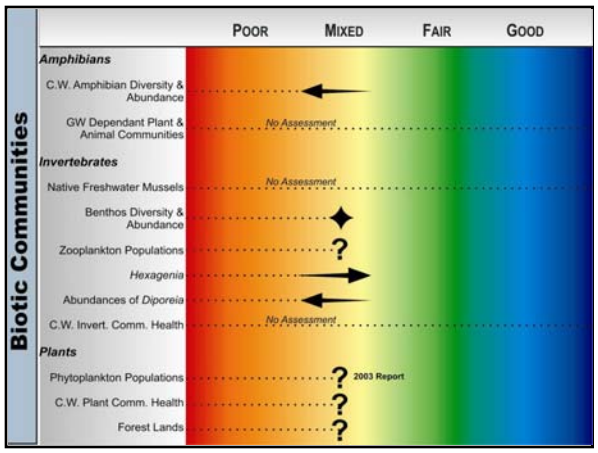
<Click for animation – cartoon>

We have seen myriad headlines recently on pharmaceuticals in drinking water. Much effort is ongoing at the federal, state, and provincial levels to better understand the issue and develop outreach programs to minimize the release of unwanted medicines.

Moving on to Biotic Communities…



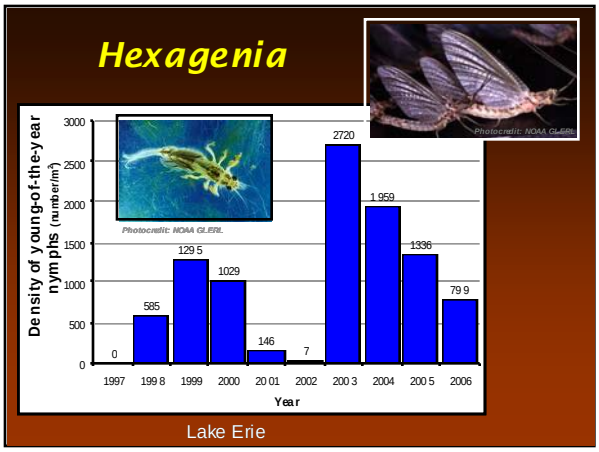
When you look at the overall health of biotic communities in the Great Lakes, we see a **mixed** status, varying geographically by lake, and also **mixed** trends.



Working our way up the food chain again -- beginning with our benthic residents….

Benthos Diversity is assessed in this case using Milbrink's Index, which measures substrate quality by characterizing aquatic **oligochaete community composition.**

Low index values are found in upper lakes and offshore, indicating oligotrophic conditions. Lake Erie data shows the highest values of productivity, indicating more eutrophic conditions - with an increasing **trend** in the central and eastern part of the basin.

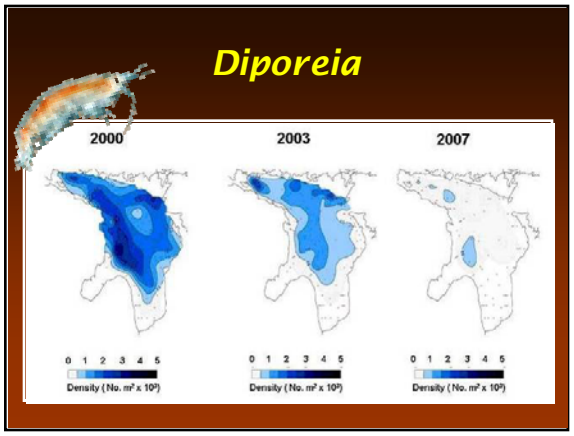


In Lakes Michigan, Superior, and Huron, status of mayfly populations is classified as **poor.**

To date, **only** the possible recoveries of *Hexagenia* in Lake Erie have been investigated. Studies have revealed relatively high recruitment, but as you can see here the density of nymphs has been steadily decreasing for reasons unknown. Could be residual pollution, densities of *Dreissenids,* or temperature changes.

…but what we **hope** to see aren't effects of Global Warming –it's **Global Swarming** we want…..

healthy populations are indicative of **quality** habitat and are a **major** trophic link between detrital energy and **fish**….and ultimately to the economy as well.



This amphipod has seen better days in the basin… Nearshore populations are extirpated or rare, as you can see here in Lake Huron.

The exception - *Diporeia* populations in Lake Superior are **good,** and seem to be fairly stable.

Initial declines were observed within 2-3 after years *Dreissenid* establishment, and competition for food has been hypothesized as the reason for declines.

But 2 things very important to note :

1 - reasons for the declines are far more complex than simple food availability, and

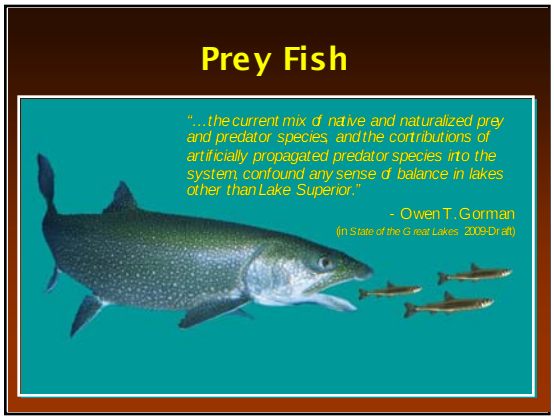
2 - the continuing declines have incredible implications to the food web. Many fish rely on *Diporeia* as a major prey item, and recent evidence suggests that fish such as Whitefish, bloater, and sculpin are already being affected…

Over 99% of native mussel species in the lower lakes have been wiped out due to establishment of *Dreissenid*s.

There **are** isolated nearshore communities that are still naturally reproducing. These refugia sites are shallow and have a high degree of connectivity to the lake and better host fish access.

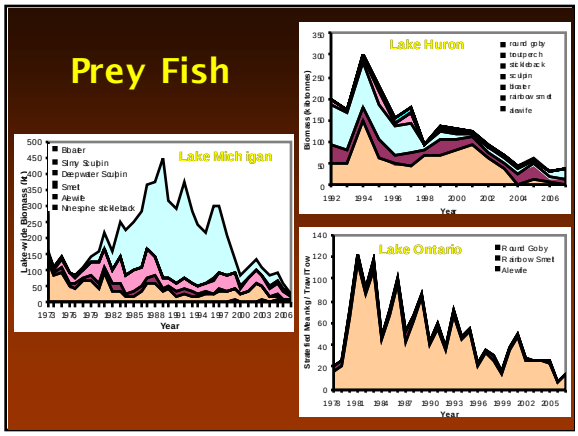
For native mussels offshore, the question is: *will populations in open waters recover*?

..and Ongoing research in the St. Lawrence River suggests that – **YES** - after a period of time following invasion, native numbers stabilized and reproduction **IS** occurring.



The overall status of Preyfish populations is **Mixed** with a **Deteriorating** trend.

With the exception of Lake Superior, the Great Lakes fish communities are shifting from their natural state.



We're seeing historic lows of non-native preyfish in Lakes Michigan, Huron and Ontario.

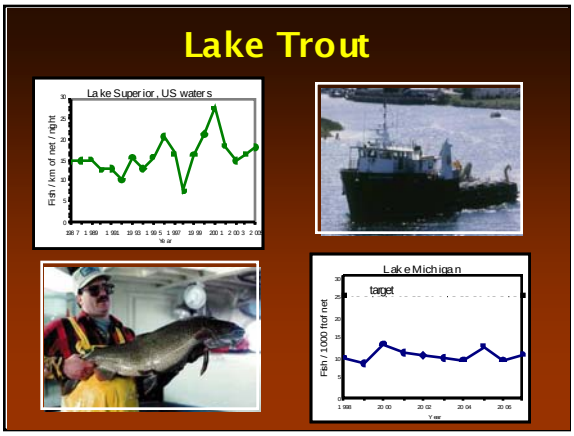
The decline in *Diporeia* and increasing colonization of *Dreissenids* may be signaling a shift in **food web** toward a benthic organization and **furthering** community change.

Re-establishing rare or extirpated native preyfish communities should be priority in all the Great Lakes.

Salmon and trout populations show an **improving** trend. Species are stocked to maintain a balance with preyfish populations in order to support a healthy recreational fishery in most lakes.

Most introduced **salmon** populations are successfully reproducing, and they are now considered naturalized components of the ecosystem.

The question is remains whether they **should** be introduced and how to determine the appropriate stocking levels in order to avoid oscillations of the forage base – this is the big ongoing challenge for fishery managers.

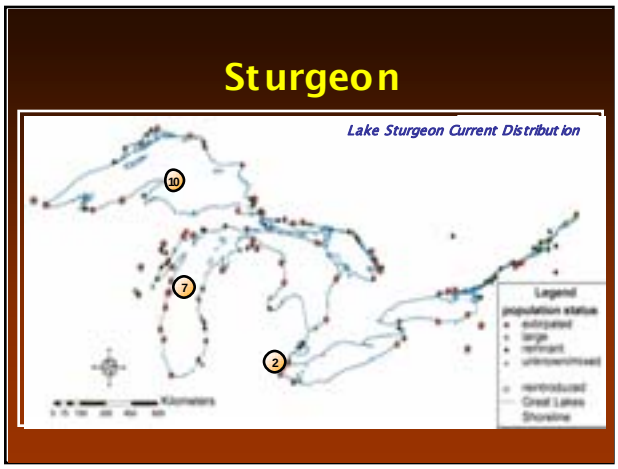


Restoration of lake trout began in the early 60s with control of sea lamprey, controls on exploitation, and hatchery production. Today the status of populations is **mixed** with **unchanging** trends. The US Fish and Wildlife Service and Ontario Ministry of Environment together stock from 7-9 million lake trout every year in the Great Lakes.

Lake Superior is currently the only great lake with **established** and **maintained** natural reproduction. Natural reproduction ***is*** seen offshore in Lake Michigan, however, the problem with young fish, whether stocked or not, is survivabilty.

We are also finding that current strains stocked may not be appropriate for offshore habitats, and are limiting colonization potential.

To address this, the introduction of alternate strains from Lake Superior have been initiated in Lake Erie, and will start soon in Lake Ontario and are being considered for Lake Michigan- these strains are better candidates for deep, offshore areas not colonized by traditional strains.



Most areas with remnant sturgeon populations continue sustaining at a small fraction of historical abundance. To put that into perspective, Lake Michigan estimate of lakewide abundance is 10,000 individuals….well below **1%** of the most conservative historic estimates.

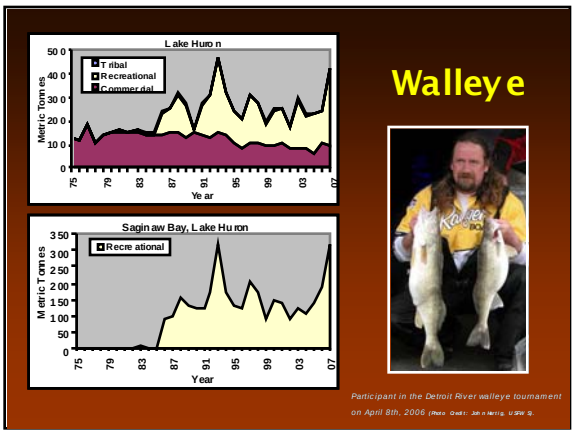
<click>

At least 36 tributaries to the upper lakes support remanant spawning lake sturgeon populations, with confirmed reproduction in 17 streams tributary to Superior and Michigan, and 2 locations in the St. Clair and Detroit Rivers.

Binational research efforts have resulted in nearly 7,000 sturgeon tagged in Saginaw Bay, southern Lake Huron, Georgian Bay and the North Channel.

Tag recovery data and telemetry research indicate that a **robust** lake sturgeon stock (greater than 45,000 fish) reside in the North Channel.

Agencies are working in concert on reintroduction and rearing assistance programs to strengthen populations.



Walleye populations are **fair** in Lake Superior and the Huron-Erie Corridor, and **Good, and improving** in Lake Huron. Harvests have also **improved** in recent years but remain below targets.

In Saginaw Bay, the production of very strong year classes has continued in four of the last five years – this can be attributed to the collapse of alewives in Lake Huron. The population is approaching recovery criteria established by the Michigan Department of Natural Resources.

It was a conservation victory **in 2007** when the bald eagle was removed from protection under the Endangered Species Act in the U.S.

This premier ecological indicator continues to be protected by the **Bald and Golden Eagle Protection Act** and **Migratory Bird Treaty Act** in the U.S.

Relative to their **Species at Risk** status in Canada, nationally they are considered **not at risk**.

Ontario bald eagles have been divided into two populations, and the northern population has been downlisted to a species of concern. The southern population remains listed as endangered, but has been steadily increasing on Lake Erie.

Basin-wide, bald eagle populations are increasing and expanding into new territories to nest.

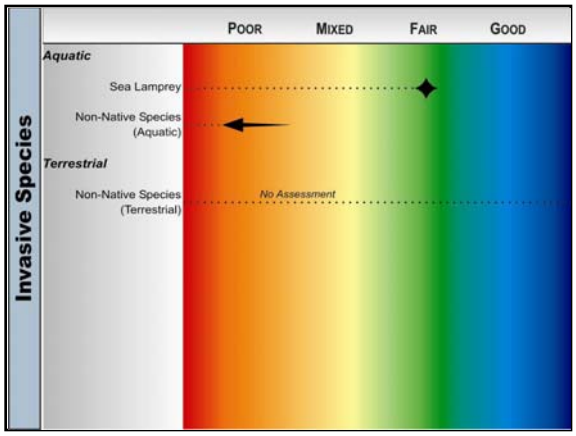
The U.S.-Canada Bald Eagle Working Group, under the Lake Ontario LAMP, has completed a binational initiative in coordination with the St. Lawrence Working Group

In the study, the groups

- Identified and prioritized valuable habitat, and
- Improved restoration goals by developing a GIS to identify shoreline habitat sites. 40 sites were field-checked and management recommendations were made.

For more information on this study, there is a poster in the foyer and individuals leading the study are here in attendance if you would like to speak to them about the project.

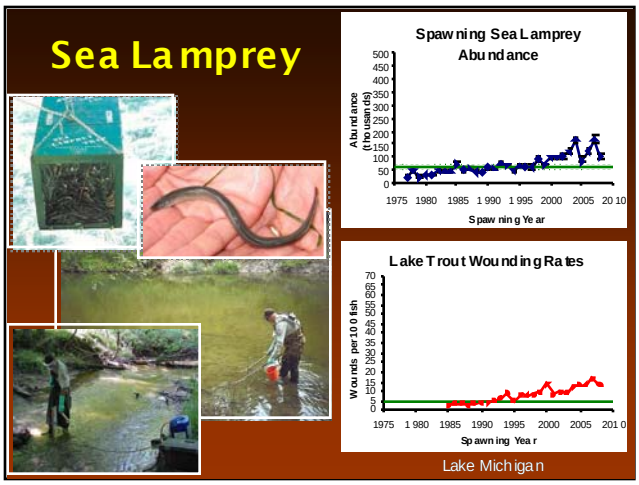
As a former sea lamprey choker myself, when I think of Great Lakes invasive species…a very toothy individual comes to mind….



But overall….

The indicators in this category show that the situation for non-native species is **poor** and **declining**.

The status of Sea Lamprey is considered **fair** with an **unchanging** trend.



Abundances are above target ranges in all lakes except Lake Ontario, and **poor** status is reported in Lakes Michigan and Erie.

Focusing on Lake Michigan..

Abundance has been trending upward and has shown sharp increases recently, although a sharp decrease was observed during 2005 that is attributed to a 2003 treatment of the Manistique River (tributary to Lake Michigan).

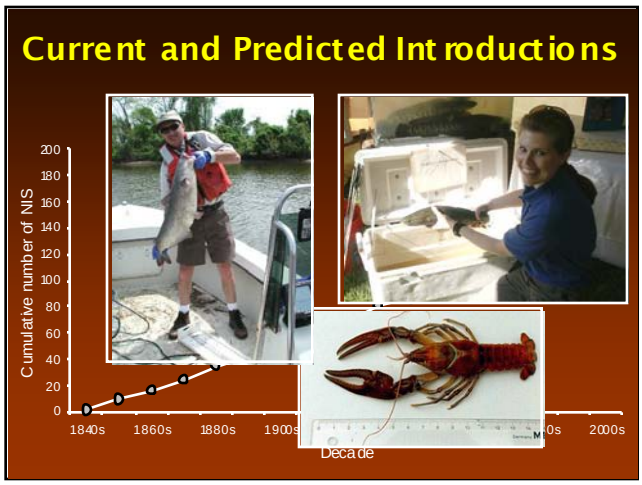
The **failure** of the Manistique dam to block sea lampreys, and the fact that this system is essentially a larval factory, has contributed to the increases in northern Lake Michigan abundance.

Continuing the search for new sources through the Larval Assessment Program is critical for control and **Continued, effective** stream treatments are necessary to overcome the reproductive potential of this invasive species.

Invasive species effects don't discriminate toward taxa,

Outbreaks of avian botulism and Viral Hemorrhagic Septicemia virus have been reported throughout the basin and are being monitored extremely closely. Agencies around the basin have held field exercises recently to improve early detection and rapid response programs.

VHSv was probably introduced via ballast or the transport of bait fish. Significant fish kills have occurred in all lakes with the exception of Superior, and the only population-level effects have been on the St. Lawrence River muske population.

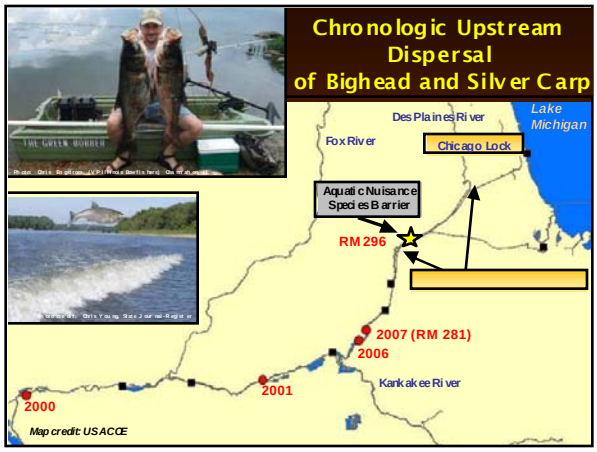


There are currently 185 NIS reported, and at least 13 of these have become **invasive**.

…As far as ***new*** *introductions….*

An EPA report identified 156 species of concern, in which about half (~70) are considered potentially invasive and half of those have medium to high potential to cause ecological impacts when they arrive.

Potential new invaders include the blue catfish, rusty crayfish and snakehead among many others, unfortunately.



We are also keeping an close eye on those species we know are closing in...specifically Asian carp.

We are seeing more catches upstream in recent years….(the red locations on the map). The furthest upstream confirmed catch of bighead carp was collected at RM 281 in June of last year. This is 15 miles from the electrical barrier, which serves as the final barrier to dispersal.

Assessments and telemetry studies are ongoing in the pools and main channels…and aside from the scientific work, recreational anglers are out there helping to 'cull' the population during annual bowfishing tournaments....and having a **hayday** doing it!

Management Implications and Conclusions

- Maintain contaminant monitoring efforts
  - Nutrients
  - Media
  - Biota
- Consider cumulative effects of invasive species, contaminants, and climate change

In summary, we must adapt management practices and continue monitoring efforts for several areas:

1) Nutrients in the Nearshore

Because of a current lack of control for invasive mussels, agencies must be vigilant to control phosphorus loads.

2) Continued monitoring of PBTs and emerging chemicals in **Air, water, sediments**

3) Biomonitoring - It's becoming increasingly difficult to maintain current monitoring efforts for bald eagles….this is directly related to challenges within state, provincial, and federal organizations and lack of prioritization of biomonitoring programs needed to maintain trend data.

I challenge the group here to discuss the management implications of these hurdles among breakout sessions later this afternoon.

In the analysis of these biotic communities, we need to consider the effects of non-native mussels, pressures of non-point source pollution, and impacts of climate change.

Management Implications and Conclusions

- Conduct regular assessments of food-web dynamics
  - e.g. *Diporeia – Dreissena* interactions
- Continue and enhance sea lamprey control – integrated approach
- Integrate inventories, mapping, and mitigation of invasive species to improve strategies at a basin-wide scale

We need to continue to address water quality in the nearshore and consider how we're impacting vulnerable areas,

Also consider ways be more inclusive with restoration projects, for example incorporating native mussel refugia into a coastal wetlands plan

Continued monitoring of the fish communities and assessments of predators and preyfish; this includes looking more closely at our basement trophic level to define the cause of the negative response of *Diporeia* to *Dreissena*

And of course, an integrated approach to sea lamprey control is required basin-wide – including use of lampricide **with** traps, pheromones, barriers and male sterilization.

We also need to improve the coordination of invasive species **information** in order to examine trends and develop **new, integrated** strategies for the entire basin.

Acknowledgments

- U.S. EPA
- Environment Canada
- U.S. Fish and Wildlife Service
- U.S. FWS, Digital Library System and NCTC Image Library
- NOAA, Great Lakes Environmental Research Laboratory (GLERL) PhotoGallery
- USGS
- Ontario Ministry of Natural Resources (OMNR)
- Tetra Tech
- Wisconsin Sea Grant

Thank you very much.

Have a great week.