Slide 1
I'm not sure how forecast got in the title on the agenda but I'm here to just provide abundance data.

Slide 2
Invasives have had a significant effect on the system. Chlorophyll-a has declined 30-50% in Michigan waters. Key native species are gone - for example, Diaporeia. Preyfish numbers are well below historic levels and diversity of preyfish has also declined. Bloaters (bloater chubs) account for much of decrease in numbers but also emerald shiners are gone.

Slide 3
Diet of Chinook salmon is greater than 90% alewife. Lake trout eat other things in addition to alewife. Not listed but a large component is round goby.

Slide 4
Our trawl survey is conducted in September since 1973. Individual trawls of the area swept by the trawl at 70 sites are then expanded to provide a lakewide estimate for forage.
The trawl data are used to determine age, size, and composition of the forage.

Slide 5
We also have an acoustic survey to estimate forage.

Slide 6
The blue line represents kilo-tons of alewife from the acoustic survey. The 20-80 percentile (level 1) does a good job to encompass the time series. 7 of the last 10 years have been outside the level 2 bounds. The last two years indicate relatively good alewife. These totals are just about equivalent to what fish are eating so there is just enough food but we're not putting anything in the bank. We should be eating the interest. Acoustic estimates are much more consistent with the estimated levels of consumption by predators.

Slide 7
The bottom trawl is a different story. We are outside the level 1 and level 2 every year.

Slide 8
There is no difference for age-0 alewife density between the early period and current as represented by the overlap of colored bars on the right hand side of the figure.

Slide 9
We also see no difference for yearling and older alewife.

Slide 10
There is a big difference for alewife density using the bottom trawl data.

Slide 11
There is a significant decline in the density of rainbow smelt from the acoustic data.

Slide 12
There is also significant decline in the density of rainbow smelt from the trawl data. In 1990 these were the dominant fish over alewife.

Slide 13
Bloater chubs are basically not present in the acoustic survey.

Slide 14
This is also true for the bottom trawl.

Slide 15
Slimy sculpin numbers are in pretty good shape and lake trout eat slimy sculpin.

Slide 16
We have however seen a decline in the biomass of deep water sculpin.

Slide 17
Round goby numbers are increasing but there are huge error bars around the estimates. They tend to be patchy however they are all over the lake and tend to be abundant.

Slide 18
This is an echogram indicating low numbers of alewife (top) and higher numbers (bottom) for 2009 and 2010. We're still working on analyzing the 2011 data. Each dot represents a fish.

Slide 19
Comparison between bottom trawl and acoustic estimates. Are findings consistent between surveys? If not, do we know why differences exist? Are results from respective surveys consistent with other observations of the ecosystem?

Slide 20
This slide shows that there are no statistically significant differences in acoustic and bottom trawl biomass (kg per hectare) of alewife, rainbow smelt, or bloater. However, the estimates from the acoustic survey are much more consistent with the estimated consumption from Decision Analysis model.

Slide 21
[slide text]

Slide 22
[slide text]

Slide 23
[slide text]

Slide 24
Variability of alewife biomass estimtes makes use of the Red Flags level 2 indicator difficult.

Question: There seems to be remarkable overwinter survival if alewife. Where did it come from? Answer: 2010 was a large year class. We saw die-offs around the lake this year that we haven't seen in several years. 2011 appears to less abundant however even with extra sampling effort this year. In 2009 we weren't able to sample the southern part of the lake where many of those small alewife are typically present.

Question: What age groups of alewife are present and how long do they live? Answer: We have 4 year classes out there. Alewife typically live to age-7. Review of age-specific data upon returning home from Portage, I can add the following details: Spawning-age

fish (age-2 and older) were 46% of the 2010 acoustic biomass estimate. Age-2, age-3, age-4, and age-5 fish each represented 5% or more of total biomass.