Department of Environmental Quality
Water Resources Division
Measures of Success

June 19, 2013

Mission: CLEAN AND SAFE WATER RESOURCES

Welcome to the Water Resources Division's (WRD) Measures of Success. This is our attempt to define the expected outcomes for many of the issues facing the WRD's programs. We work hard on many activities that affect and/or measure the quality of the waters of our state, and this is how we propose to measure the success in having clean and safe water. It is important to achieve these outcomes such that Michigan has a robust economy in conjunction with clean and safe water resources. Achieving these outcomes will also result in a more robust economy and improved quality of life for Michigan's residents and visitors; for example, water quality improvements at beaches and fewer fish consumption advisories will translate to increased tourism and sporting equipment purchases.

These measures are primarily based on what we can presently measure. There are additional outcomes that are not presently included but desirable. We anticipate that these outcomes and measures will change as we get better at defining and measuring them.

The mission of the WRD is to make Michigan's waters safe and clean for recreating, fishing, drinking, and healthy aquatic ecosystems. Five major goals provide definition to this mission: (1) Enhance Recreational Waters; (2) Ensure Consumable Fish; (3) Protect and Restore Aquatic Ecosystems; (4) Ensure Safe Drinking Water; and (5) Protect Public Safety. For each major goal, measurable outcomes (measures of success) are identified.

The use of outcome oriented goals and measurements serves to focus efforts, motivate staff, communicate progress, improve environmental health and compliance conditions, increase our accountability, and foster collaboration. We intend to use these goals and measurements to enlist external assistance, encourage cooperation across organizational boundaries, and encourage discussion about strategic adjustments and priority trade-offs. We also intend to use these goals and measurements to align our work processes and activities in order to attain the outcome focused goals. The goals and outcomes set here are expected to be reviewed and modified as appropriate.

The use of measurements associated with the goals is essential. Measurements provide insights in many areas, including informed priority setting and daily decisions; finding problems and assessing their relative importance; identifying preventable causal factors; and communicating progress and problems. Measurement reinforces the importance of a goal and managerial priorities, and helps us gauge how well prior actions worked and when adjustments are needed.

The goals we are identifying will, on occasion, require us to stretch to meet them. While attainment of these goals is ideal, the immediate objective is the development of cogent strategies to meet them. These strategies will guide the WRD in measuring progress toward the goals; regular use of the data to make informed decisions; and regular reporting on goals, progress, and strategies, including reporting to the public.

The following five goals are intended to represent the outcomes that are expected from the WRD. These goals are rather self-evident, but the specific measurements established for each goal consider what is needed to assess attainment of the goal, as well as what we are currently able to measure and report.

Limited interpretation of the results is provided. The scale used to portray progress toward meeting the outcomes ranges from Excellent to Poor (Excellent, Good, Fair, Poor) with the category “Don’t know yet” included for where we do not yet have measurements to interpret.

The outcomes included in this document are evolving as we engage and obtain input from other agency staff and our stakeholders. An important contribution to our original thinking was provided as recommendations from the Department of Environmental Quality’s (DEQ) former Environmental Advisory Council in its December 16, 2010, report to the DEQ, “Following the Roadmap: Next Steps in Implementing Outcome-Based Environmental Management." The report includes important suggestions for moving forward on establishing relevant outcomes and their use, and specific recommendations for additional outcomes in areas related to water resources protection, restoration, and management. The specific recommendations for outcomes related to the WRD are provided in this document as Appendix A.

WRD staff continues to be engaged in the process of developing outcomes and measures. In particular, they have identified a number of important resource protection activities for which outcomes are needed but for which developing the outcomes are challenging from various perspectives, including moving from an output to an outcome based approach and identifying and implementing appropriate monitoring and tracking tools to measure progress toward the endpoints. Outcomes that are not well developed but are the subject of ongoing discussion are included in a new section, “Outcomes Under Construction.”

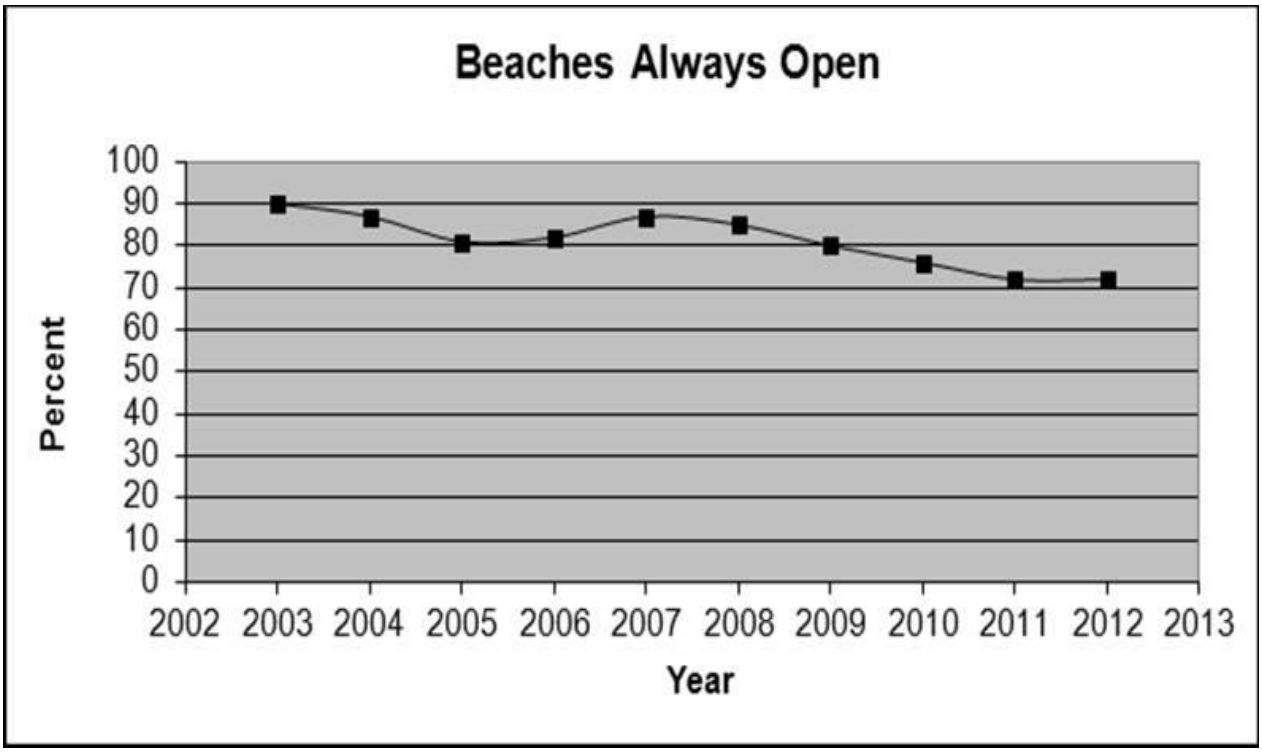
If you have questions or comments on this document, please contact Laura Smith at smithl16@michigan.gov. We are especially interested in comments regarding appropriate outcomes and measures.

GOAL 1: ENHANCE RECREATIONAL WATERS

Ensure that all recreational waters are safe for human contact.

Outcome 1: Clean, safe beaches – By 2014, 100% of Great Lakes and inland lake beaches monitored by beach programs will be safe for swimming.

Measure: Percent of monitored beaches with no closures or advisories due to unacceptable levels of *E. coli* during the recreational season.



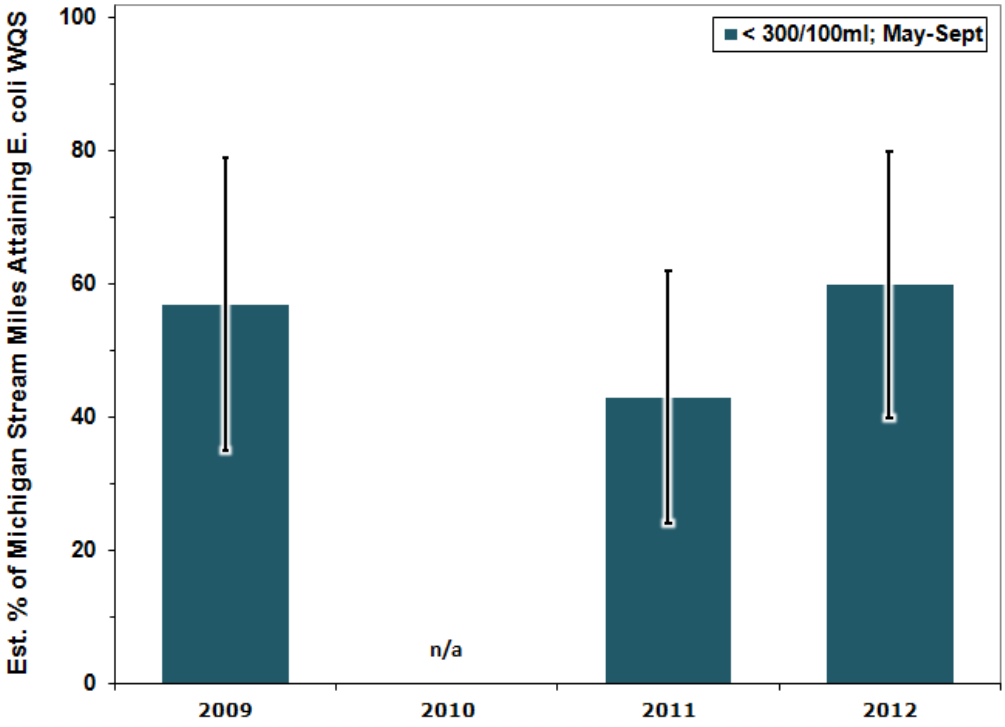
How are we doing? Fair

Comment: The percentage has fallen in recent years due at least in part to increased monitoring at beaches with known or suspected water quality problems. The DEQ has been working with local communities to identify sources of contamination and to implement corrective actions to restore water quality. Much of this work is funded by the Great Lakes Restoration Initiative.

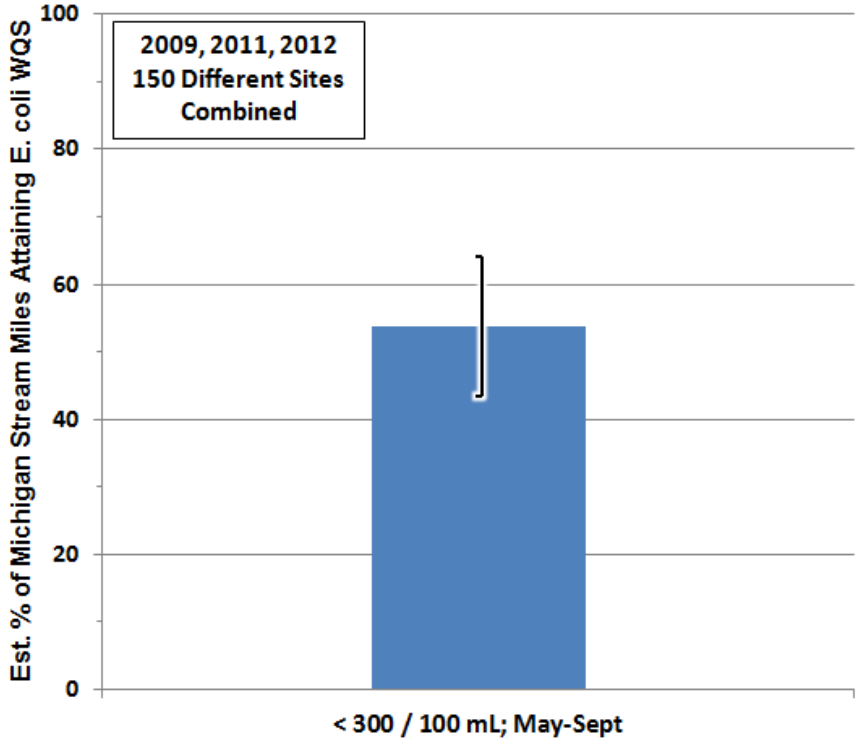
Outcome 2: Swimmable rivers and streams – All rivers and streams will meet total body contact water quality standards (WQS).

Measure: Percent of monitored river/stream miles that meet total body contact WQS.

Results: 2009 – 57%; 2011 – 43%; 2012 – 60% (all values are estimates)



Estimated percent of all Michigan stream miles with a geometric mean *E. coli* concentration less than the Water Quality Standards limits for total body contact recreation season in 2009, 2011, and 2012. Error bars represent 95 percent confidence intervals.



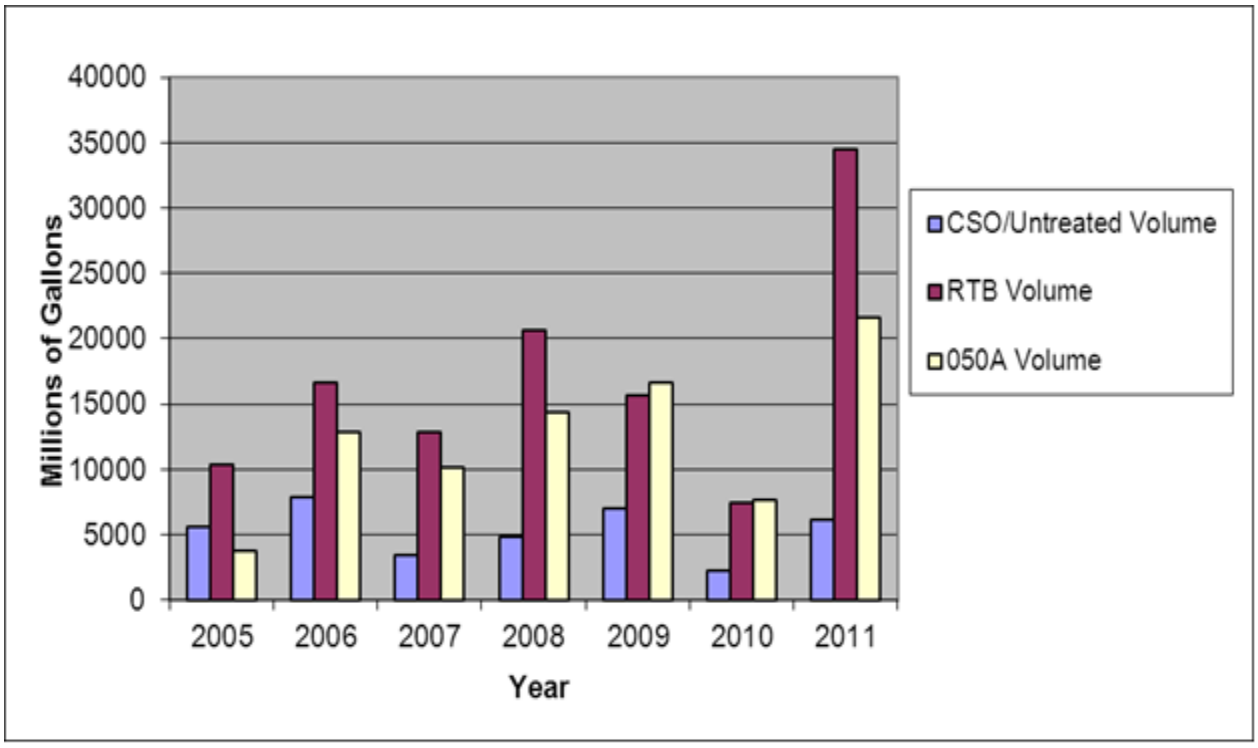
Estimated percent of all Michigan stream miles with a geometric mean E. coli concentration less than the Water Quality Standards limits for total body contact recreation season using 2009, 2011, and 2012 data combined. Error bars represent 95 percent confidence intervals.

How are we doing? Poor

Comment: Monitoring conducted in 2009 based on a random sampling design indicated that only an estimated 57% of stream miles were at or below the daily maximum WQS for total body contact. In 2011 and 2012 sampling of different sets of randomly selected sites found that an estimated 43% and 60%, respectively, of stream miles were at or below the daily maximum WQS for total body contact. The variability in data over this short time span is likely a result of the fact that different sites were sampled each year and that each year had distinctive weather patterns. When data from these 3 years were pooled, it was estimated that 54% of stream miles were at or below the daily maximum WQS for total body contact.

Outcome 3: Eliminate untreated sewage discharges – The long-term combined sewer overflow (CSO) goal is complete elimination of untreated CSO discharges. For sanitary sewer overflow (SSO), the goal is to minimize untreated SSO discharges, recognizing that SSOs may occur in a well designed and operated sewer system in response to rainfall that exceeds the 25-year, 24-hour storm (our design storm). Initially, our interim goal was to reduce the volume of SSOs discharged annually, from approximately 58 million gallons in 2007 to less than 20 million gallons in 2020, due to events less than the 25-year, 24-hour storm. We now realize this goal needs to be refined.

Measure: Annual volume of untreated CSO/SSO discharges.



CSO/Untreated, Retention Treatment Basin, and Related Wet Weather Volume (million gallons per year)

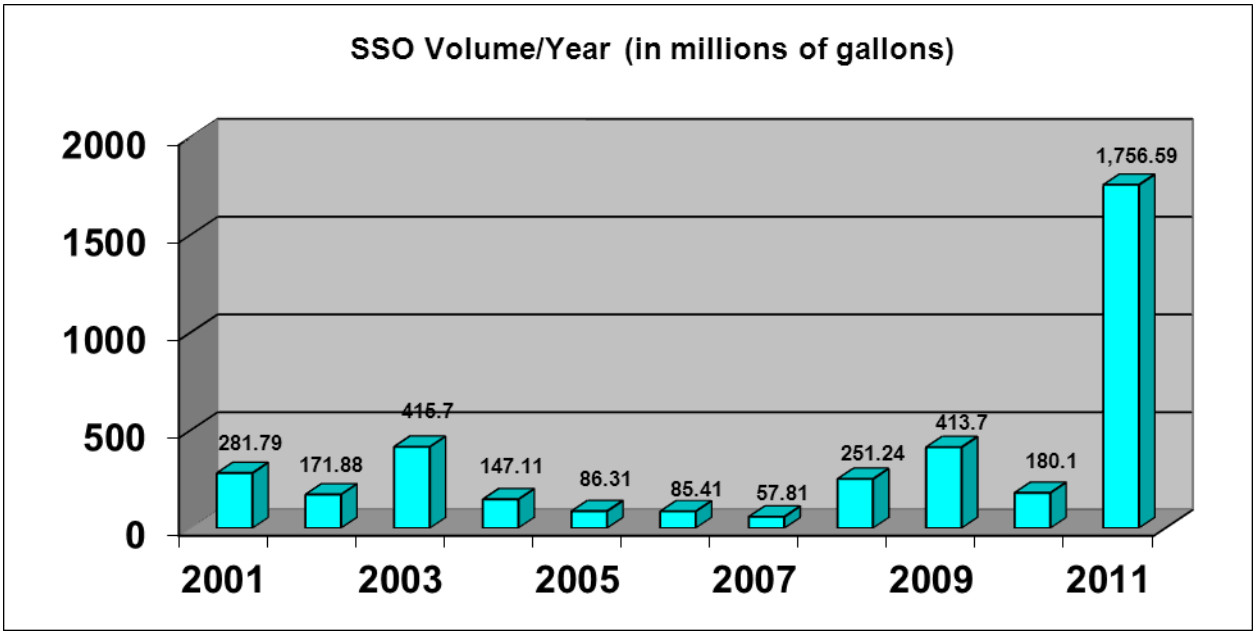
How are we doing? Good

Comment: There has been considerable progress in Michigan in eliminating untreated discharges of sewage. However, the recent economic downturn is causing delays in some major projects, especially those in Detroit and Dearborn. This will result in additional time to meet the goal of elimination of untreated CSOs. It should be noted that the volume of discharge is highly dependent on the amount of precipitation, and whether that precipitation comes during short periods of time or during frozen or saturated ground conditions.

The Detroit Wastewater Treatment Plant (WWTP) and its long-term control plan (LTCP) milestones greatly influence statewide data. In past reports, the discharges from one of Detroit's primary wet weather outfalls have been grouped with untreated CSO discharges. Based upon the fact that discharges from this outfall receive primary treatment through the Detroit plant but lack disinfection, it is more accurate to characterize these discharges as primary treated excess flow without disinfection (not untreated). Therefore, the discharges from this outfall (50A) have been separated from the CSO/Untreated Volume and the Retention Treatment Basin (RTB) Volume. Discharges from this outfall for past years are likewise reclassified for the purpose of this report and are represented in the figure above.

One of the key components of Detroit's LTCP (1996) was increasing the primary treatment capacity of the WWTP in order to significantly reduce untreated CSOs from the upstream collection system outfalls to the Rouge and Detroit Rivers. This included construction of 2 additional circular clarifiers, a new pump, and other rehabilitation projects at the plant. This project component was completed by 2005 at the cost of approximately $166.5 million.

More important in terms of volume trends is the portion of untreated CSO discharges versus the volume of discharge from RTBs. This is because the goal of the LTCP is to provide adequate treatment of CSOs to meet WQS through treatment at an RTB. When comparing annual volume of untreated CSO discharges to the volume of partially treated or adequately treated RTB volumes, statewide progress is evident (see figure above). It is expected that as LTCPs are implemented statewide, the component of the total overflow volume that is the RTB treated volume will continue to increase in the coming years. The data from 2011 is indicative of such a trend. While 2011 was a wet year for Michigan (record rainfall was experienced in many areas of Michigan, including portions of southeast Michigan, where many CSO communities are located), the data shows that treated RTB volume increased substantially while untreated CSO volume remained proportionately low.



How are we doing? Good

Comment: During the period from 2001 through 2007, Michigan made substantial progress in the goal to eliminate SSOs. Data from the last 4 calendar years shows dramatic increases in SSOs, especially in 2011 (see figure above). We are reviewing the detailed data to determine the cause for this increase, whether it is related to increase in storm intensity, better reporting, or more failure of municipal systems. Initial reviews indicate that more intense storms are responsible for a large part of this increase, especially for 2011 data. This may be an early indicator of the effects of climate change, as sewer systems designed to handle certain size storms are more frequently subjected to more intense storms. As stated earlier, many areas in Michigan experienced higher than normal rainfall in 2011.

We plan to modify this measure for future reports. We intend to look at the LTCPs for CSOs and graphically depict our anticipated progress in eliminating untreated CSOs based on those schedules. We also intend to report separately on SSOs not associated with wet weather events, and also report on SSOs from wet weather events where the storm is less than our sewer design standard. We believe these will be better measures of our progress to control SSOs. We recognize the SSOs may occur as a result of very large storms, but controlling SSO events in these situations is not practical, nor a valid measure of statewide progress.

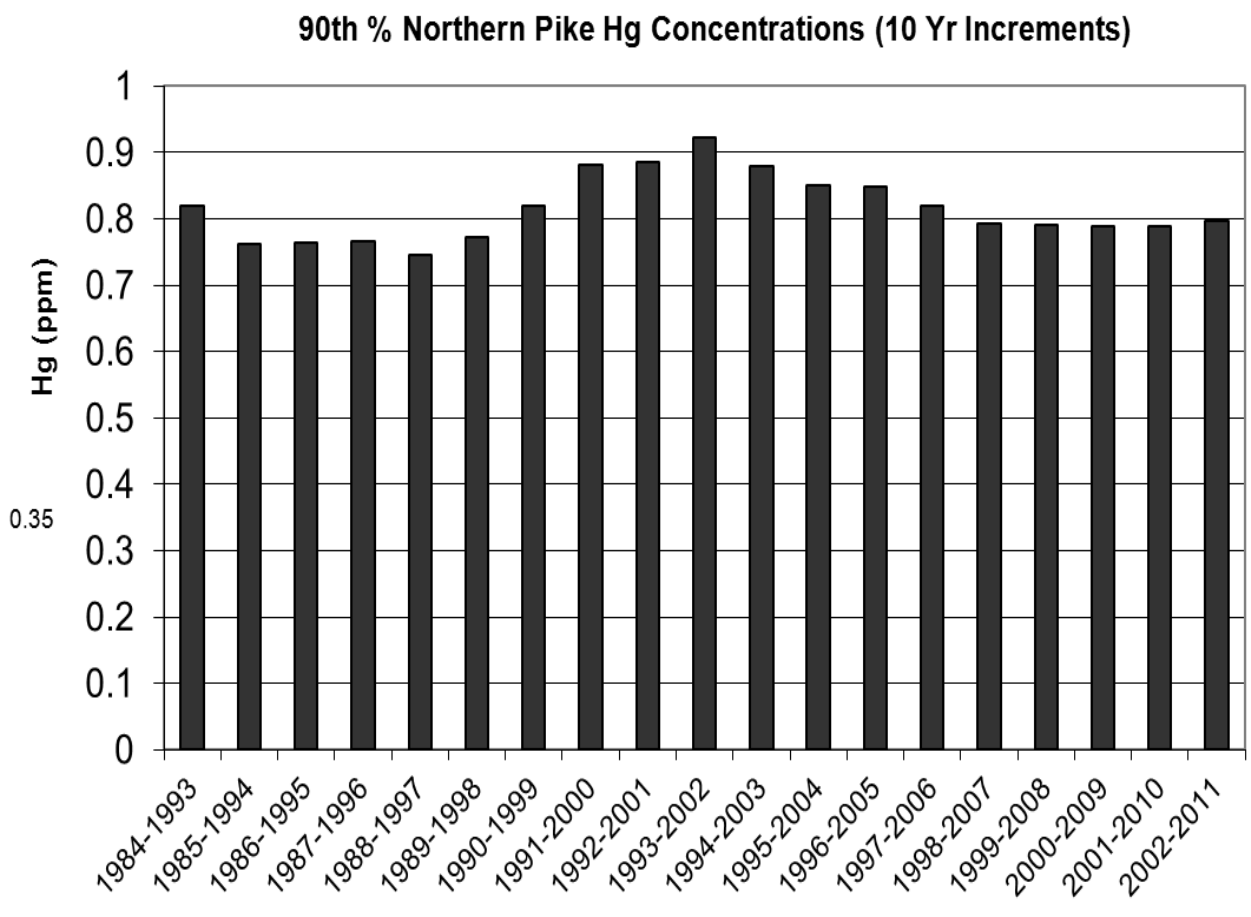
GOAL 2: ENSURE CONSUMABLE FISH

Protect human health and wildlife by reducing exposure to contaminants in fish to levels that are safe.

Outcome 1: Eliminate mercury contamination.

Outcome 1A: Reduce the mercury levels in edible portions of Great Lakes, inland lakes, and stream fish to below 0.35 milligrams per kilogram (mg/Kg) (parts per million) by 2020.

Measure: Mercury concentrations in the 90th percentile of length normalized walleye, northern pike, or largemouth bass from selected sites in the Great Lakes and inland waters.



Estimated 90th percentile mercury concentrations in standard length northern pike from inland waters of Michigan for consecutive running 10-year periods.

How are we doing? Poor

Comment: There has been essentially no change over time. The mercury concentration in these fish appears to be greatly dependent on the mercury from atmospheric deposition, which is primarily due to burning coal to generate electricity. Currently in Michigan, coal fired power plants discharge about 4,000 pounds of mercury per year to the atmosphere, while point source wastewater facilities discharge less than 20 pounds per year to surface waters. Achieving this goal is premised on the DEQ Mercury Strategy being implemented as scheduled (by 2015), with appropriate controls on mercury emissions from burning coal.

Outcome 1B: All streams will achieve the mercury WQS of 1.3 nanograms per liter (ng/L) of total mercury as an annual average ambient concentration by 2020.

Measure: Percent of rivers/streams monitored that meet 1.3 ng/L.

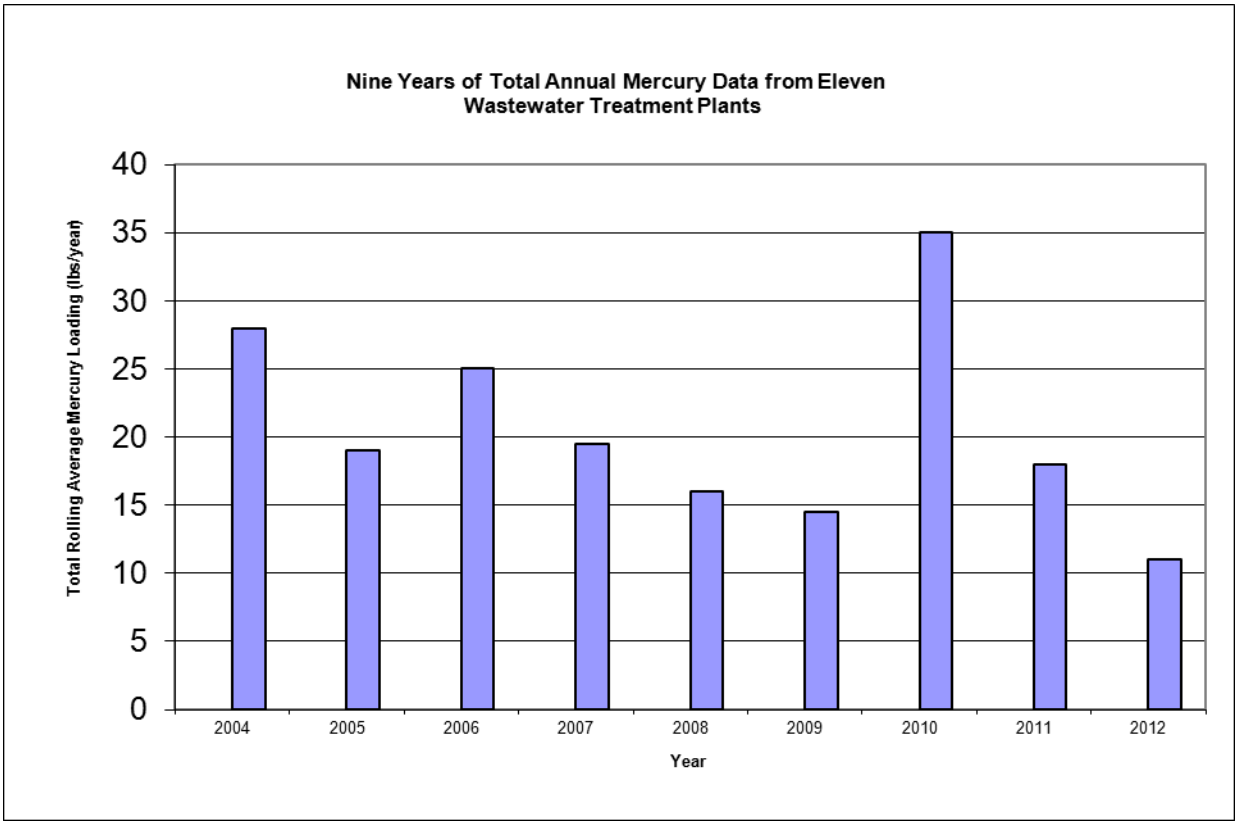
Results 2007-2011: Only 56% of stream miles met the WQS based on data from a 5-year monitoring program. This is the same estimated percentage as for the period 2005-2009.

How are we doing? Fair

Comment: Mercury concentrations in flowing waters appear to portray greater progress in controlling mercury than does mercury in fish tissue where it bioaccumulates at levels that may negatively affect human health and wildlife when consumed. Mercury in water also appears to be greatly dependent on the mercury from atmospheric deposition, which is primarily due to burning coal to generate electricity. Achieving this goal is premised on the DEQ Mercury Strategy being implemented as scheduled (by 2015), with appropriate controls on mercury emissions from burning coal.

Outcome 1C: Reduce the concentration of mercury discharged from permitted point source discharges of mercury with a goal of eventually achieving 1.3 ng/L in all such discharges.

Measure: Annual mercury loading from representative WWTPs.

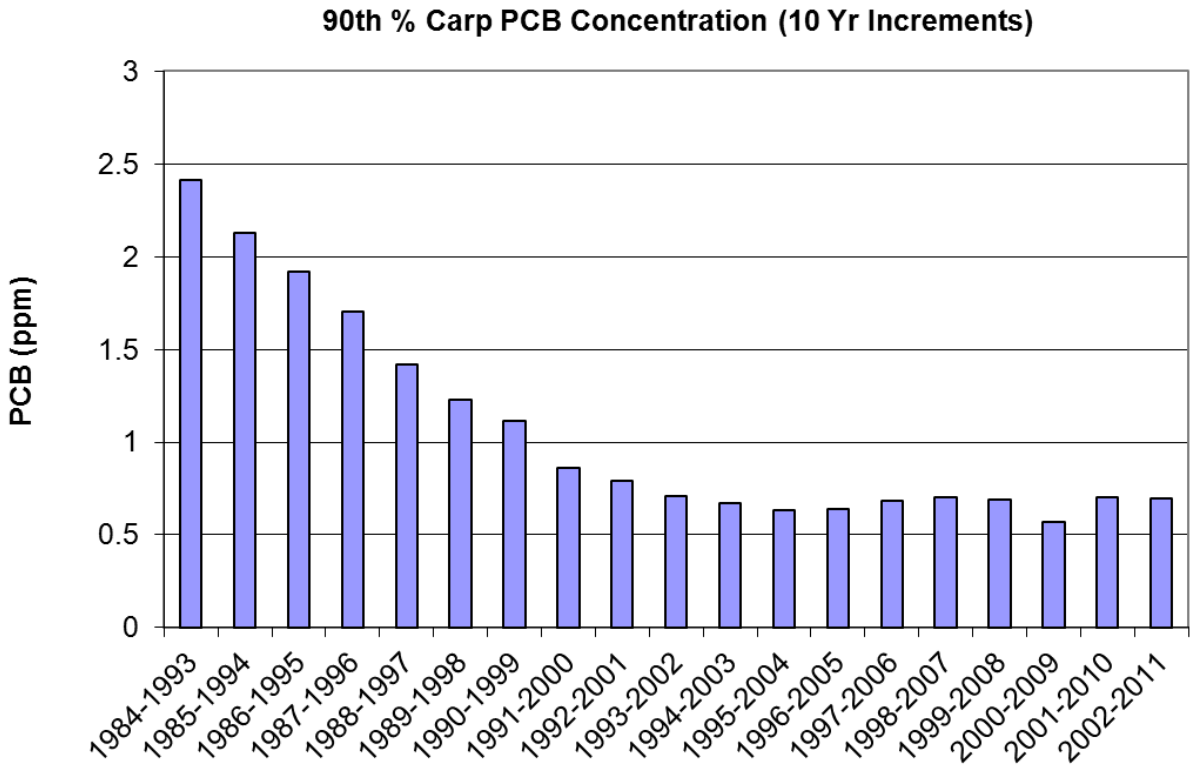


How are we doing? Excellent

Comment: These permitted point source discharges all have requirements to implement mercury minimization plans and eventually meet a discharge limit of 1.3 ng/L. However, these sources of mercury are dwarfed by the amount of mercury that comes into surface waters from atmospheric deposition, generally from the burning of coal. Because of this, the goal into the foreseeable future is to maintain a loading of 16 pounds or less while still addressing case-specific situations that arise. This represents the current loading with the representative WWTPs being well operated and maintained.

Outcome 2: Eliminate polychlorinated biphenyl (PCB) contamination – Reduce PCB levels in edible portions of Great Lakes, inland lakes, and river fish to below 0.05 mg/Kg by 2025.

Measure: PCB concentrations in the 90th percentile of lipid normalized carp fillets (site dependent) from selected sites not impacted by legacy pollution.



Estimated 90th percentile PCB concentrations in standard lipid carp from inland waters of Michigan for consecutive running 10-year periods.

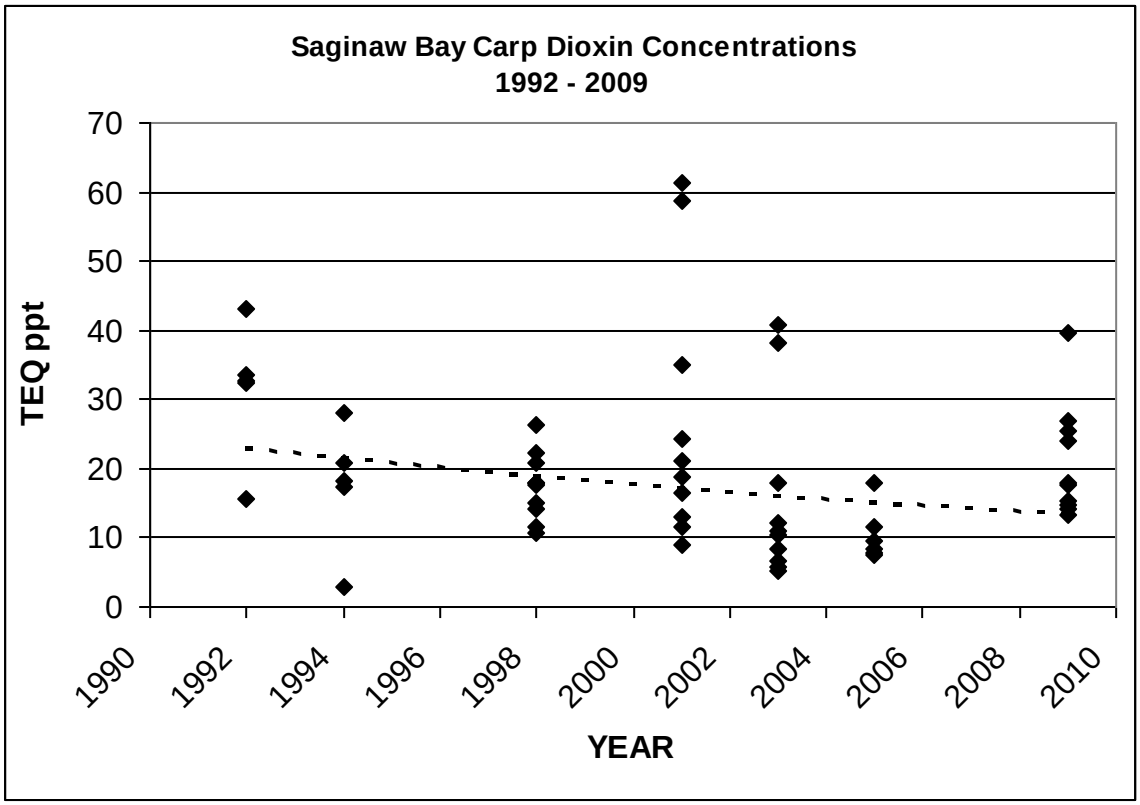
How are we doing? Good overall; Fair in recent years

Comment: PCBs have been banned from open use for 30 years. Point source discharges have been controlled, and several sediment remediation activities for PCBs have been completed. The rate of change in recent years has declined, which is a reflection of the ubiquitous nature of PCB in the environment, its slow degradation rate and the global transport of PCB once it is released.

Outcome 3: Eliminate dioxin contamination.

Outcome 3A: By 2025, achieve an average concentration of 0.53 nanogram per kilogram (parts per trillion) dioxin toxic equivalent (TEQ) levels in fish in the Saginaw River and Saginaw Bay.

Measure: Temporal trend in lipid-adjusted dioxin TEQ concentrations in whole carp from Saginaw Bay.



How are we doing? Fair

Comment: The primary point source discharge of dioxin has been controlled, a large PCB sediment remediation of the Saginaw River was completed that likely removed dioxins as well, several hot spots of sediment contaminated with dioxin have been removed from the Tittabawassee River, and the downward trend in dioxin concentrations is expected to continue. Additional sediment remediation actions are being planned for the Tittabawassee and Saginaw Rivers and associated floodplains.

GOAL 3: PROTECT AND RESTORE AQUATIC ECOSYSTEMS

Restore and maintain the physical, chemical, and biological integrity of public trust waters, including inland lakes, streams, wetlands, and the Great Lakes.

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Outcome 1: Ensure healthy aquatic biota – Through 2015, ensure that the condition of the state's wadeable streams does not degrade, such that there is no statistically significant increase in the percent of streams rated "nonattaining," and no statistically significant decrease in streams rated "attaining."

Measure: The trend in attainment status of the other aquatic life and wildlife designated use based on benthic macroinvertebrate communities; percent monitored waters attaining the designated use based on an assessment of the benthic macroinvertebrate communities.

Results 2008-2012: Data collected from this 5-year statewide monitoring cycle indicate that 95% of Michigan's rivers and streams attain the aquatic life designated use.

How are we doing? Status – Excellent; Trend – Don't know yet

Comment: These results indicate that Michigan's wadeable streams are largely supporting this aspect of the designated use. Statewide trend data will not be available until 2014 or 2015.

Outcome 2: Protect natural hydrology.

Measure 1: Percent of new water withdrawals registered that do not cause an adverse resource impact (ARI).

Results:

2010 – There were 213 new large quantity withdrawals (LQW) registered between July 8, 2009, when the Water Withdrawal Assessment Process became effective, and July 9, 2010 (Year 1 of the program); 100% have not caused an ARI. Two proposed withdrawals were not approved because they were likely to cause an ARI.

2011 – There were 381 new LQWs registered during Year 2 of the program (July 9, 2010-July 8, 2011); 100% have not caused an ARI. Two proposed withdrawals were not approved because they were likely to cause an ARI.

2012 – There were 517 new LQWs registered during Year 3 of the program (July 9, 2011-July 8, 2012; 100% have not caused an ARI. Four proposed withdraws were not approved because they were likely to cause an ARI.

Measure 2: Number of watersheds where new LQWs since October 1, 2008, are likely to cause an ARI.

Results 2012: None based on registered withdrawals through July 8, 2012. However, there may be unregistered LQWs or undiscovered discrepancies between registrations and installed wells that could potentially cause an ARI.

How are we doing: Excellent

Comment: The development of the Water Withdrawal Assessment Process is a major accomplishment toward achieving this goal, and it is performing as designed with excellent results.

Measure 3: Percentage of known or suspected ARIs on which the WRD is taking action to resolve or has resolved.

Results: There were no known or suspected ARIs through the 2012 reporting cycle.

Measure 4: The stream hydrology at United States Geological Survey gauge sites is trending toward natural flow regimes as measured by the Richards-Baker Flashiness Index.

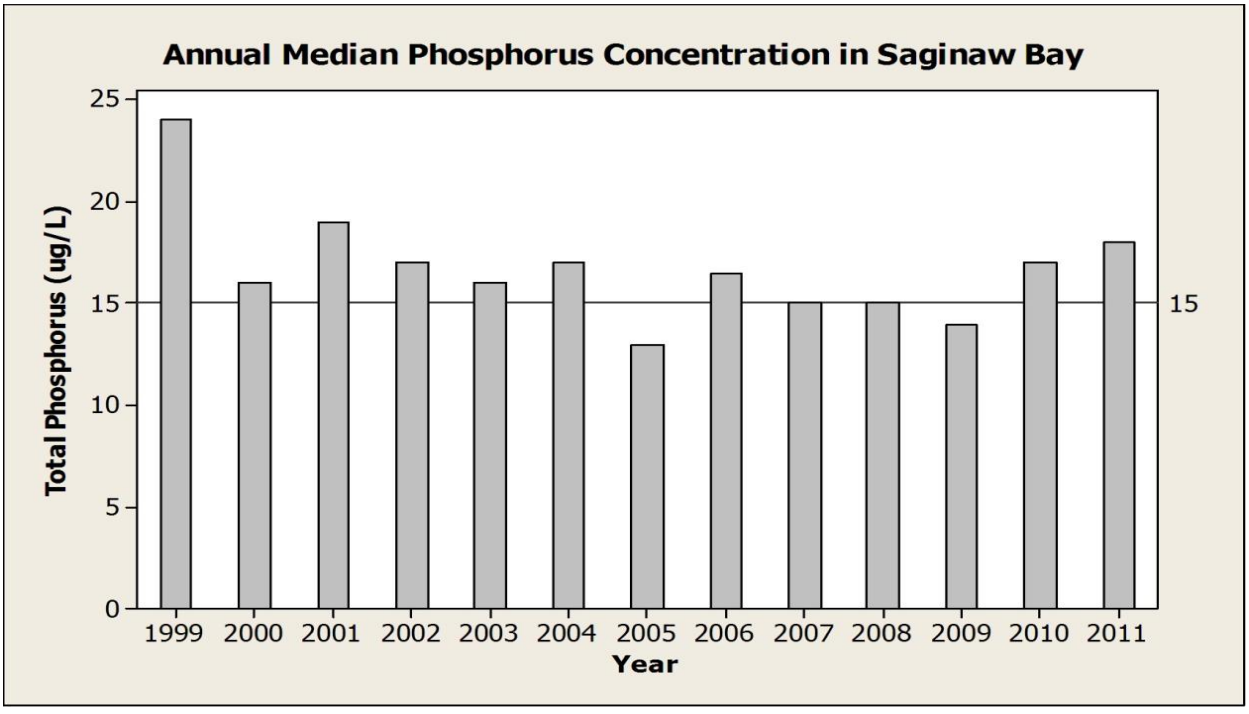
Results: Between 2007 and 2012, stream flashiness trends at 14 gauge sites improved, changing from an increasing trend to no trend or a decreasing trend. This implies that unnatural streambank erosion rates at these sites are not worsening or even improving. However, flashiness trends at 11 gauge sites worsened, changing from no trend or a decreasing trend to increasing flashiness. This implies that unnatural rates of streambank erosion are possible.

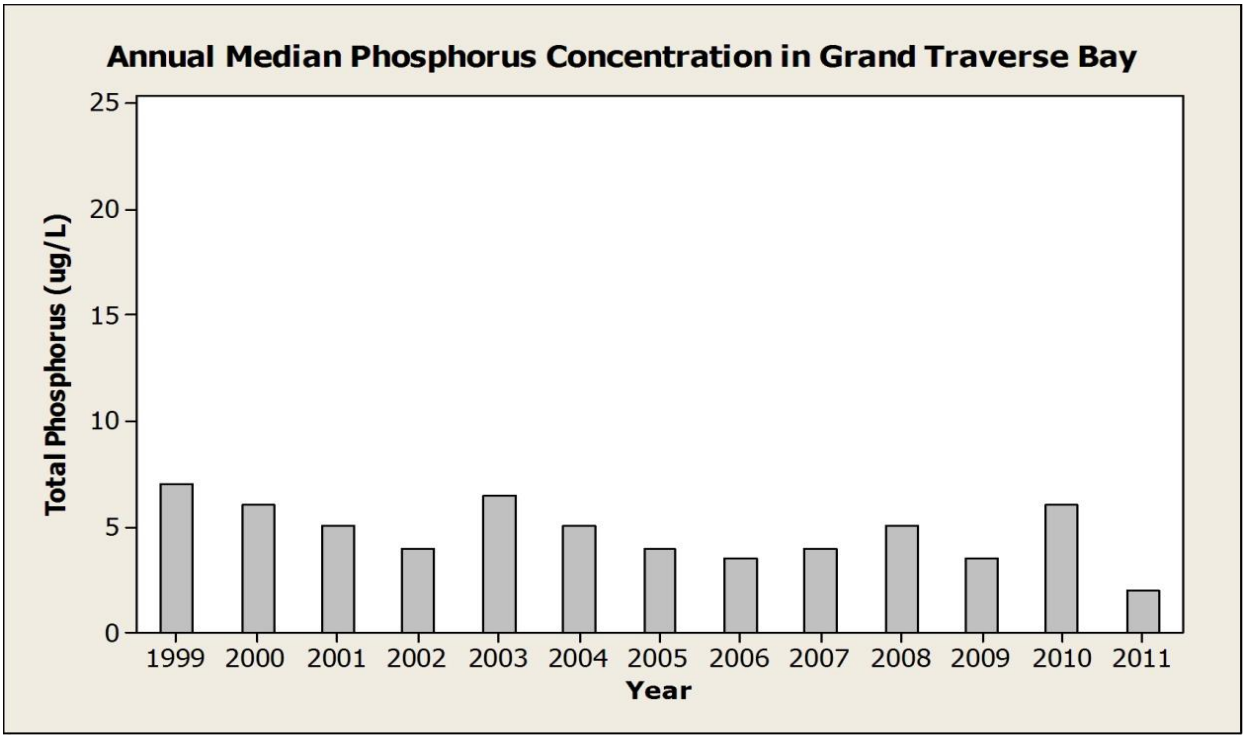
How are we doing? Fair

Comments: These data will next be updated in 2017.

Outcome 3: Meet the total phosphorus goal in Saginaw Bay of 15 micrograms per liter (µg/L) and maintain a neutral trend in total phosphorus in Grand Traverse Bay.

Measure: Phosphorus concentrations and trends in Grand Traverse and Saginaw Bays.





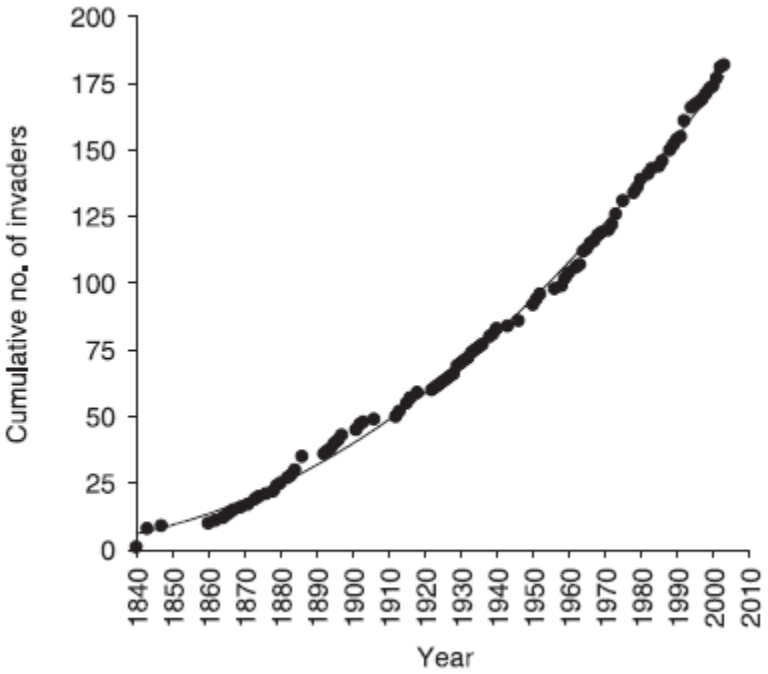
How are we doing? Fair for Saginaw Bay; Excellent for Grand Traverse Bay

Comment: In Saginaw Bay, phosphorus reductions appeared to be occurring slowly as recently as 2009, but there was an uptick in concentrations in 2010 and 2011. Recent efforts have been refocused by the Saginaw Bay Coastal Initiative including the "muck" on the beach issue. However, the presence of invasive species, such as the zebra mussel and quagga mussel, changing lake levels, and other factors have complicated this situation. Additional studies are underway to try to further understand these interactions.

Outcome 4: Reduce the rate of introduction of aquatic invasive species into the Great Lakes to 1 species every 30 years by implementing preventive measures.

Measure: Number of new aquatic invasive species introduced into the Great Lakes.

Result: Based on available studies, the modern (1960-2003) rate of invasion is estimated to be about 1 species every 28 weeks (Ricciardi, A. 2006. Patterns of Invasion in the Laurentian Great Lakes in Relation to Changes in Vector Activity. Diversity and Distributions, 12, 425-433).



Cumulative number of invaders in the Great Lakes between 1840 and 2003. Line fitted by least-squares regression: $y = 6.02 + 0.27x + 0.005x^2$, where x = years since 1840. The second-order equation ($r^2 = 0.997$) provides a better fit than a straight line ($r^2 = 0.966$).

How are we doing? Poor; there is no knowledge of a new aquatic invasive species established in the Great Lakes basin since 2006; however, there is a low level of certainty associated with our ability to maintain this recent invasion rate. The lack of a comprehensive monitoring program limits our ability to detect new invaders, and there can be a significant lag in the time of introduction and species' establishment and detection.

Comments: Significant and bold action is needed to meet this outcome. In addition to this measure, the following program outputs were developed.

> Program Output: The number of oceangoing vessels under the Michigan ballast water permit.
>
> Results as cumulative number of Certificates of Coverage issued since 2007: 2009 - 110; 2010 - 174; 2011 – 212.
>
> In 2012 the permit was reissued and vessels needed to reapply (i.e., the count of Certificates of Coverage issued under the permit resets).
>
> Results as cumulative number of Certificates of Coverage issued since 2012: 2012 - 106.
>
> How are we doing? Excellent on Michigan's permit, but overall effectiveness is doubtful

Comment: Michigan has led the nation in efforts to prevent future introduction of aquatic invasive species into the Great Lakes. However, support from the federal government and Canada is needed to accomplish this goal, and that support has been very slow in coming. The United States Environmental Protection Agency has a new 2013 National Pollutant Discharge Elimination System permit and the United States Coast Guard has a new 2012 final rule that makes some positive movement toward slowing the introductions via ballast water.

Program Output: Hydrologic separation between the Great Lakes basin and the Mississippi River basin, especially in the Chicago Area Waterways System.

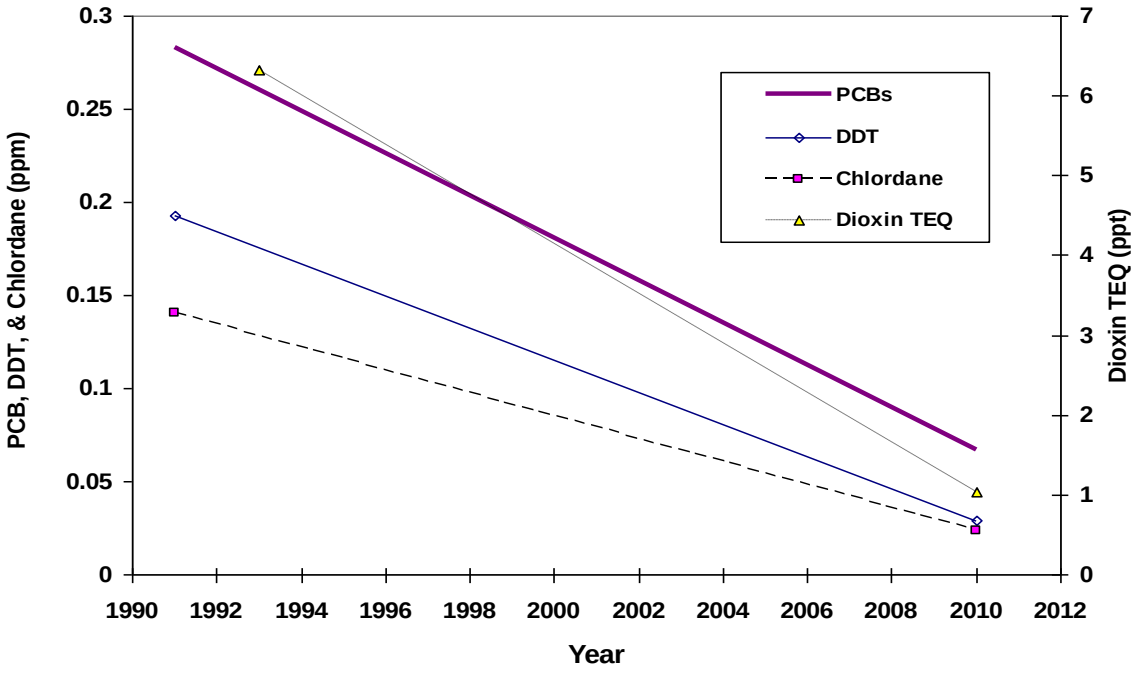
Results: The basins remain connected with no immediate plans for separation.

How are we doing? Poor

Comment: Michigan continues to participate in activities to promote hydrologic separation of the two basins. These activities include participation in the Asian Carp Regional Coordinating Committee and the use of legal action in the form of ongoing lawsuits calling for the development and implementation of plans to permanently and physically separate carp-infested waters in the Illinois River basin, the canal, and connected waterways from Lake Michigan; and the implementation of immediate actions to close some of the locks on the Chicago Sanitary and Ship Canal and connecting channels, operate electric barriers in the canal at maximum efficiency, and monitor for Asian carp and eradicate any Asian carp found. In addition, the United States Army Corps of Engineers plans to conduct a feasibility study (Great Lakes and Mississippi River Interbasin Study) of the range of options and technologies available to prevent the spread of aquatic nuisance species between the Great Lakes and Mississippi River basins through the Chicago sanitary and ship canal and other aquatic pathways.

Outcome 5: Enhance the quality of the Outstanding International Resource Waters - Lake Superior Basin.

Measure 1: Temporal trend in concentrations of PCB, dichlorodiphenyltrichloroethane (DDT), chlordane, and dioxins in Lake Superior (Keweenaw Bay) lake trout, with a goal of maintaining measurable declines.

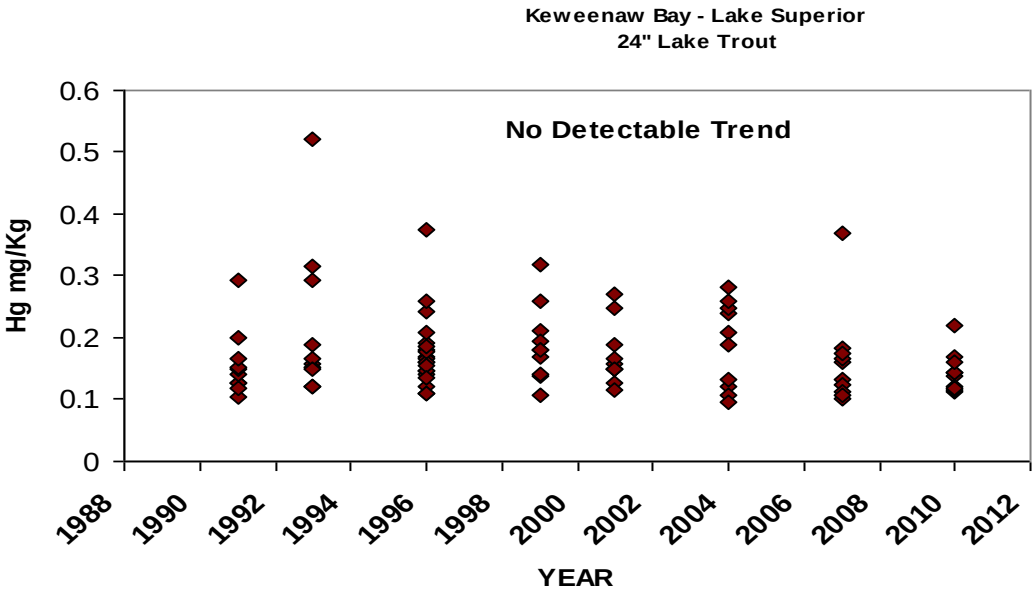


Temporal trends in Lake Superior lake trout contaminant concentrations.

How are we doing? Excellent

Comment: Lake trout have been collected from Keweenaw Bay every 2 to 3 years since 1991 and analyzed as whole fish. Temporal trends in contaminant concentrations are evaluated using regression techniques on that dataset. We expect these declines to continue.

Measure 2: Concentrations of mercury from Lake Superior lake trout, with a goal to begin showing measurable declines by 2020.



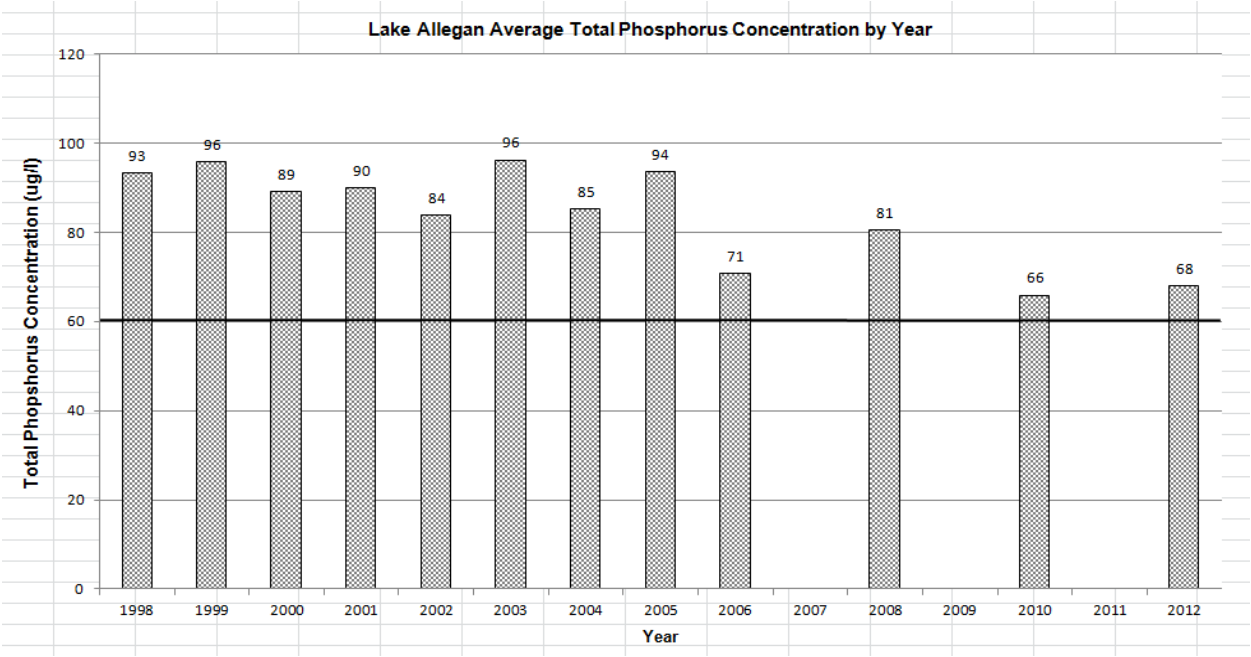
Temporal trend in Lake Superior lake trout mercury concentrations

How are we doing? Fair

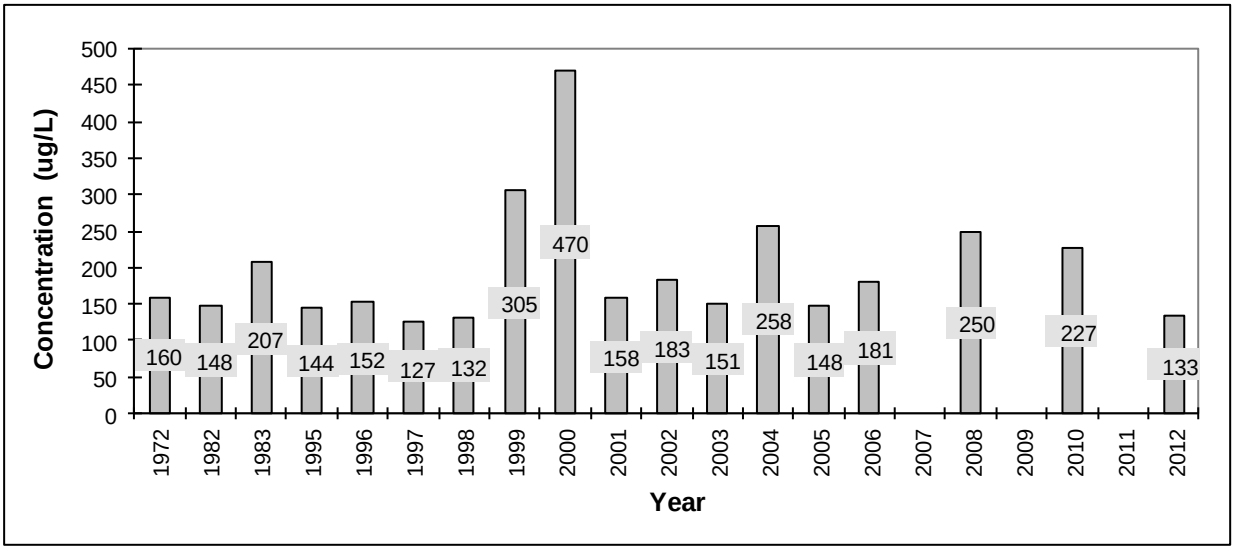
Comment: Although there is no detectable downward trend in mercury concentrations in whole lake trout from Lake Superior, they are not increasing as they are in the other Great Lakes.

Outcome 6: By 2020 achieve the total phosphorus targets for the following impaired lakes: Lake Allegan (60 µg/L); Lake Macatawa (50 µg/L); Ford Lake (50 µg/L); and Belleville Lake (30 µg/L).

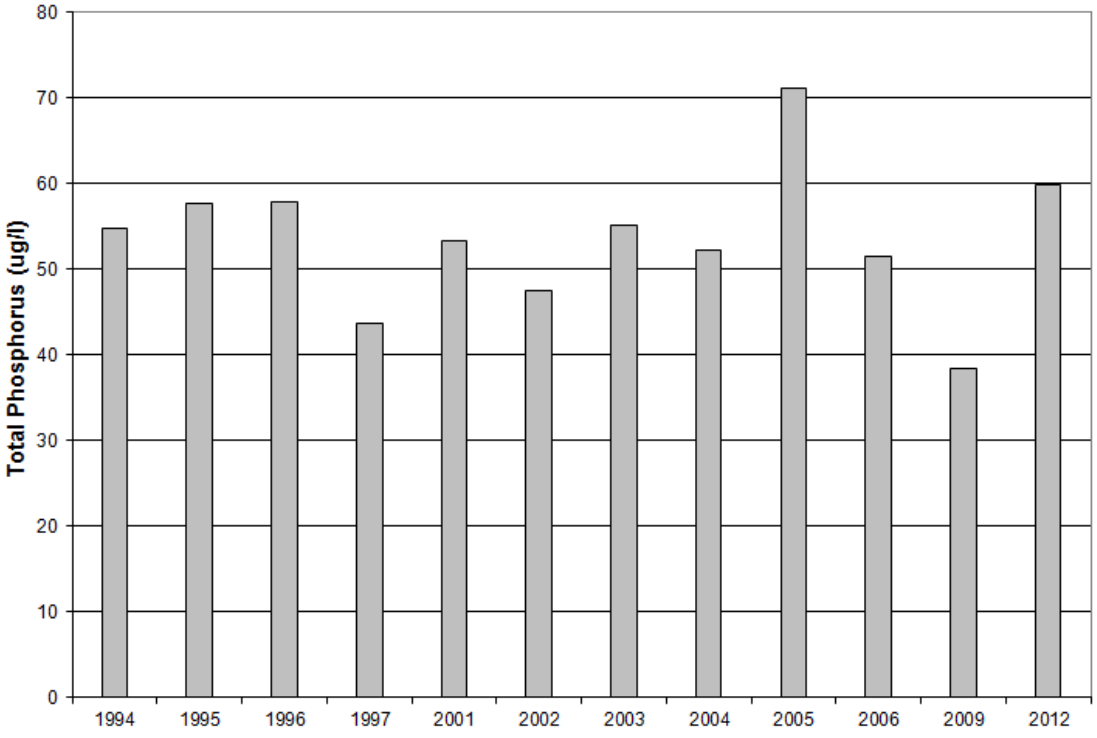
Measure: Total phosphorus concentration in the lakes.



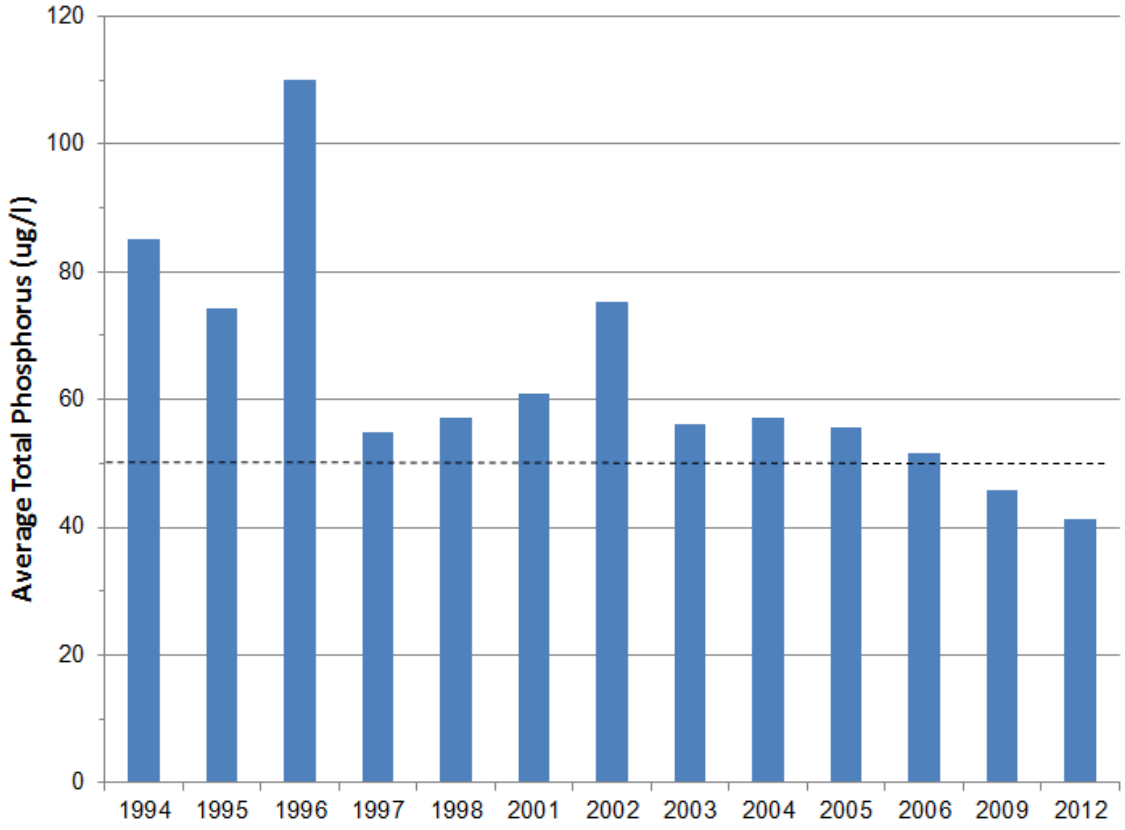
Lake Macatawa Spring Total Phosphorus Concentrations by Year

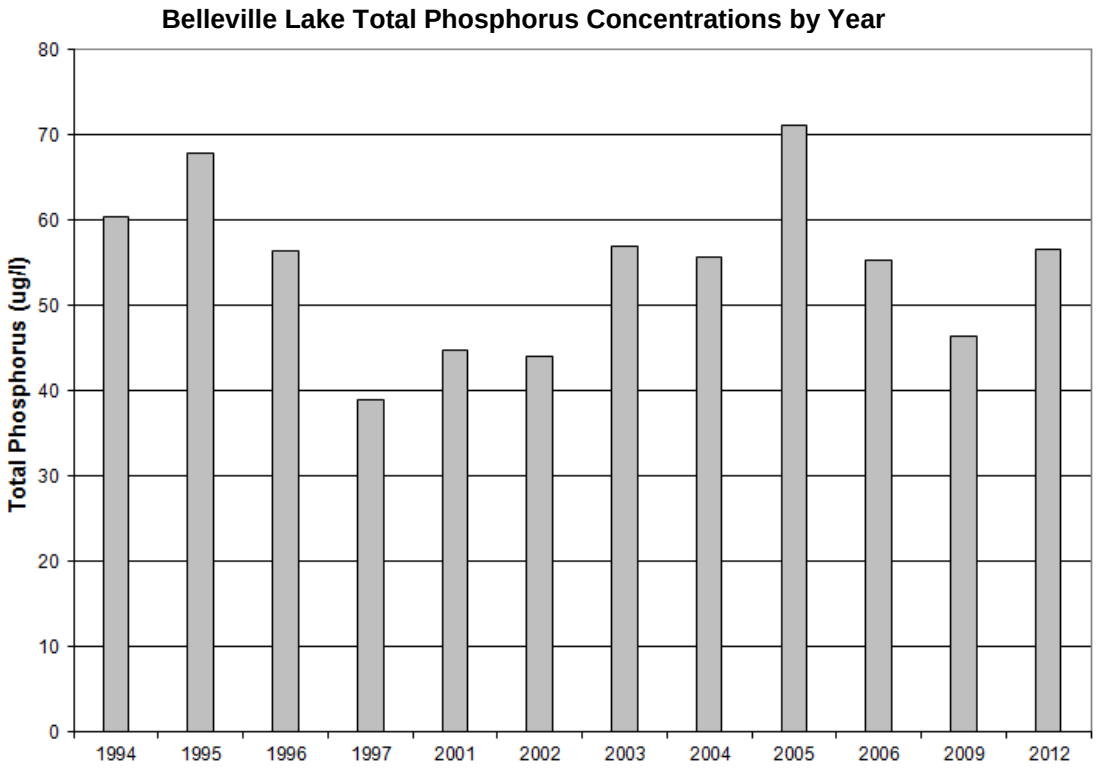


Ford Lake Total Phosphorus Concentrations by Year



Ford Lake (Inlet) Total Phosphorus Concentrations by Year





How are we doing? Poor for Lake Macatawa; Fair for Lake Allegan; Fair for Ford Lake; Poor for Belleville Lake

Comment: Lake Allegan may be showing some signs of a decline in phosphorus levels. In the Lake Allegan watershed, point sources have reduced their phosphorus discharges, and nonpoint source reduction efforts have been underway. In some recent years, Ford Lake and Belleville Lake have shown some signs of a decline in phosphorus levels (especially at the inlet to Ford Lake, which has a target set at 50 µg/L), perhaps due to point source and nonpoint source loading reductions to the middle Huron River watershed. However, in Ford Lake and Belleville Lake, nuisance blooms are still occurring and phosphorus levels increased in 2012, signaling that the lakes will need some additional time to meet designated uses. The lakes likely are still seeing high phosphorus levels, due in part to both internal phosphorus loadings and lake dynamics, as well as variable weather patterns (e.g., 2012 was a warm, dry year), and will require additional time and load reductions to achieve their desired targets. Lake Macatawa does not show any evidence of a decline in phosphorus levels in spite of several activities undertaken to reduce nonpoint sources of phosphorus.

Outcome 7: By 2017 restore 10 water bodies included on the state's nonattainment list.

Measure: The number of water bodies restored between 2012 and 2017. Results will be provided every 2 years to coincide with updates to Michigan's water quality nonattainment list beginning in 2014.

Outcome 8: By 2017 eliminate 20 specific causes of water body impairments included on the state's nonattainment list.

Measure: The number of causes of water body impairments eliminated between 2012 and 2017. Results will be provided every 2 years to coincide with updates to Michigan's water quality nonattainment list beginning in 2014.

Outcome 9: By 2017 improve water quality conditions in five 12-digit Hydrologic Unit Code (HUC) watersheds.

Measure: A watershed is improved if one or more water quality impairment is removed for at least 40% of the impaired water bodies or impaired miles/acres, or there are significant watershedwide improvements, as demonstrated by valid scientific information, in one or more water quality parameters associated with the impairments. Improvements must be documented as compared to the nonattainment list. Results will be provided every 2 years to coincide with updates to Michigan's water quality nonattainment list beginning in 2014.

Outcome 10: Increase the number of permits issued for natural shorelines by 50% over the previous year for the next 3 years (2011, 2012, and 2013).

Measure: Increase in number of shoreline protection permits issued for natural shoreline designs.

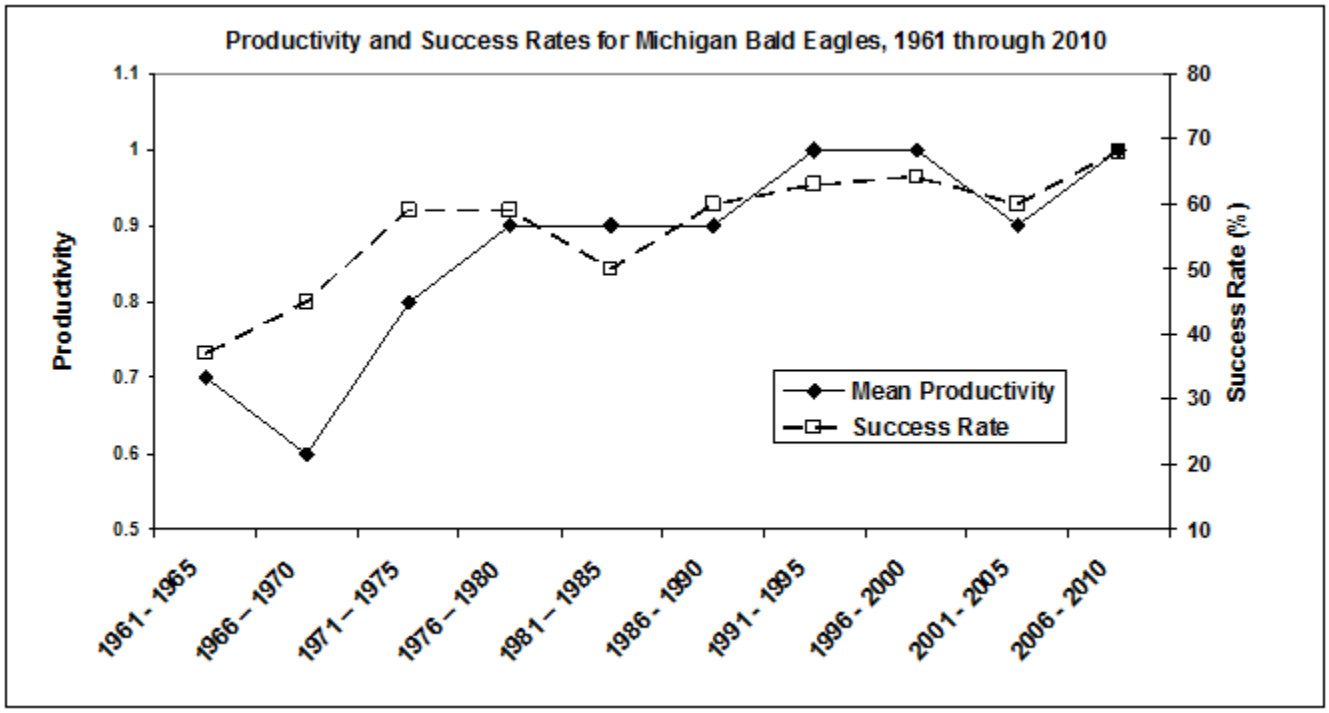
Results: Fiscal year (FY) 2011 – Issued 24 natural shoreline permits (target was 17 permits); FY 2012 – Issued 62 natural shoreline permits (target was 36 permits).

How are we doing? FY 2011 – Excellent; FY 2012 – Excellent

Comments: The WRD has been actively working with our partners through the Natural Shoreline Partnership and the Michigan Inland Lakes Partnership to develop educational materials and promote natural shoreline design. We have observed an increase in the permitted shoreline protection projects that use natural shoreline design over the course of the last two FYs as a result of continued outreach by the DEQ and the partnerships. Based on the FY 2010 baseline, the target number of natural shoreline permits for FY 2011 was 17 and the WRD issued 24 natural shoreline permits; the target for FY 2012 was 36 and the WRD issued 62 natural shoreline permits; and for FY 2013 the target is 93 permits.

Outcome 11: Reduce the levels of contaminants in the environment so that the productivity (i.e., total number of fledged young per occupied nest) and success rate (i.e., percent of nests producing at least one fledged young) of bald eagles are at levels associated with a healthy population.

Measure: Statewide average productivity and percent nesting success rate for bald eagles are at least 1 and 50%, respectively.

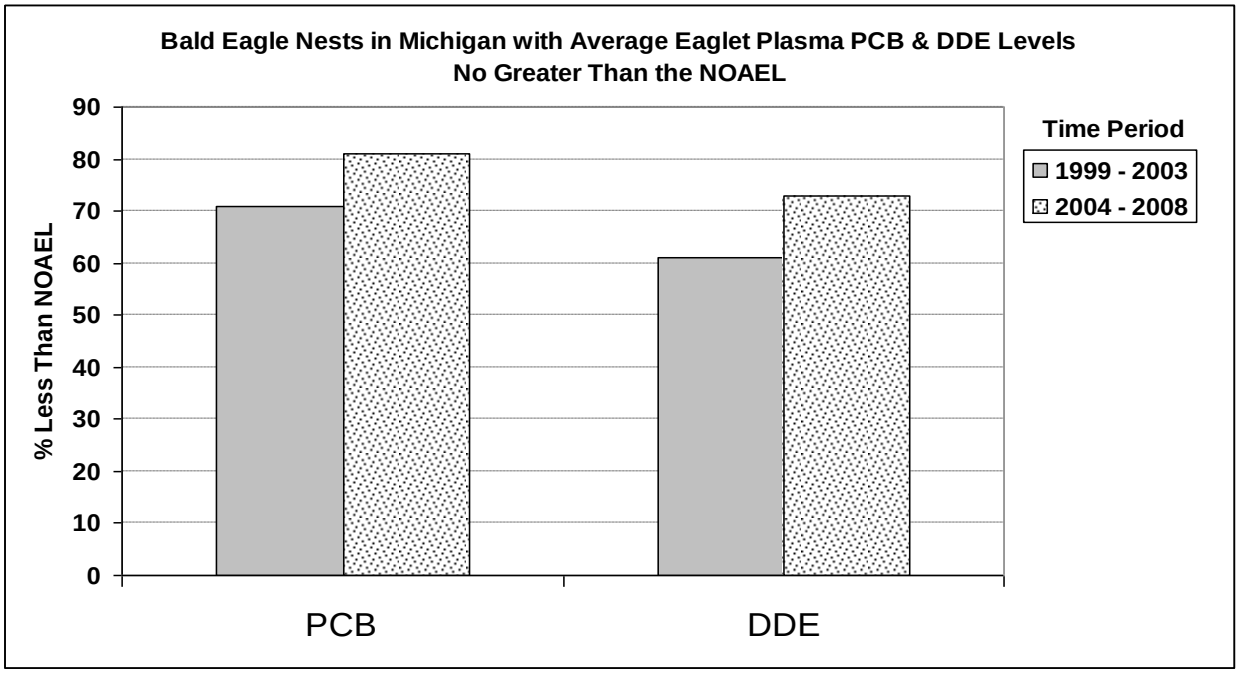


How are we doing? Good

Comment: The average statewide bald eagle productivity from 2006 to 2010 was greater than 1 young per occupied nest and the nesting success rate was greater than 50%. This is much improved since the 1960s when the statewide productivity and nesting success rate averaged 0.59 and 41%, respectively.

Outcome 12: Reduce the levels of PCBs and dichlorodiphenyldichloroethylene (DDE) in the environment so that they are below levels associated with adverse effects in eaglets.

Measure: Percentage of bald eagle nests in Michigan with average eaglet plasma levels of PCBs and DDE no greater than the No Observable Adverse Effect Levels (NOAEL) of 35 µg/L and 11 µg/L, respectively.

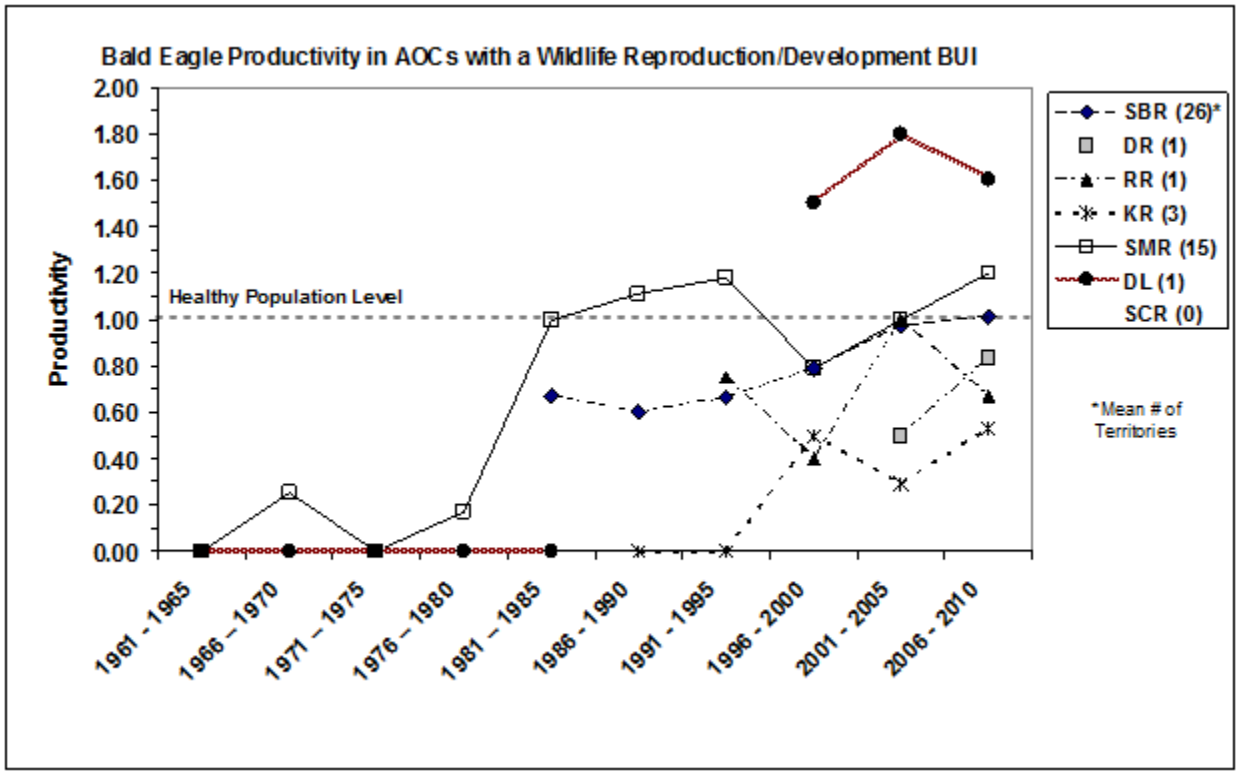


How are we doing? Good

Comment: The concentration of PCB and DDE in eaglet plasma has decreased over the last 10 years. However, 20% to 30% of eaglets contain concentrations of PCB or DDE that exceed their NOAELs.

Outcome 13: Reduce the levels of contaminants in the Areas of Concern (AOC) that have a "Bird or Animal Deformities or Reproductive Problems" Beneficial Use Impairment (BUI) so that the average bald eagle productivity is at the level associated with a healthy population.

Measure: The number of AOCs with a "Bird or Animal Deformities or Reproductive Problems" BUI (Kalamazoo River [KR], River Raisin [RR], Detroit River [DR], St. Clair River [SCR], Saginaw Bay/River [SBR], St. Marys River [SMR], and Deer Lake [DL]) that have a bald eagle productivity of at least 1 young per occupied nest.



How are we doing? Fair

Comment: The average productivity of bald eagles in only 2 of the 7 AOCs with a "Bird or Animal Deformities or Reproductive Problems" BUI has averaged at least 1 young per occupied nest over the last 10 years (the increased productivity of bald eagles in the Deer Lake AOC resulted in the removal of this BUI in 2011). The productivity of bald eagles in most of the 7 AOCs has been increasing over the last 10 years.

GOAL 4: ENSURE SAFE DRINKING WATER

Outcome 1: Ensure that groundwater is safe to drink.

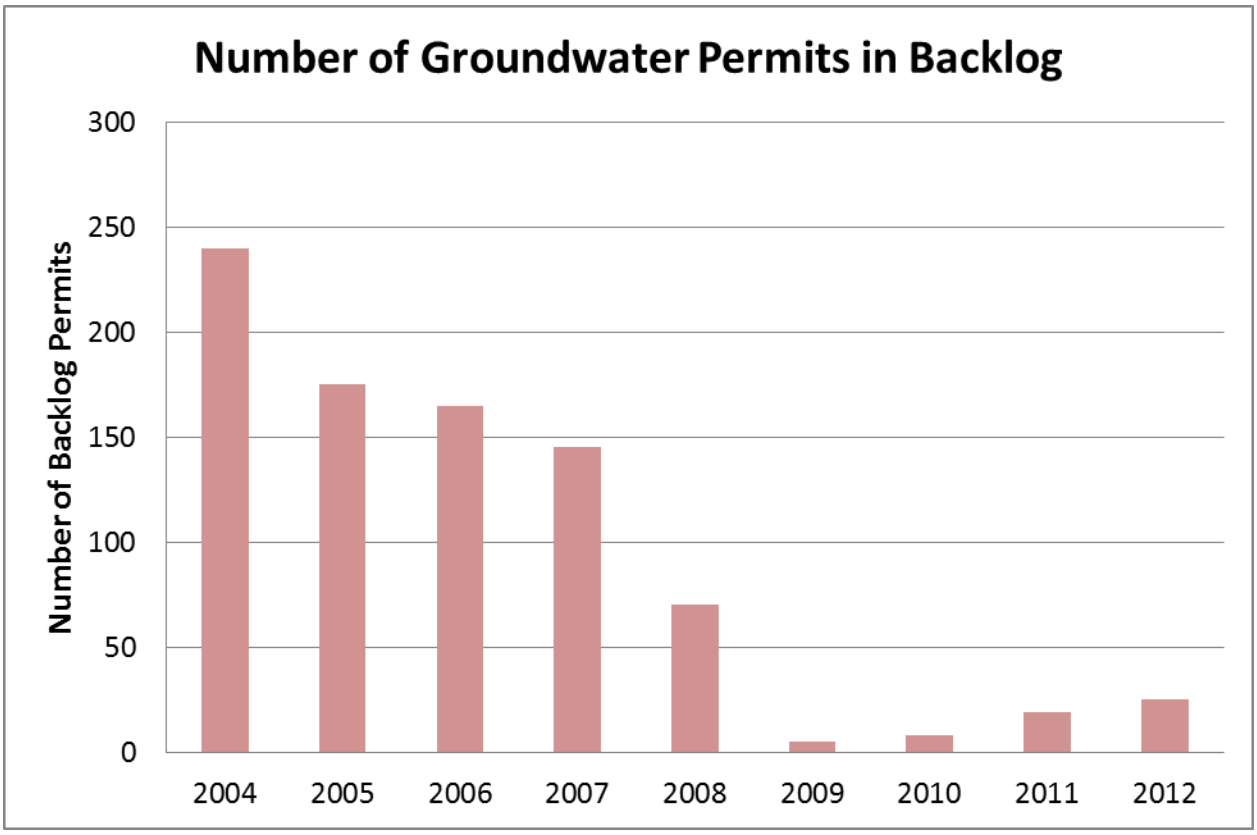
Measure: Groundwater meets all applicable health-based standards for drinking.

How are we doing? Don't know yet

Comment: There currently is no coordinated or compiled groundwater monitoring in Michigan. This needs to be examined and developed. This was identified as a departmentwide issue to be addressed in future Strategic Plans with multiple divisions involved. In the interim, the following program outputs will be used to measure progress.

Program Output 1: The Groundwater Discharge Permit backlog will be eliminated, meaning that the permits will be timely with up-to-date limits and requirements to protect groundwater.

Measure: Number of Groundwater Discharge Permits that are in backlog.



How are we doing? Excellent

Comment: The Groundwater Discharge Permit backlog was essentially eliminated by 2010. When implementation of the Backlog Elimination Plan began in 2004, there were 240 groundwater permit applications for which no permit action had been taken. At the end of FY 2009, only 8 groundwater permit

applications from the original 240 did not have final permit decisions. For FY 2011, there were 19 backlogged applications. The backlog remained steady at 25 applications for FY 2012.

Program Output 2: By 2014 permitted groundwater discharges will not be creating or contributing to metals mobilization in groundwater.

Measure: Groundwater Discharge Permits with limits and requirements that prevent metals mobilization in groundwater.

Results 2011: During 2009, 101 of 110 permits addressed metals mobilization. Of the remaining 9 facilities, 2 received permits during FY 2011. Of the remaining 7 pending permits, 5 were issued during FY 2012; 2 permits remain pending. In addition, 2 new permits are pending for food processors that were previously addressed under administrative consent orders.

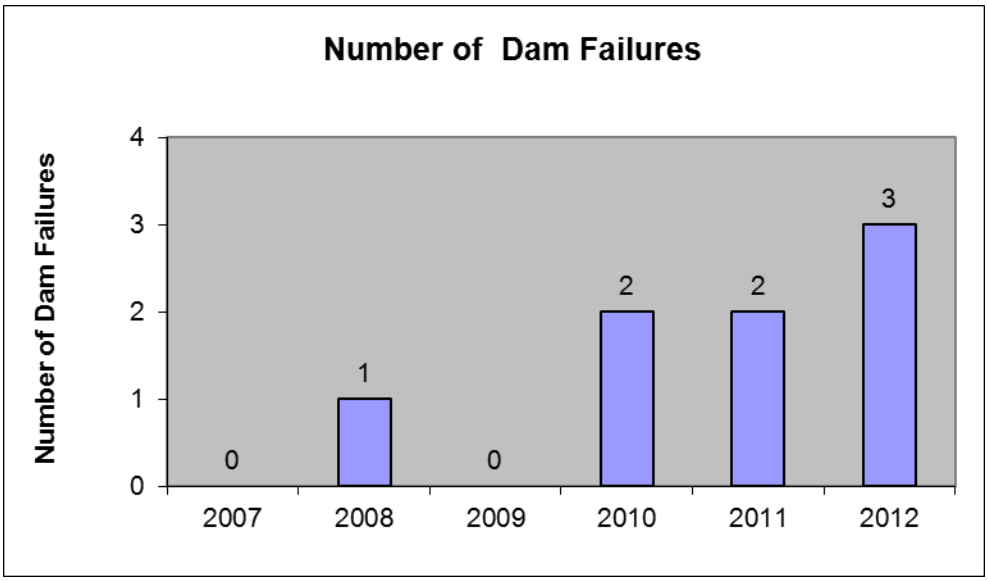
How are we doing? Good

Comment: During FY 2011, the WRD began implementing the food processors permit to address the remaining facilities. The WRD revisited the food processors permit with the industry during FY 2012, which lead to a revised permit in May 2012. The WRD began implementing the revised permit, and by the end of FY 2012 issued all but 2 of the pending permits. It is expected that the remaining permits will be issued in FY 2013.

GOAL 5: PROTECT PUBLIC SAFETY

Outcome 1: Ensure there are no dam failures in conditions less than the flood designs.

Measure: Total dam failures per year.



How are we doing? Fair

Comment: The number of dam failures has dramatically declined since the passage of the Dam Safety Act in 1990. The act requires regular dam inspections that identify possible problems and requires the owner to address serious issues that endanger the dam.

OUTCOMES UNDER CONSTRUCTION

1. Recent studies have found a positive correlation between human development on lakeshores and lake watersheds and long-term cumulative ecological degradation of inland lakes. The WRD is working with inland lake property owners, local governments, construction companies, and other stakeholders to promote natural shorelines and "soft" engineering techniques where shoreline modifications are necessary. Work is ongoing to identify appropriate environmental, social, and administrative outcomes and measures.

2. Wetlands provide important ecological and social benefits and the WRD has a well established, successful program to ensure their protection through regulatory activities and by promoting voluntary wetland protection and restoration. Developing environmental outcomes and measures that adequately portray the importance of wetland resources and demonstrate success in their protection is challenging because available monitoring and tracking tools have not been traditionally used or developed for this purpose. A priority for the WRD is to identify meaningful and measurable environmental outcomes that will describe a successful program within the means of readily available tools and resources.

APPENDIX A

The information below is an excerpt from "Following the Roadmap: Next Steps in Implementing Outcome-Based Environmental Management. Recommendations of the Environmental Advisory Council, December 16, 2010."

The following list of program areas is not exclusive of all the possible choices. That is, interested parties (including the DEQ), could ultimately choose to move forward with only some of the items identified and/or choose to add additional program areas for the development of outcomes.

We recommend that outcomes be developed in the following priority program areas.

Wet Weather Related Programs

Many of the challenging water impairments in urban watersheds are related to wet weather events. The regulatory framework for managing wet weather is defined by specific regulatory programs: storm water, combined sewer overflows, and sanitary sewer overflows that are largely managed on independent tracks. Yet the costs and water quality benefits of programs within and between these tracks vary enormously. **In order to create a common basis to evaluate alternatives and tradeoffs and facilitate coordinated efforts, interested parties should develop a statement of unifying outcomes for managing wet weather issues that cuts across individual program areas.**

Wetlands

Part 303, Wetlands Protection, defines regulated wetlands and their importance to Michigan's citizens and provides a process for authorization of construction activities in wetlands under both state and federal law where such impacts are unavoidable. The program as administered by the DEQ also provides assistance to landowners in identification of wetlands, promotes wetland restoration, provides for monitoring and assessment of wetland resources, and encourages public support through education and stewardship. The state has established the goal of restoring 500,000 acres of wetland by 2079 through partnerships with other state, federal, and private agencies. Due to budgetary constraints in 2009, the state considered elimination of the Michigan wetland program, returning regulation of activities in wetlands to federal agencies under Section 404 of the Clean Water Act. Instead, the Legislature passed Public Act 120 of 2009, which amended the wetland (and related) law and provides program funding for three years while a statutory-created Wetland Advisory Council evaluates the program and make recommendations for improvement. In developing its report, due August 15, 2012, **the Council is encouraged to consider agreed-upon outcomes for Michigan's wetlands program and the policies and resources necessary to achieve those outcomes.**

Critical Dunes Program

The DEQ regulates activities that significantly alter the physical characteristics of dunes in the 70,000 acres of designated critical dune areas. The governing statute, which dates to 1989, contains difficult decision-making criteria and provides little guidance as to how the DEQ is to apply those criteria. The DEQ has implemented several program improvements recommended by a work group of affected interests convened in 2008. But the underlying program implementation issues have not been resolved. The improving economy will soon increase development pressure in the high-value dune areas with resulting pressure for program reform. These program reforms are likely not possible without agreement on the fundamental purposes of regulating development in critical dunes. Further, the role of

regulation should be designed with reference to the full range of private and public sector activities encouraging appropriate dune management. **Interested parties should agree to the outcomes for critical dune protection and development in order to determine the nature of, and role of government in, appropriate dune management.**

Non-Native Invasive Species

Non-native invasive plant, animal, or microbial species are having dramatic economic and environmental impacts on native plant and animal communities as well as human health. Generally speaking, most of the coordination, control and management of non-native invasive species has reacted to rather than prevented introductions, and has been limited by media specific activities dictated by available funding sources. The number of existing non-native invasive species that are already well established and spreading rapidly throughout Michigan and the certainty of new introductions require strategically focused efforts. This strategic focus could be provided by a statement of the desired outcomes for invasive species management that illustrates why the management of invasive species is environmentally and economically important. **Interested parties should develop a statement of desired outcomes that encourages consistent action by involved agencies, determines the scale of treatment and prevention techniques, and focuses efforts at prioritized sites.**