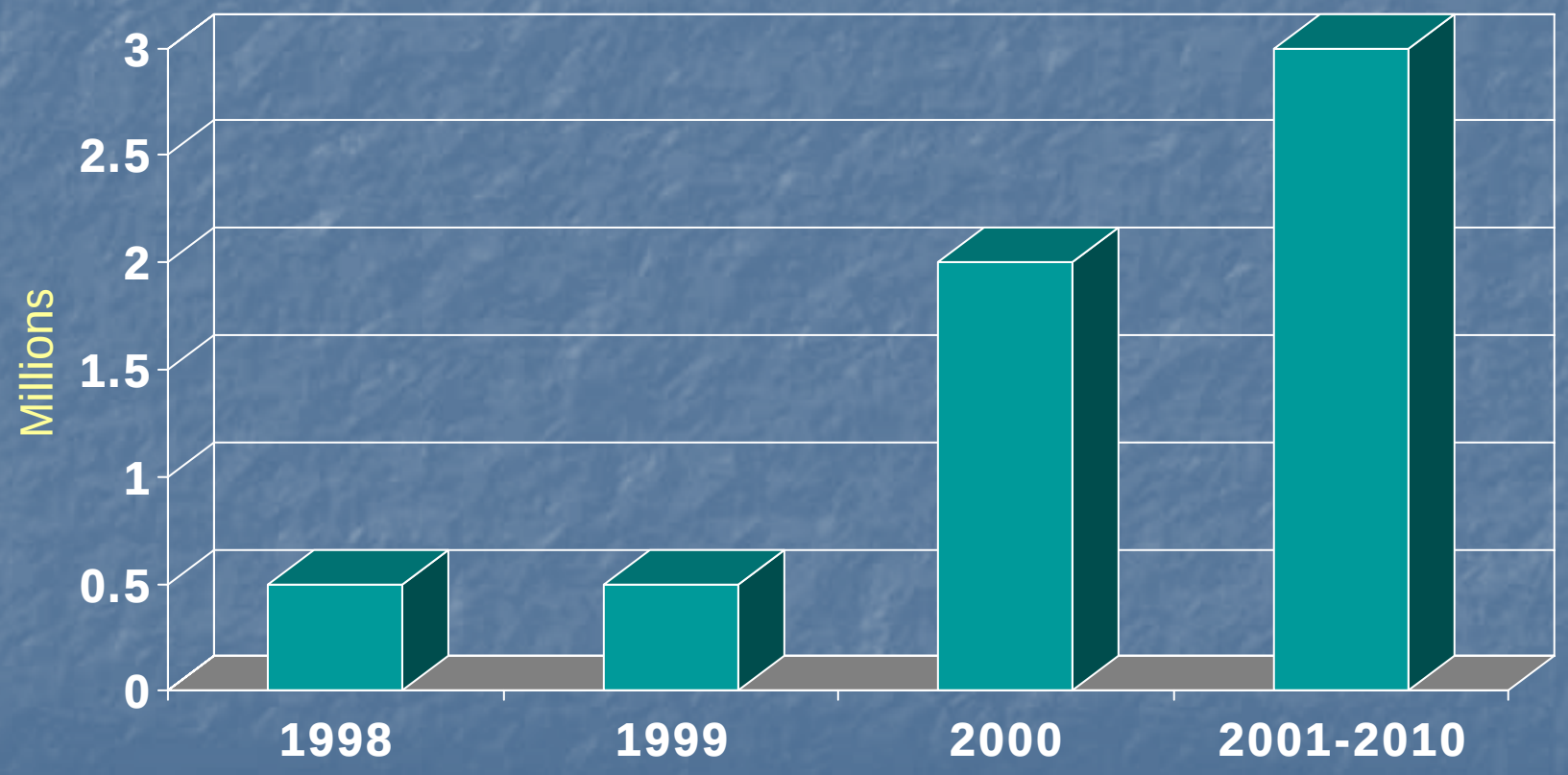
Monitoring and Outcomes in Water Bureau

April 15, 2010

Monitoring Strategy

- Completed in January 1997, updated in April 2005
- Identifies a comprehensive list of monitoring activities with cost estimates
- Implementation primarily through grants and contracts
- Internal monitoring program review conducted in 2009; recommendations being finalized

Funding Increase For Water Quality Monitoring From the Clean Michigan Initiative



Monitoring Goals

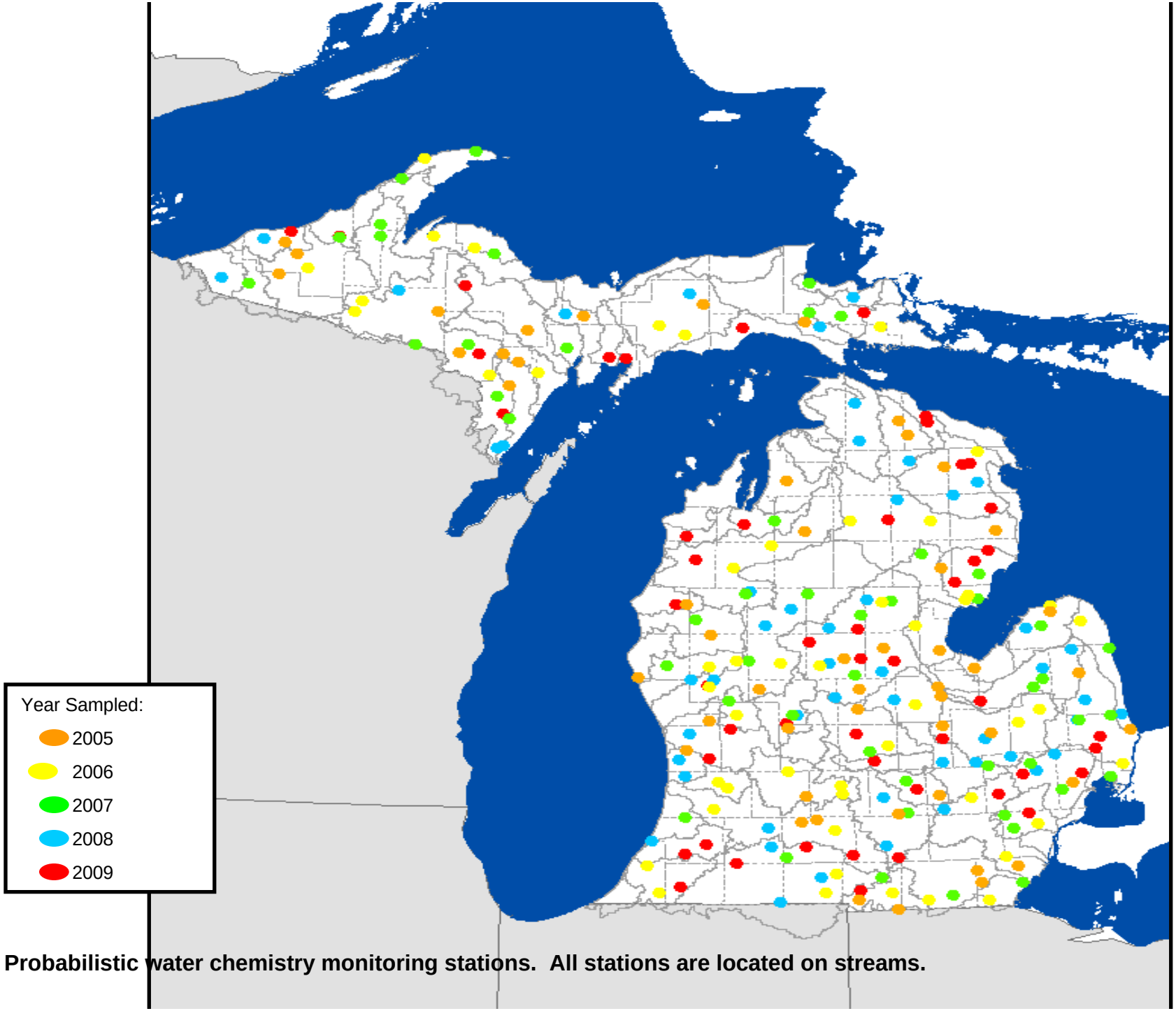
- Assess the current status and condition of individual waterbodies and determine whether MI Water Quality Standards are being met
- Measure temporal and spatial water quality trends
- Provide data to support DNRE water quality protection programs and evaluate their effectiveness
- Detect new and emerging water quality problems

Water Quality Monitoring Program Elements

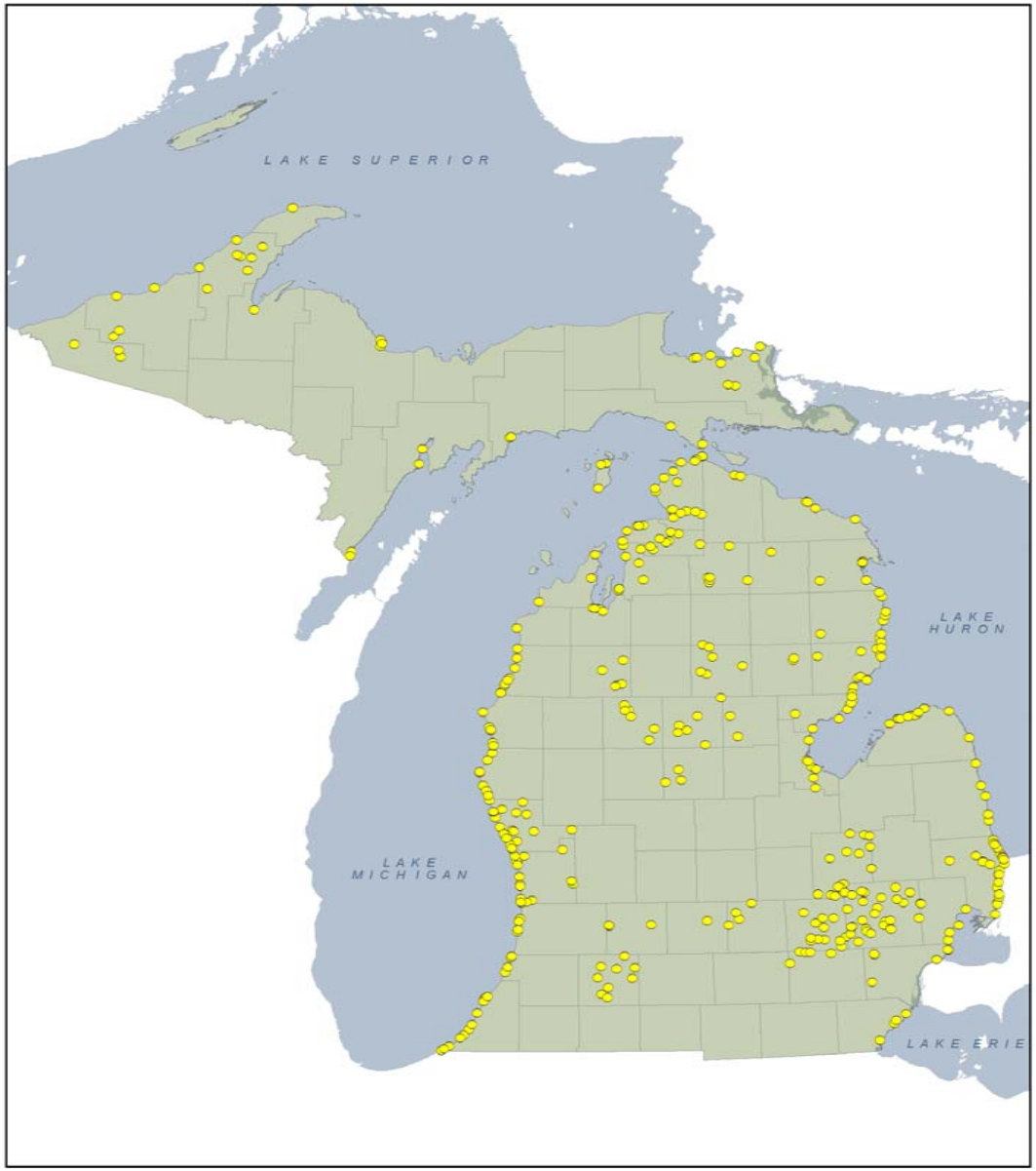
- Water Chemistry
- Sediment Chemistry
- Fish Contaminants
- Biological Integrity & Physical Habitat
- Wildlife Contaminants
- Beach Monitoring
- Volunteer Monitoring
- Inland Lake Quality
- Stream Flow

Assess Current Status

- 250 randomly-selected streams/rivers monitored between 2005 and 2009 for mercury, trace metals, nutrients
- Trophic condition in 735 public-access lakes monitored from 2001-2010
- Over 700 fish tissue samples from ~ 50 locations analyzed for bioaccumulative contaminants each year
- Benthic invertebrates monitored at 300-400 sites annually to assess attainment of Water Quality Standards
- Since 2001, DNRE has awarded over $3 million in grants to county health departments to monitor beach water quality



Probabilistic water chemistry monitoring stations. All stations are located on streams.



Beaches monitored in 2009 through DNRE grant awards.

Trend Monitoring

- Water chemistry (fixed and probabilistic river stations, volunteer inland lakes)
- Sediment chemistry (inland lakes)
- Fish contaminants (river, inland lake, Great Lakes sites)
- Wildlife contaminants (bald eagles, herring gull eggs)
- Long-term biological community trend stations (~ 10 per watershed)

Water chemistry trend monitoring locations in Michigan (Bay, Connecting Channel, Intensive, and Integrator types).

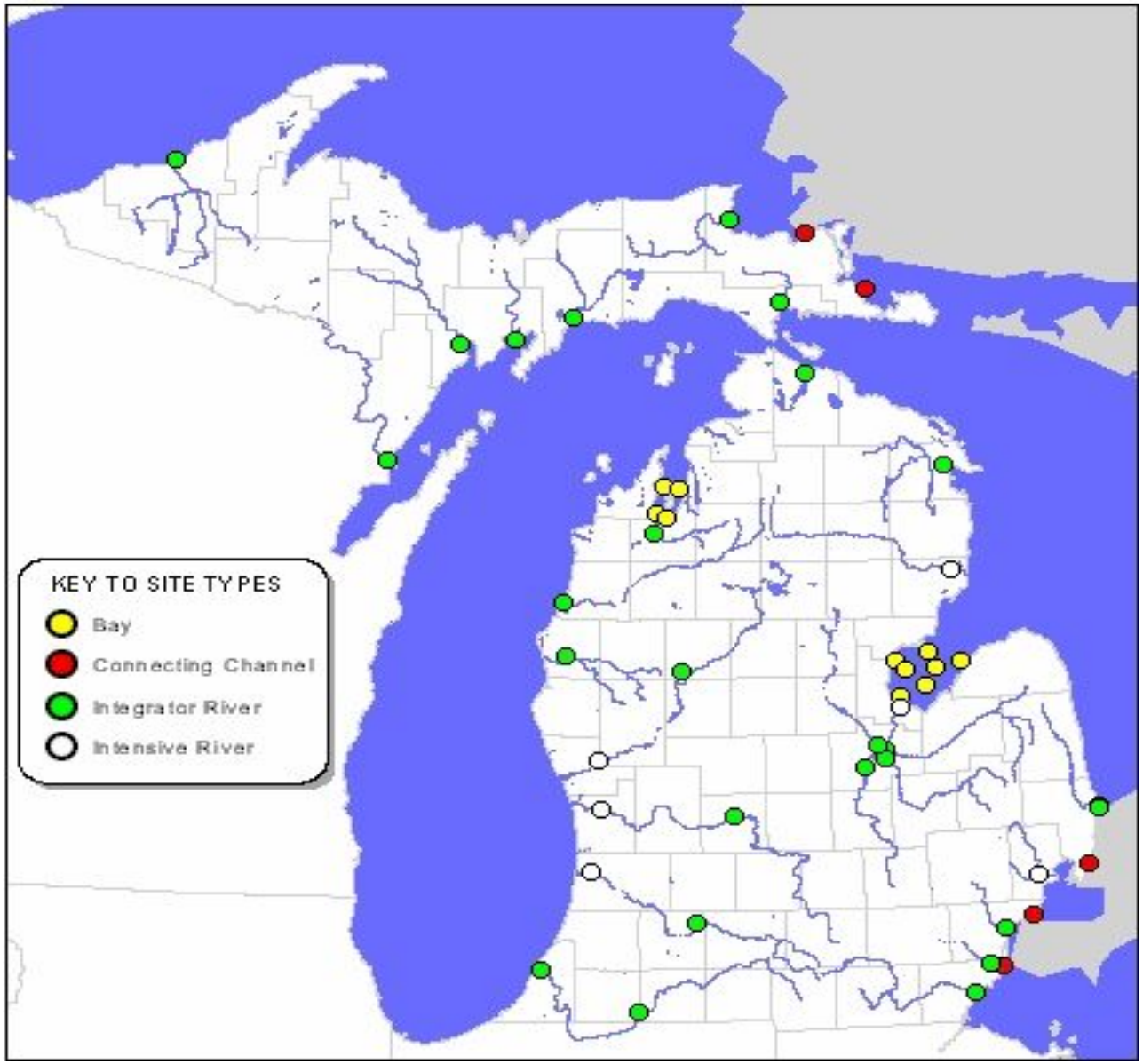
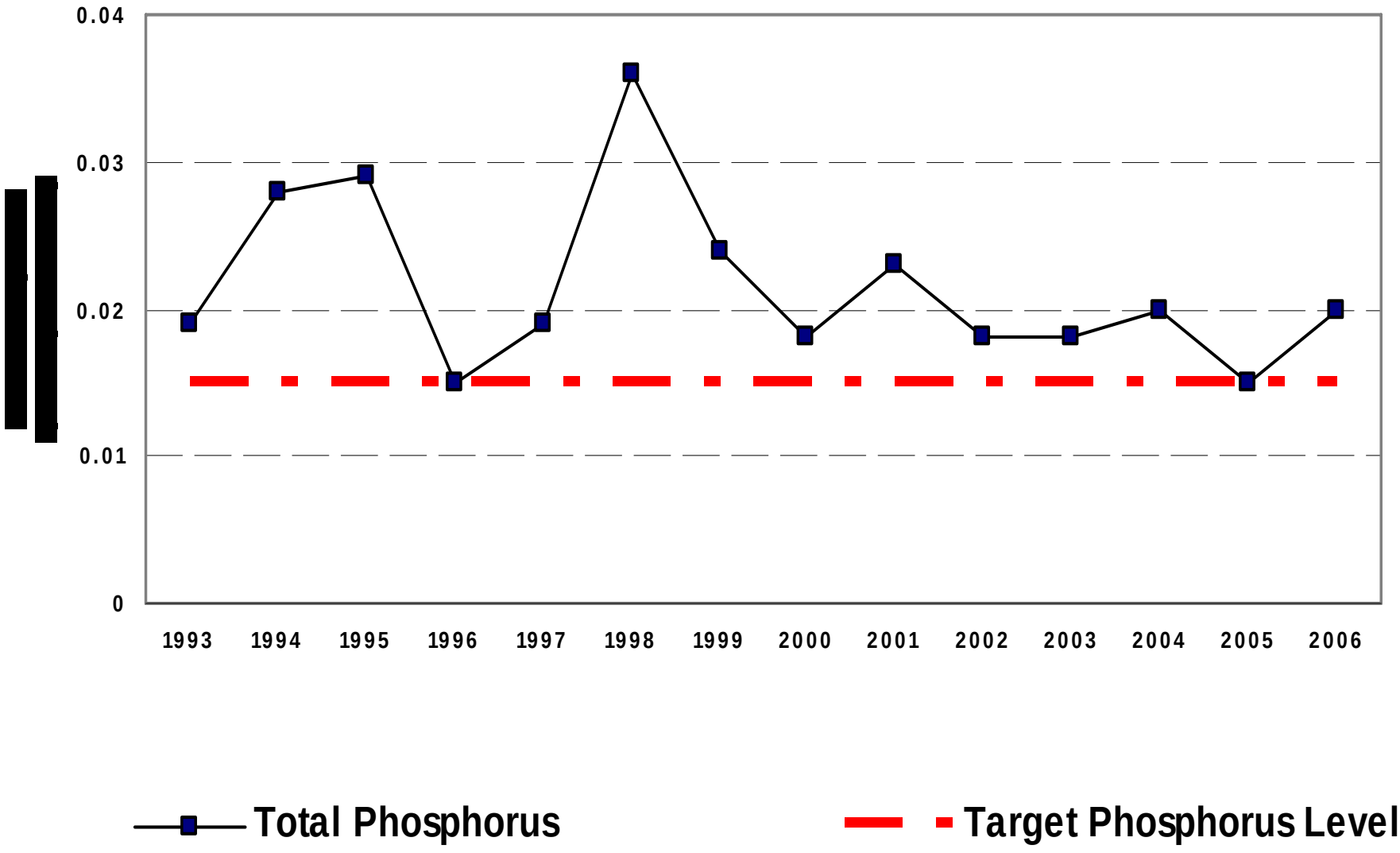
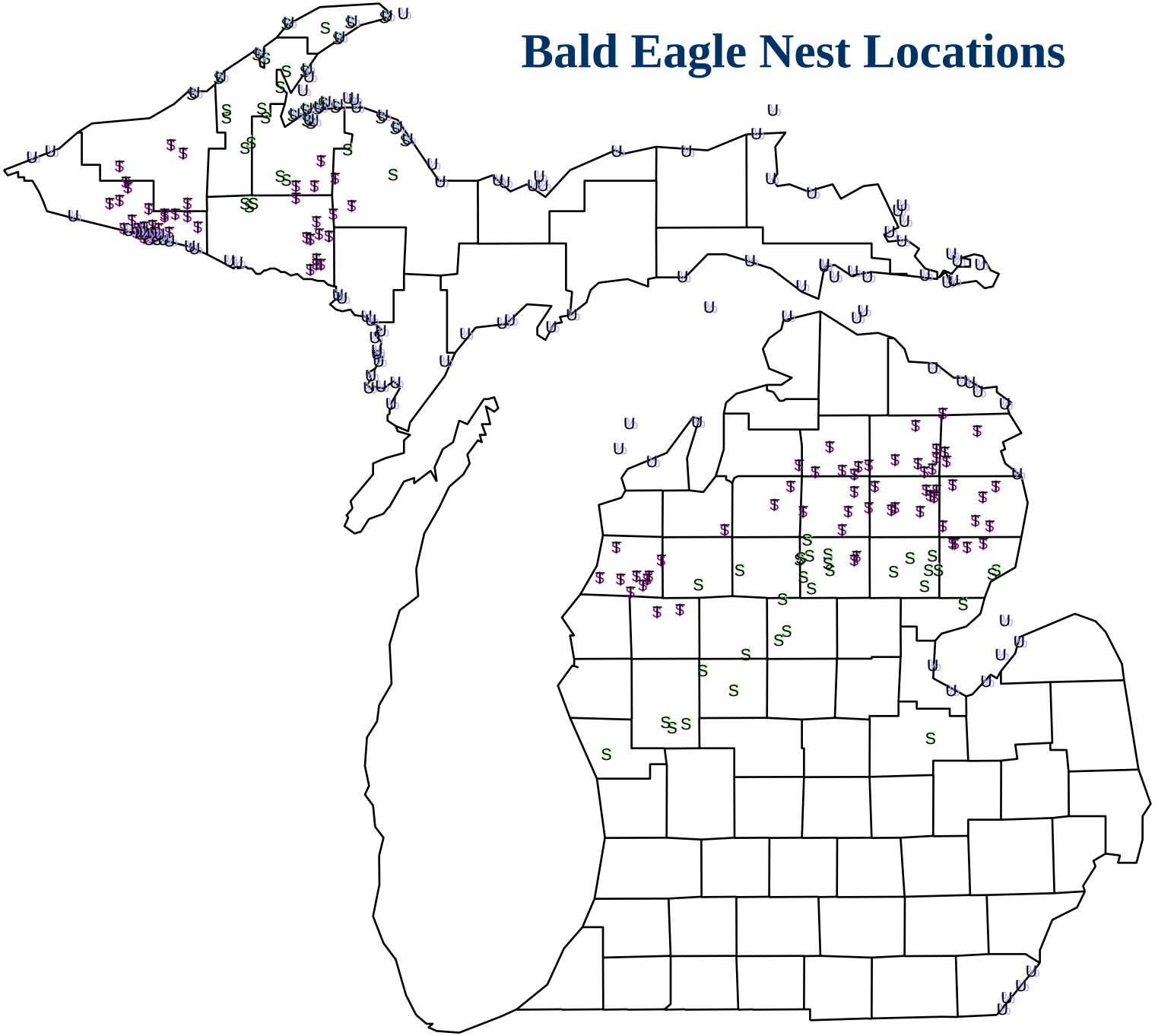
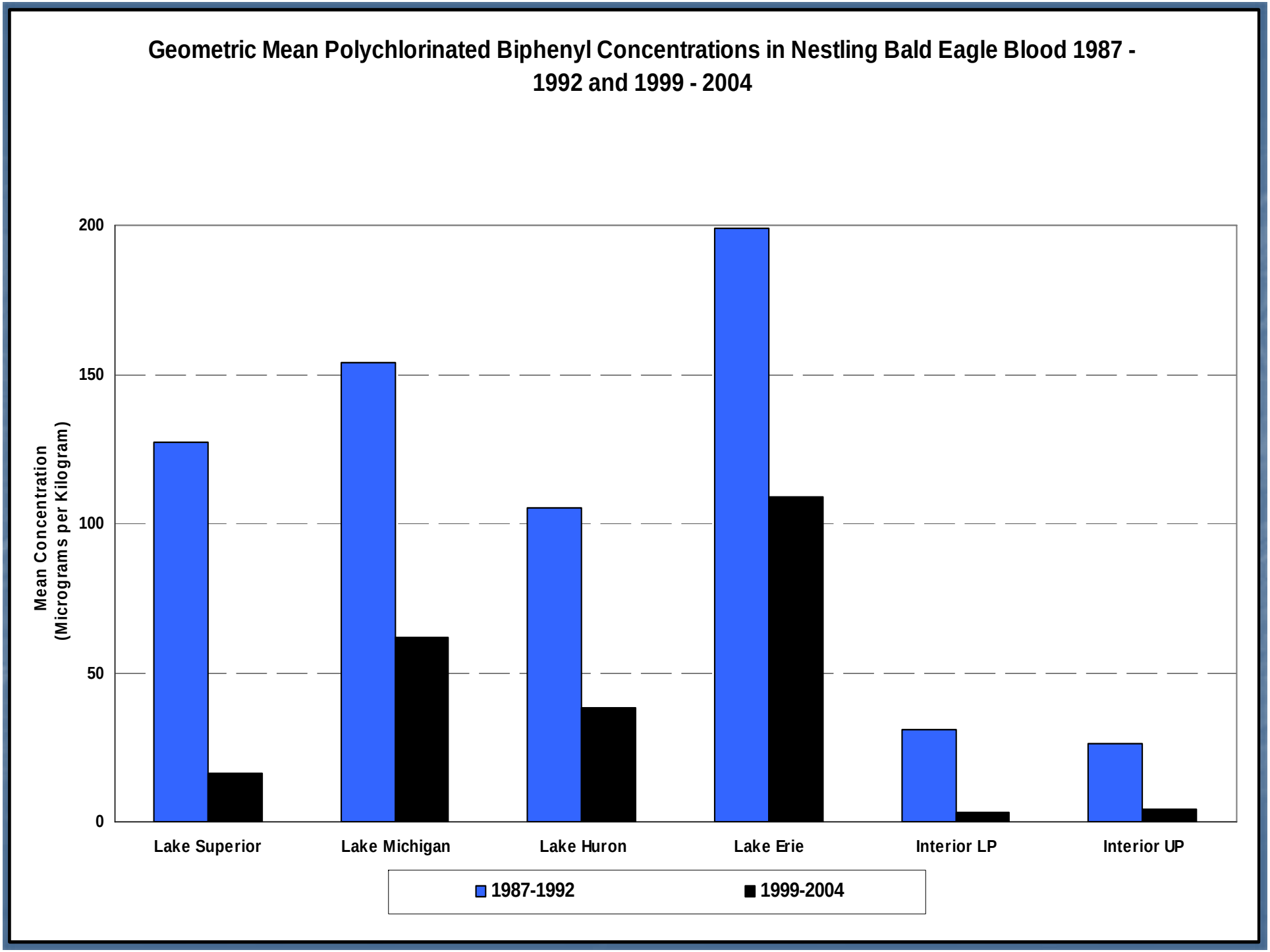


Exhibit 53. Average Annual Total Phosphorus Levels in Saginaw Bay 1993 - 2006



Bald Eagle Nest Locations




Geometric Mean Polychlorinated Biphenyl Concentrations in Nestling Bald Eagle Blood 1987 - 1992 and 1999 - 2004
Mean Concentration (Micrograms per Kilogram)
200
150
100
50
0
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Interior LP
Interior UP
1987-1992
1999-2004

Program Effectiveness Monitoring

- NPDES (ambient and compliance monitoring)
- Non-point source projects
- Total Maximum Daily Load development
- Areas of Concern and Lakewide Management Plans
- Drinking water protection (ambient and compliance)
- Air deposition
- Remediation and Redevelopment Division projects

Example Projects

- Dead River flood (pre and post flood data)
- Kennecott Mine baseline monitoring
- Lake Allegan and Lake Macatawa TMDLs
- Saint Marys River/Sugar Island bi-national monitoring
- Selenium monitoring around Marquette County mines
- Pathogen sampling near selected drinking water intakes

Lake Allegan Water Quality

Parameter	Goal	Baseline (1999)	Current (2006 and 2008)
Total Phosphorus (ug/l)	60	96	71, 81
Chlorophyll *a* (ug/l) (April – September Average)	30	64	32, 46
Dissolved Oxygen (mg/l) (Daily Minimum)	5	3.1	6.7, 4.8
Secchi (inches) (April – September Average)	42	26	35, 28
Carp/Catfish (Average % Fish Community)	30	87	Schedule Fish Community Survey

Emerging Issues

- Since 2003, emerging issue grants totaling $150K - $200K each year have been awarded to academia, local governments, and non-profit organizations

- Projects have included:
  - PBDEs
  - pharmaceutical chemicals
  - personal care products
  - blue-green algae and algal toxins
  - nuisance aquatic species
  - aquatic pathogens

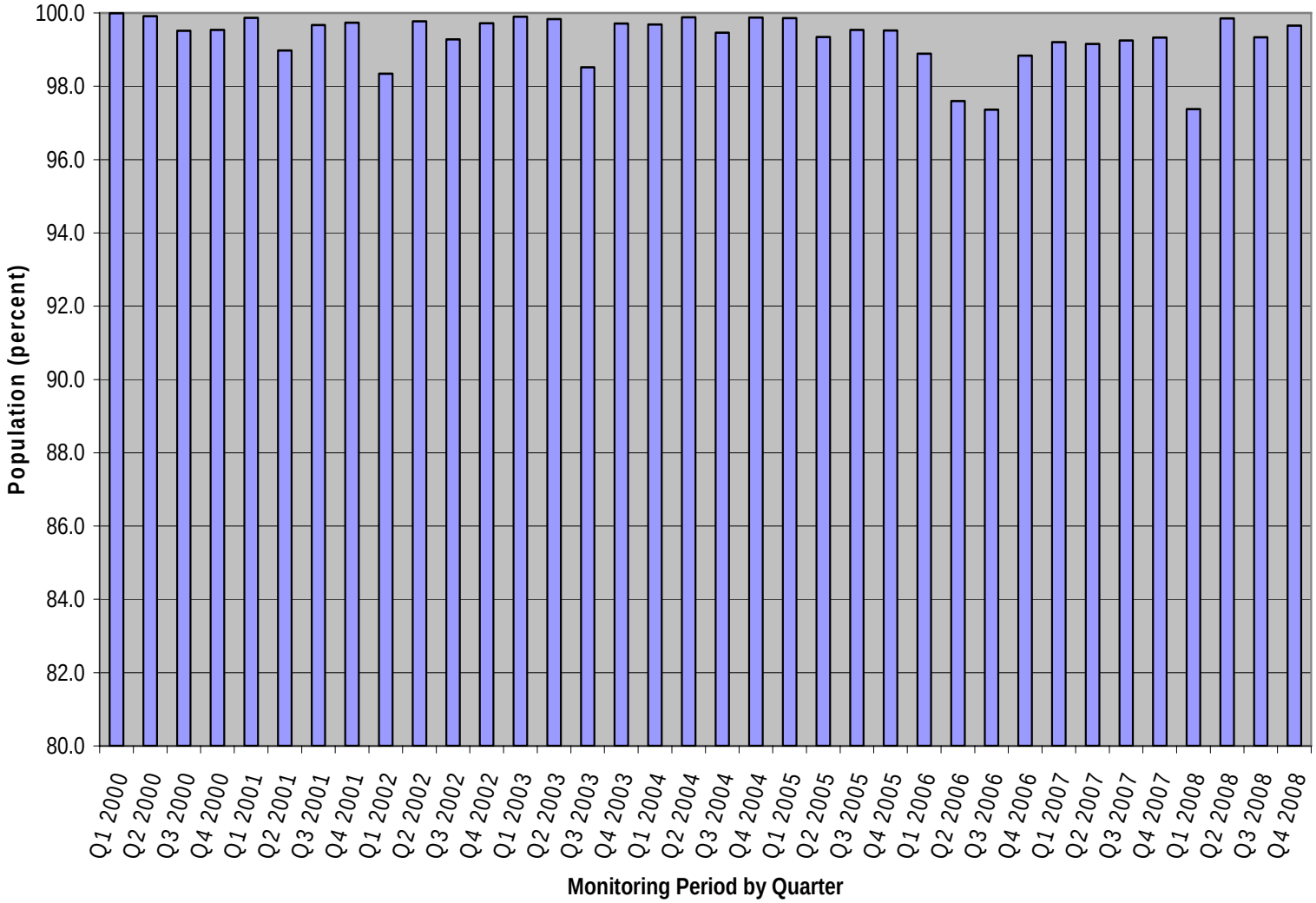
Outcomes

- Measures of Success first version completed November, 2009
- Clean and Safe Water
- 5 Major Goals
- Outcomes with measurements for each goal

Ensure Safe Drinking Water

- Goal 1: By 2015, 100 percent of the population served by community water systems (CWS) will receive drinking water that meets all applicable health-based drinking water standards through effective treatment and source water protection.

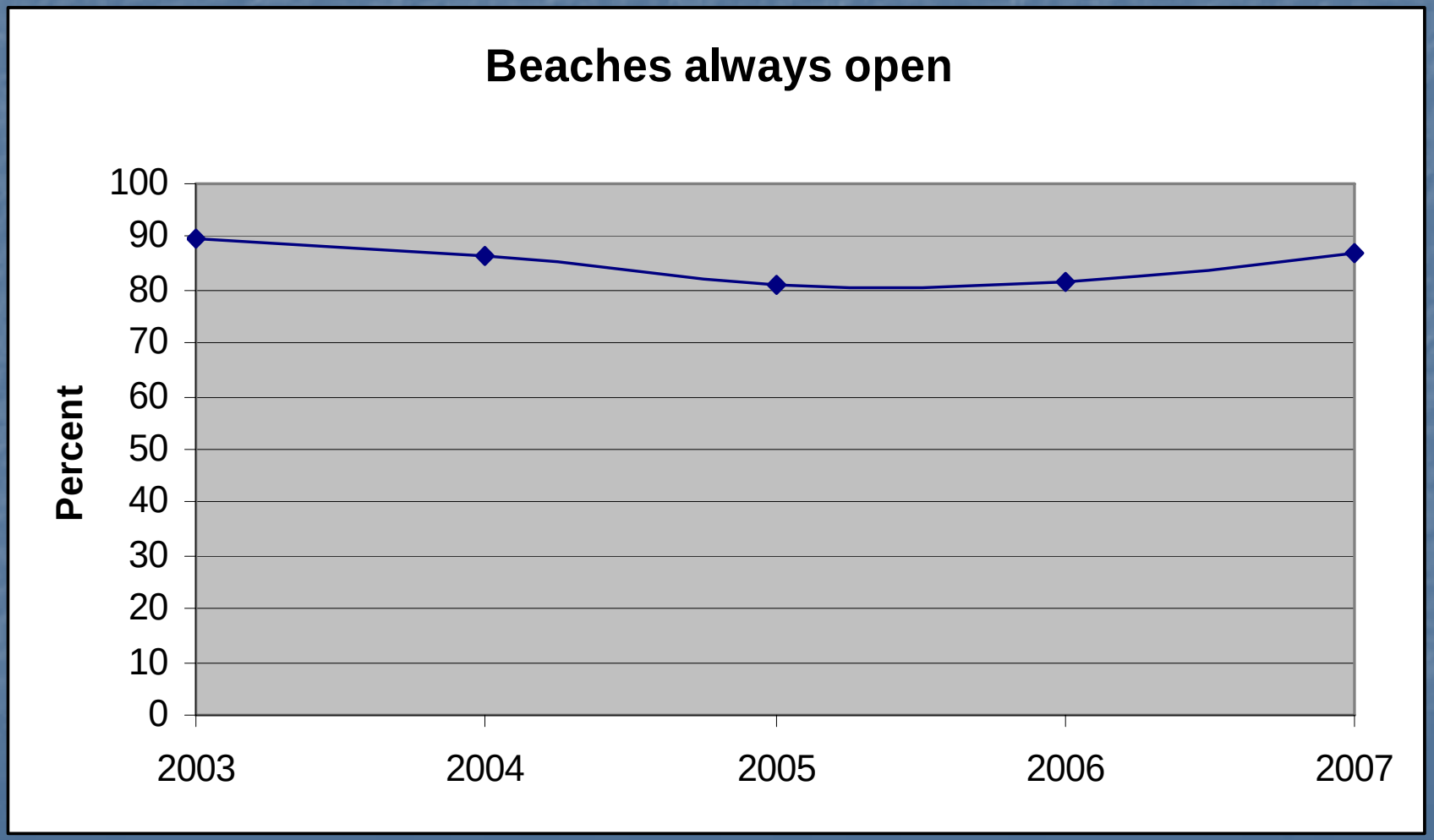
Percentage of Population Receiving Drinking Water Meeting Michigan Standards (Community Water Supplies)



- How are we doing? Excellent
- Comments: This goal is very close to being met with results routinely near 100 percent. We recognize that routinely achieving 100 percent will be difficult, because there will likely always be some incidents that prevent this achievement. This is why we have developed a program response “evaluation” to help us understand where we are, and perhaps lead to improving our results.

<u>Major Goal 3: Enhance Recreational Waters</u>: Ensure that all recreational waters are safe for human contact.

Clean, safe beaches - By 2014, 100 percent of Great Lakes and inland lake beaches monitored by beach programs will be safe for swimming


Beaches always open
Percent
100
90
80
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007

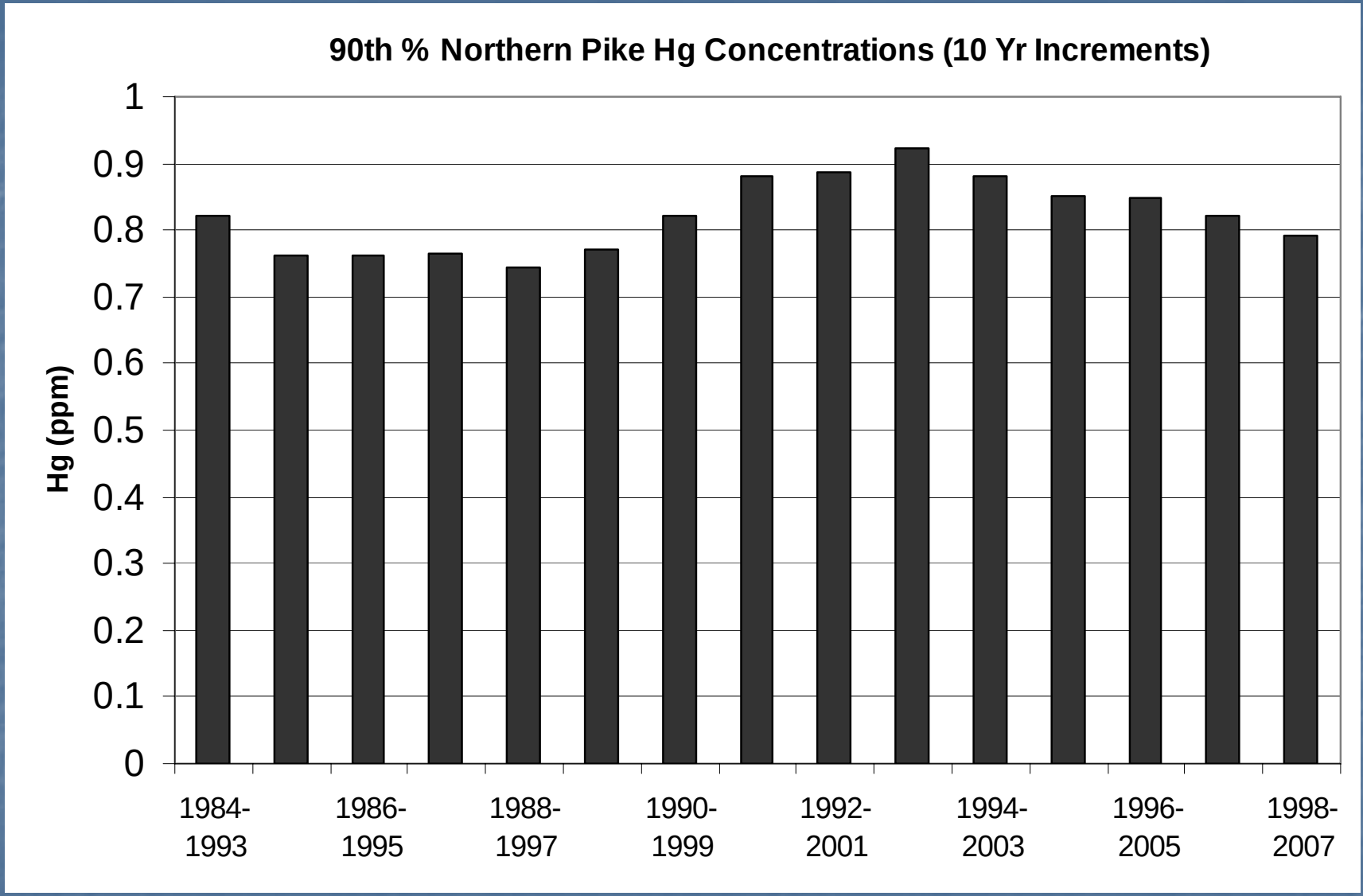
- How are we doing? Good
- Comment: This is a relatively new program that has been expanded by the BEACH Act. The monitoring has been implemented and reported consistently now, but the necessary activities to address the problems identified are not always identifiable. As this program matures, this is expected to improve.

Major Goal 2: Protect Groundwater: Ensure that groundwater is safe to drink, and that groundwater is conserved in adequate quantity to support all uses (drinking water, industrial use).

- Goal 1: Groundwater meets all applicable health based standards for drinking.
- Measure: There currently is no coordinated or compiled groundwater monitoring in Michigan. This needs to be examined and developed.
- How are we doing? Don't know yet.
- Comment: The DEQ has identified this as an issue to be addressed in the fiscal year 2010 Strategic Plan, with multiple divisions involved. In the interim, we propose the following program responses.

Fish safe to eat

- Goal 1A: Reduce the mercury levels in edible portions of Great Lakes, inland lakes, and stream fish to below 0.35 mg/kg by 2020.


90th % Northern Pike Hg Concentrations (10 Yr Increments)
Hg (ppm)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1984-1993
1986-1995
1988-1997
1990-1999
1992-2001
1994-2003
1996-2005
1998-2007

- 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 about 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.