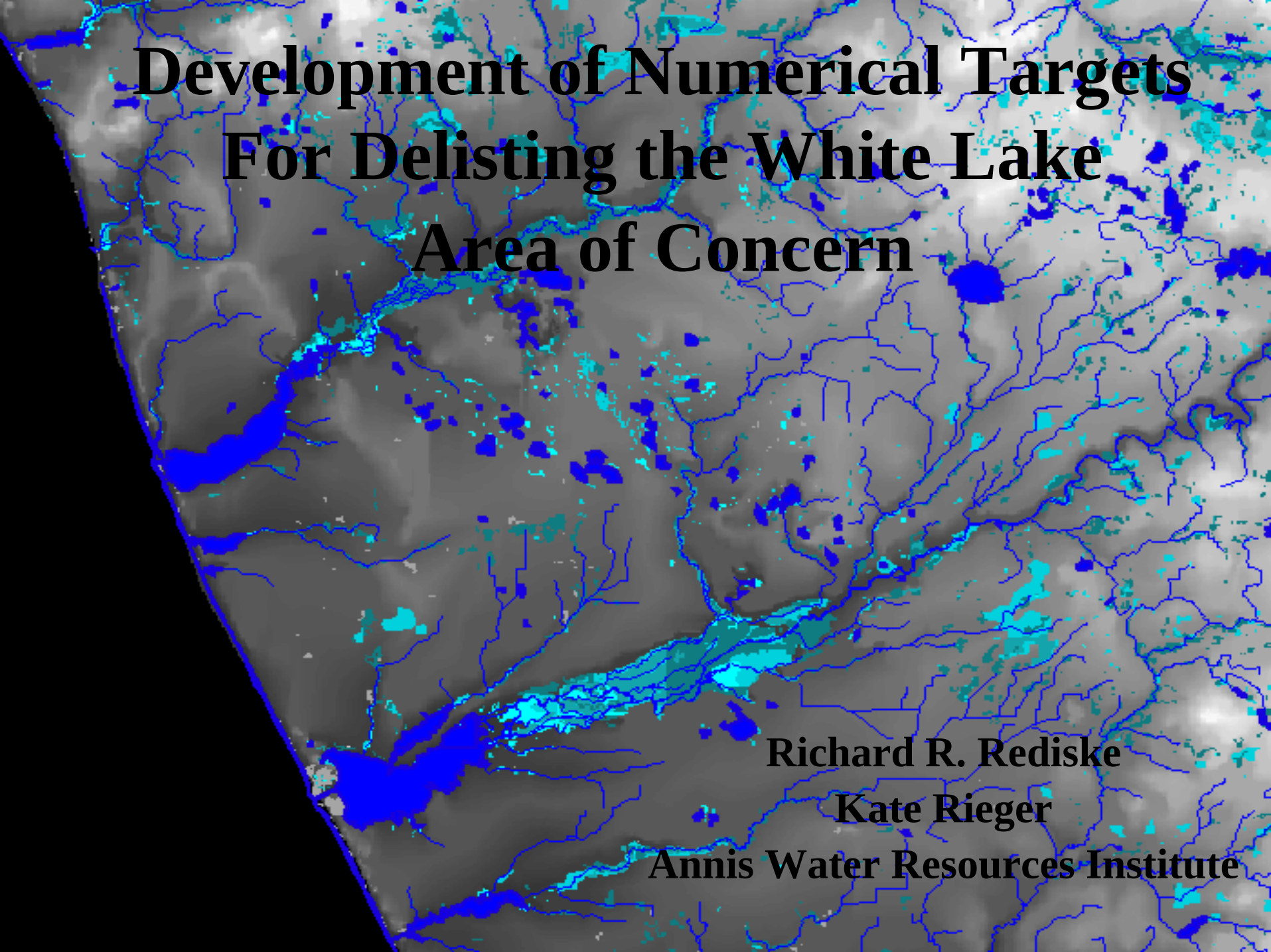
# Development of Numerical Targets For Delisting the White Lake Area of Concern



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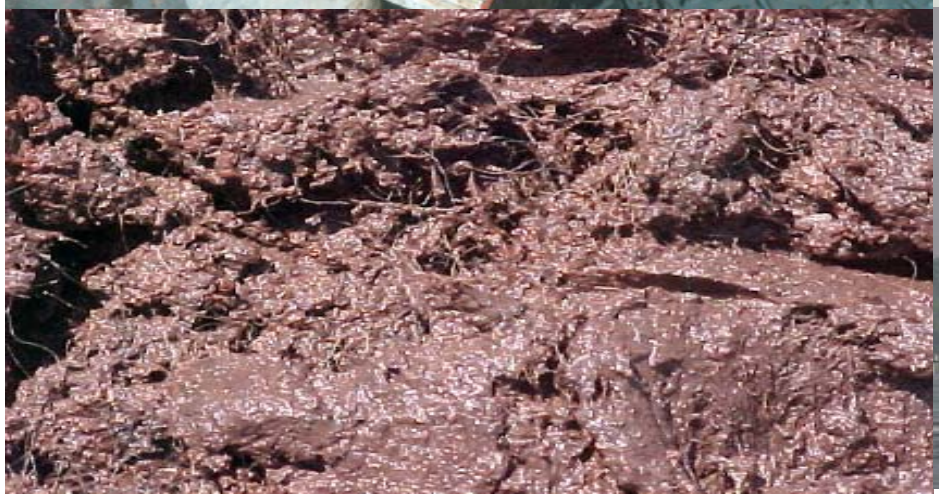
# *Historical Problems in White Lake*

- **Habitat destruction from logging (1800s)**
- **Direct discharge of wastewater: leather tanning, specialty chemical, and municipal sewage. 1890s-1970s**
- **Fish kills and tainting**
- **Oil slicks, floating scum, algal blooms, foul odors**
- **Contaminated sediments**
- **Anoxic and eutrophic conditions from the excessive loading of nutrients and oxygen demanding materials**
- **Designated an Area of Concern in 1985 (one of 43 of the worst sites of contamination in the Great Lakes)**
- **8 Beneficial Use Impairments (BUIs) identified from environmental pollution and ecosystem degradation**

# *Tannery Bay*



# Hooker Chemical

# *How Do We Get Off the AOC List?*

- **Establish indicators and numerical targets for the restoration of each BUI**
- **Develop and implement a monitoring program to determine status and progress**
- **When monitoring data show compliance with a target for a specified length of time or a specific condition has been remediated, submit a request for delisting**

# *BUIs for White Lake Lake*

| Impairment | Rationale |
|---|---|
| **Restrictions on fish and wildlife consumption** | **Elevated PCBs in carp and mercury in walleye and bass** |
| **Degradation of Fish and Wildlife Populations** | **Fish Tainting, loss of sport fish, proliferation of rough fish, anoxia, and contaminated sediments** |
| **Degradation of Benthos** | **Low diversity, low numbers, dominance by worms, anoxia, and contaminated sediments** |
| **Restrictions on Dredging** | **Contaminated Sediments** |

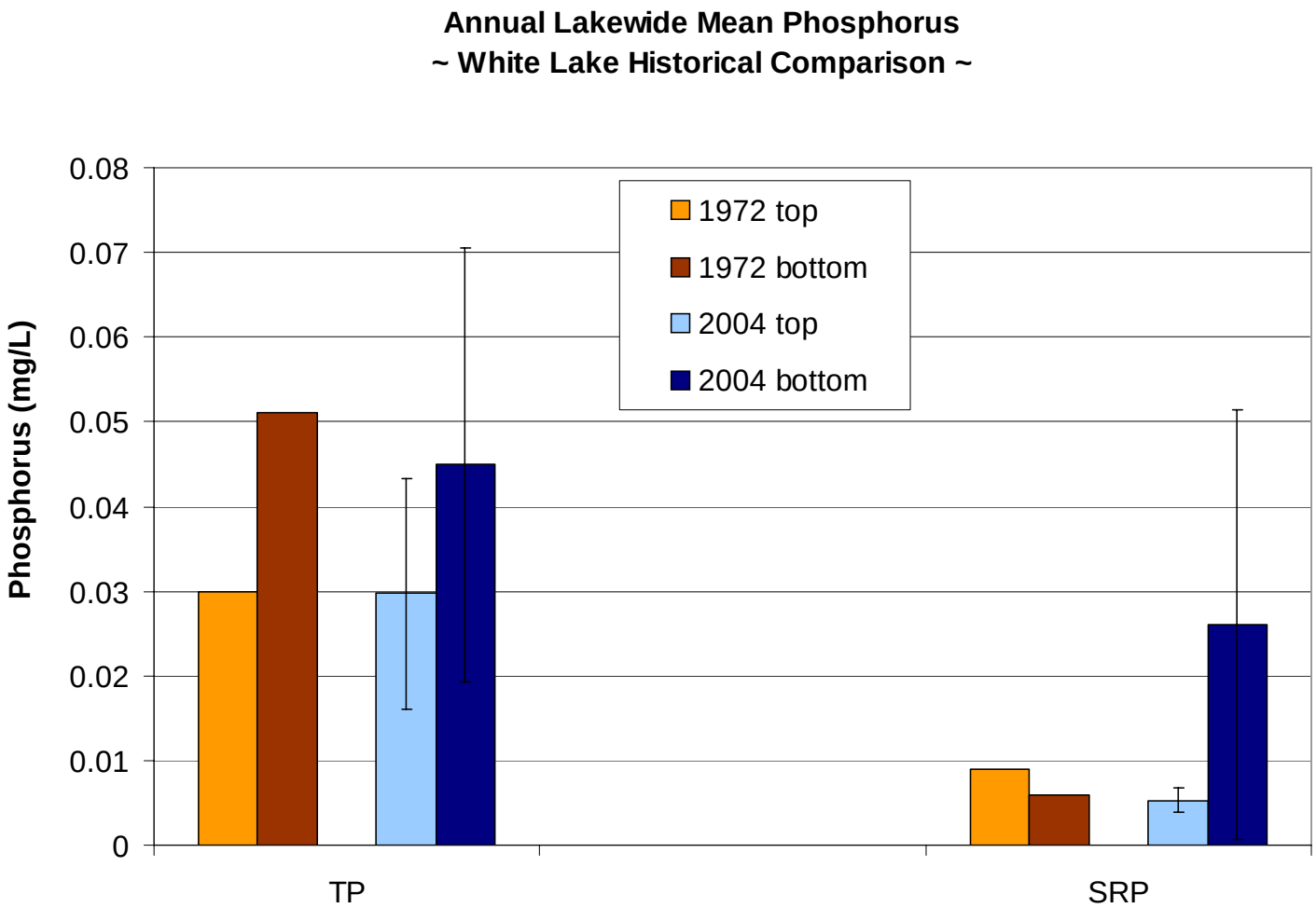
# *BUIs for White Lake Lake*

| Impairment | Rationale |
|---|---|
| **Loss of Fish and Wildlife Habitat** | **Degradation due to contaminated sediments, poor water quality** |
| **Groundwater Contamination** | **Hooker Chemical, Muskegon Chemical, DuPont** |
| **Eutrophication and Undesirable Algae** | **Historic eutrophic conditions** |
| **Degradation of Aesthetics** | **Hides, floating scum, sulfide odor** |

# *Target Development Process*

1. **Consider historical and current sources of degradation**
2. **Identify parameters/target levels from site specific information, regulatory guidelines, and literature references**
3. **Monitoring program design**
4. **Identify partners/funding sources**
5. **Approval of the PAC and stakeholders**
6. **Scientific peer review**

# *Change in Phosphorus Concentration*



# *Change in White Lake Benthos 1972 and 1999 Mean Values*

| | 1972 | 1999 |
|---|---|---|
| **Sediment Toxicity** | **Tannery Bay and the Occidental Dead Zone** | **1 small area** |
| ***Hexagenia*** | **Rare** | **Recovery in the shallow zones near the river mouth** |
| **Amphipods** | **Low** | |
| **% Oligochaeta** | **95** | **82** |
| **Chironomidae (#/$m^2$)** | **70** | **577** |

# Restoration Progress in White Lake

- **Discharge of industrial and municipal wastewater removed from White Lake. Advanced tertiary treatment system installed (1974). Wastewater discharge eliminated in 2005.**
- **Remediation of the Tannery Bay**
- **Numerous enforcement activities resulting in groundwater and soil remediation (Occidental, DuPont, White Chemical, Howmet, Genesco, White Lake Landfill)**
- **Numerous conservation efforts to improve water quality in the White River Watershed**
- **Howmet/Alcoa and CMI grants to improve water quality.**

# *Why Consider Delisting and Target Development?*

- **Lakes meet the MDEQ Water Quality Standard for total phosphorus (30 ug/l)**
- **Areas of toxic sediment have been remediated**
- **Industrial pretreatment and source control**
- **Productive fisheries (MDNR and public)**
- **Public perception of the BUIs has changed**
- **Opportunity to become active managers**
- **Data drives informed decisions and actions**
- **Great Lakes Legacy Act and funding emphasis to support delisting**

# *Target Setting Process*

- **AWRI facilitated the establishment of indicators and numerical targets for the restoration of 5 BUIs as part of a $22,000 grant from the Great Lakes National Program Office**
- **AWRI reviewed scientific historical and current data, literature, and MDEQ/EPA guidance.**
- **Indicators and Targets were developed with input from the PACs and stakeholders.**
- **Indicators and Targets were peer reviewed by recognized scientists.**
- **Targets were modified based on peer review and adopted by the PAC in March and April 2006.**

# *Target for Delisting the Degradation of Aesthetics BUI*

**Public areas in the White Lake AOC should not contain quantities of contaminants, debris and algal scum that impede the access and enjoyment of the resource. Areas that require removal/restoration for delisting include the Bush Creek/east bay and Genesco property where hides are present and the abandoned Whitehall and Montague dumps in the wetlands. In addition, no more than 10% of the lake should be covered with algal scum for 5 consecutive days.**

# Target for Restrictions on Drinking Water Consumption BUI

**Private groundwater supplies in the vicinity of Resource Conservation Recovery Act and Comprehensive Environmental Response, Compensation and Liability Act sites meet the MDEQ criteria for potable water based on annual monitoring. For areas where groundwater contamination exceeds MDEQ criteria for drinking water, an alternate supply source (public or private) of potable water must be available. In addition, plume migration from these sites must been controlled by an approved MDEQ/EPA remediation plan and the effectiveness confirmed by annual monitoring.**

# Target for Delisting the Eutrophication BUI

**The BUI will be considered restored when average the following annual concentrations/values are achieved for White Lake:**

| Indicator | Target | Justification |
|---|---|---|
| Surface Total Phosphorus Concentration | 25 ppb | Mesotrophic Conditions |
| Chlorophyll *a* | 8 ppb | Mesotrophic Conditions |
| Secchi Disk depth | 2.5 m | Mesotrophic Conditions |
| TSI | 45-50 | Closer to Statewide Average |

# Target for Delisting the Degradation of Benthos BUI

**This BUI will be considered restored when average benthic macroinvertebrate populations White Lake reflect the following conditions, for three (3) consecutive sampling periods/events:**

| Indicator | Target |
|---|---|
| Sediment Toxicity | Amphipod Survival >60% |
| *Hexagenia* | Present in river mouth littoral zone, Increasing trend over 3 years |
| Amphipods | Present in river mouth littoral zone, Increasing trend over 3 years |
| % Oligochaeta | < 75% Decreasing Trend |
| Chironomidae (#/$m^2$) | > 500 Increasing Trend |
| Diversity (SW) | 1.5 Increasing Trend |

# Target for Delisting the Fish Consumption BUI

- **Key fish species: walleye, smallmouth bass, and carp**
- **Sample design: 10-20 fish of each species collected in July and/or August**
- **Tissue analyzed: edible portion**
- **Reference systems: pooled non AOC drowned river mouth: Mona Lake and Pentwater Lake**
- **Restoration target end: BUI will be considered restored when edible portion analyses of key fish species are not significantly different from the pooled reference site data for 2 consecutive 5 year sampling periods. If a significant difference between White Lake and the reference systems remains at the end of the monitoring period, all available fish contaminant monitoring data for White Lake will be evaluated for a statistically significant decreasing trend in concentration. In this situation, the BUI will be considered restored when edible portion analyses of key fish species in White Lake show a significantly different decreasing trend from 1986 to the end of the monitoring period.**

# *Future Actions*

- **Complete targets for remaining BUIs. Grant Funding obtained and targets will be completed in 2007.**
- **Develop and implement a monitoring program to determine status and progress.**
- **Conduct corrective actions as necessary.**
- **When monitoring data show compliance with a target for a specified length of time, submit a request for delisting.**

# *Acknowledgements*


- **Great Lakes National Program Office**
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