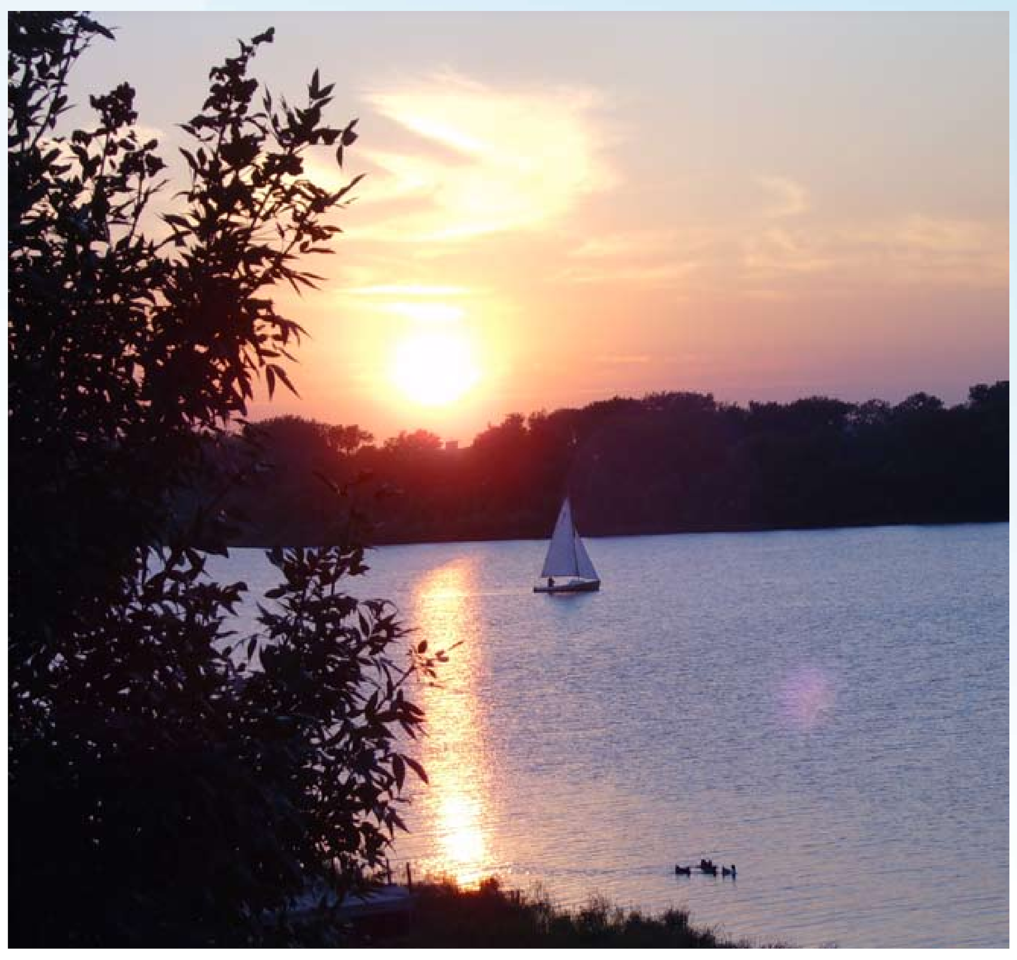
WELCOME

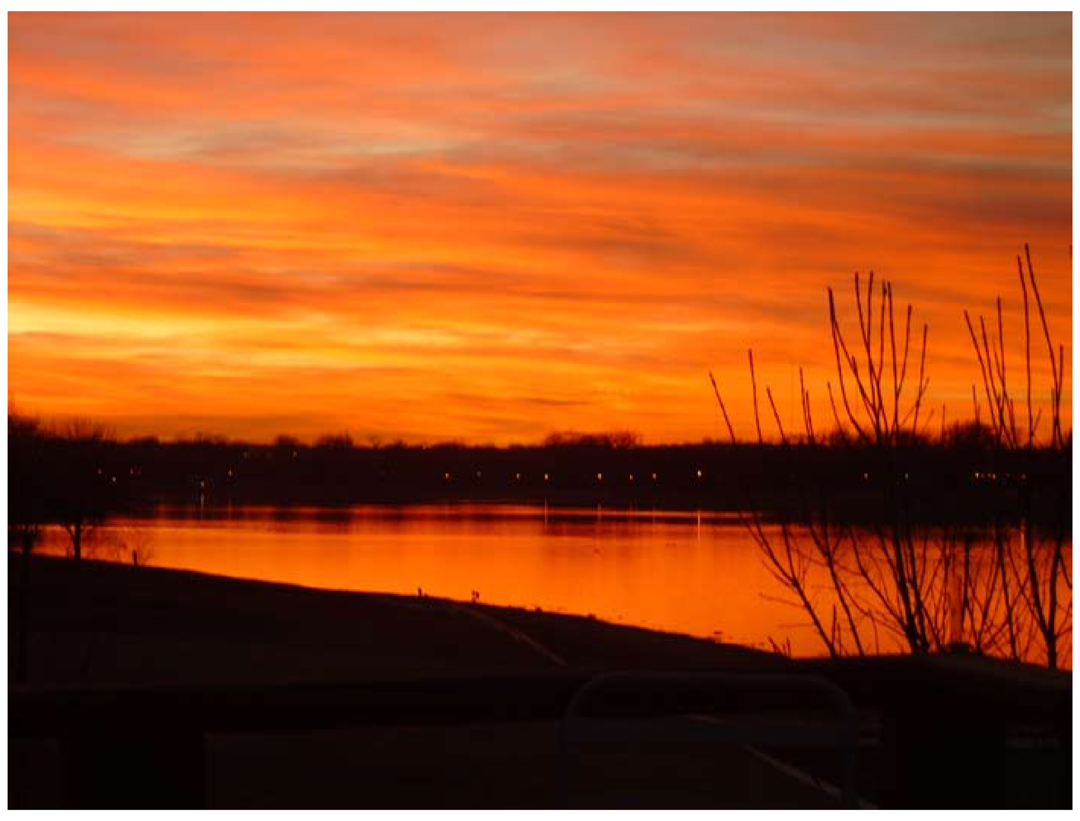
Carter Lake Watershed Management Plan Public Meeting

March 11, 2008
Open House: 6:30 to 8:30 p.m.
Formal presentation: 7:00 p.m.

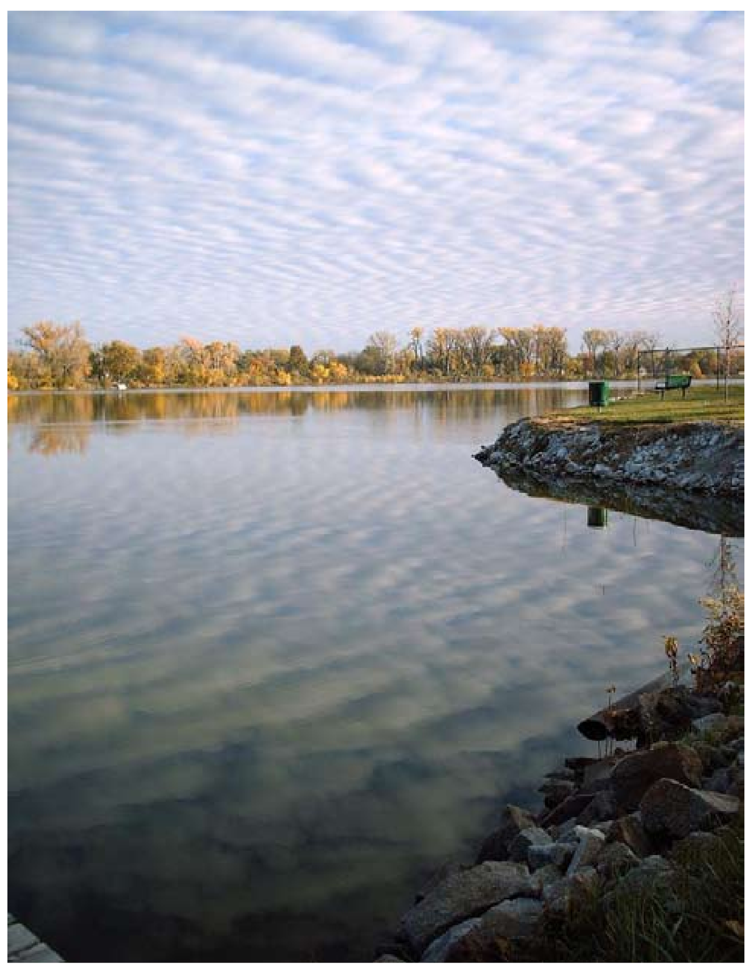
PLEASE SIGN IN, THANKS!







carter lake

Carter Lake Water Quality Goals & Objectives

GOAL 1. Achieve A "Full Support" Status For The Aquatic Life Use

Objective 1: Increase growing season median water clarity from 16 inches to 54 inches to meet the Iowa Lake Restoration Program Goal, but not to fall below 30 inches to meet the TMDL goal.

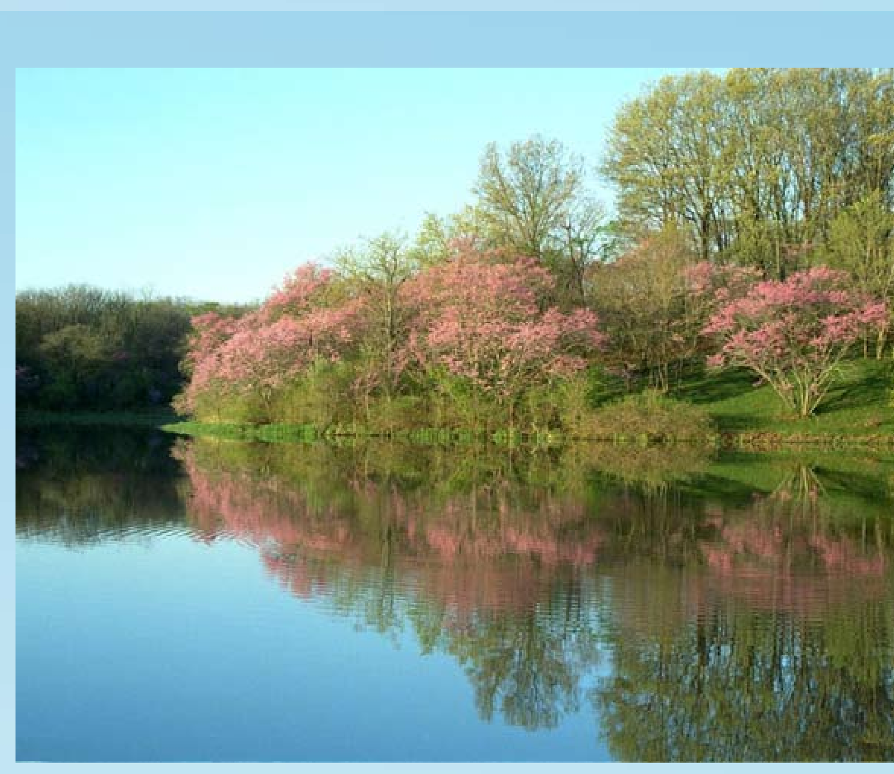
Objective 2: Reduce growing season in-lake total phosphorus from 153 ug/l to 75 ug/l.

Objective 3: Reduce growing season in-lake total nitrogen from 2,140 ug/l to 409 ug/l.

Objective 4: Decrease growing season median chlorophyll a concentrations from 59 mg/m3 to 21 mg/m3.

Objective 5: Maintain water column average dissolved oxygen above 5.0 mg/l throughout the year.

Objective 6: Maintain healthy diverse aquatic habitats that support balanced populations of fish, herps (amphibians/retiles) and invertebrates.



GOAL 2. Reduce Contaminant Levels In Fish To "Safe" Levels

Objective 7: Reduce and maintain contaminant levels below water quality standards in the Carter Lake inflows.

GOAL 3. Maintain A "Full Support" Status For The Recreation Use

Objective 8: Maintain E.coli bacteria concentrations below 235 col./100mls during the recreation season.

Objective 9: Maintain algae toxin concentrations below 7 ppb for all 22 weeks of the recreation season and prevent level of algal toxins above 20 ppb in any measurement.

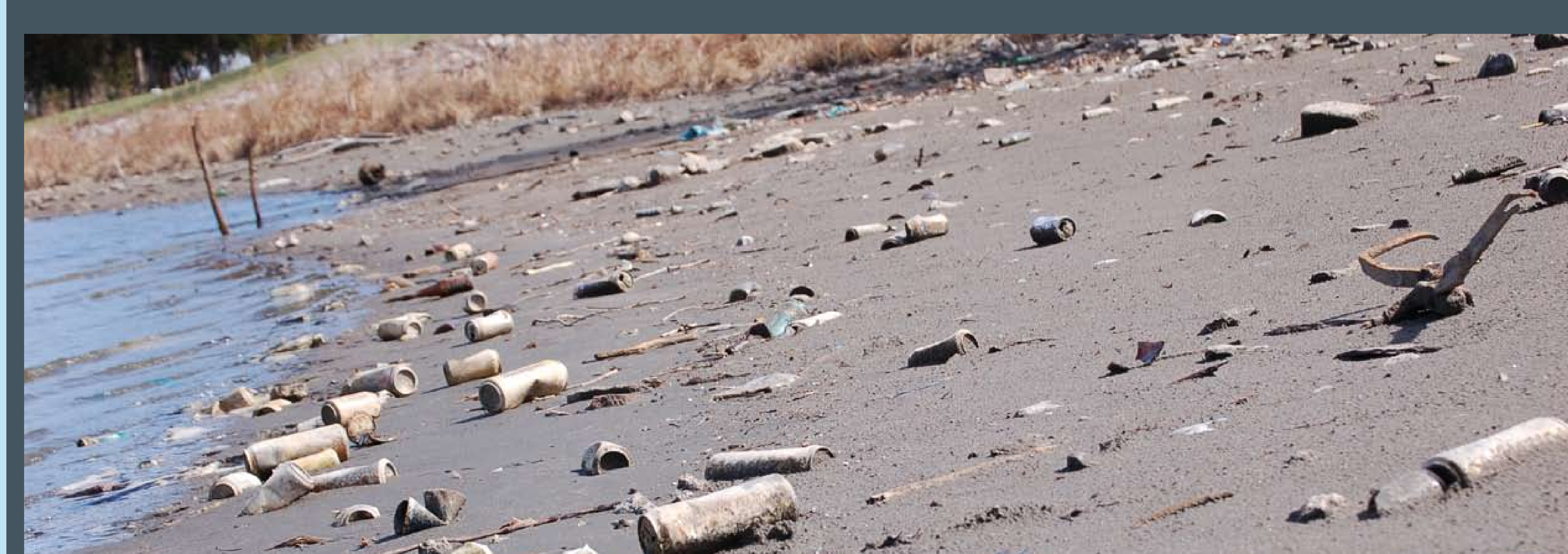
Objective 10: Provide a sustainable recreational fishery by adopting regulations and management plans jointly recommended by the Iowa Department of Natural Resources and the Nebraska Game and Parks Commission.

GOAL 4. Maintain A "Full Support" Status For The Aesthetic Use

Objective 11: Keep the lake and park area free of trash and junk.

Objective 12: Stabilize areas of eroding shoreline.

Existing shoreline



Shoreline example

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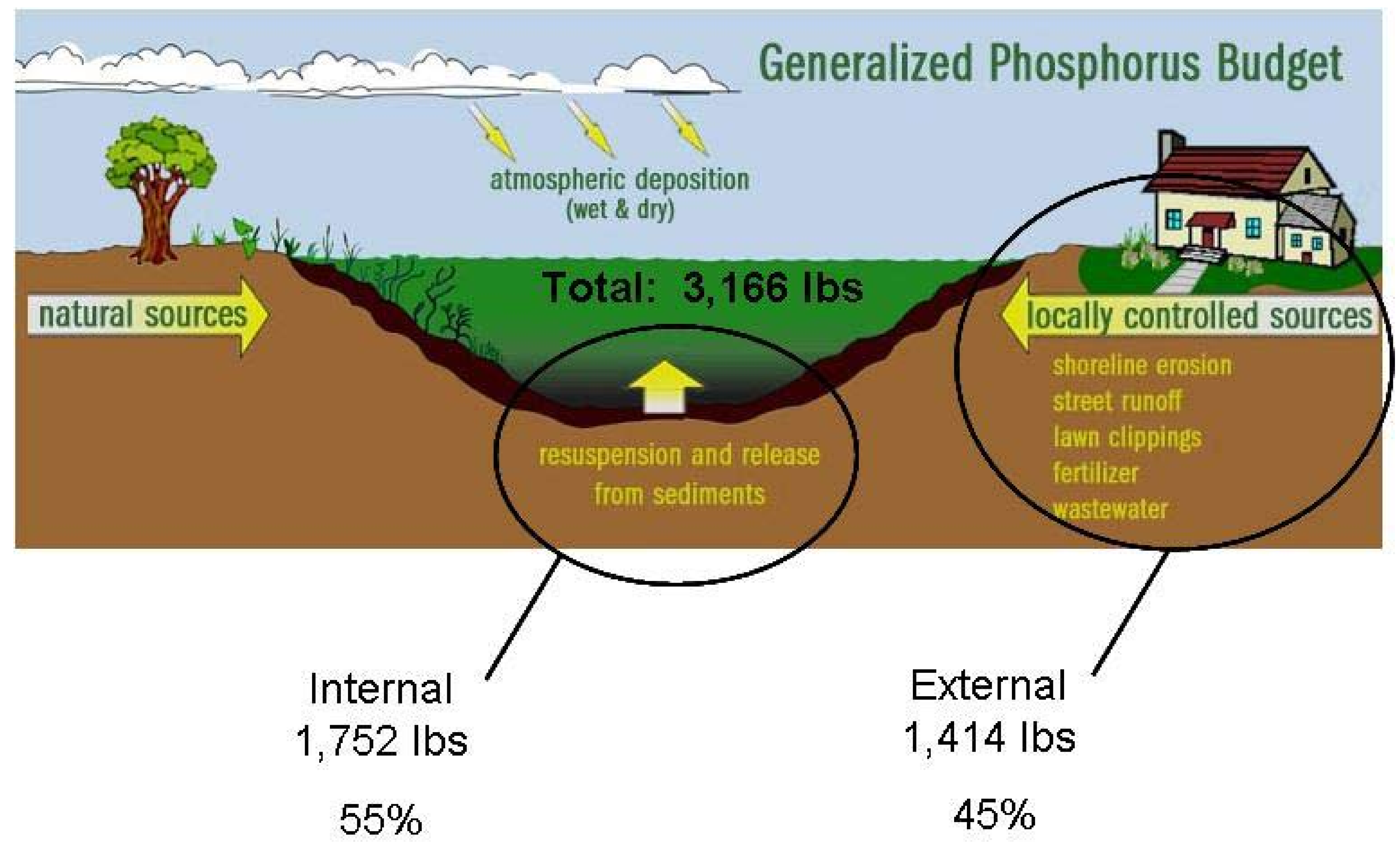
Water Quality



Carter Lake was included on the both Nebraska's and Iowa's list of impaired waters

Impaired waters must be addressed by state agencies

- Determine acceptable pollutant(s) levels for waterbody
- Compare existing pollutant level(s) to acceptable limits
- Determine necessary pollutant reduction(s)
- Receive Environmental Protection Agency (EPA) approval
- If a state fails to address impaired waters, the EPA will take action

Total Maximum Daily Load (TMDL) report produced

- Approved actions must be taken to include the pollutant load reductions and goals

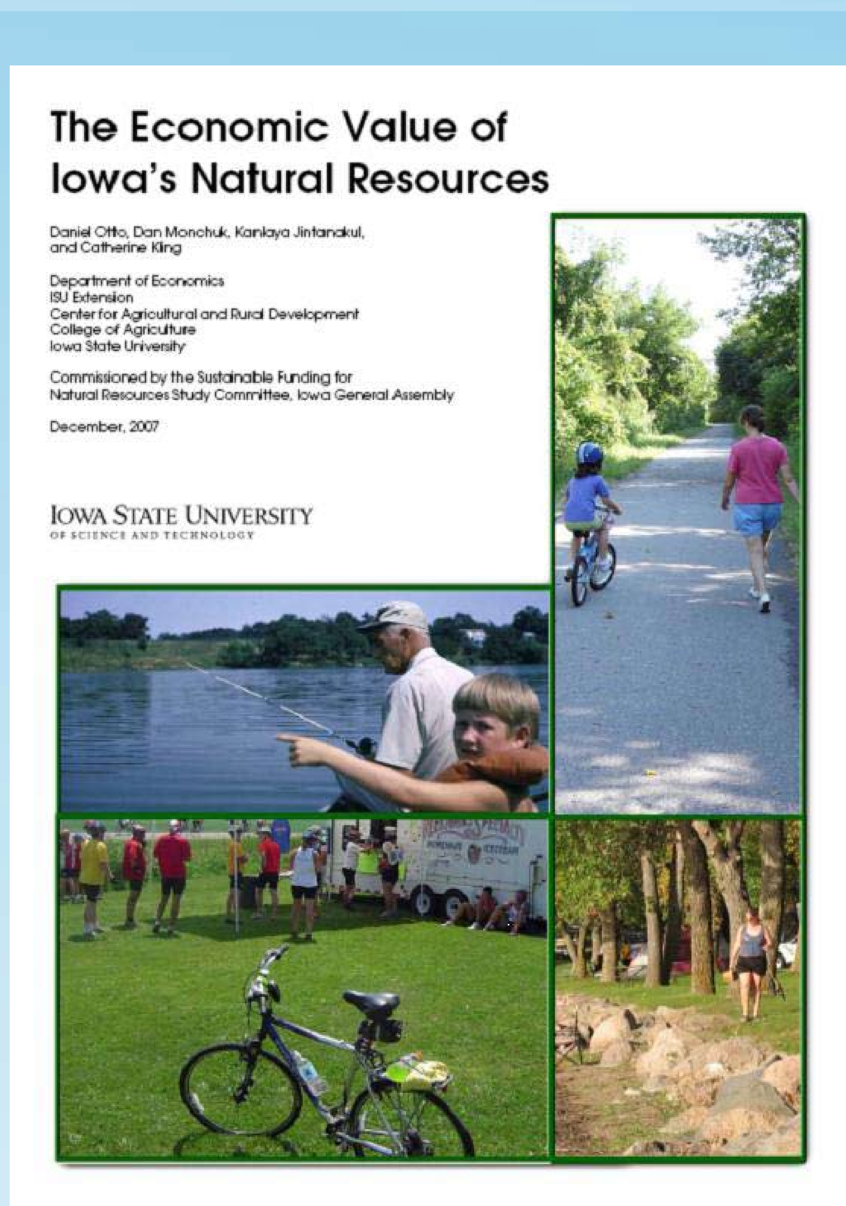
Stormwater permit issued to the Cities of Carter Lake and Omaha

- The permits must strive to attain the goals of the TMDL

Addressing the issue

- Implement best management practices (BMPs), which are the recommendations in the Watershed Management Plan
- If the best management practices are not implemented fail to improve water quality, more stringent limits will be placed in the permits
- Failure to meet these limits results in daily fines levied by the State and/or EPA
- Respective cities would have to set aside city funding to improve the condition of the lake

Lake Economics



The Economic Value of Iowa's Natural Resources

Daniel Otto, Dan Monchuk, Kanlaya Jintanakul, and Catherine Kling

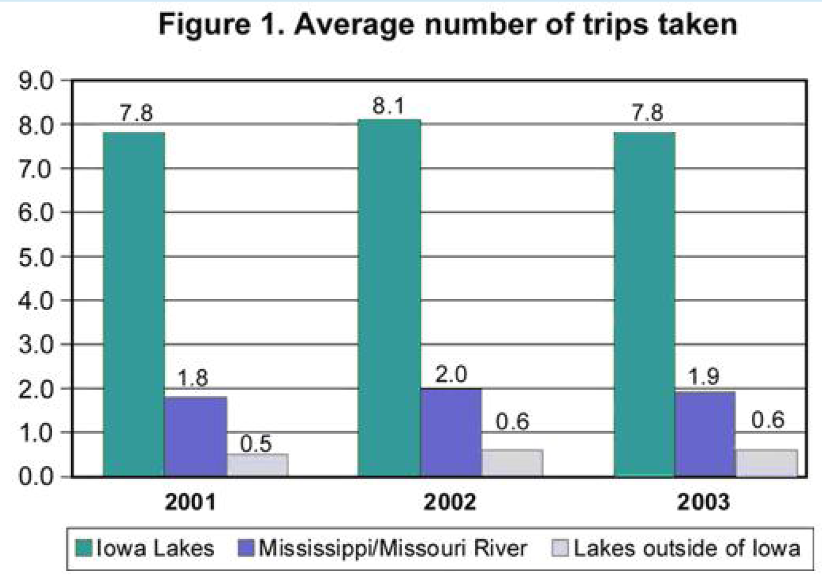
Department of Economics
ISU Extension
Center for Agricultural and Rural Development
College of Agriculture
Iowa State University

Commissioned by the Sustainable Funding for Natural Resources Study Committee, Iowa General Assembly

December, 2007

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

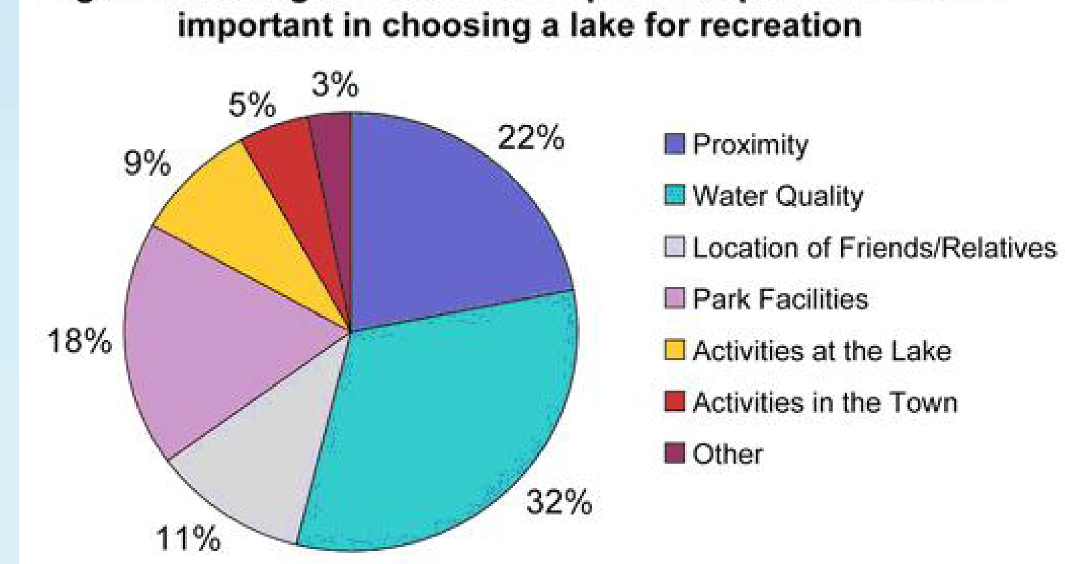
Figure 1. Average number of trips taken



Iowa Revenue Generation and Local Employment Support

- About 50 million visits a year to Iowa state/county parks and lakes
- Recreation spending level of $2.63 billion
- 27,400 jobs and $580 million in income generated from recreation industry
- Over $1.1 billion annually is the economic value for the rates of participation in outdoor recreation activities
- Quality of life improvement: retains and attracts skilled workers
- Environmental improvements generate economic benefits
- Add $425 million to the GDP

Figure 2. Average allocation of importance points to factors important in choosing a lake for recreation



- Lakes with better water quality had more value than lakes with poor water quality
- People are willing to pay for significant improvements in water clarity
- Ratio of cost/benefit positive investment for lake improvement efforts
- Most popular fishing destination are lakes & a majority travel < 25 miles

Property Value and Real Estate Taxes

- If lake improvement makes lake property more desirable, value will increase
- Increased real estate can alter tax base and level of real estate taxes
- Increased market activity leads to increased tax revenues

Carter Lake Alone in 2002-2005:

- Averaged 47,754 visitors annually
- Visitors spent an average $2.51 million annually
- Supports 31 jobs and $0.63 million of labor income in the region

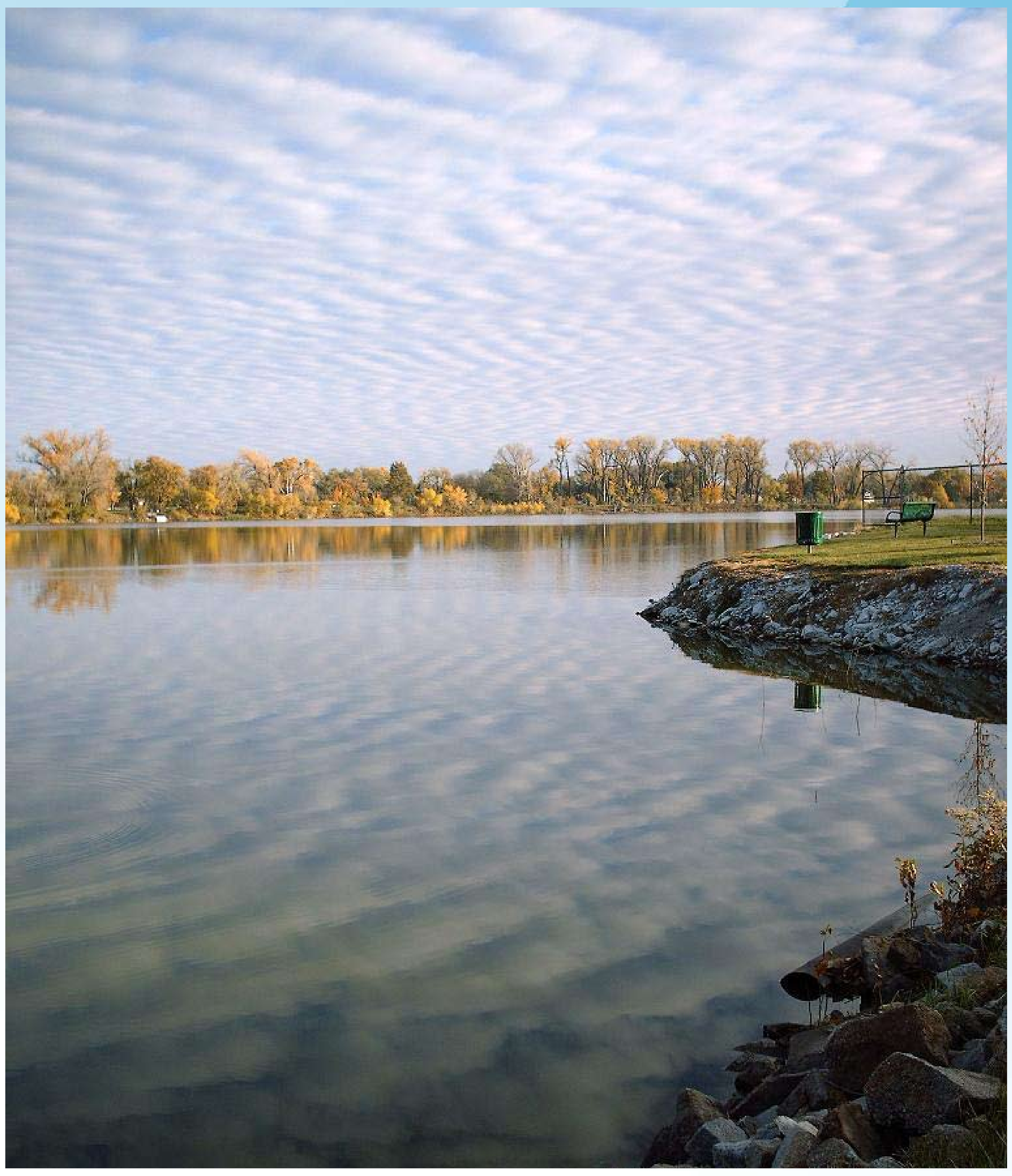
Category	Single Day	Multiple Day	Annual Single Day	Annual Multiple Day	Total
Supplies	$17.00	$59.65	$780,769	$108,921	$889,690
Eating and Drinking	$9.45	$96.30	$434,016	$175,844	$609,860
Gas and Car Expenses	$5.10	$29.70	$234,231	$54,232	$288,463
Lodging	$0.60	$69.80	$27,557	$127,455	$155,011
Shopping and Entertainment	$10.85	$36.05	$498,314	$65,827	$564,142
Total	$43.00	$291.50	$1,974,887	$532,279	$2,507,166

Information & Education (I & E) Program

The I & E Program is intended to be a dynamic plan that will address educational needs of the watershed residents as defined by the CLEAR Council and sub-committee.

GOAL 1. Promote stewardship among the users of public and private recreational areas within the watershed environment.

- Stencil sidewalks with awareness message to all users.
- Post signs on the consequence of pet waste and trash.
- Solicit volunteers to remove trash from the lake and park areas.

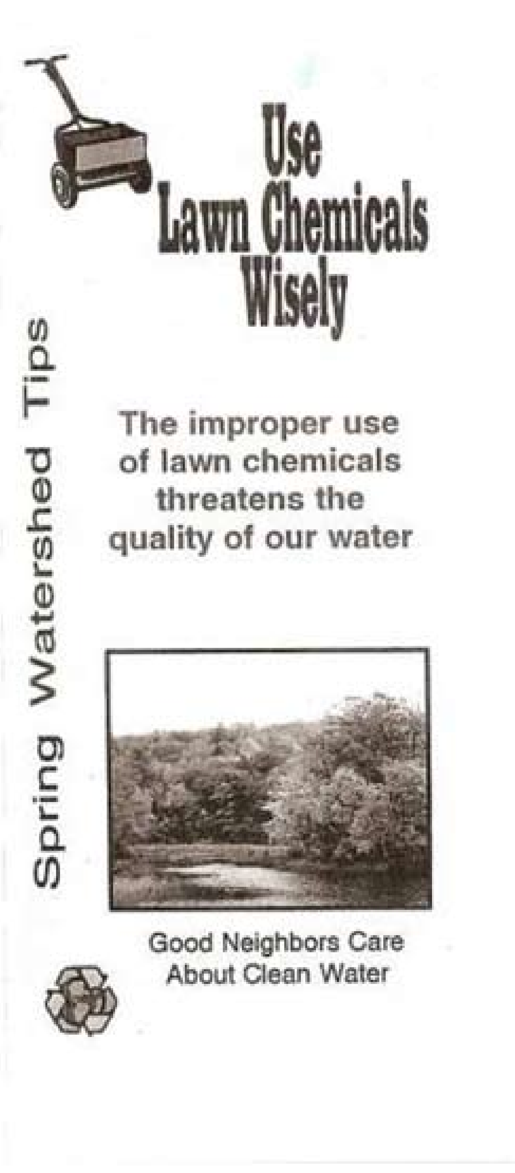


GOAL 2. Promote awareness to Best Management Practice (BMP) to homeowners and businesses in the Carter Lake Watershed.

- Promote the installation of rain gardens on public and private land through the development and dissemination of information, workshops, and tours of existing sites.
- Promote phosphorus free fertilizers by providing free soil tests and fertilizer for homeowners and holding workshops on lawn care.
- Promote existing disposal days for auto waste products and disseminate educational materials on the impacts of these products on water quality.
- Educate boat owners on proper fueling of watercraft and impacts of fuels on water quality.

GOAL 3. Inform the public of activities that have been done and will be done to improve the lake.

- Establishing a web-site that provides photos and continual updates on ongoing or completed components of the project.
- Use the blue channel and local media for periodic updates on what has been done or special events related to the project.



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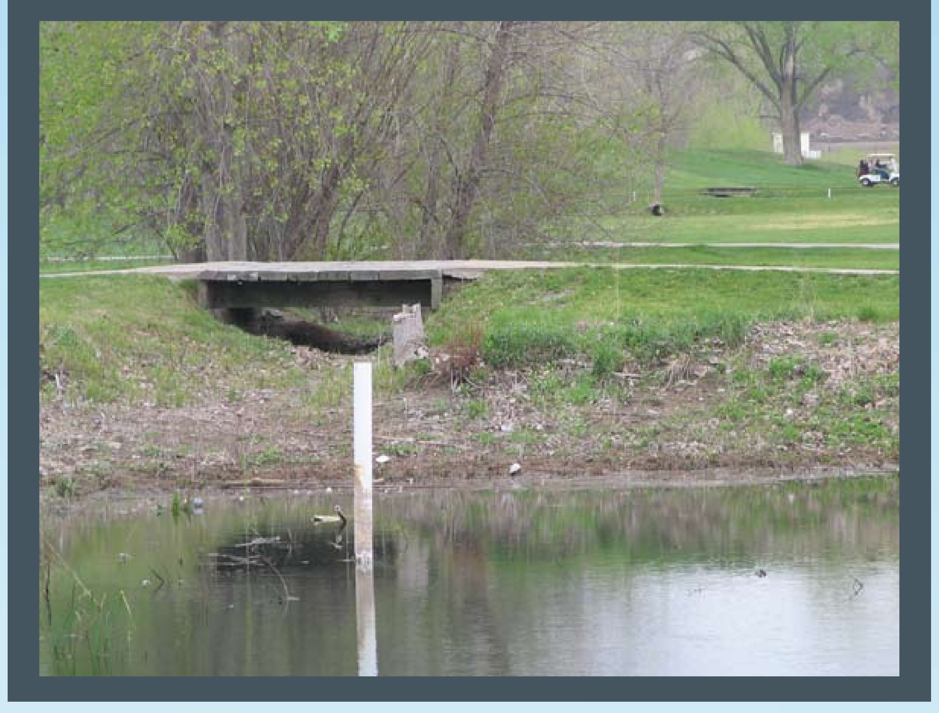
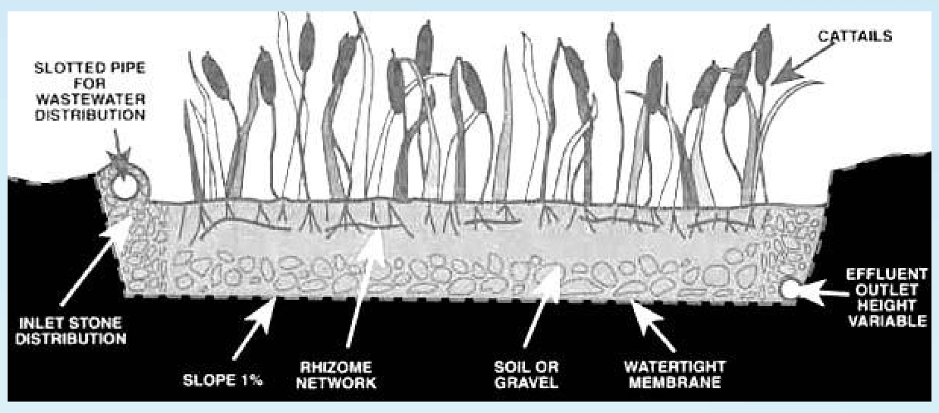
Bioretention, Bioswales/Filter Strips & Vegetated Buffers

Bioretention

- Capture and retain storm water in a shallow, offline, vegetated retention area
- Promote infiltration, evaporation and evapotranspiration of storm water
- Place adjacent to commercial or industrial areas within watershed, in public, and the golf course or private open space

Existing conditions





Bioretention examples

Photo from Austin Peay State University, Tennessee

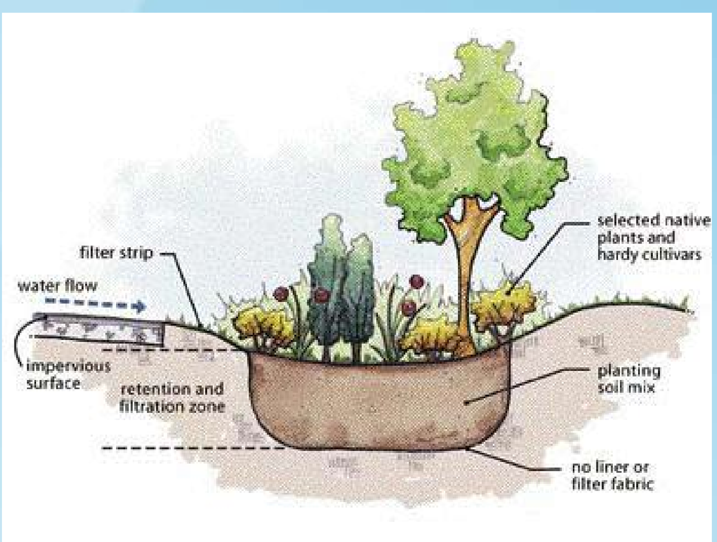
Source: *City of Lenexa, Kansas.*

Bioswale/Filter Strips

- Promote infiltration, evaporation and evapotranspiration of storm water
- Convey and filter storm water leading to Carter Lake
- Replace existing concrete liners, place in commercial and industrial areas, enhance existing swales in Levi Carter Park and the golf course.

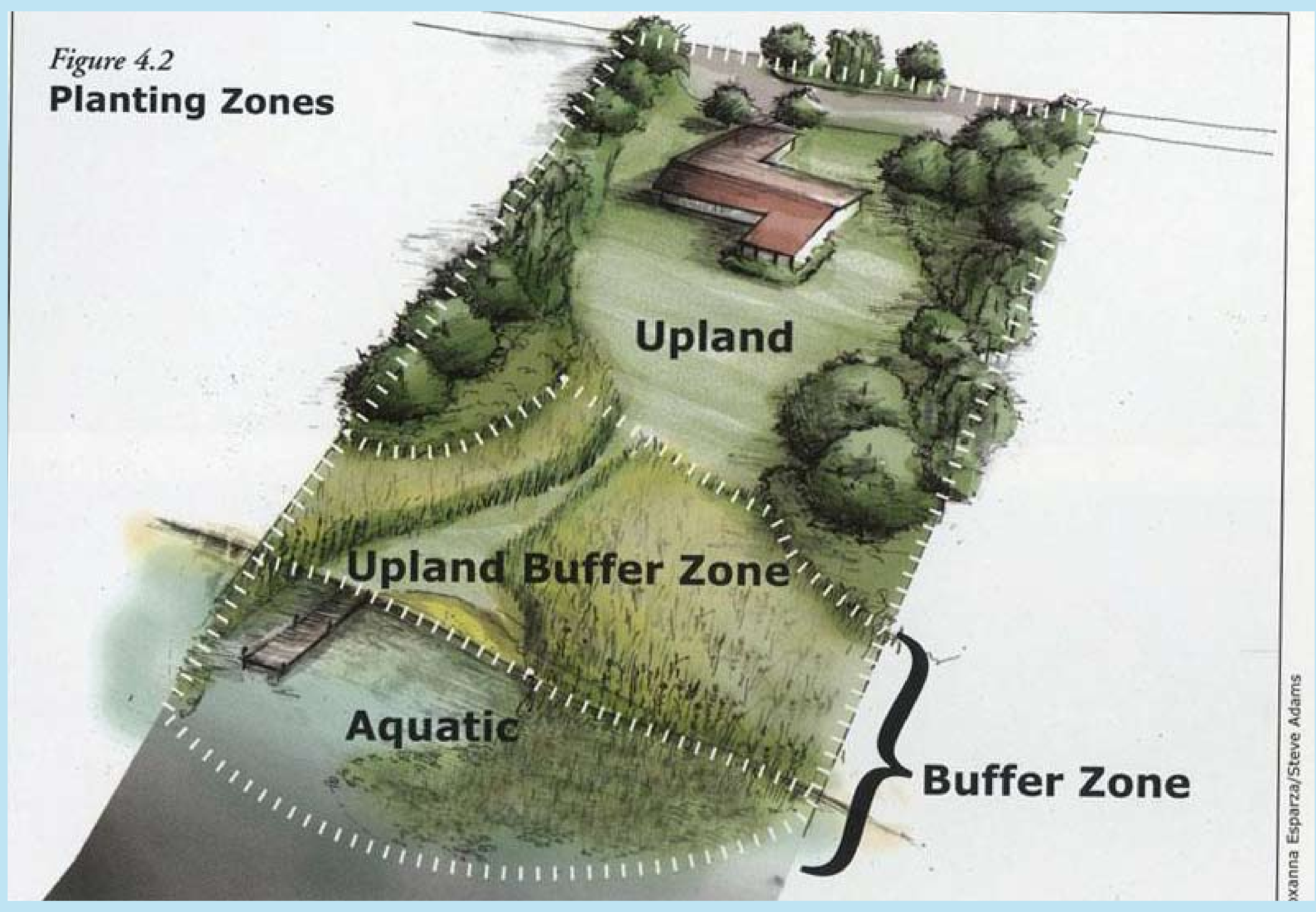
Existing conditions

Bioswale examples



Vegetated Buffers

- Relatively flat, vegetated areas that accept sheet flow from storm water runoff surrounding a water body
- Removal mechanisms include filtration and infiltration to filter out sediment and phosphorus and minimize erosion of runoff that enters the lake as overland flow from the surrounding area
- Primary benefits of buffer strips is to maintain a thick stand of vegetation between water bodies and paved or fertilized areas



	Estimated Annual Phosphorus Reduction	Treatment Cost
Bioretention, Biowswales/filter strips and vegetated buffers	218 pounds	$1,487,600

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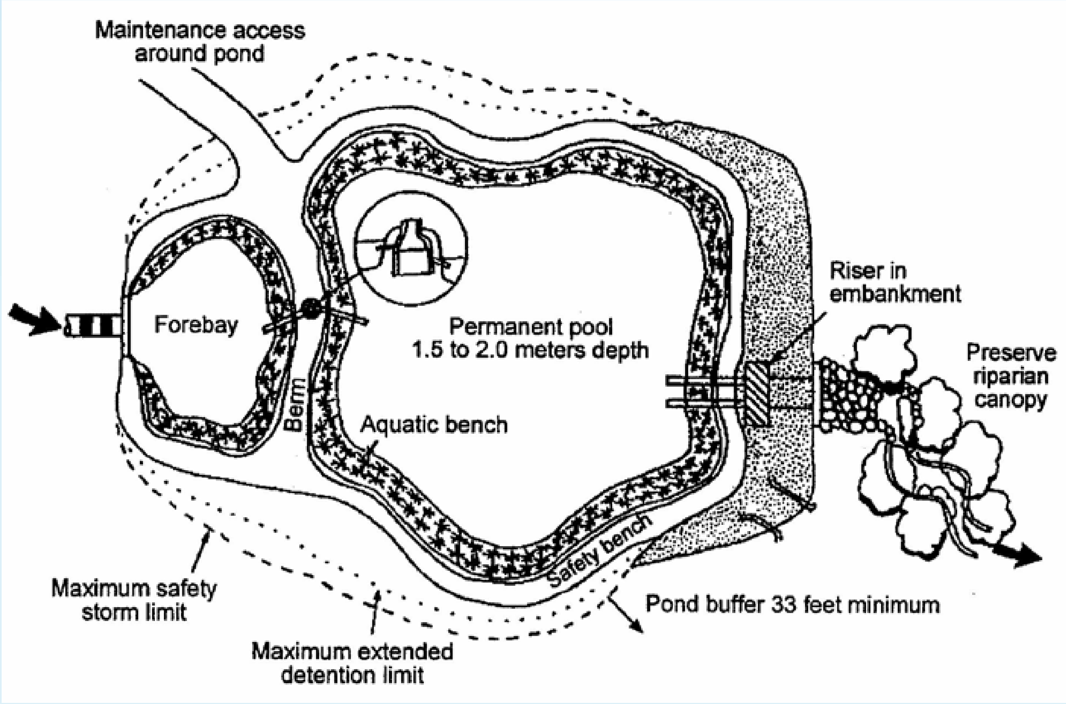
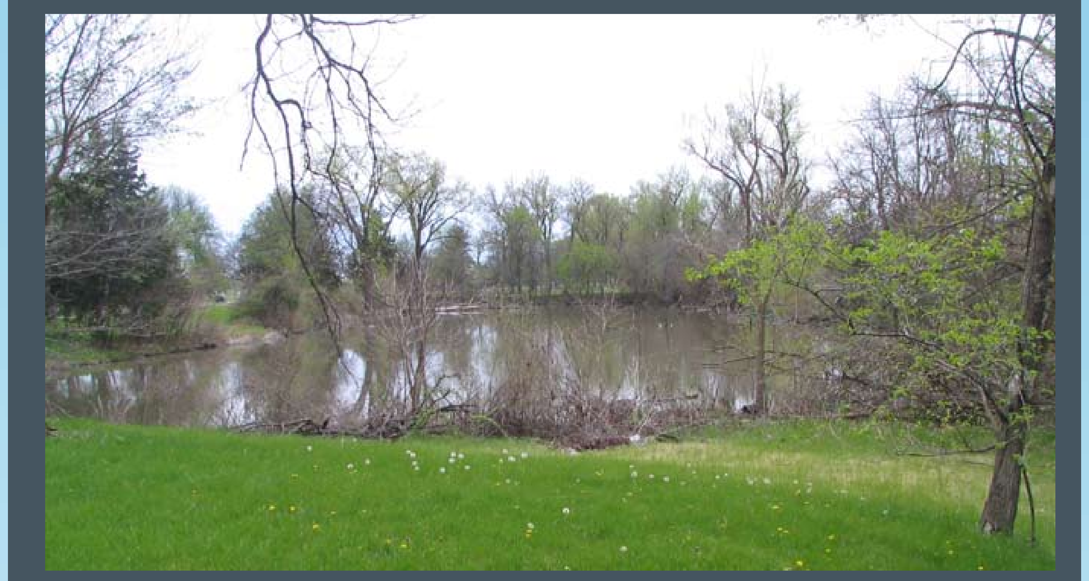
Wet Detention Ponds, Water Quality Inlets & Septic Tank Inspections

Wet Detention Pond

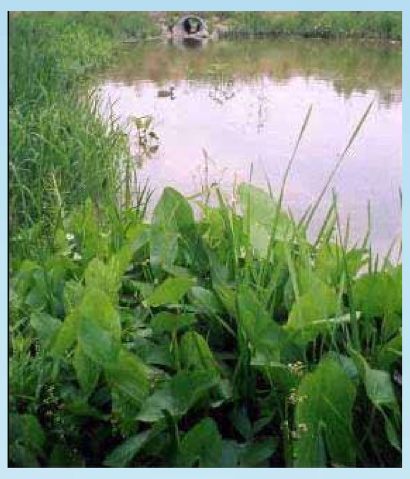
- Wet Detention ponds are incorporated into a stormwater treatment system, generally considered "end-of-the-pipe" BMPs
- Primary pollutant removal mechanism is sedimentation (settling)
- Moderate to high potential for removing metals, nutrients, and organics
- Ponds can be modified to increase their storage capacity and enhanced with vegetation to increase their water-quality treatment effectiveness
- Enhance pond in the northwest corner of Levi Carter Park
- Divert additional drainage area from Omaha to pond



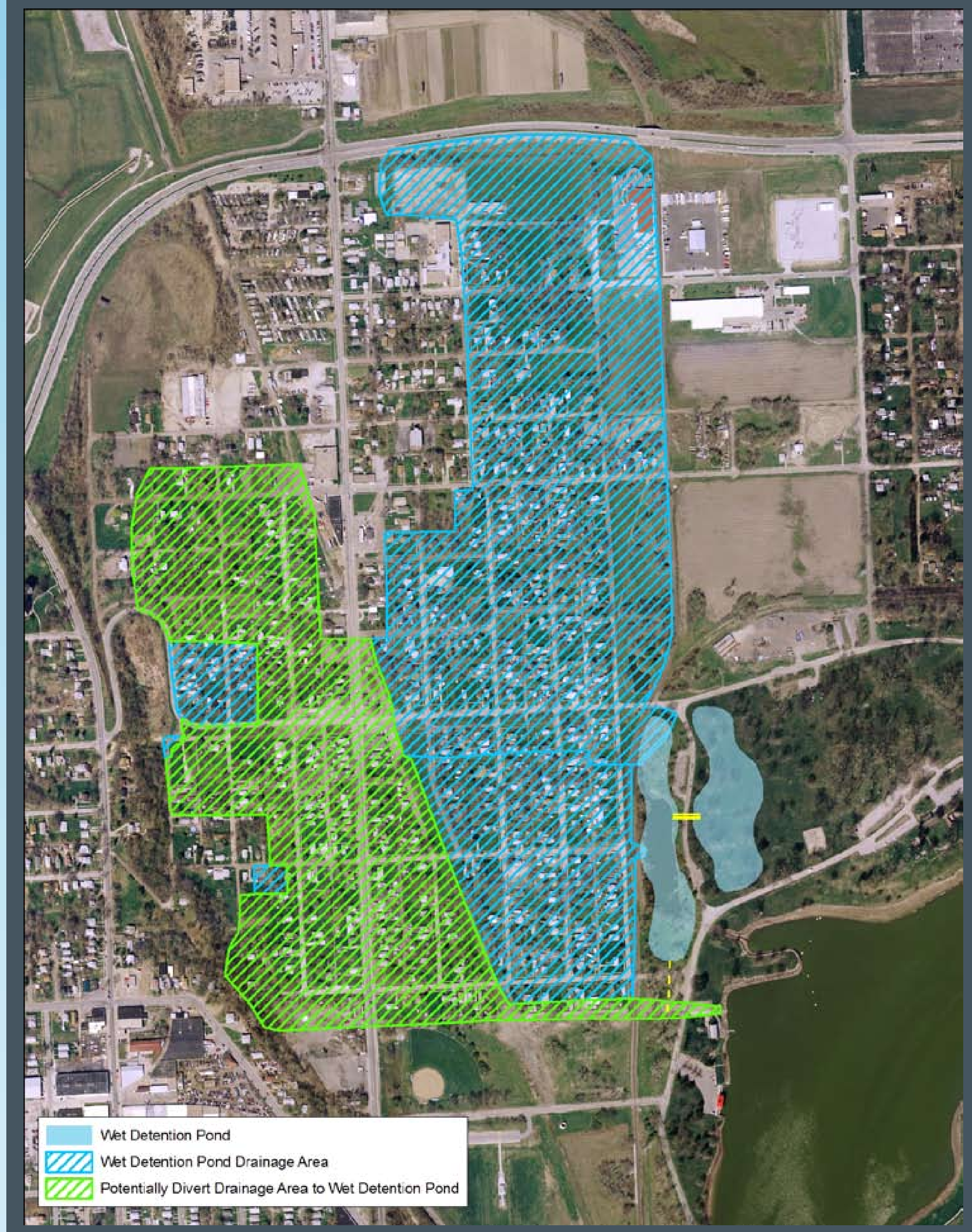
Existing conditions



Wet detention pond examples



Potential wet detention pond expansion



	Estimated Annual Phosphorus Reduction	Treatment Cost
Wet Detention Pond*	437 pounds	$506,000

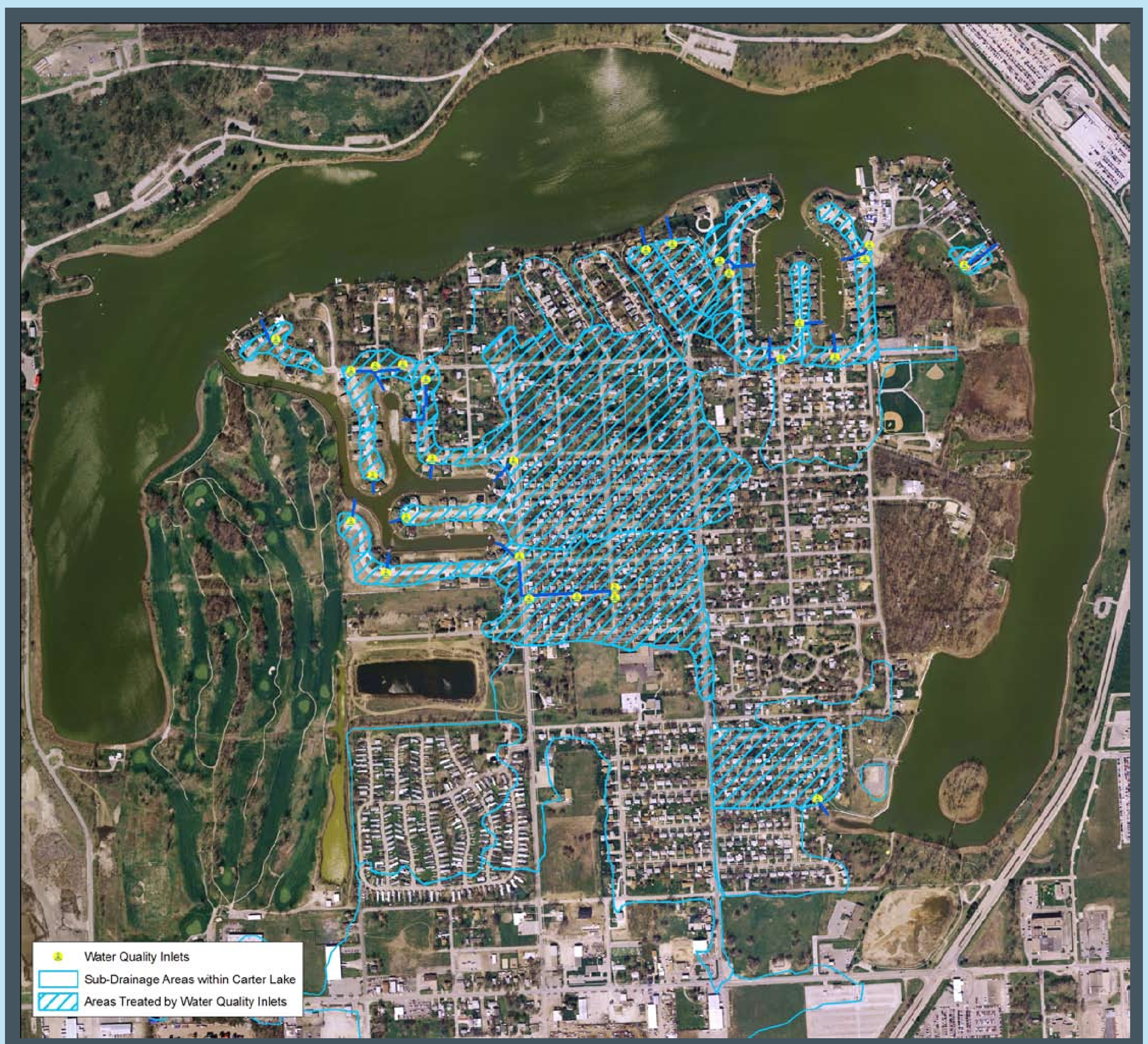
*Includes phosphorus reduction and cost of the associated alum injection system

Water Quality Inlets

- Stainless steel baskets that suspend from drain inlet grates
- Frame lined with fabric mesh and contains oil-absorbing filter pillow
- Filter removes pollutants from small stormwater flows, large flood flows bypass the filter by overtopping the basket
- Insert in inlets where other BMPs could not be applied

Existing condition

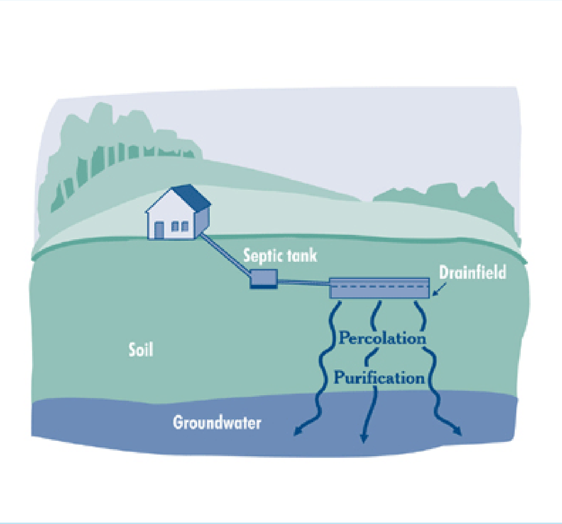
Water quality inlet example



	Estimated Annual Phosphorus Reduction	Treatment Cost
Water Quality Inlets	25 pounds	$45,000

Septic Tank Inspections

- proximately 200 households in Omaha, north of Carter Lake, run on septic systems
- Septic systems need to be maintained in order to prevent failure
- Failure of systems would result in phosphorus-rich waste seepage into the ground water, which generally flows towards Carter Lake



	Estimated Annual Phosphorus Reduction	Treatment Cost
Septic Tank Inspections	49 pounds	$50,000

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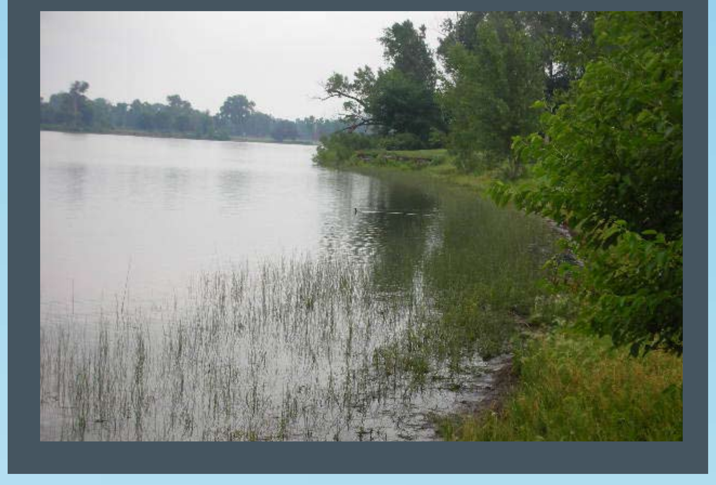
Wetland Enhancement/Creation, Shoreline Stabilization & Sediment Forebays

Wetland Enhancement/Creation

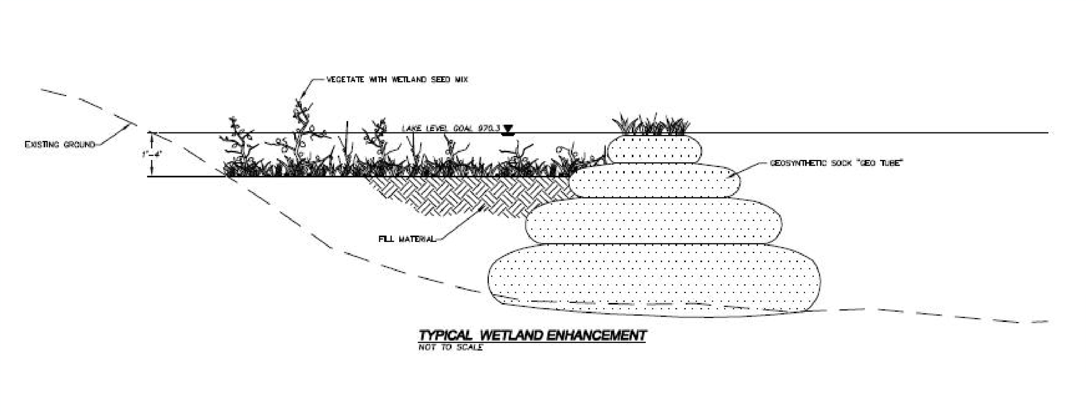
- Shallow marshes planted with emergent vegetation that are designed to treat stormwater runoff
- Wetland vegetation uptakes phosphorus and provides competition for algae
- Provides aesthetic and wildlife benefits
- Create adjacent to golf course, behind hard armored structures and enhance existing wetlands
- 20 acres total created/enhanced

	Estimated Annual Phosphorus Reduction	Treatment Cost
Wetland Enhancement/ Creation	270 pounds	$601,300

Existing condition



Wetland enhancement/creation examples

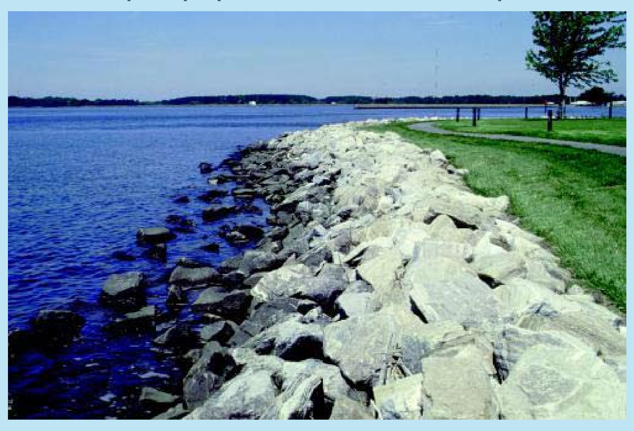


Shoreline Stabilization

- Prevent erosion and reduce sediment deposition into the lake
- Eroding shorelines are not aesthetically pleasing and make lake access difficult
- Stabilize approximately 13,200 ft of shoreline
- Hard Engineering Approach:
  - Offshore Breakwaters
  - Jetty Structures
  - Rock Riprap Protection
- Soft Engineering Approach:
  - Geotube Protection
  - Shoreline Regrading

Existing condition

Rock riprap protection example



Geotube example (construction)

	Estimated Annual Phosphorus Reduction	Treatment Cost
Shoreline Stabilization	130 pounds	$2,483,500

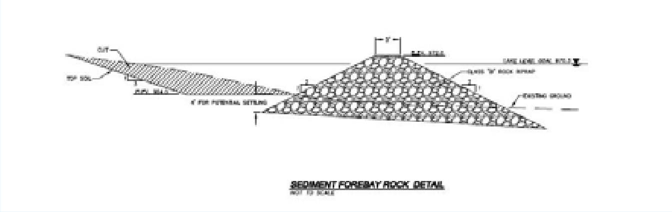
Geotube example (vegetated/post construction)

Sediment Forebays

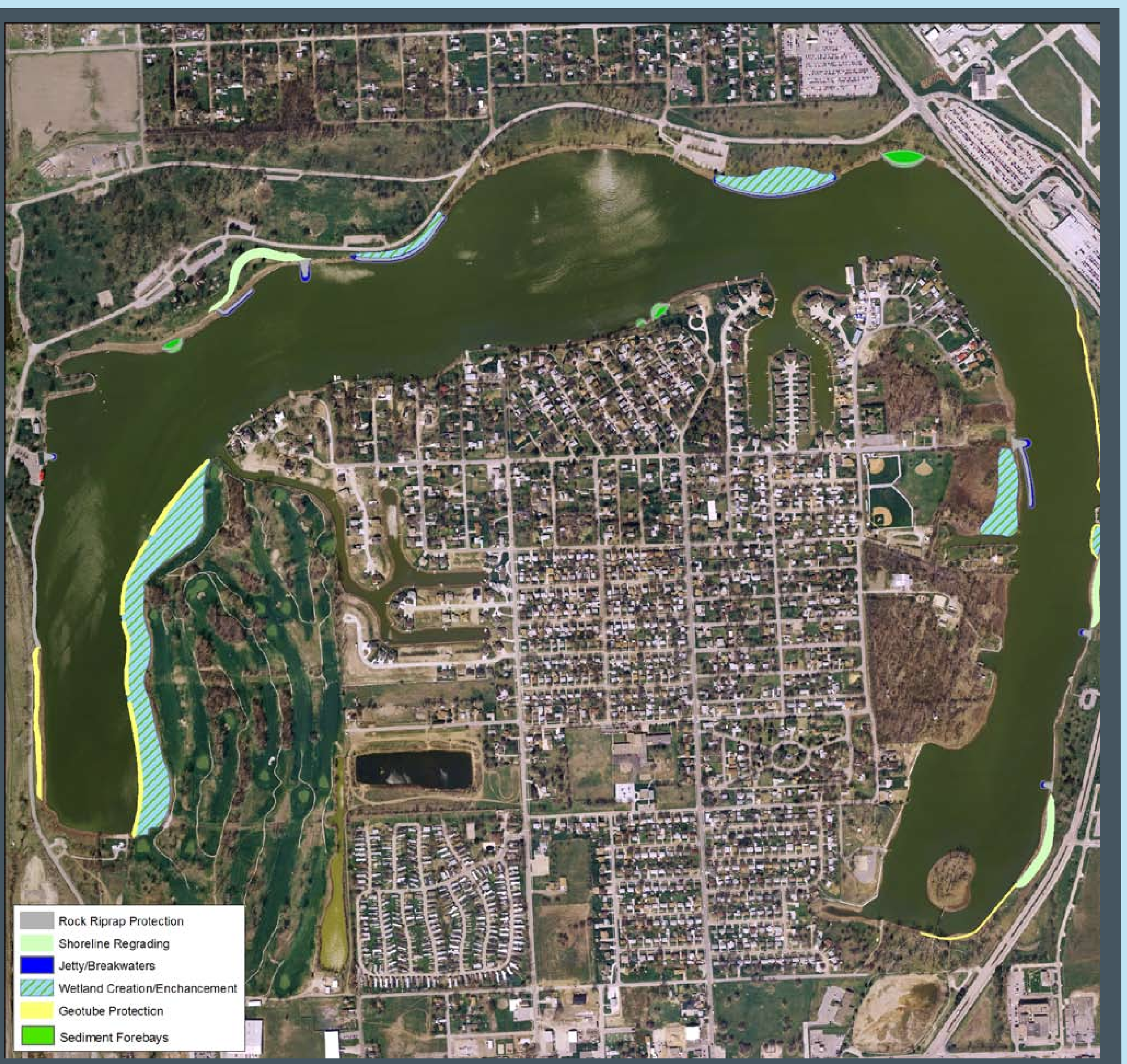
- Small basins located at a storm water outlets
- Initial storage areas to trap and settle out sediment and heavy pollutants before they reach the lake
- Prevent sedimentation in main body of lake

	Estimated Annual Phosphorus Reduction	Treatment Cost
Sediment Forebays	103 pounds	$1,159,200

Existing condition



Sediment forebay example



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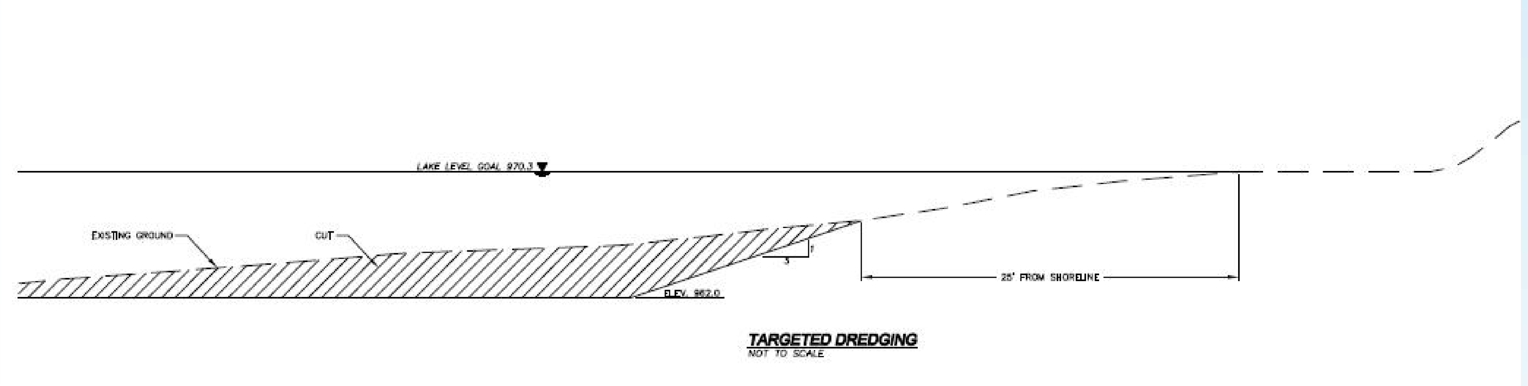
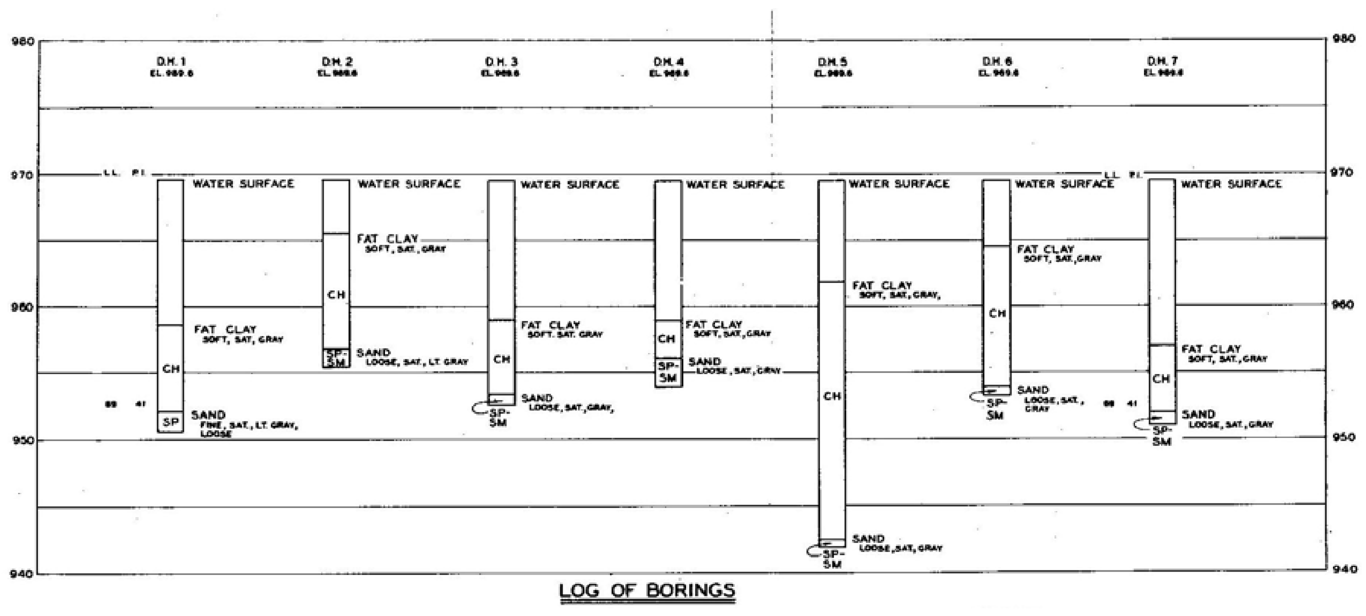
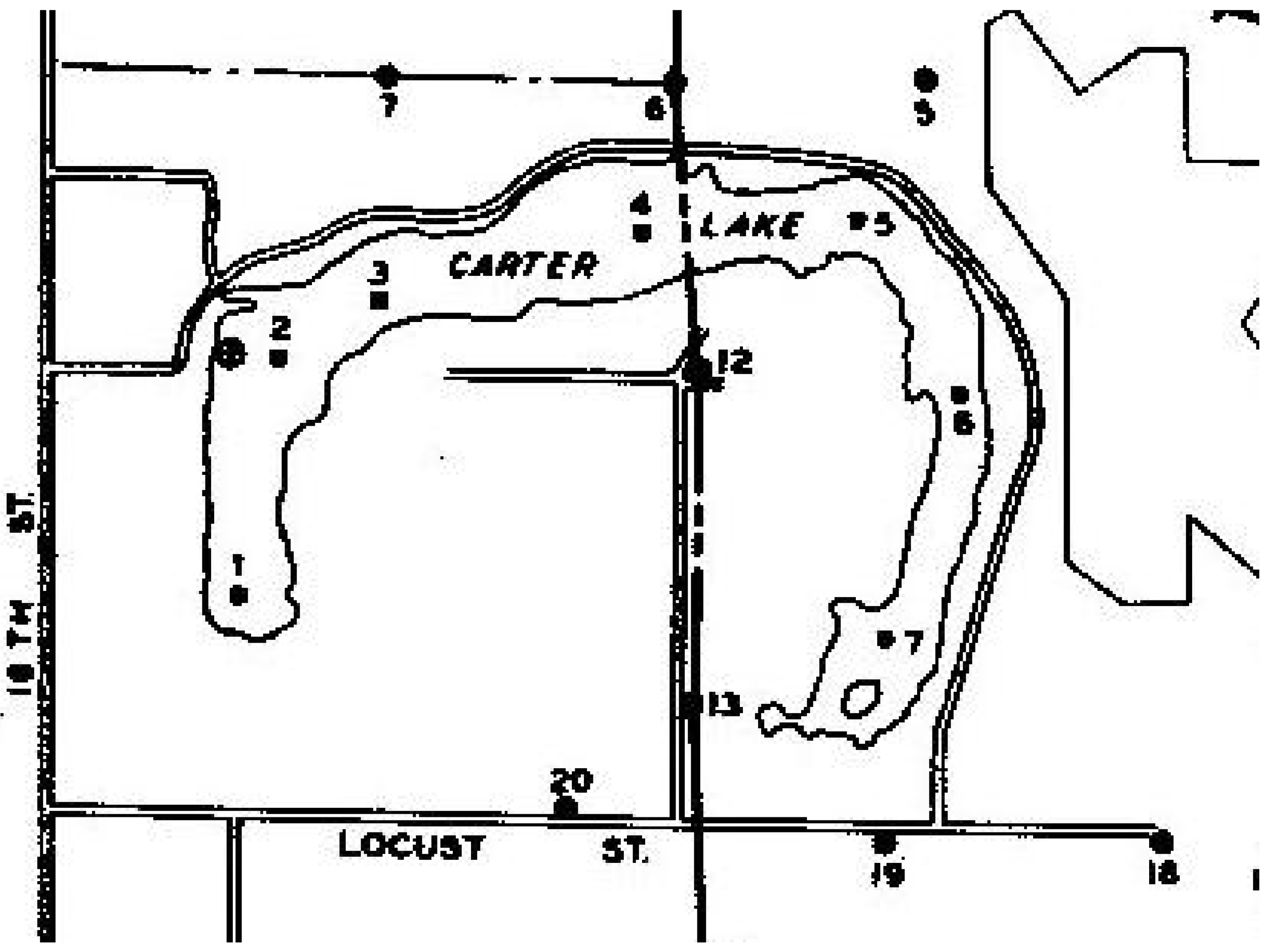
Targeted Dredging & Targeted Fill

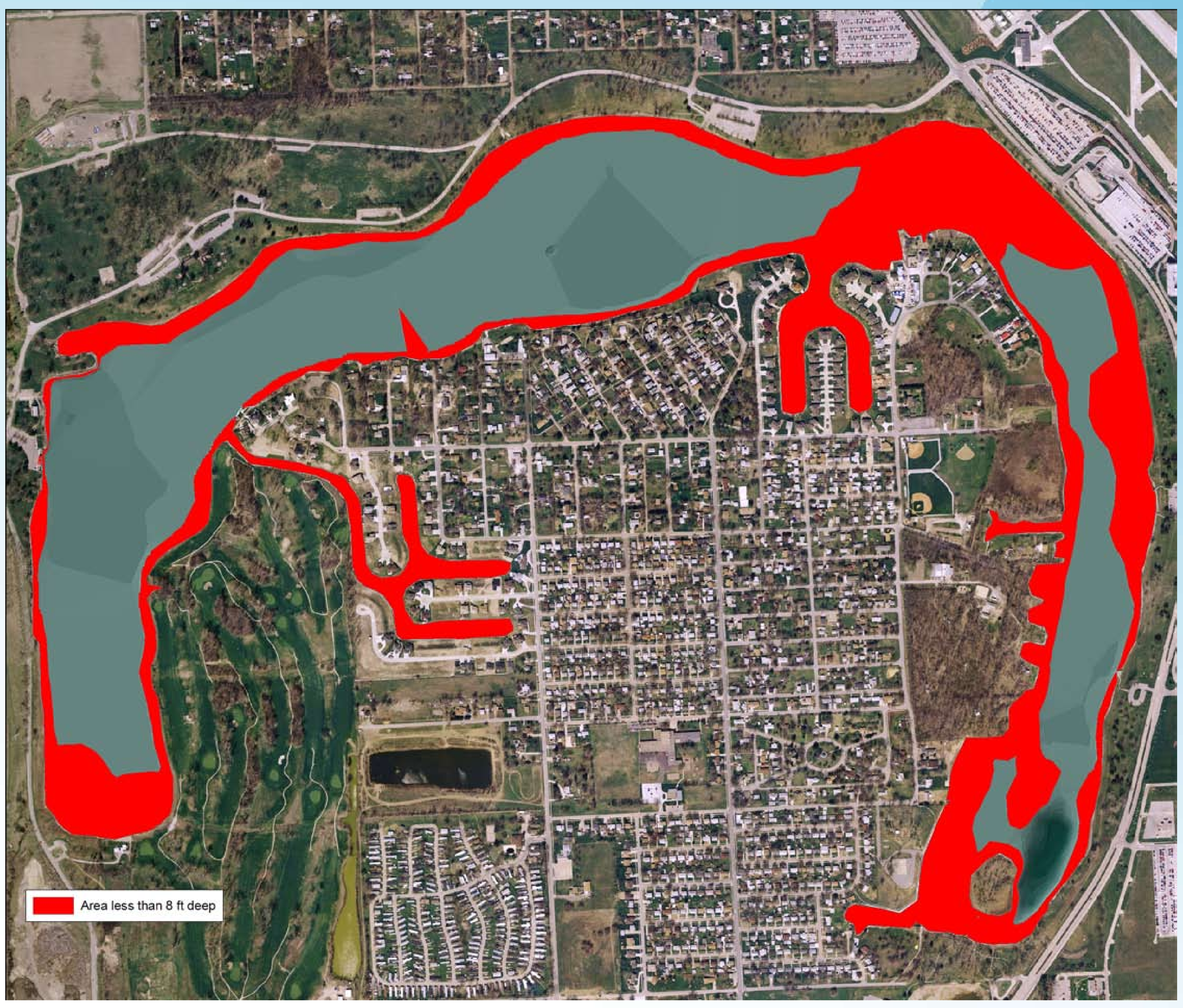
Targeted Dredging

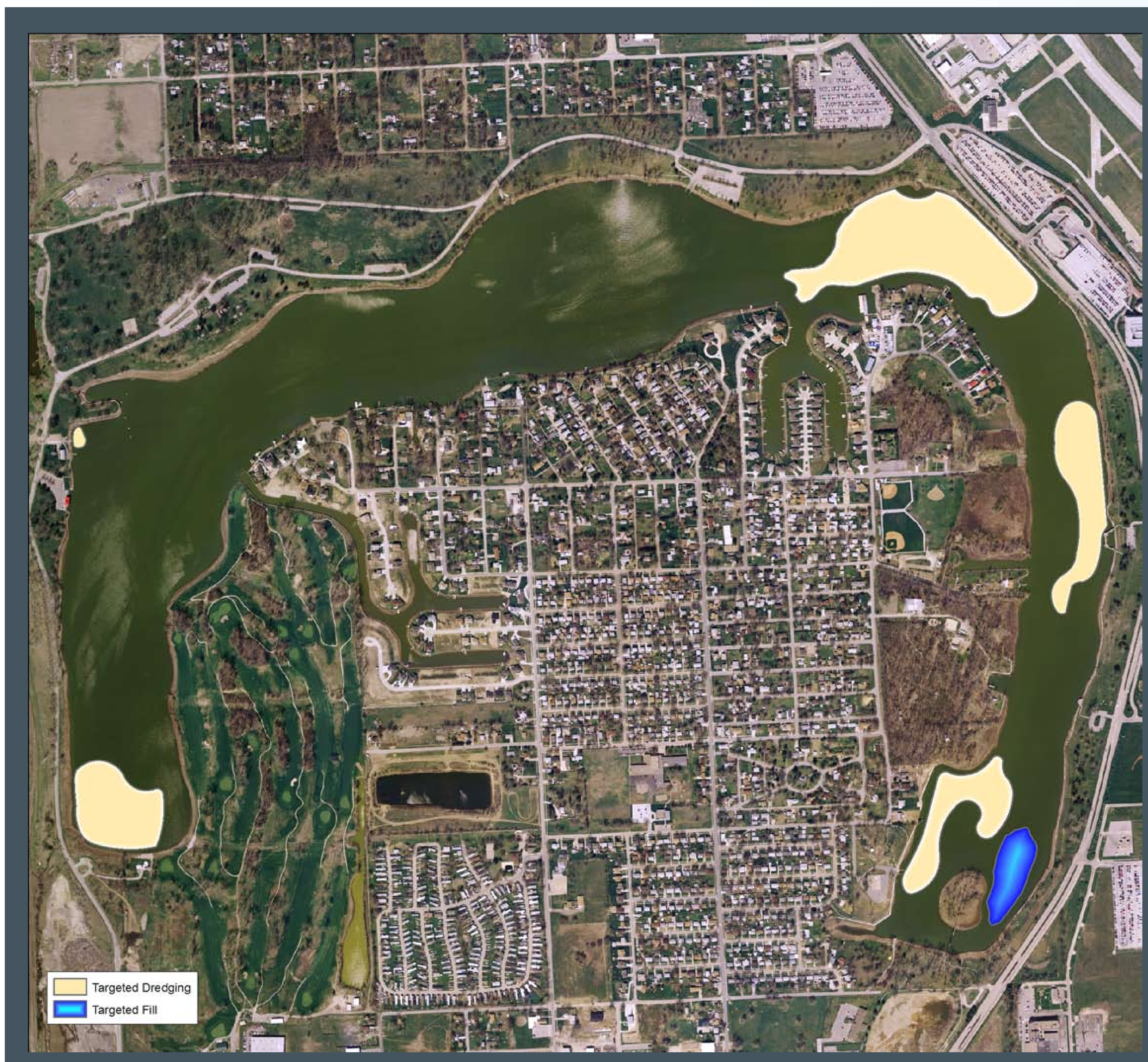
- Dredging in strategically selected locations that have experienced high sediment deposition
- Dredge areas less than 8 ft deep (when lake at desired level), except along shoreline
- Increases average depth of lake and increases water volume
- Removal of lake bottom material reduces organic sediment and attached pollutants (especially phosphorus) available for resuspension
- **Remove approximately 92,000 cubic yards from targeted areas**











	Estimated Annual Phosphorus Reduction	Treatment Cost
Targeted Dredge/Fill	Not Estimated	$1,610,000

Targeted Fill

- Dredge material may be pumped from shallow areas to locations of suspected seepage losses such as the deep hole near the island off of Abbott Drive
- Hole can hold approximately 64,000 cubic yards
- Place a minimum of 35,000 cubic yards in hole to ensure no seepage occurs

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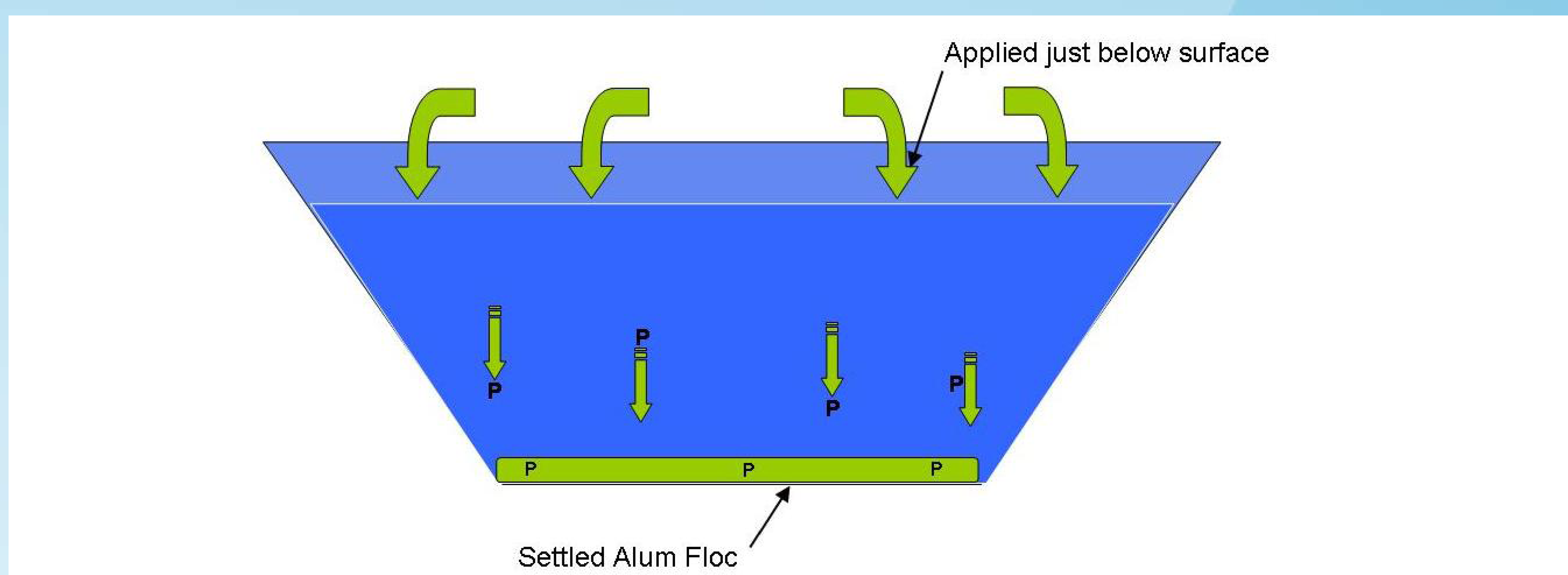
Whole Lake Alum Application & Alum Stormwater Injections

Whole Lake Alum Application

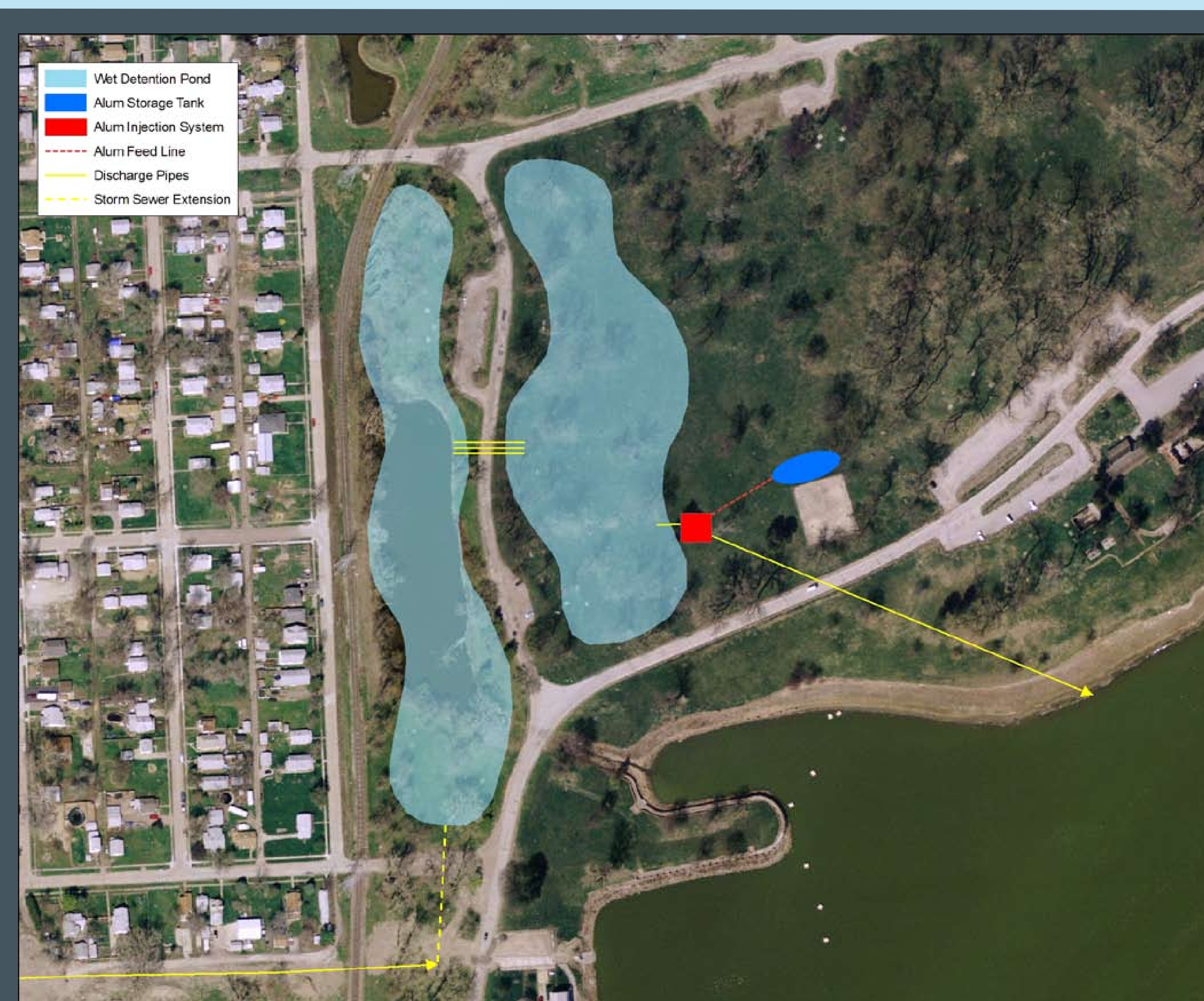
- Addition of aluminum sulfate (alum) to the water column of a lake
- Alum bonds with phosphates to form a floc, and precipitates (settles) to the bottom of the lake
- Alum floc removes phosphorus from the water column as it settles
- Forms a thin layer on the top of the sediment
- Layer acts as a barrier to prevent the release of phosphorus to the water column from the sediment
- Lifetime varies from site to site, estimates range from 3 to 10 years

	Estimated Annual Phosphorus Reduction	Treatment Cost
Whole Lake Alum Application	448 pounds	$600,000



Alum Stormwater Injections

- Alum can be injected into major storm sewer lines before discharged to the lake
- Alum forms non-toxic precipitates that binds to phosphorus, suspended solids and heavy metals
- Pollutants are rapidly removed from the treated water as the precipitate settles out in a detention basin or sediment forebay
- Alum is injected into the storm water by a variable-speed chemical metering pump on a flow-weighted basis, to ensure proper dosage

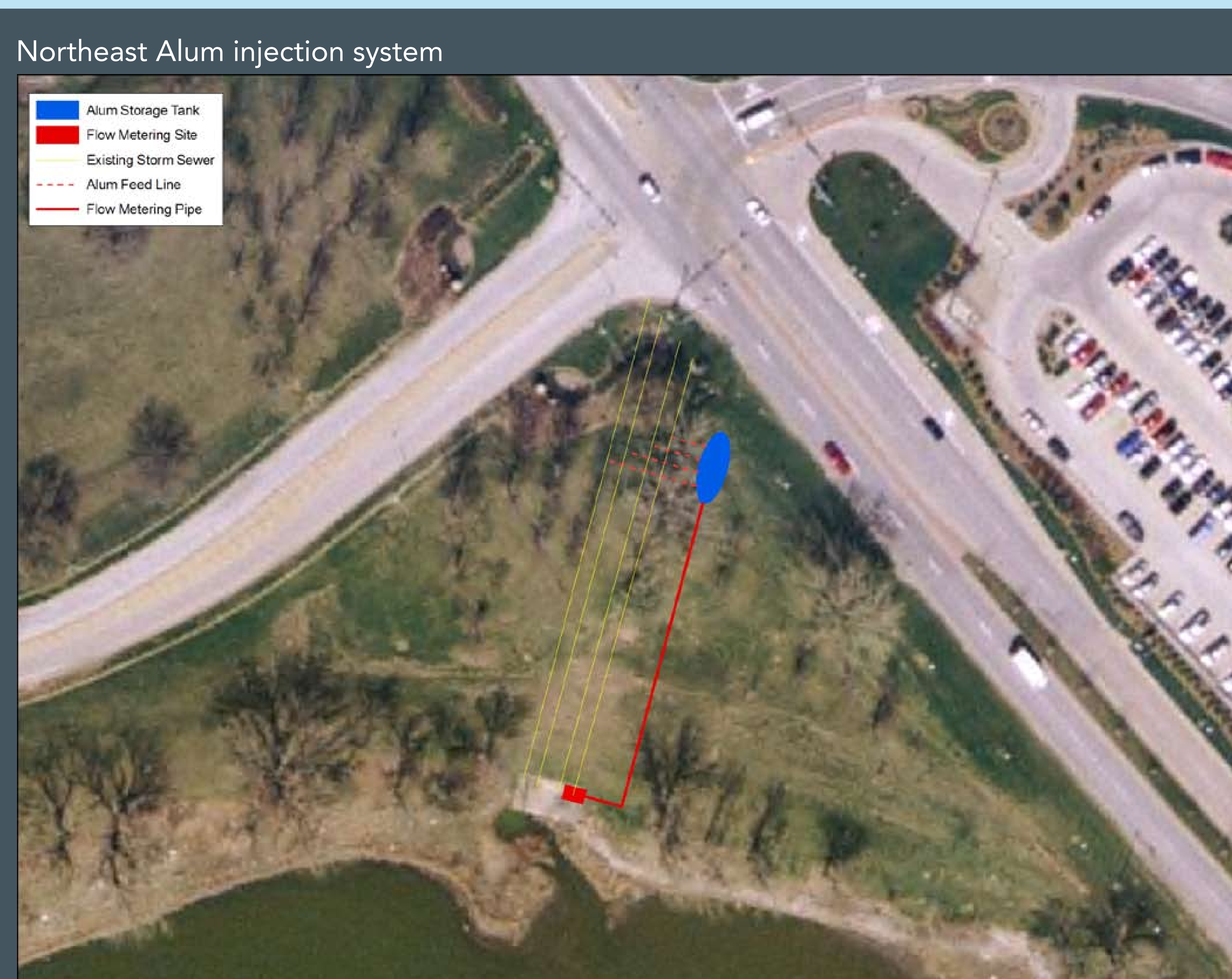


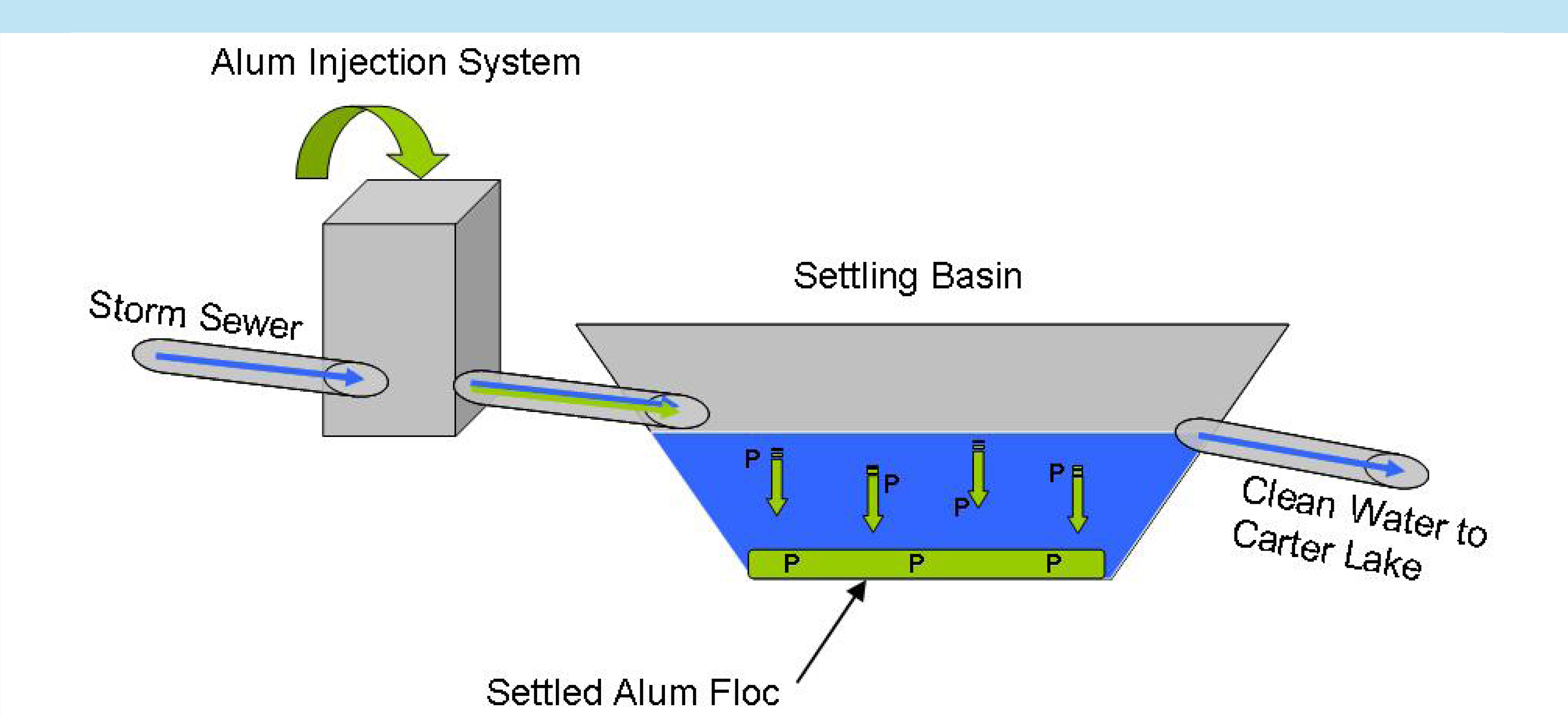
	Estimated Annual Phosphorus Reduction	Treatment Cost
Northwest Alum System*	437 pounds	$506,000

**Includes phosphorus reduction and cost of the associated wet detention pond*

	Estimated Annual Phosphorus Reduction	Treatment Cost
Northeast Alum System	67 pounds	$97,000

Northeast Alum injection system





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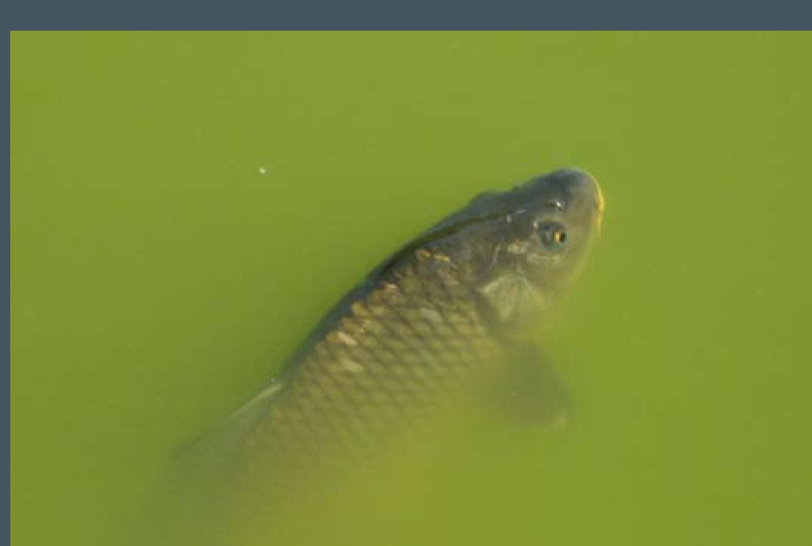
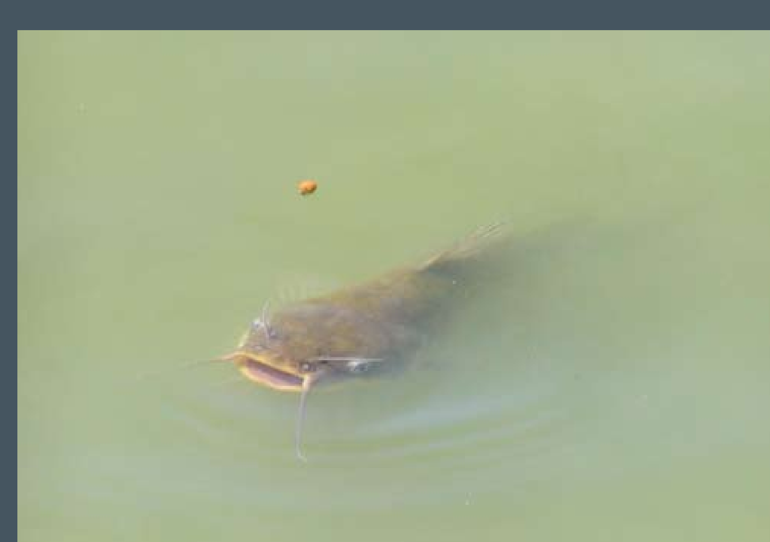
Fish Renovation

Existing Conditions

- Bottom feeding fish (i.e. carp and bullhead) are known for stirring up sediment from lake bottoms due to their feeding and swimming habits
- Eliminating the bottom feeding fish species will reduce internal pollutant loads



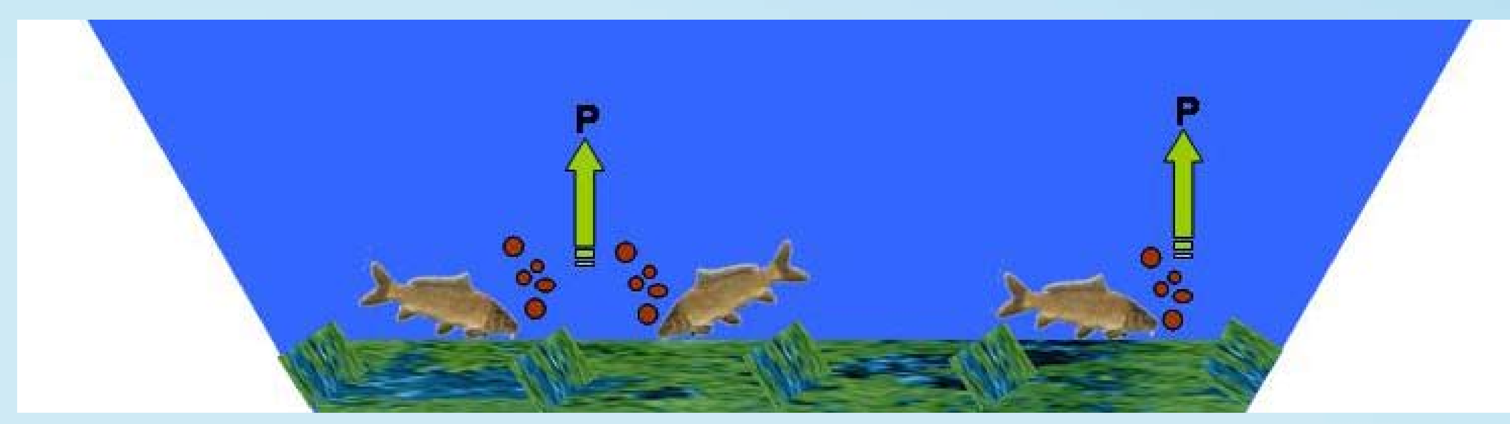


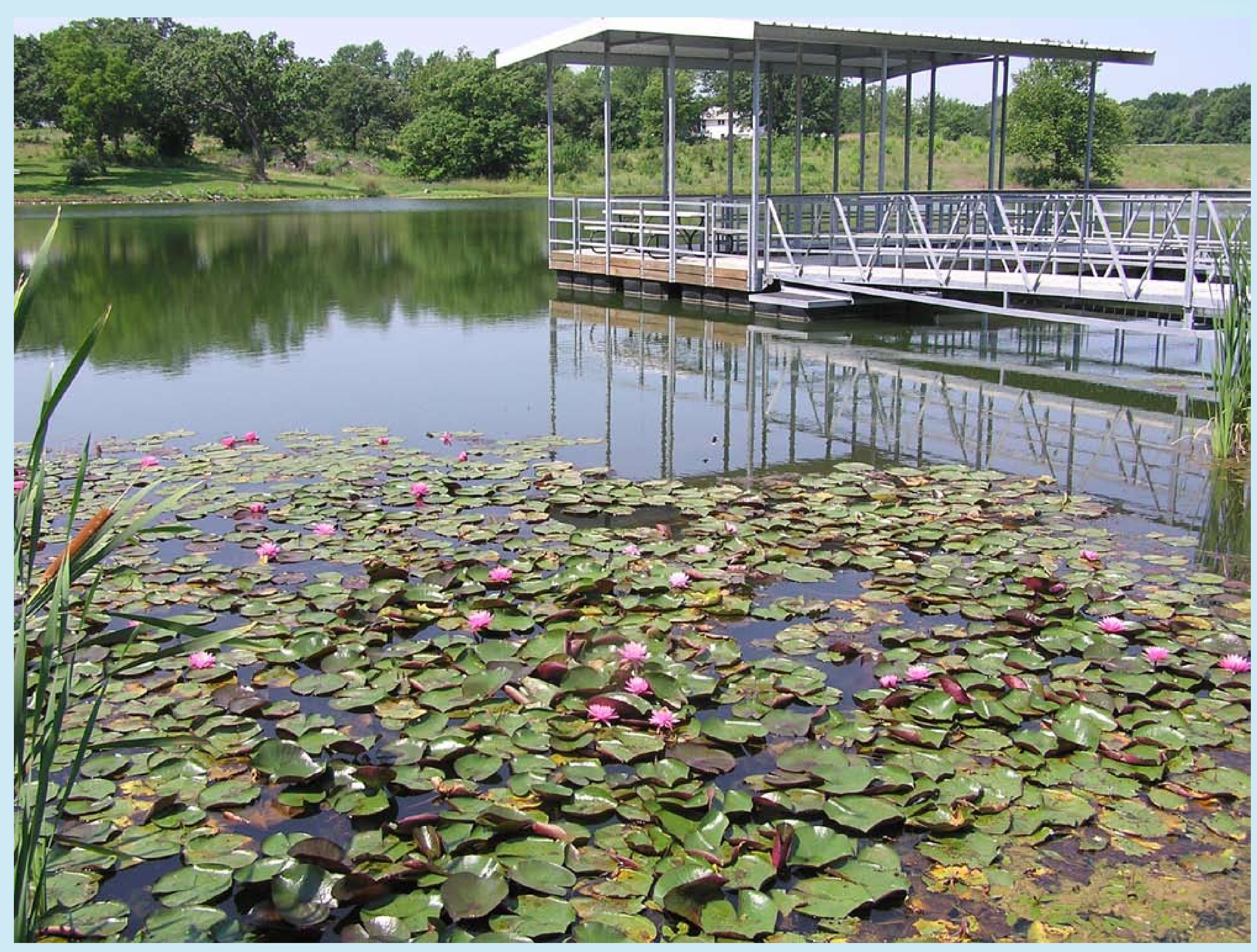
Chemical Application

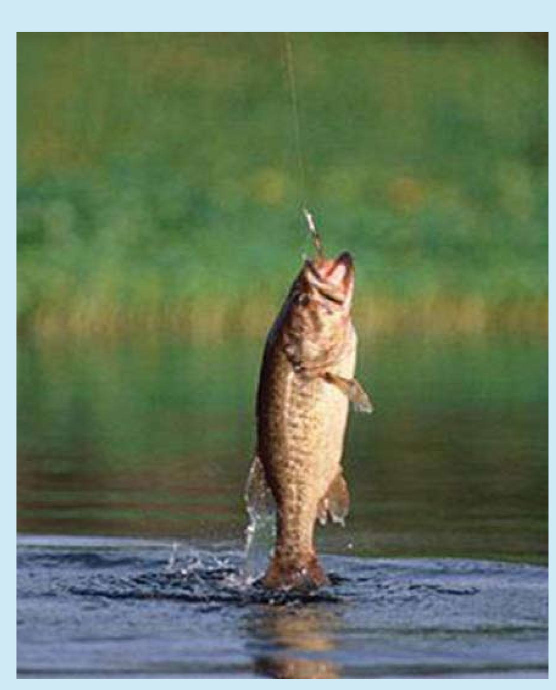
- Rotenone (a naturally occurring substance) is applied to open water to eradicate fish species from the lake
- Rotenone works quickly, breaks down in a short period of time, and leaves no harmful residues
- Rotenone does not pose a health hazard to those applying, or the animals that might consume treated water or organisms

Benefits

- Renovation will rebalance the fish species population
- Restock with more desirable species (i.e. largemouth bass, bluegill and channel catfish)
- Remove fish tissue from the lake that may have bio-accumulated PCBs over the years.
- Results in improved water quality and fishing opportunities
- Increases the abundance of desirable rooted aquatic plants that compete with free floating algae







	Estimated Annual Phosphorus Reduction	Treatment Cost
Fish Renovation	168 pounds	$200,000

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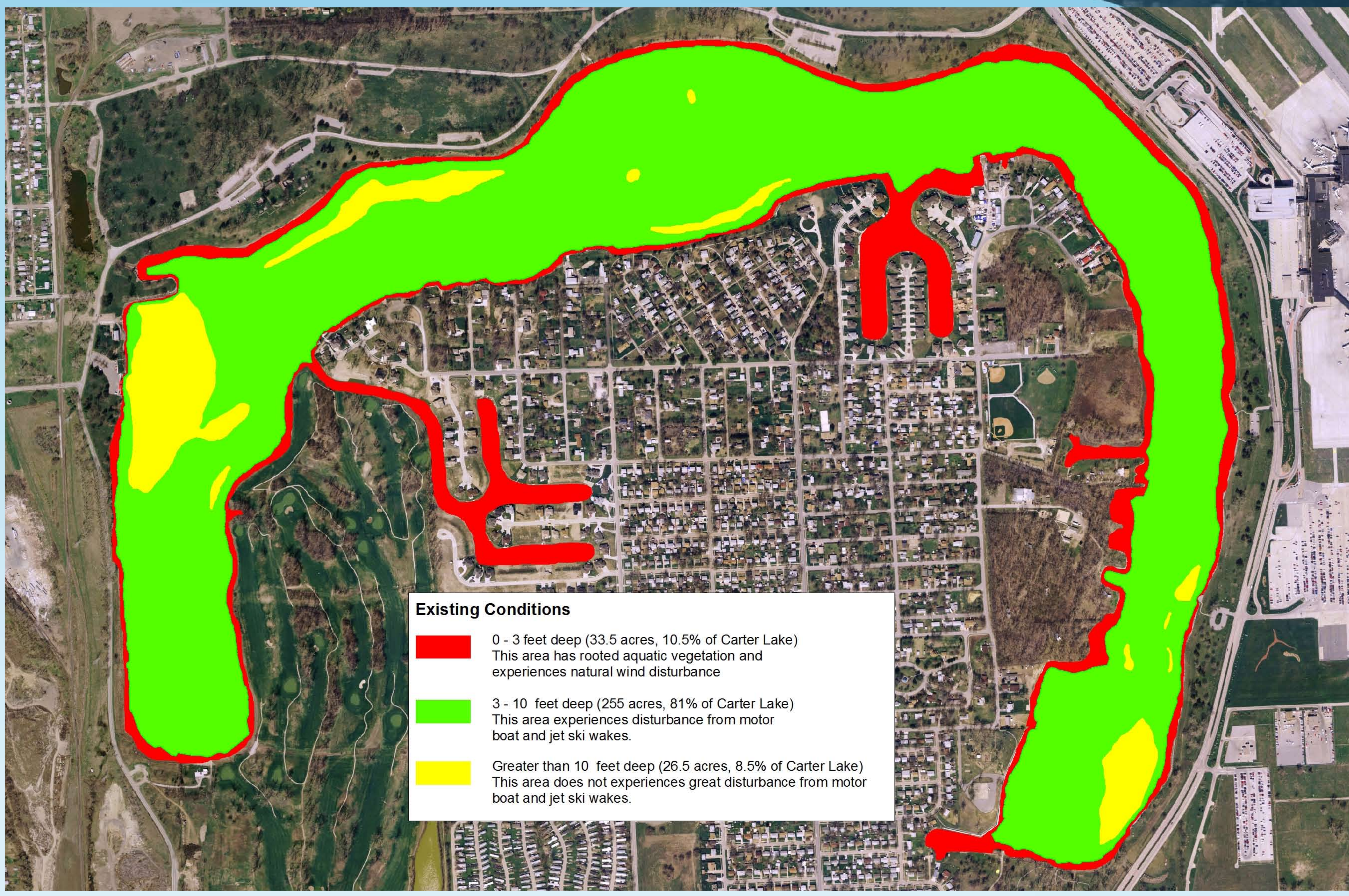
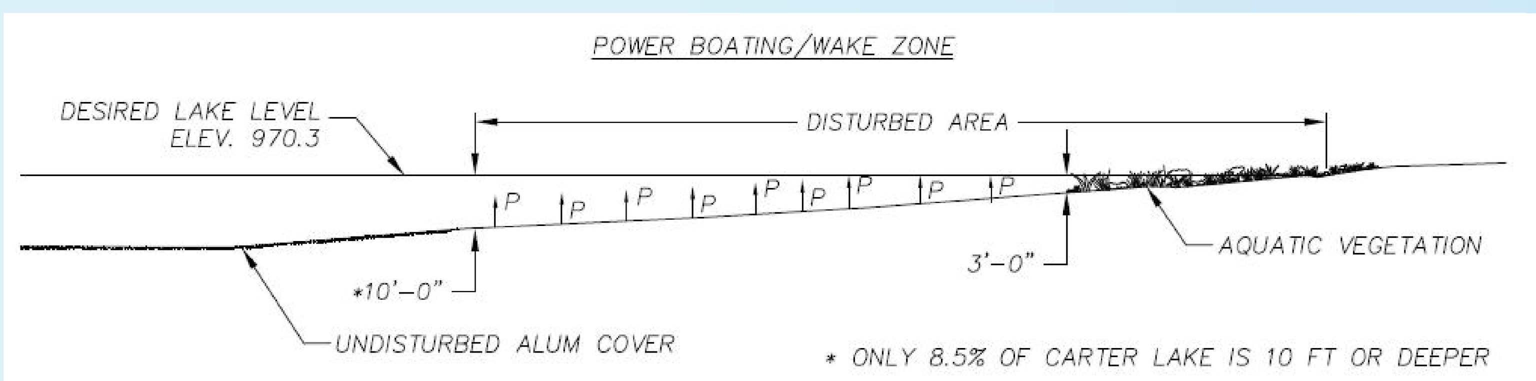
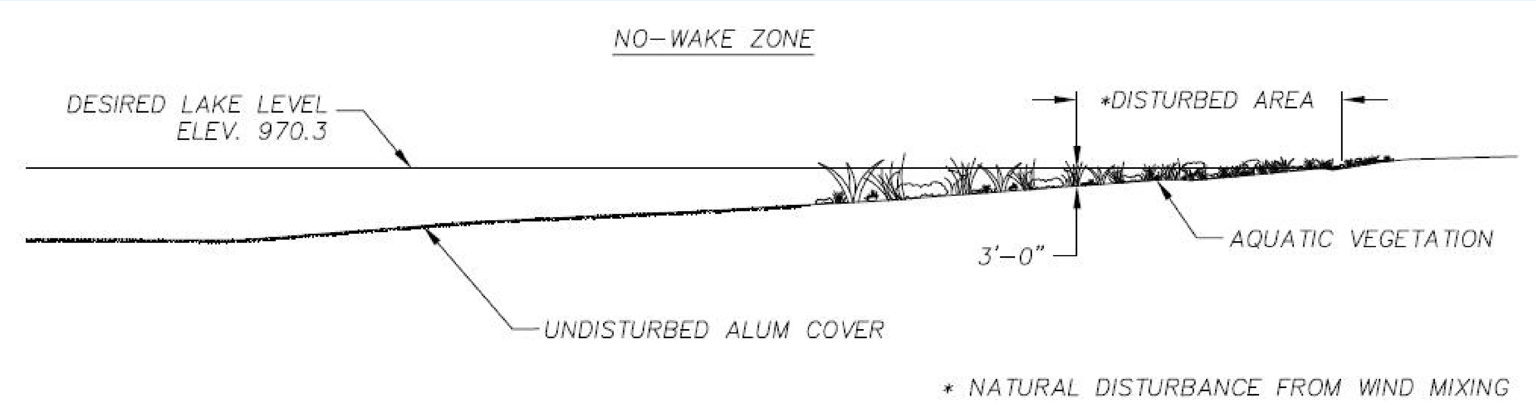
Watercraft Management



Boating and Water Quality

- High speed motorboats cause stir up sediment from the lake bottom
- Reduce resuspension of phosphorus into water column, less available to algae
- Reduce shoreline erosion
- Compliments and enhances benefits of several other alternatives



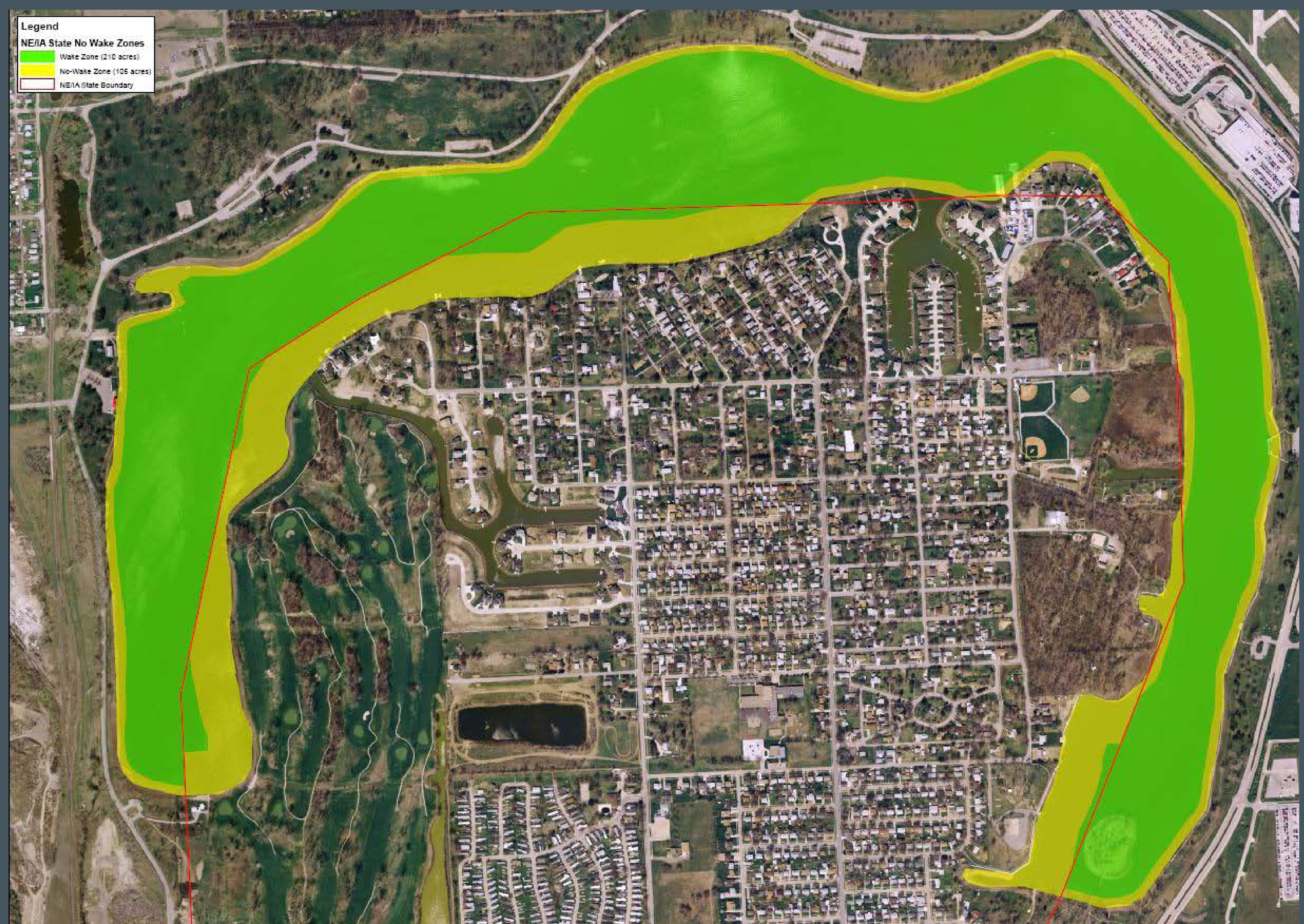


Watercraft Management and Safety

- Existing state laws
  - 90 ft no-wake on NE shoreline
  - 300 ft no-wake on IA shoreline
- Propose 100 acres of effective no-wake zone
- A watercraft management plan would benefit boaters by defining and enhancing safety zones, improving water quality and providing consistent enforcement guidelines

Example wakes created by boats and jet skis

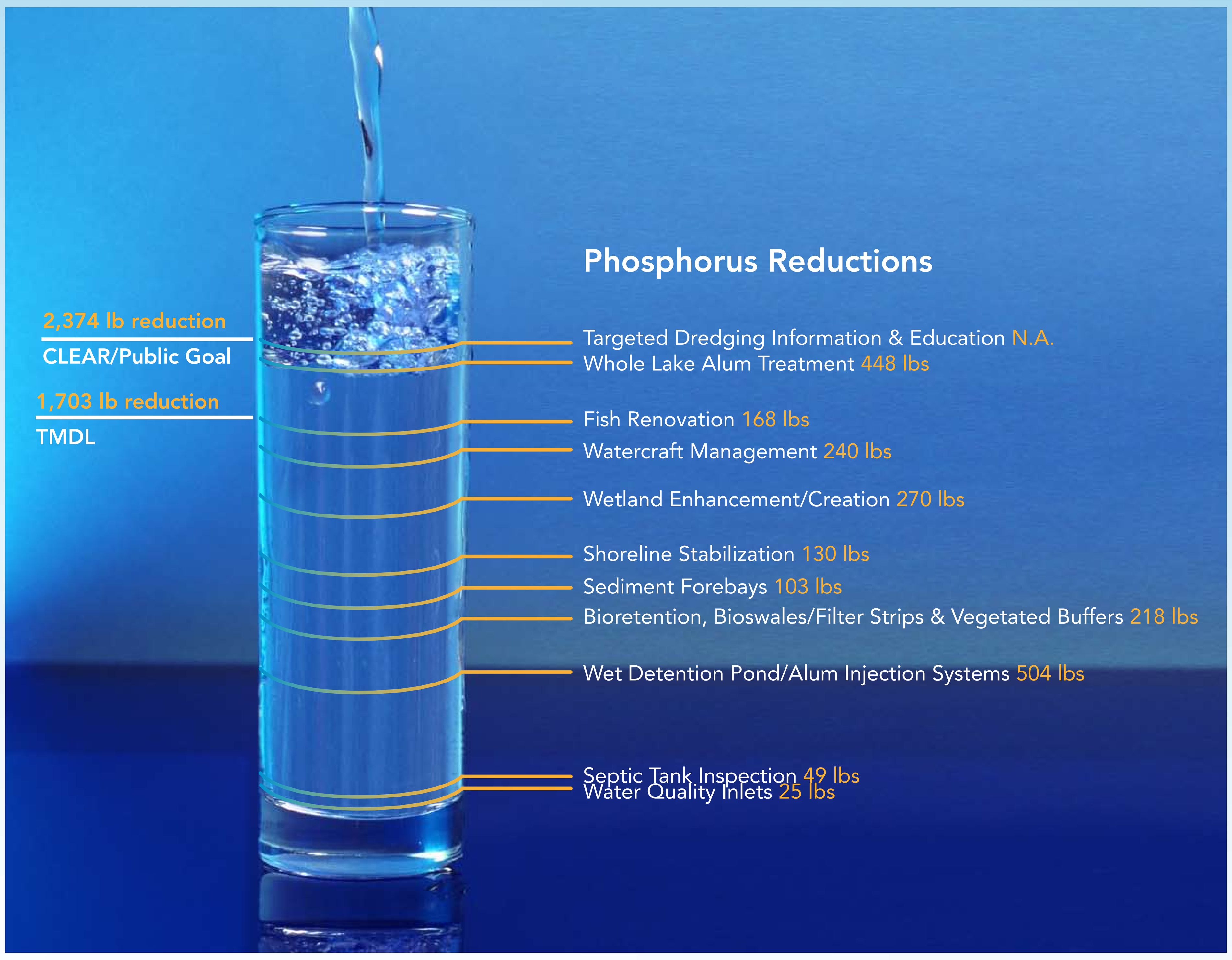
Current regulations



	Estimated Annual Phosphorus Reduction	Treatment Cost
Watercraft Management	240 pounds	Not Applicable

carter lake

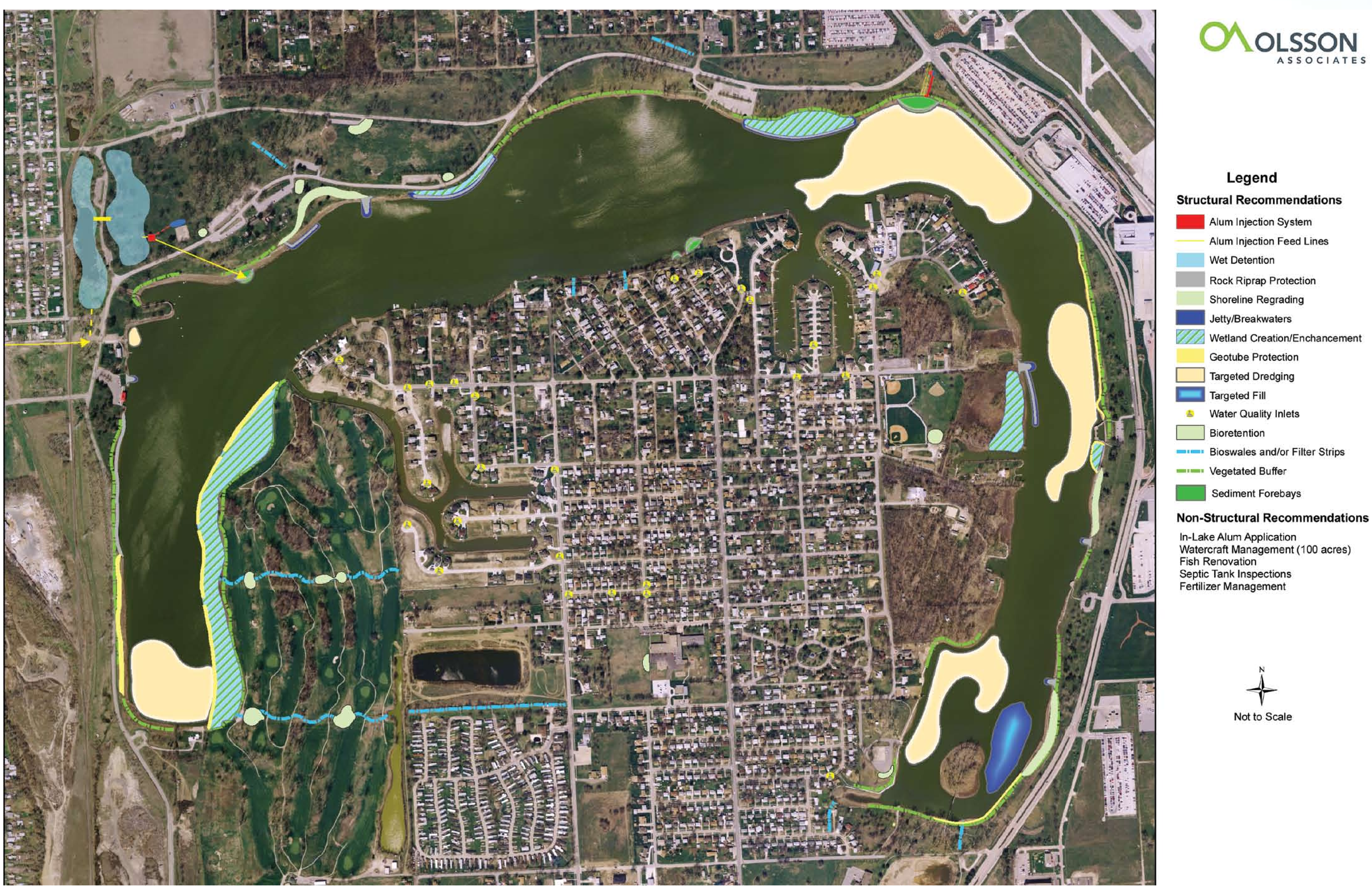
Carter Lake Final Plan



Existing phosphorus load	3,166 pounds
TMDL	1,463 pounds (1,703 pound reduction)
CLEAR/public goal	792 pounds (2,374 pound reduction)

Alternative	Installation/ Construction Cost
Targeted Dredging	$1,610,000
In-lake Alum Treatment	$600,000
Fish Renovation	$200,000
Watercraft Management*	$0
Wetland Enhancement/Creation	$601,310
Shoreline Stabilization	$2,483,455
Sediment Forebays	$1,008,000
Bioretention, Biswales/Filter Strips and Vegetated Buffers	$1,487,600
Wet Detention Pond/Alum Injection Systems	$603,000
Septic Tank Inspection	$50,000
Water Quality Inlets	$45,000
Subtotal:	$8,643,365
15% Contingency:	$1,296,505
TOTAL:	$9,939,870

*The only direct cost associated with watercraft management is the cost of marking the designated area(s). Options for marking and associated cost should be evaluated by the project sponsors.



Watershed and In/Near-Lake Alternatives

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