Rein in the Runoff

Spring Lake Stormwater Integrated Assessment Project

"Rein in the Runoff"

Spring Lake Rotary Club
June 12, 2009

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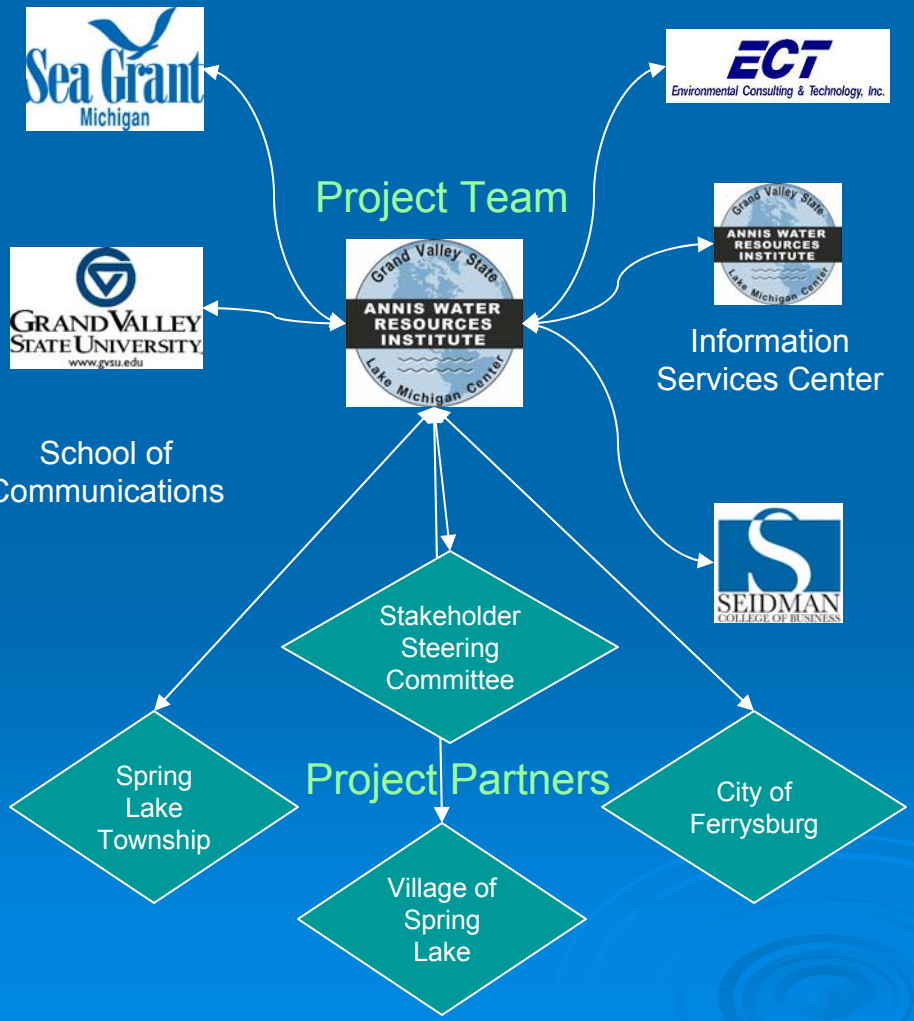
Grand Valley State University

Grand Valley State ANNIS WATER RESOURCES INSTITUTE Lake Michigan Center

Sea Grant Michigan

ECT Environmental Consulting & Technology, Inc.

What is Rein in the Runoff?



- Integrated Assessment
- Stormwater management alternatives
- Spring Lake Watershed

Integrated Assessment

- Application of existing scientific information
- Education and involvement of stakeholders
- To answer policy issue or question

Policy Question

What stormwater management alternatives are available to the communities in the Spring Lake Watershed that allow for future development and also mitigate the effects of stormwater and improve the water quality of Spring Lake, the Grand River, and ultimately, Lake Michigan?

Photo credits: E.S. Isely

Project Objectives

- Increase understanding of the causes and consequences of stormwater runoff
- Increase stakeholder participation in stormwater control and management
- Identify regulatory mechanisms to improve local stormwater management and control
- Recommend alternative BMPs for stormwater management

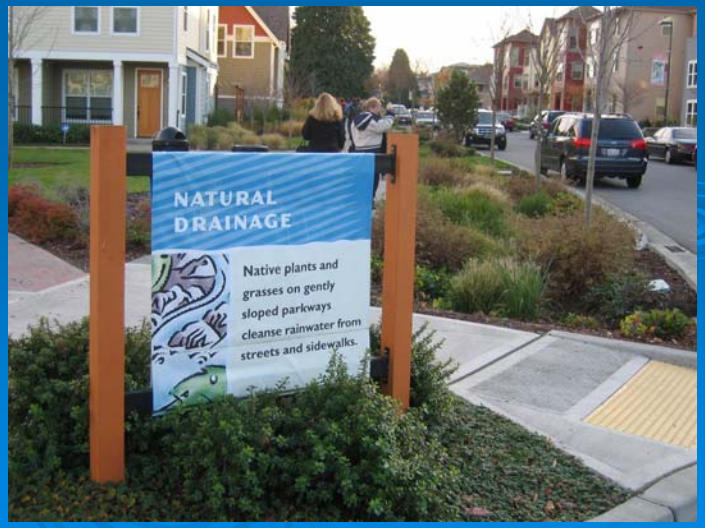
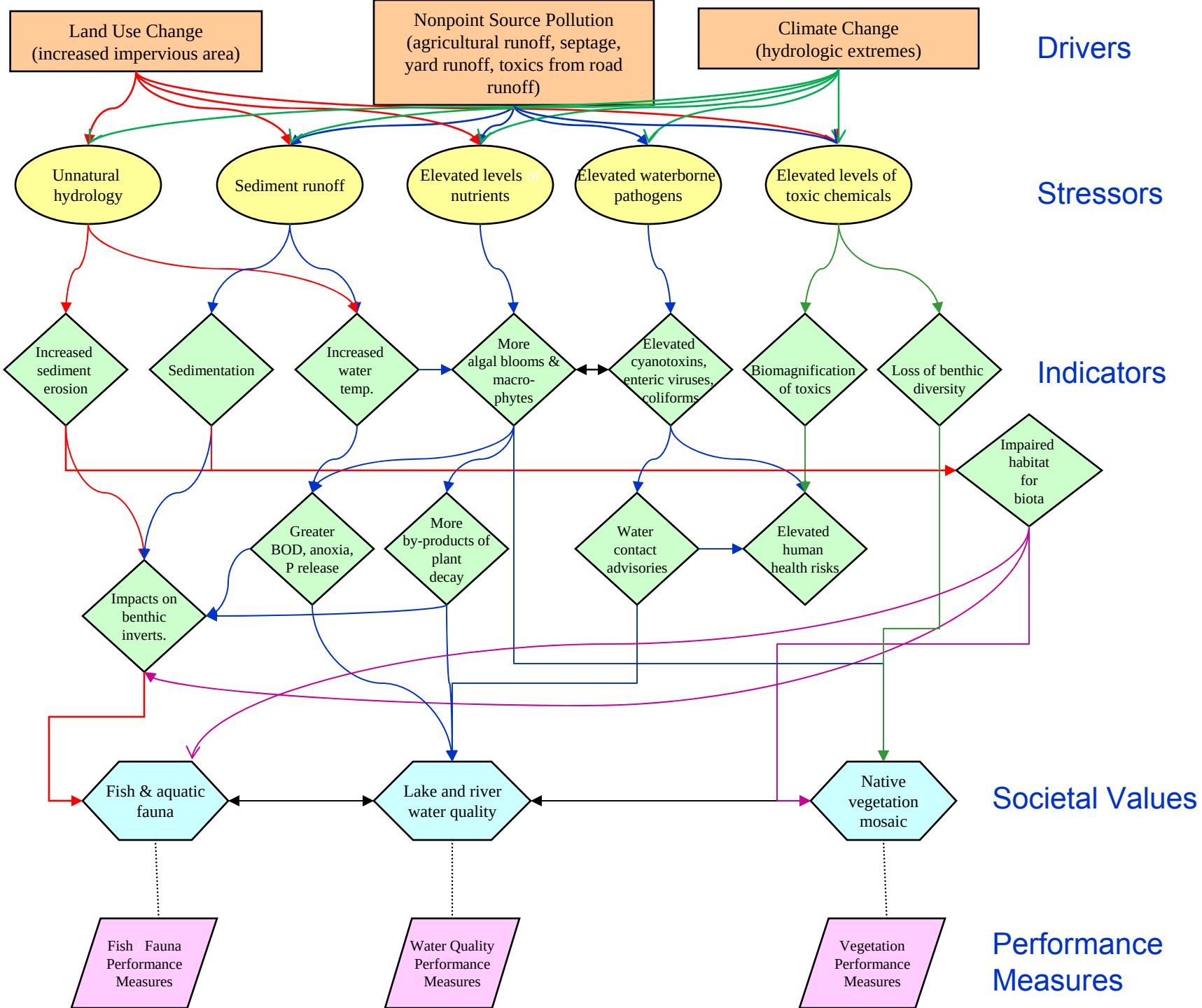


Photo credits: E. Isely


Land Use Change (increased impervious area)
Nonpoint Source Pollution (agricultural runoff, septage, yard runoff, toxics from road runoff)
Climate Change (hydrologic extremes)
Drivers
Unnatural hydrology
Sediment runoff
Elevated levels of nutrients
Elevated waterborne pathogens
Elevated levels of toxic chemicals
Stressors
Increased sediment erosion
Sedimentation
Increased water temp.
More algal blooms & macro-phytes
Elevated cyanotoxins, enteric viruses, coliforms
Biomagnification of toxics
Loss of benthic diversity
Indicators
Impaired habitat for biota
Greater BOD, anoxia, P release
More by-products of plant decay
Water contact advisories
Elevated human health risks
Impacts on benthic inverts.
Fish & aquatic fauna
Lake and river water quality
Native vegetation mosaic
Societal Values
Fish / Fauna Performance Measures
Water Quality Performance Measures
Vegetation Performance Measures
Performance Measures

What is Stormwater Runoff?

- Stormwater is rain, sleet or snow
- Stormwater runoff
  - Rain or melting snow that cannot soak into the ground
  - Flows over land and hard surfaces into waterways
  - Collects pollutants and debris which also end up in our lakes, rivers and streams

Why is stormwater runoff a problem?

Photo credit: Spring Lake Lake Board

Photo credit: A. Steinman

- Poor water quality
- Too much water, too fast
- Human factors
- Consequences to people and wildlife

Poor Water Quality

- Sediment from construction sites and eroding streambanks
- Biological matter like leaves, grass, lawn clippings
- Oil/gasoline from boats, cars, storage tanks
- Nutrients (phosphorus/nitrogen) from fertilizers
- Pesticides from lawns, gardens, agricultural fields, golf courses
- Bacteria/viruses from pet waste, farm animals, wildlife, failing septic systems
- Trash/garbage
- Road salt/chemicals

Water Volume & Velocity

- Stormwater falls on hard surfaces
  - Cannot seep into the ground
  - Runs off to lower areas
- More water flows into rivers and lakes
- Heavier flows are faster
  - Erode streambanks
  - Cause local flooding
  - Washout wildlife/habitat

Photo credit: C. Morse, Muskegon Chronicle

Human Factors

Photo credit: Progressive AE

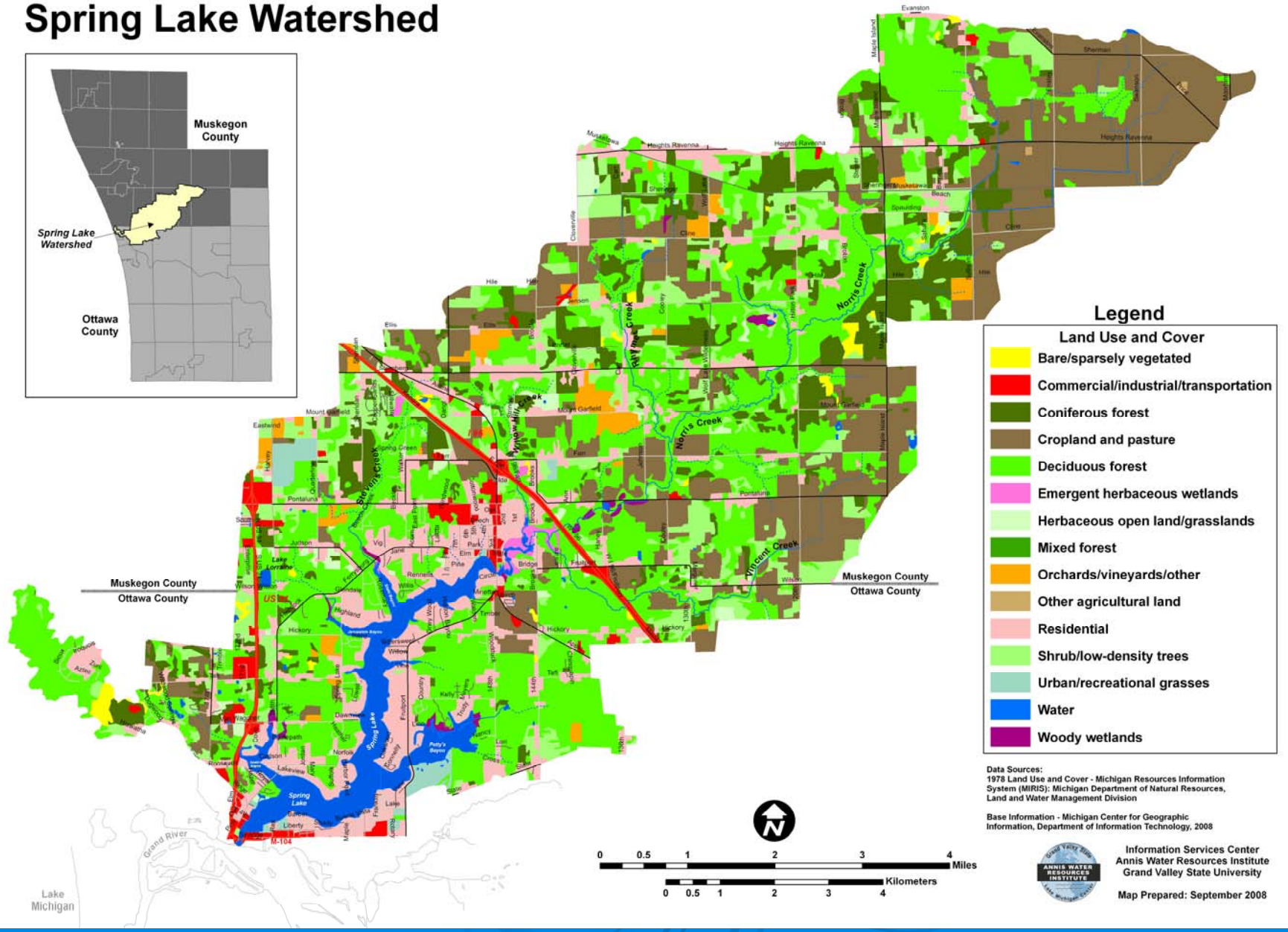
- Polluted stormwater runoff generally occurs where people go about their normal, daily routine
- Example problems
  - Excessive fertilizing or pesticide use
  - Failing to pick up pet waste
  - Using salt/chemicals to de-ice driveways, parking lots, sidewalks
  - Failing to maintain vehicles that leak oil
  - Littering
  - Washing cars or watering lawns
  - Failing to maintain septic systems

Consequences

- Clean drinking water costs more
- Excess water contributes to flooding problems
- Bacteria/viruses lead to beach closings and illnesses
- Excess phosphorus/nitrogen causes algae blooms
- Problems for fish
  - Warmer water temperatures
  - Loss of habitat from too much sand build up
  - Loss of oxygen in the water from too many organisms feeding on decaying algae
- Chemicals damage plants, animals when they enter the water

Photo Credit: NOAA

1978 Land Use and Cover
Spring Lake Watershed



Legend

Land Use and Cover

- Bare/sparsely vegetated
- Commercial/industrial/transportation
- Coniferous forest
- Cropland and pasture
- Deciduous forest
- Emergent herbaceous wetlands
- Herbaceous open land/grasslands
- Mixed forest
- Orchards/vineyards/other
- Other agricultural land
- Residential
- Shrub/low-density trees
- Urban/recreational grasses
- Water
- Woody wetlands

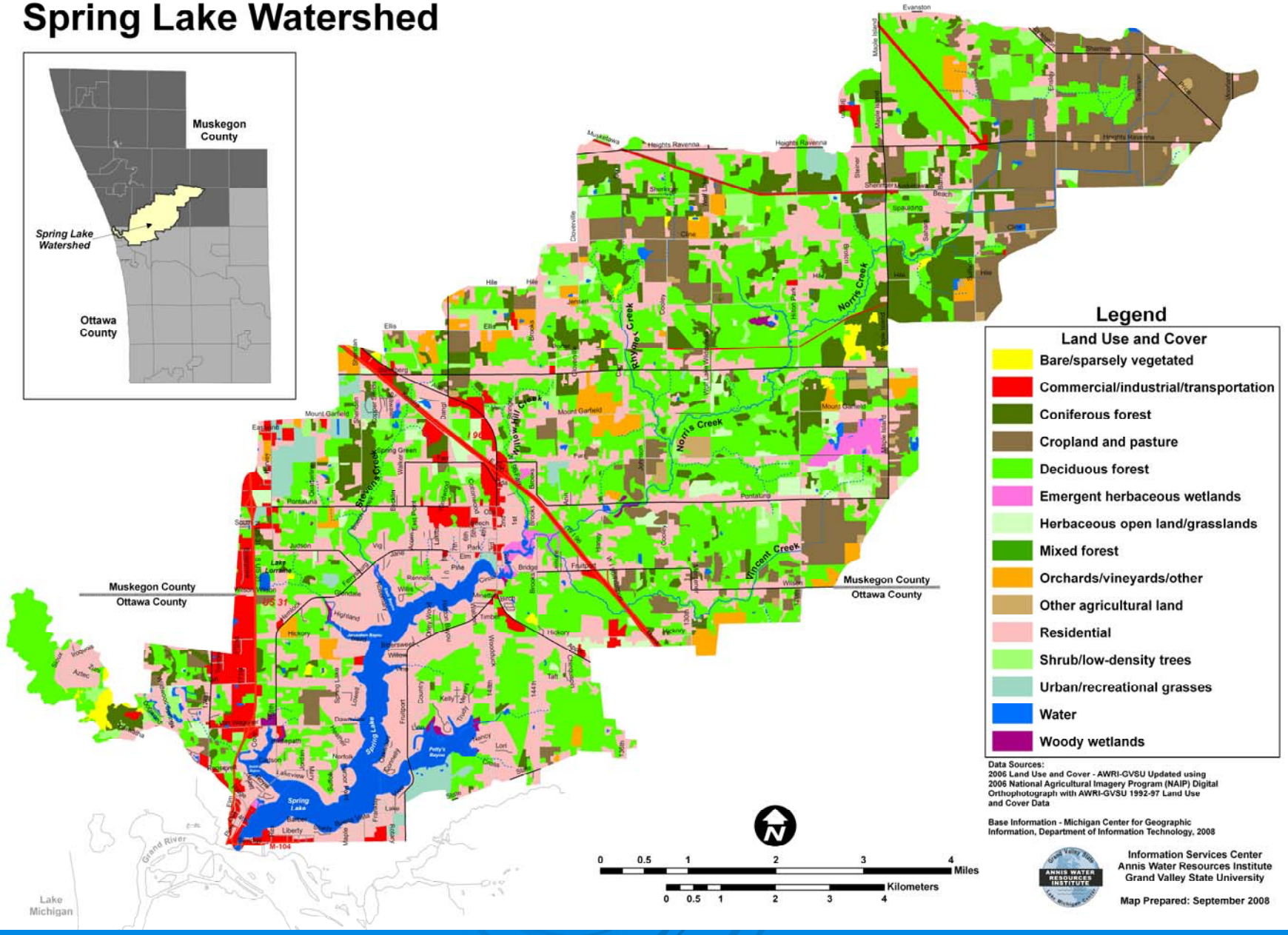
Data Sources:
1978 Land Use and Cover - Michigan Resources Information System (MIRIS): Michigan Department of Natural Resources, Land and Water Management Division

Base Information - Michigan Center for Geographic Information, Department of Information Technology, 2008

Information Services Center
Annis Water Resources Institute
Grand Valley State University

Map Prepared: September 2008

2006 Land Use and Cover
Spring Lake Watershed



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Data Sources:
2006 Land Use and Cover - AWRI-GVSU Updated using 2006 National Agricultural Imagery Program (NAIP) Digital Orthophotograph with AWRI-GVSU 1992-97 Land Use and Cover Data

Base Information - Michigan Center for Geographic Information, Department of Information Technology, 2008

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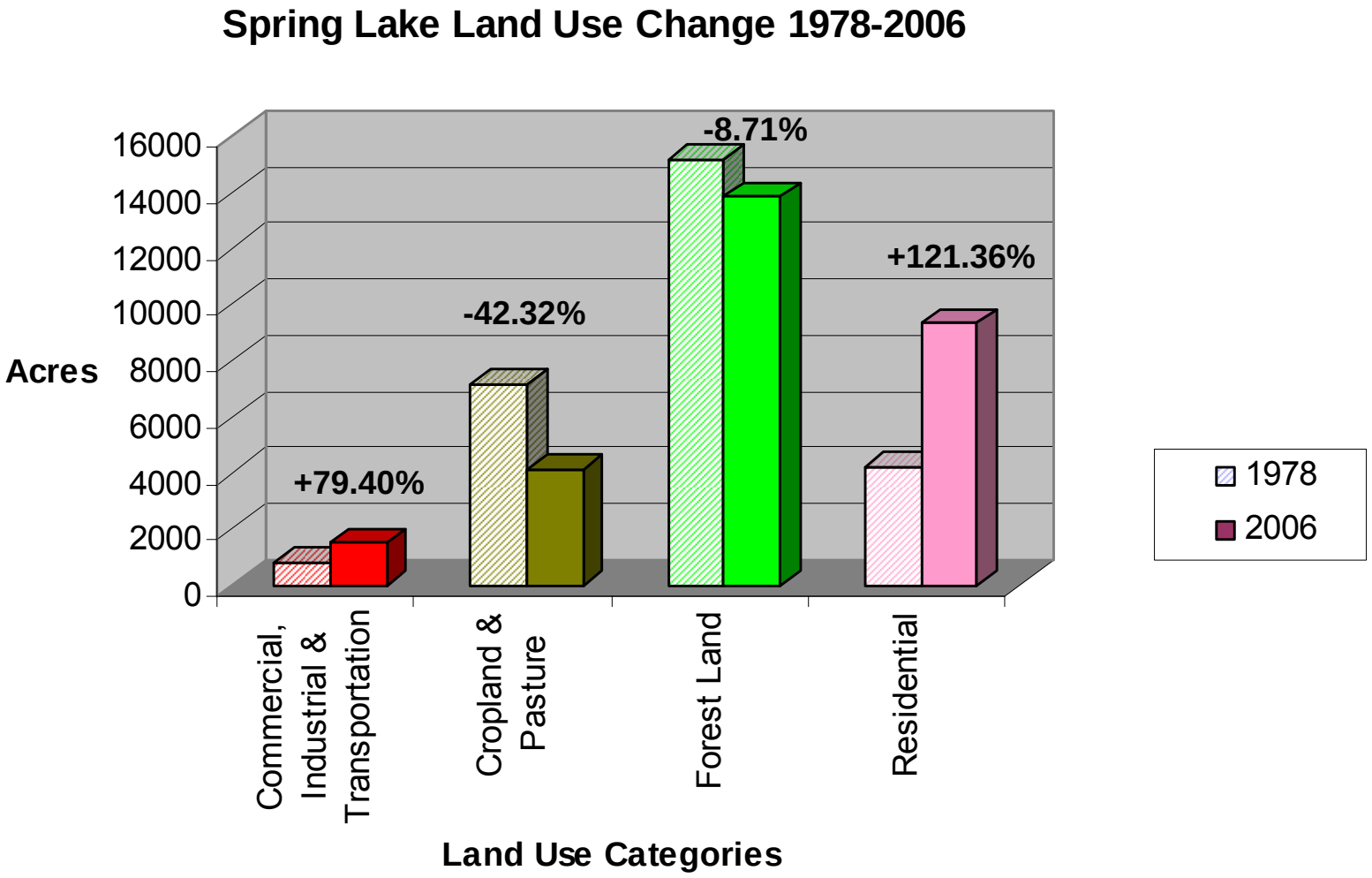
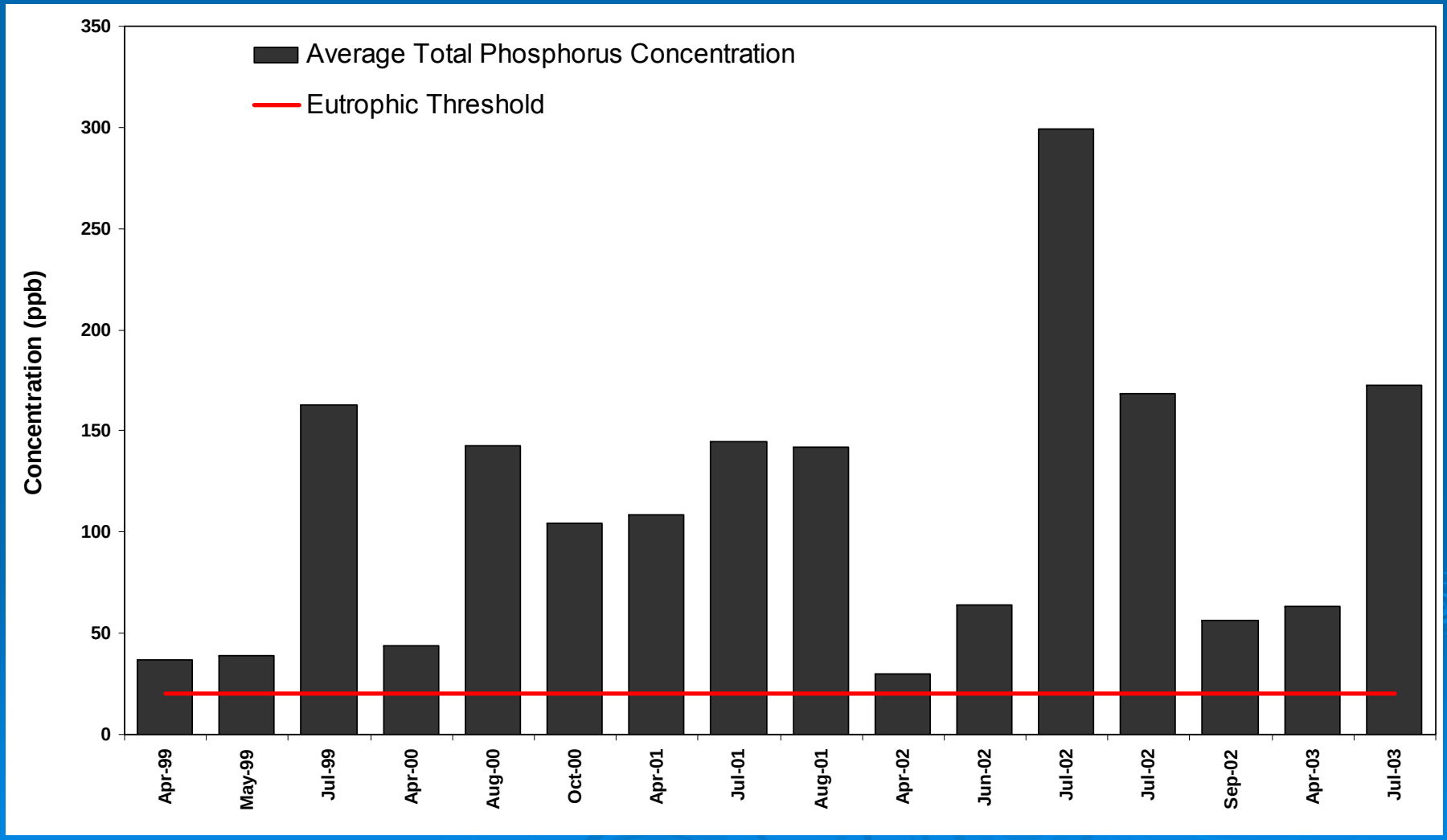
Land Use & Cover Change



Total Phosphorus: Spring Lake



Data courtesy of Progressive AE

Alum Treatment

Photo credit: AWRI

Photo credit: Progressive AE

- Reduced release of phosphorus from sediments
- Reduced total phosphorus levels in water column
- No effect on algal biomass
- Did not address new nutrient and other stormwater inputs

Steinman, A.D. and M. Ogdahl. 2008. Ecological Effects after an Alum Treatment in Spring Lake, Michigan. Journal of Environmental Quality 37:22-29.

What Can We Do About Stormwater Runoff?

Photo credit: Environmental Consulting & Technology

- Best Management Practices (BMPs)
  - Keep pollutants out of waterways
  - Controls how much and how fast stormwater gets into the waterways
  - Structural (built) or non-structural BMPs

Structural BMPs

- Rain gardens
- Riparian buffers
- Vegetated swales
- Porous pavement

- Rain barrels, cisterns
- Green roofs
- Constructed wetlands

Non-Structural BMPs

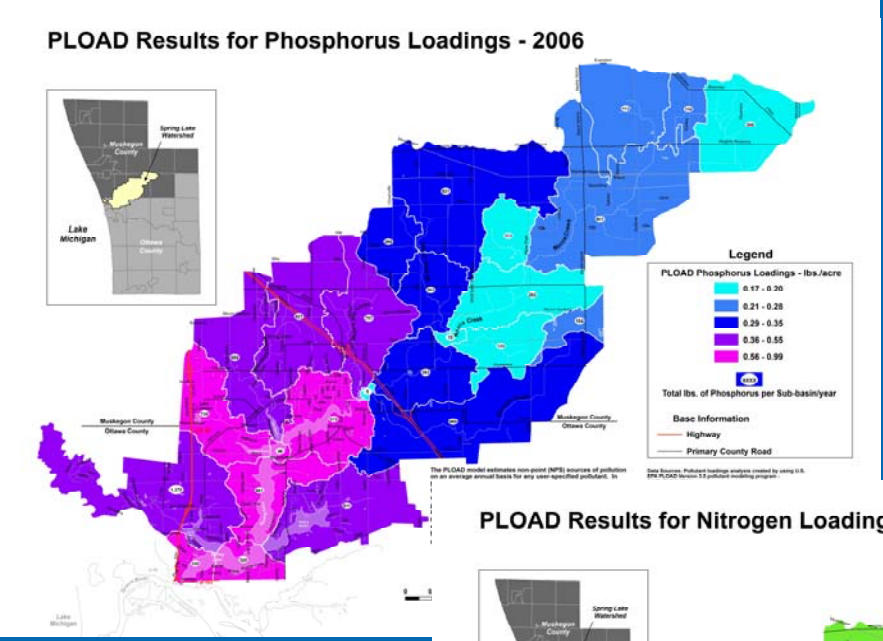
- Maintaining natural features and vegetation
- Local laws, policies
  - Stormwater
  - Wetlands
  - Riparian buffers
  - Fertilizers

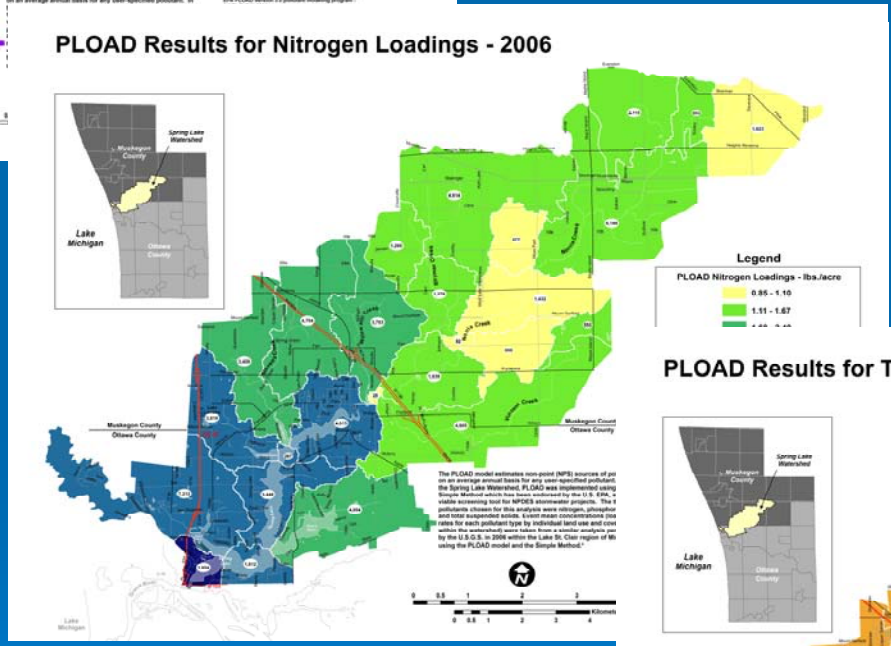
- Good house-keeping
  - Regular maintenance
    - Vehicles (cars/boats)
    - Septic systems
  - Clean up after your pet
  - Store/dispose of chemicals properly
  - Don't fertilize your lawn if it might rain
  - Don't sweep leaves into the street
  - Seed bare spots on your lawn to avoid erosion
  - Use captured rainwater to water your garden

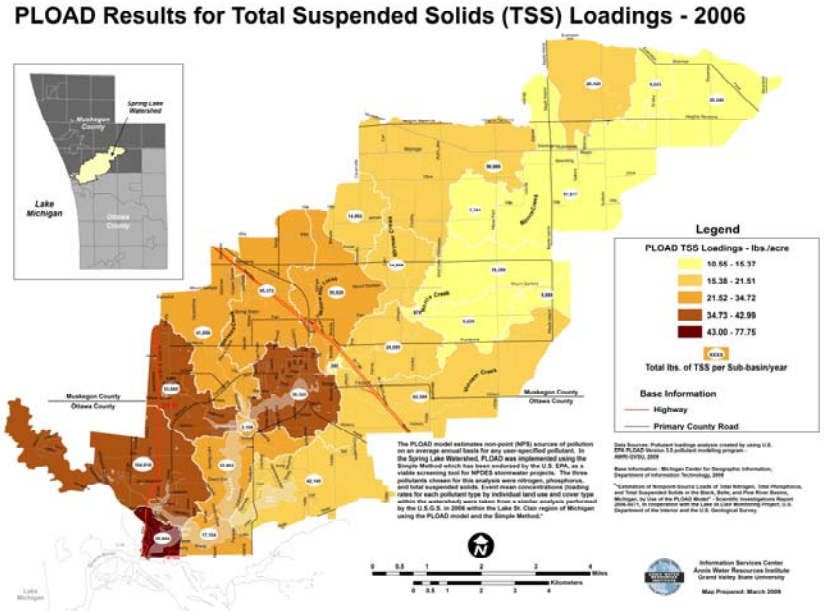
BMP Matrix

	Bioretention/Rain Gardens	Vegetated/Bio Swales	Grow Zones
Description	Shallow landscaped surface depressions designed to infiltrate and/or filter stormwater	Stormwater conveyance channel designed to filter and/or infiltrate stormwater	Native planting area
Detail	Shallow landscaped surface depressions; recommended to use deep-rooted native plants; underdrain and mechanism to direct overflow runoff is necessary; should be located at least 10' from any building.	Shallow stormwater channel that is densely planted with a variety of grasses, shrubs, and/or trees. Check dams can be used to improve performance and maximize infiltration, especially in steeper areas.	A grow zone is an upland and/or riparian native planting area.
Where Effective	Roof runoff from residential / commercial areas; parking lots (use curb cuts to direct stormwater runoff to depressed areas and/or consider "inverted" islands rather than landscaped islands.	Vegetated swales typically treat runoff from highly impervious surfaces such as roadways and parking lots.	Parks, riparian corridors and other areas that are currently maintained as mowed lawn but may not be actively used or accessed. Grow zones are excellent opportunities for reducing local maintenance costs by converting turf (or impervious) areas to deep-rooted native vegetation.

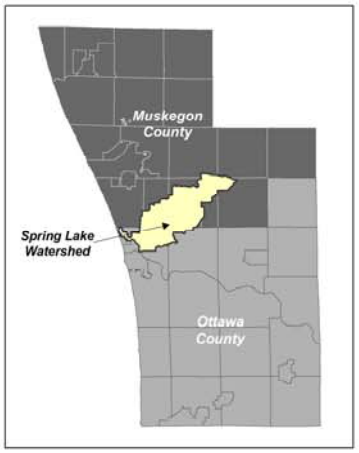
Subwatershed Pollutant Loads







ECT Potential BMP Site Locations



Muskegon County
Ottawa County

Muskegon County
Ottawa County

Rhyner Creek
Norris Creek
Willow Hill Creek
Stevens Creek
Vincent Creek
Spring Lake
Lake Michigan
Grand River

Legend

Potential BMP Site Locations

- Infiltration swale or rain garden
- Riparian buffer
- Filtration/Infiltration BMP area
- Regional storage area
- Regional treatment area
- Site Specific BMP area
- Residential Infiltration area

SSURGO Soils

A or B Hydrologic Soil Group - High to moderately, high infiltration rate, low runoff potential

Base Information

- Drains and Intermittent Streams
- Rivers and streams
- Lakes and ponds

0 0.5 1 2 3 4 Miles

0 0.5 1 2 3 4 Kilometers

Data Sources:
2005 - 06 Digital Orthophotograph - National Agricultural Imagery Program (NAIP) - U.S.D.A. Natural Resources Conservation Service (N.R.C.S.) Data Gateway, 2008

SSURGO Soils - U.S.D.A., Natural Resources Conservation Service, Data Gateway.

Base Information - Michigan Center for Geographic Information, Department of Information Technology, 2008

Potential BMP site locations: Environmental Consulting & Technology, Inc. - March, 2009.

Information Services Center
Annis Water Resources Institute
Grand Valley State University

Map Prepared: March 2009

Costs/Benefits of BMPs

- Cost data for BMP installation and maintenance
- Values associated with improved water quality
  - Real estate values
  - Recreation and aesthetic values
- Savings associated with decreased water treatment and supply

Photo credit: E. Isely

Project Website

http://www.gvsu.edu/wri/reinintherunoff

WHAT CAN YOU DO TO REDUCE STORMWATER POLLUTION?

- **Cars and boats**
  - Maintain your vehicles so that they do not leak oil or other fluids.
  - Be sure to wash vehicles on the grass or at a designated car or boat wash so that dirt and soap do not flow into our storm drains and waterways; even biodegradable cleaning products can still be toxic to fish and stimulate algae growth.
- **Yards and gardens**
  - Apply only the recommended amount of fertilizer.
  - Never apply fertilizers or pesticides before a heavy rain.
  - If fertilizer falls onto driveways or sidewalks, sweep it up instead of hosing it away.
  - Mulch leaves and grass clippings and place in the yard at the curb - not in the street. This keeps leaves out of the gutter, where they can wash into the water or storm drain.
  - Turn your gutter downspouts away from hard surfaces.
  - Seed bare spots in your yard to avoid erosion.
  - Consider building a rain garden in low-lying areas of your lawn.
  - Use captured rainwater to water your garden.

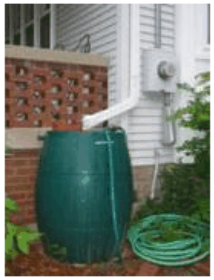
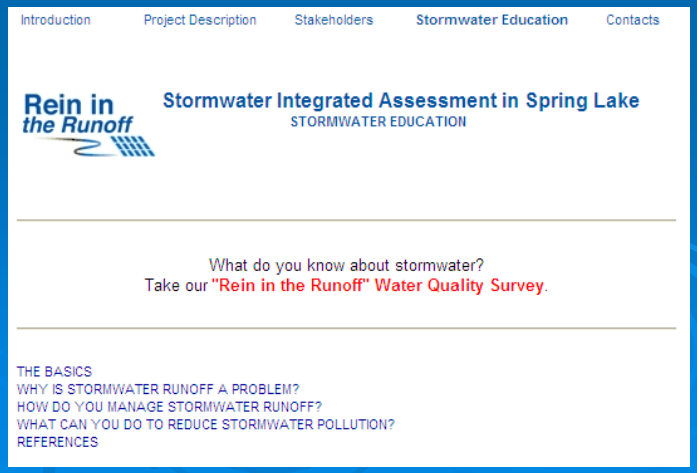


Photo credit: E. Sterrett Isely

- **Septic systems**
  - Proper maintenance includes having your septic system pumped every three (3) to five (5) years.
  - For older systems, make sure it can still handle current volumes.
  - Never put chemicals down your septic system. This can harm the system and seep into the groundwater.
- **Pets**
  - Clean up after your pet on walks and in your yard.
  - Dispose of all pet waste in the garbage.
- **Chemicals**
  - Keep lawn and household chemicals in tightly-sealed containers, where rain cannot reach them.
  - Dispose of old or unwanted chemicals at household hazardous waste collection sites or events.
- **Other**
  - Never put anything in a storm drain.
  - Don't litter.



Continuing Efforts

Photo credits: E.S. Isely

- Watershed-Based Preliminary Assessment of Wetland Functions
  - EPA Region 5, Clean Water Act grant to AWRI
  - Spring Lake Watershed selected as 1 study site in the Grand River Watershed
- River Run Township Park
  - Spring Lake Township is investigating installation of raingarden
- Spring Lake Shoreline Assessment
  - Grand Haven Area Community Foundation grant to AWRI

Questions??

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