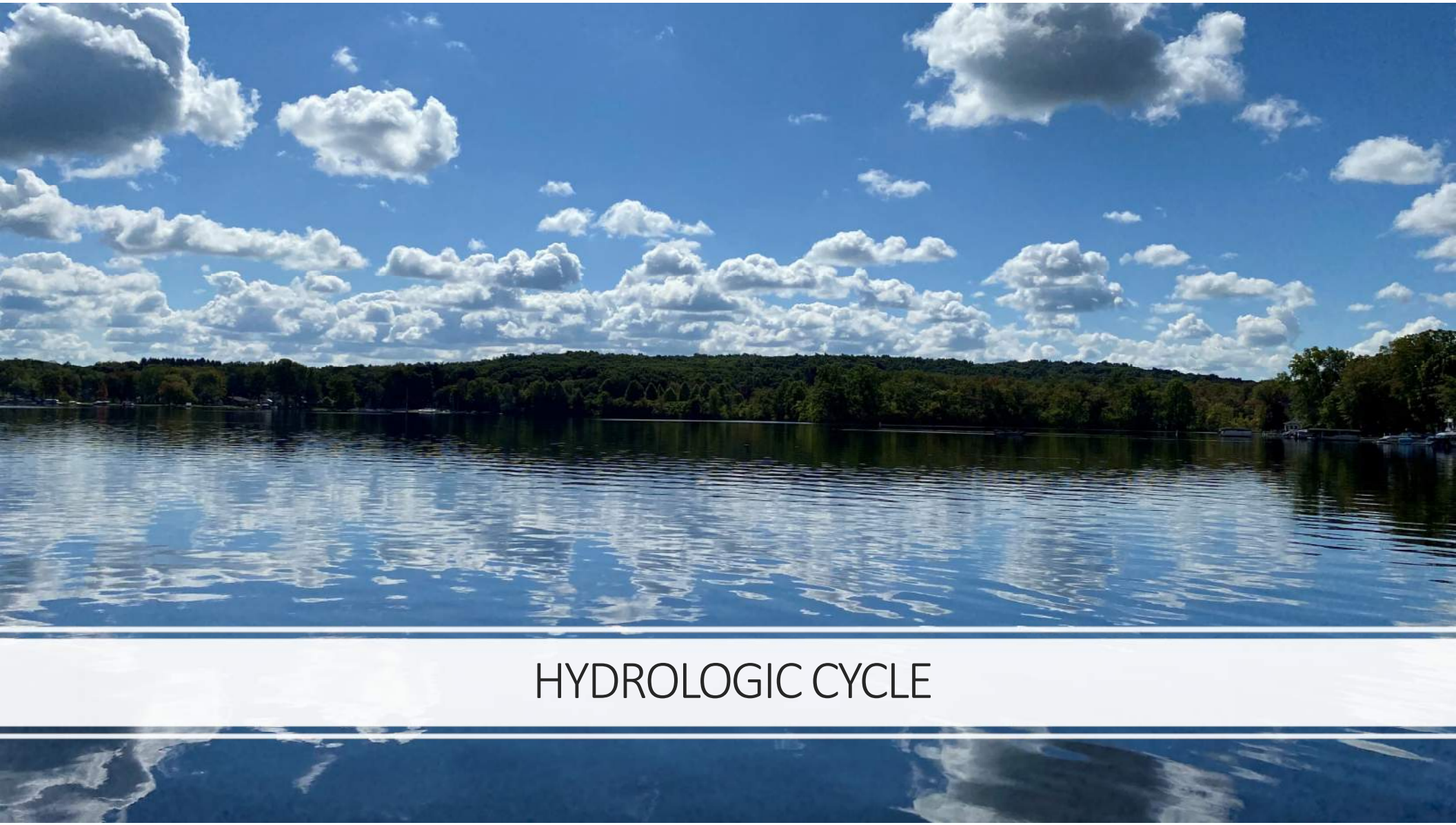
PROGRESSIVE COMPANIES

STORMWATER RUNOFF AND LAKES

Keeping Our Lakes Clean and Healthy
in a Changing Regional Climate



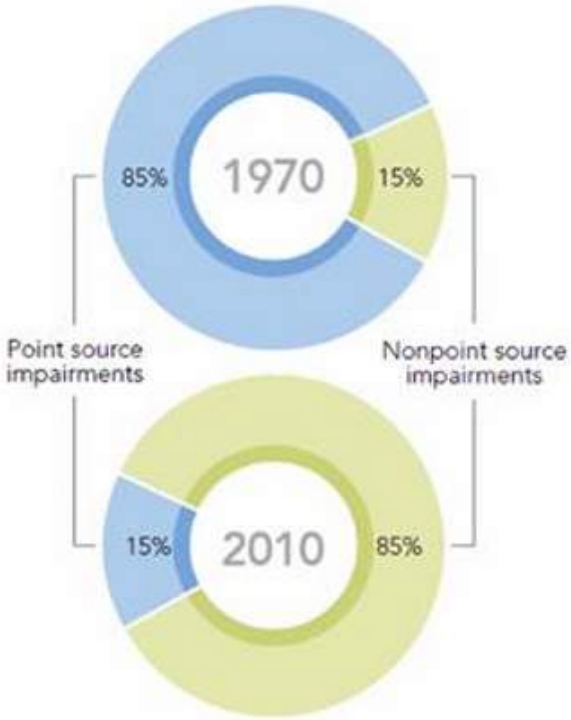
HYDROLOGIC CYCLE

National Issue

"Stormwater is the only growing source of water pollution in many watersheds throughout North America. Urbanization and climate change exacerbate stormwater pollution, and, today, more than half the world's population lives in cities."

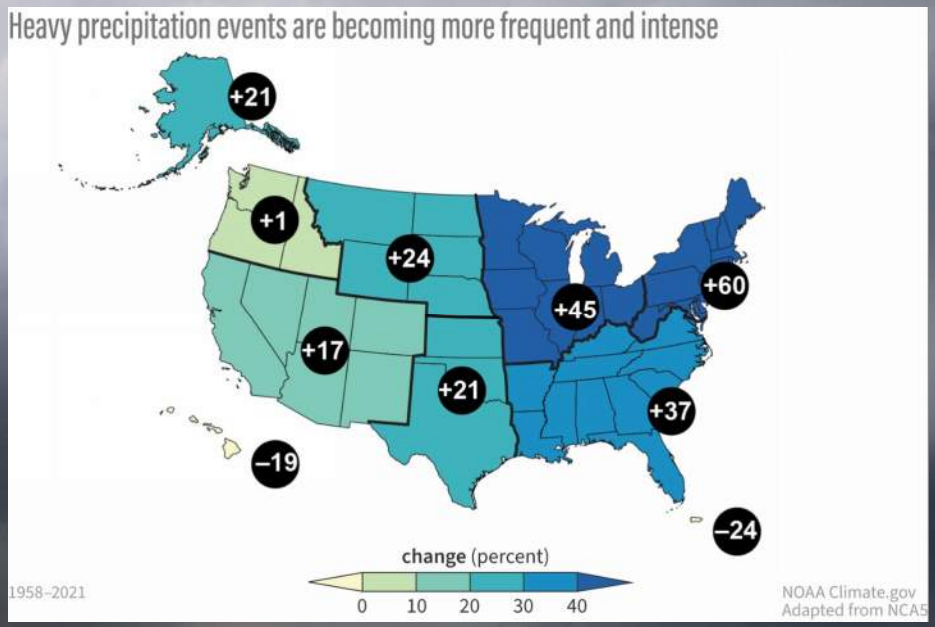
"To put this issue in the context of environmental effect, in 1970, 85% of water quality impairments were associated with point-source pollution. The remaining 15% came from nonpoint sources such as agricultural and urban stormwater. Today, after significant advancements in wastewater treatment, these values have flipped — 85% of impairments now stem from nonpoint and urban stormwater discharges."

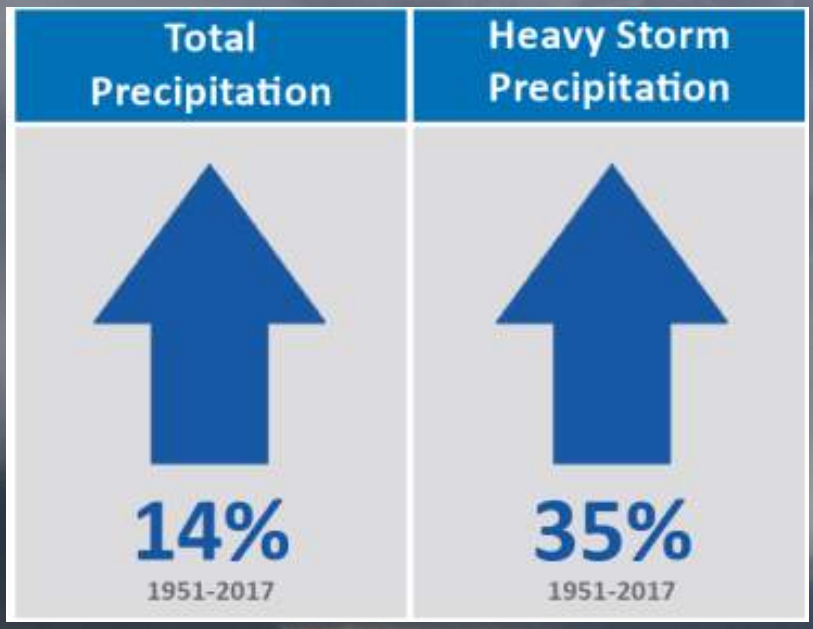
Rainfall to Results: The Future of Stormwater
Water Environment Federation, 2015



EGLE

Extreme Precipitation Events

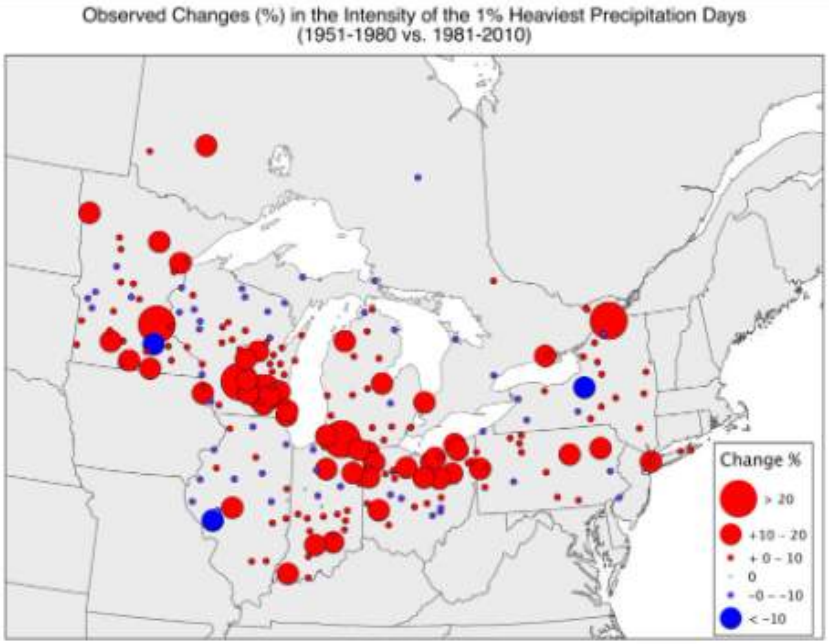




Michigan Data Courtesy of GLISA 2019

Changes in the Heaviest 1% of Daily Precipitation Events from 1951-1980 to 1981-2010 in the Great Lakes Region	
Change in Intensity of 1% Heaviest Storm (%)	5.1
Change in Number of 1% Heaviest Storm Days (%)	23.6
Change in Amount Falling in 1% Heaviest Storms (%)	24.5

Regional analysis of extreme precipitation. Values are based on observations from 230 U.S. and Canadian GHCN stations across the Great Lakes region.



Change in intensity of the heaviest 1% of daily precipitation events for GLISA quality-controlled GHCN-Daily stations in the Great Lakes region.

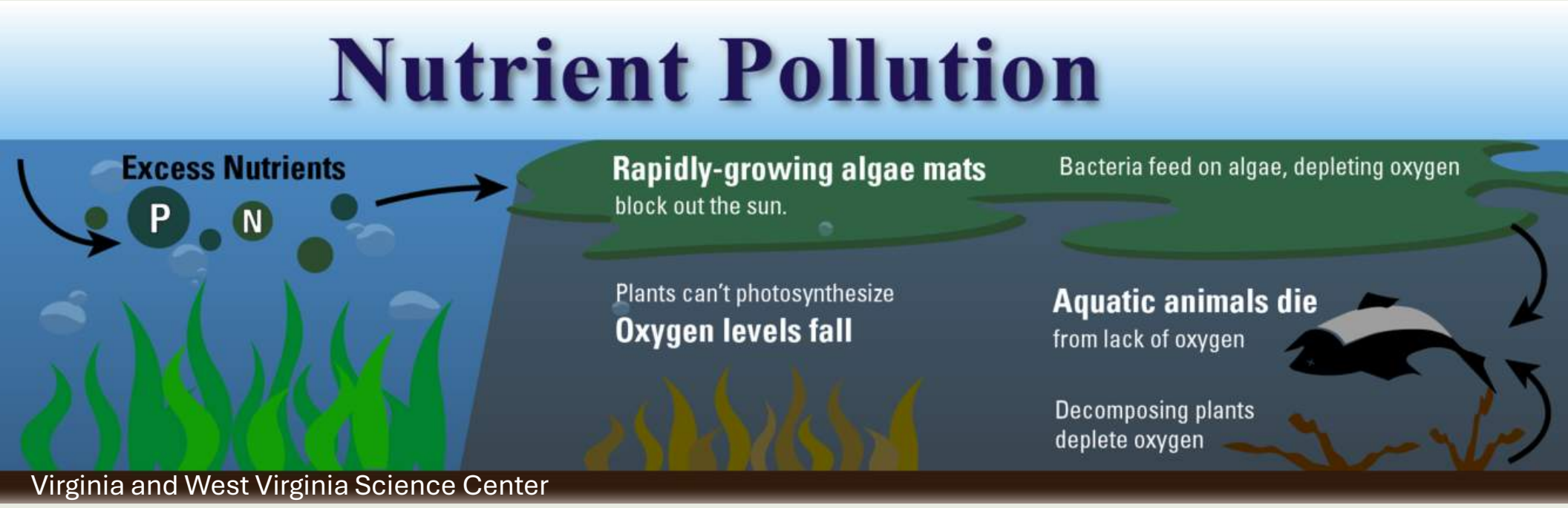
Impacts from Storm Sewers and Open Drains

- Lawn/Driveway Runoff
  - Fertilizers
  - Pet and Avian Waste
  - Pesticides
  - Household Chemicals
  - Salt
- Streets
  - Sediment
  - Oils and Greases
  - Cleaners/Detergents
  - Increased Water Temperature
  - Salt
- Outfalls
  - Soil Erosion Sediment
  - All the Above

HARMFUL ALGAL BLOOMS

Fertilizers and Nutrients

- Plant and Algal Growth
- Blocks Sunlight
- Decreases Oxygen

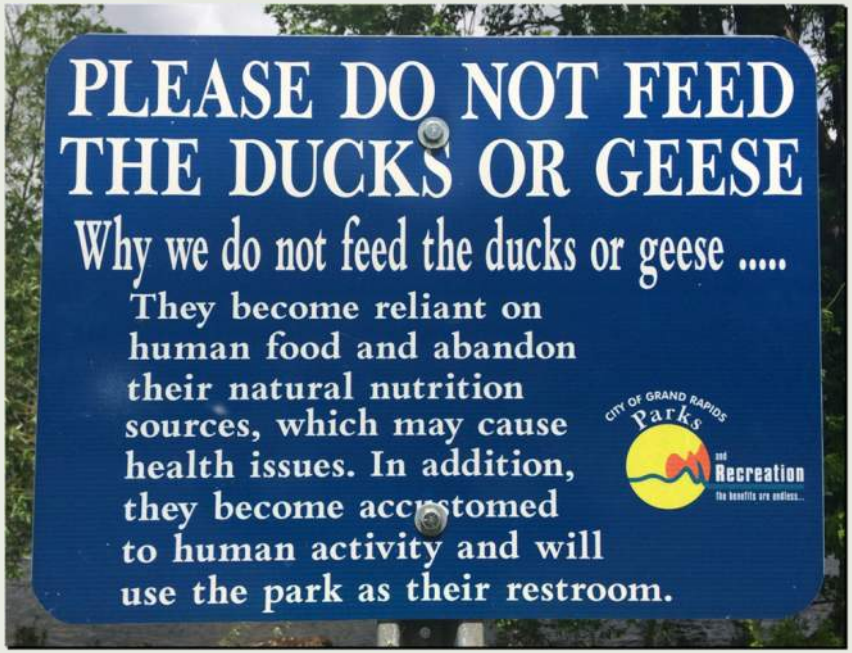


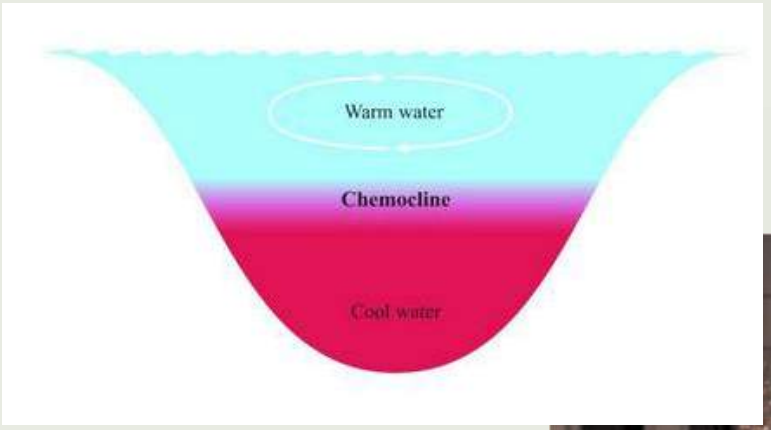
Pet and Avian Waste

- *E. coli*
- Nutrients

Household Chemicals

- *E. coli*
- Cleaners/Detergents
- Pesticides
- Oil and Grease





Chlorides

- Habitat/Biodiversity Decreases
- Water Temperature
- Very Transmissible/Soluble
- Increases Available Phosphorus
- Decreased Oxygen

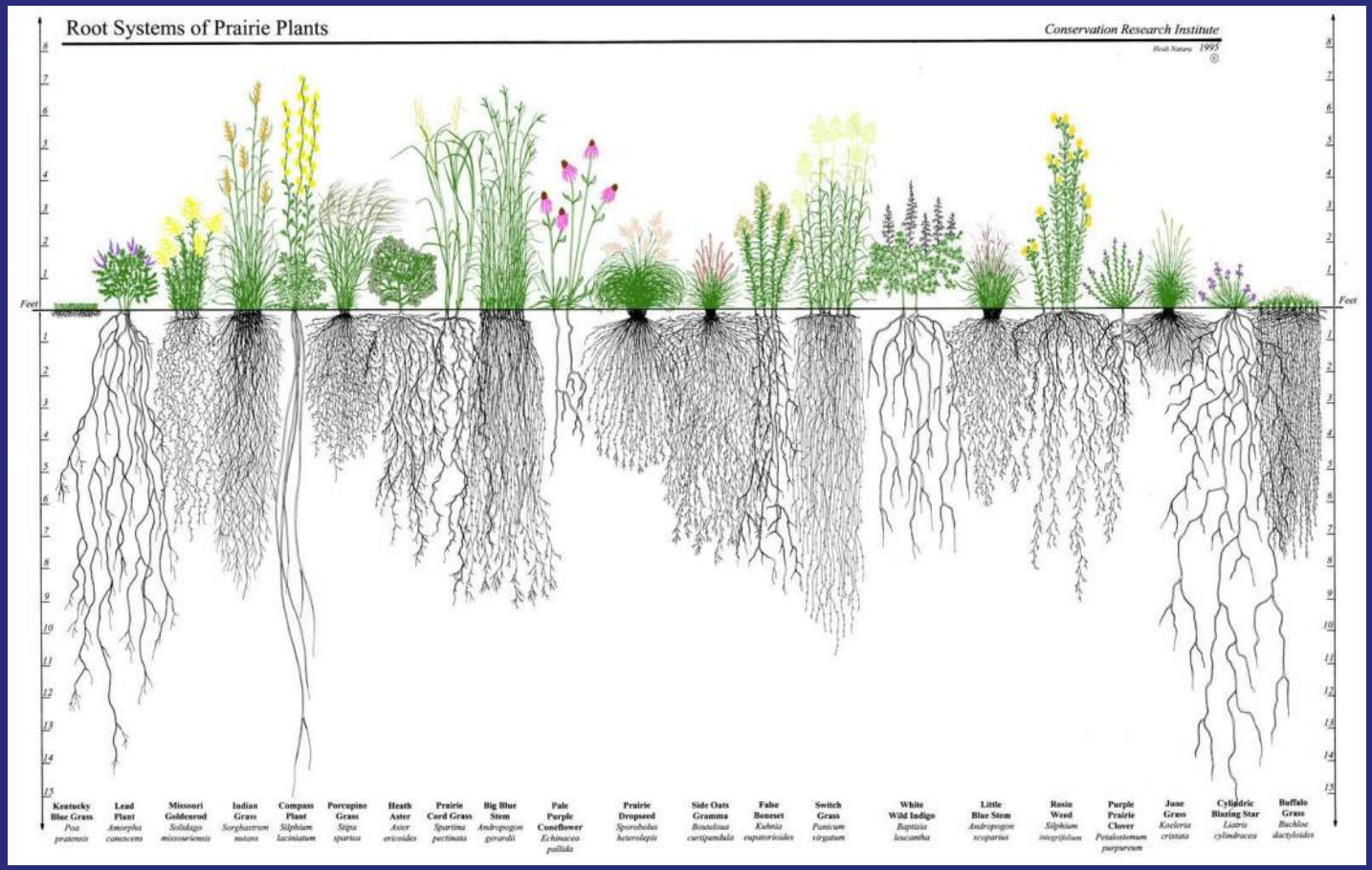
Sediment

- Habitat
- Blocks Sunlight
- *E. coli*
- Build up

Increased Water Temperature

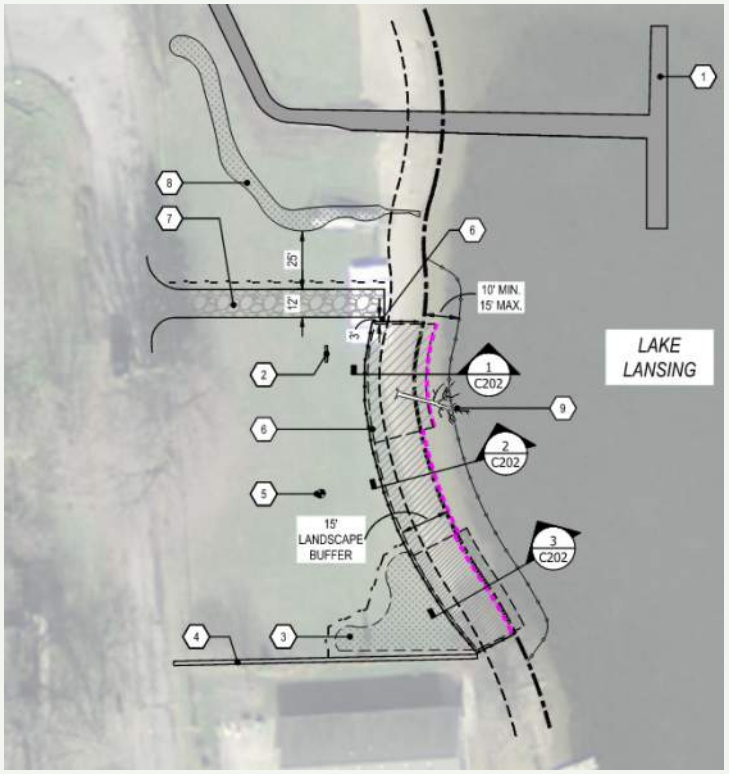
- Plant and Algal Growth
- Loss of Habitat/Loss of Native Species

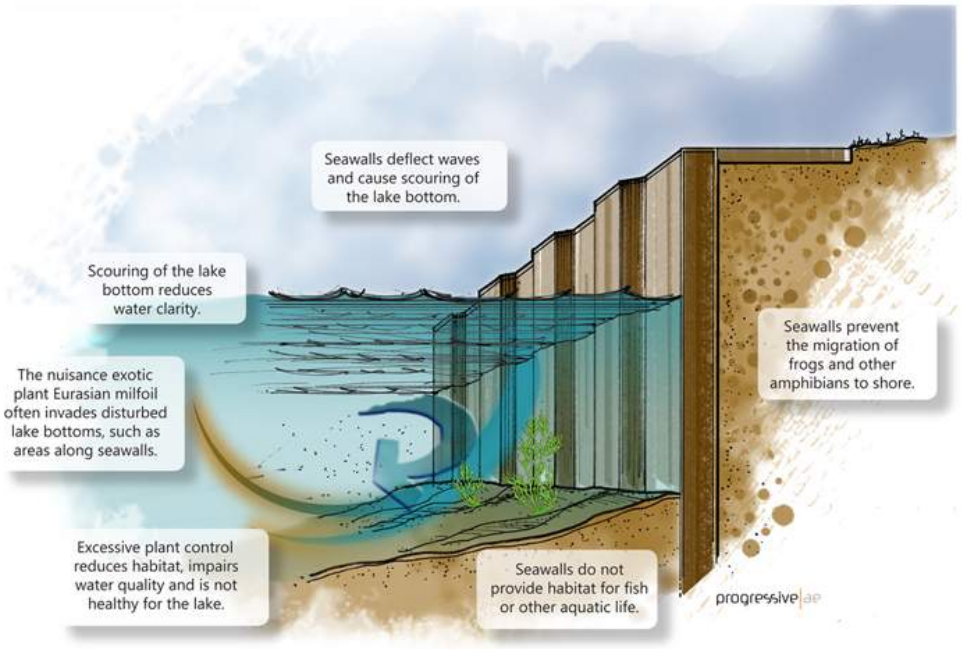
NATURE-BASED SOLUTIONS



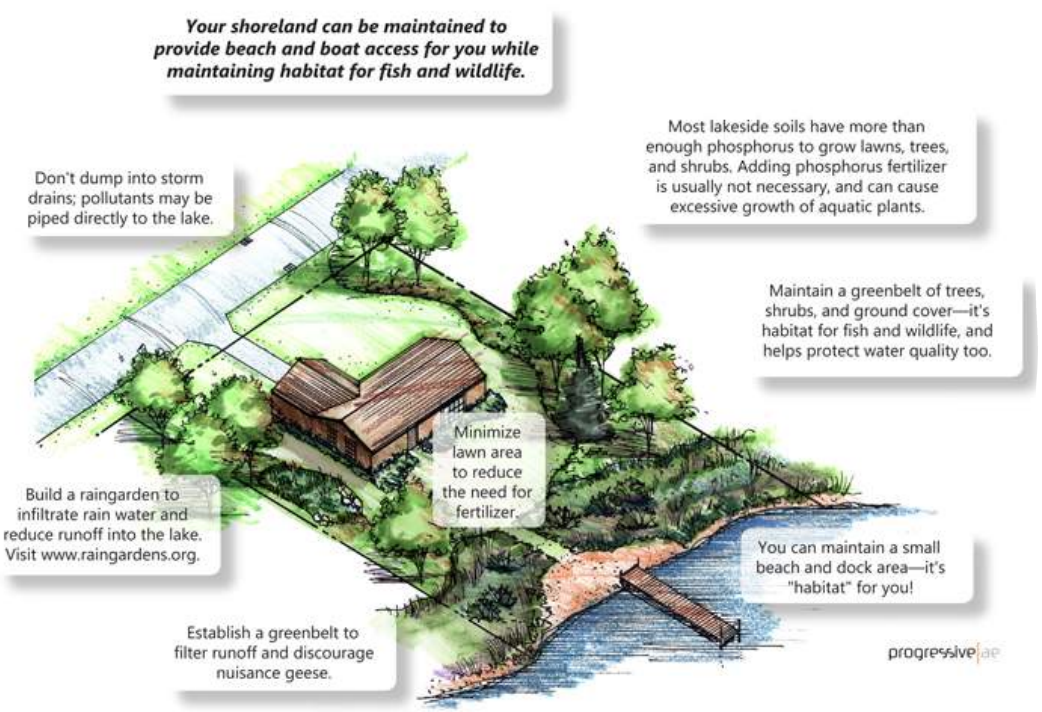
Rain Gardens and Bioswales

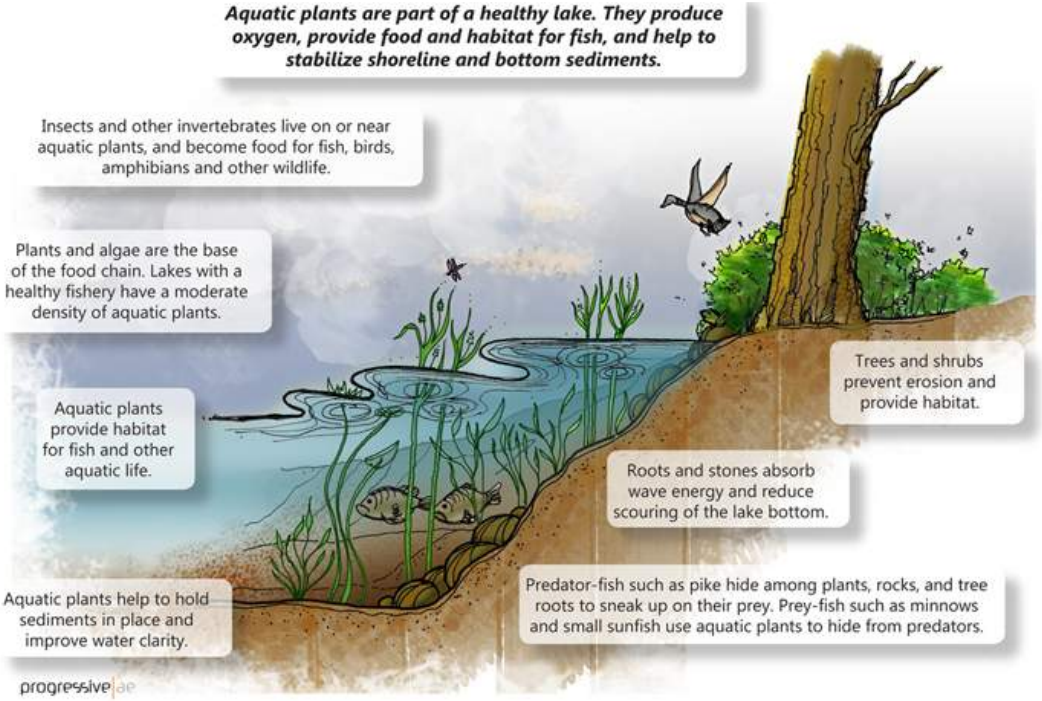
Natural Shorelines and Filter Strips





Hardened Shorelines





Natural Shorelines

Daylighting Outfalls and Buffer Strips

Permeable Pavement

Leaching Catch Basins

Mechanical Filters

- Floatables
- Solids
- Hydrocarbons

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THANK YOU

We welcome your feedback,
insights and inquiries.

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