

Water and Sediment



Overview

- Where does sediment in water come from?
- How is sediment from land transported to a waterbody?
- How do we measure sediment in water?
- What are the benefits of keeping excess sediment out of the water?
- What are regulations govern discharges of sediment from roads and lots to waterbodies?

What are common sources of sediment?

- Transportation Corridors
- Urban Areas
- Residential Areas
- Construction Sites
- Industrial Operations
- Agricultural Sites
- Forestry Operations
- Municipal Operations
- Habitat alternation / in stream sources
- Natural cycles of erosion and deposition



Sediment is the greatest pollutant by volume entering our lakes and streams!

Upstream of site

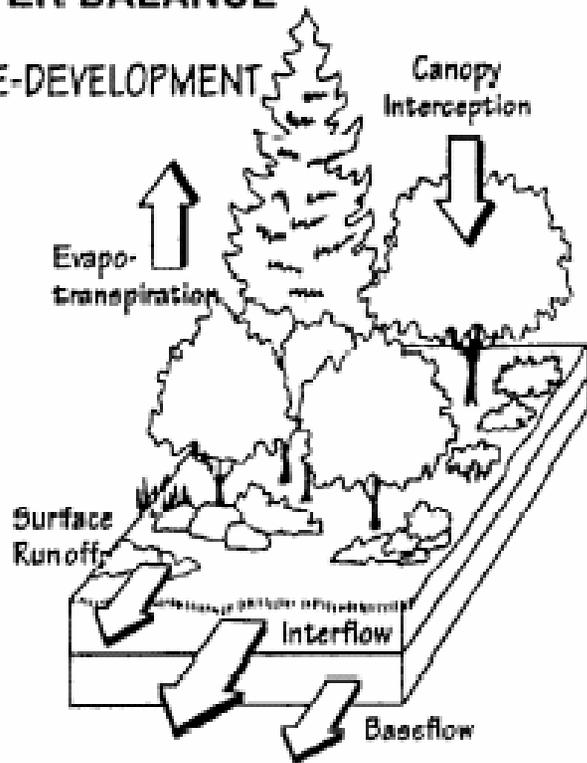


Downstream of site

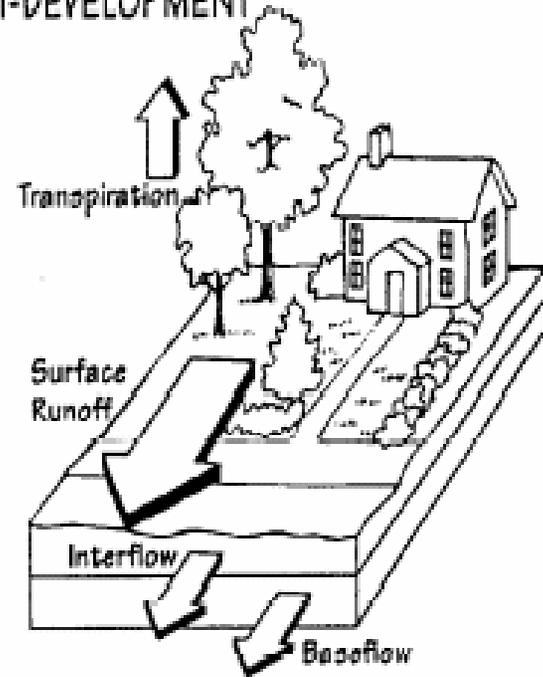


WATER BALANCE

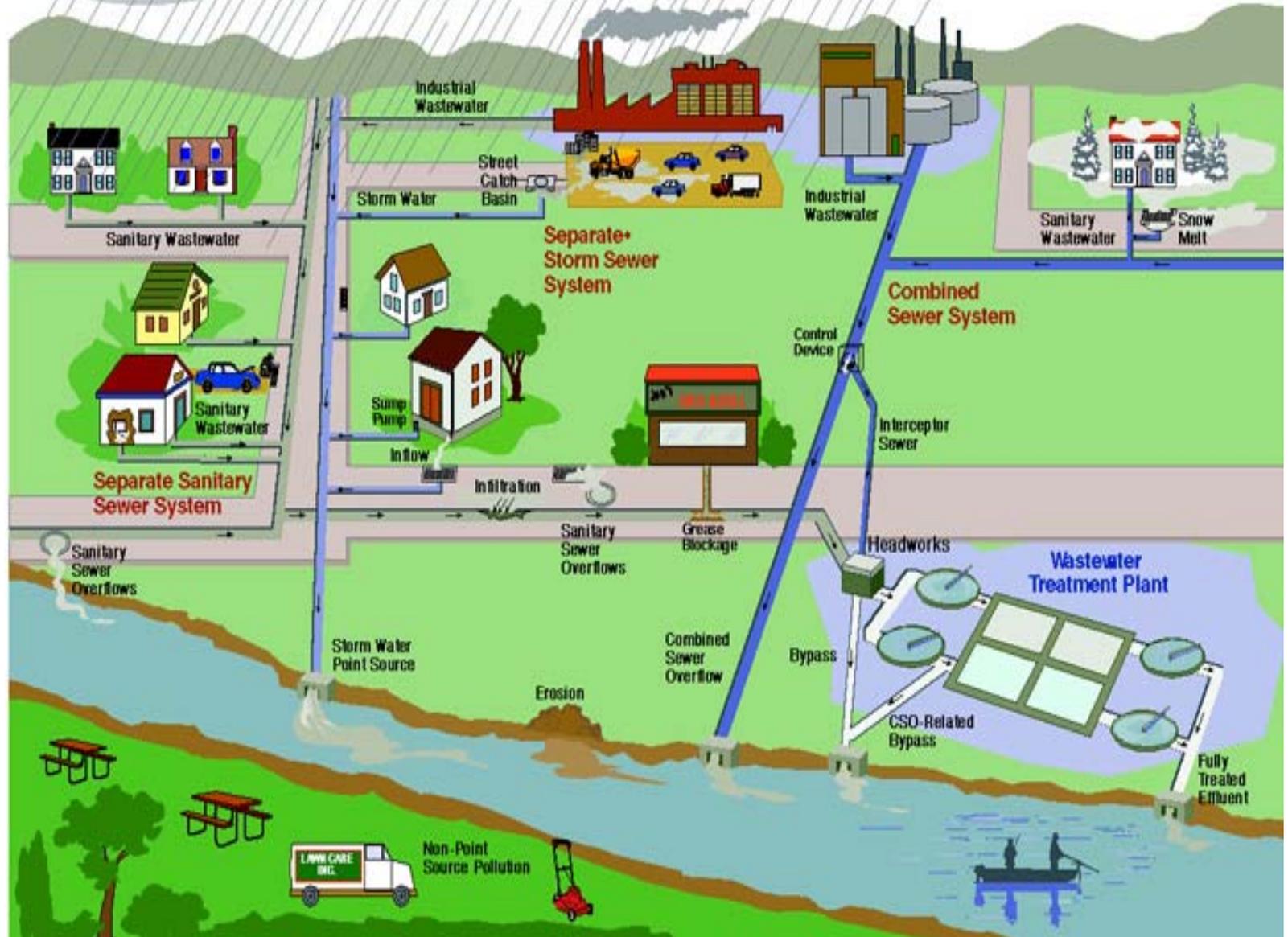
PRE-DEVELOPMENT



POST-DEVELOPMENT



Urban Wet Weather Flows



Typical Pollutant Concentrations Found in Urban Storm Water

Typical Pollutants Found in Stormwater Runoff (Data source)	Units	Average Concentration (1)
Total Suspended Solids (a)	mg/l	80
Total Phosphorus (b)	mg/l	0.30
Total Nitrogen (a)	mg/l	2.0
Total organic Carbon (d)	mg/l	12.7
Fecal Coliform Bacteria (c)	MPN/100 ml	3600
E. coli Bacteria (c)	MPN/100 ml	1450
Petroleum Hydrocarbons (d)	mg/l	3.5
Cadmium (e)	ug/l	2
Copper (a)	ug/l	10
Lead (a)	ug/l	18
Zinc (e)	ug/l	140
Chlorides (f) (winter only)	mg/l	230
Insecticides (g)	ug/l	0.1 to 2.0
Herbicides (g)	ug/l	1 to 5.0

(1) these concentrations represent *mean or median* storm concentrations measured at typical sites, and may be greater during individual storms. Also note that mean or median runoff concentrations from *stormwater hotspots* are 2 to 10 times higher than those shown here. Units = mg/l = milligrams/liter, ug/l = microgram s/liter.

Data Sources: (a) Schueler (1987) (b) Schueler (1995), (c) Schueler (1997), (d) Rabanal and Grizzard (1996) (e) USEPA (1983) (f) Oberts (1995) (g) Schueler, (1996)

Table 4-3. Typical Pollutant Loadings from Runoff by Urban Land Use (lbs/acre-yr)

Land Use	TSS	TP	TKN	NH ₃ -N	NO ₂ +NO ₃ -N	BOD	COD	Pb	Zn	Cu
Commercial	1000	1.5	6.7	1.9	3.1	62	420	2.7	2.1	0.4
Parking Lot	400	0.7	5.1	2	2.9	47	270	0.8	0.8	0.04
HDR	420	1	4.2	0.8	2	27	170	0.8	0.7	0.03
MDR	190	0.5	2.5	0.5	1.4	13	72	0.2	0.2	0.14
LDR	10	0.04	0.03	0.02	0.1	NA	NA	0.01	0.04	0.01
Freeway	880	0.9	7.9	1.5	4.2	NA	NA	4.5	2.1	0.37
Industrial	860	1.3	3.8	0.2	1.3	NA	NA	2.4	7.3	0.5
Park	3	0.03	1.5	NA	0.3	NA	2	0	NA	NA
Construction	6000	80	NA	NA	NA	NA	NA	NA	NA	NA

HDR: High Density Residential, MDR: Medium Density Residential, LDR: Low Density Residential

NA: Not available; insufficient data to characterize loadings

Source: Homer et al, 1994

Ecorse Creek Sediment Discharge



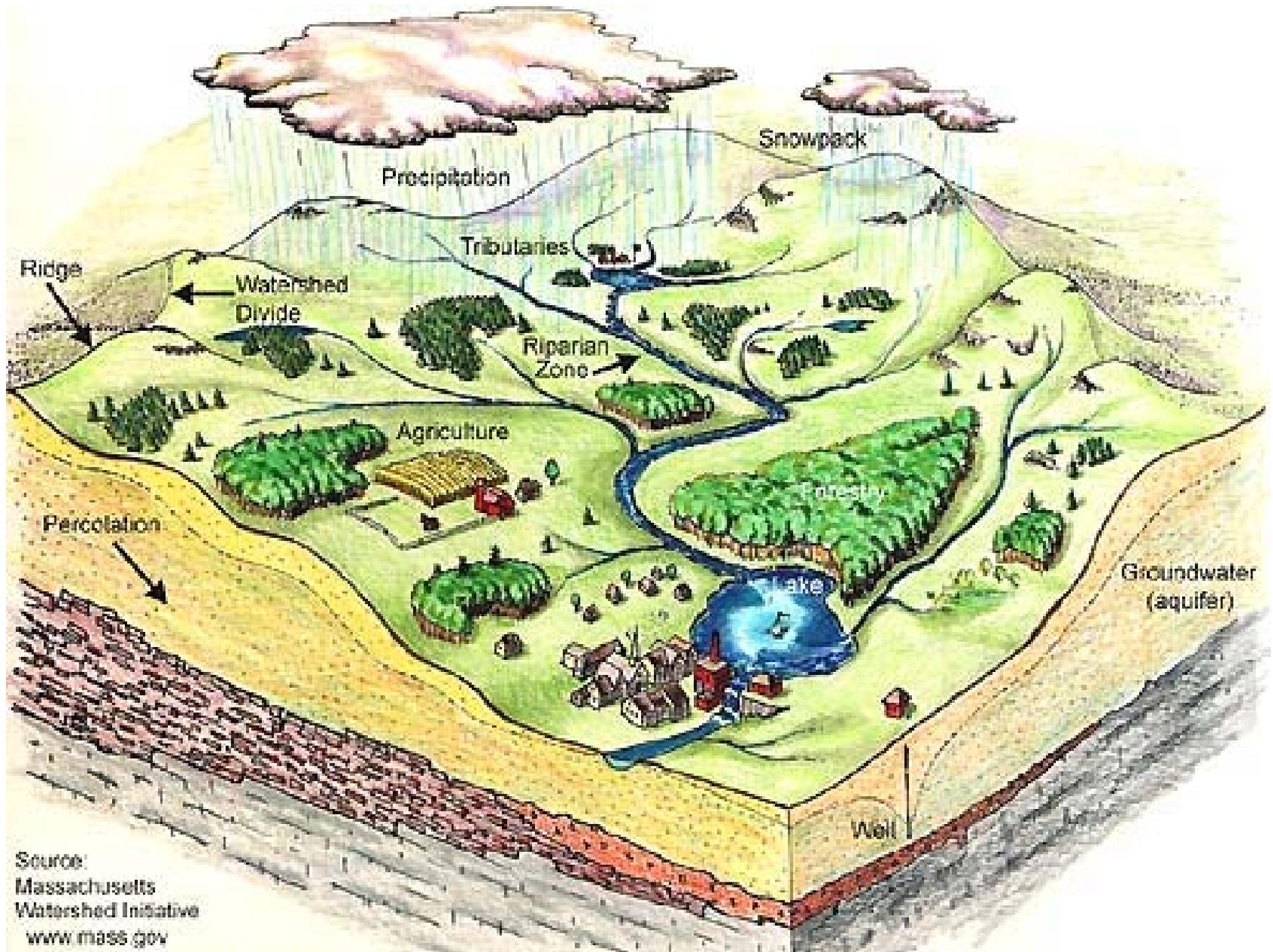
Photo by R. Burns,
Detroit Riverkeeper

Overview

- Where does sediment come from?
- How is sediment from land transported to a waterbody?
- How do we measure sediment in water?
- What are the benefits of keeping excess sediment out of the water?
- What are regulations govern discharges of sediment from roads and lots to waterbodies?

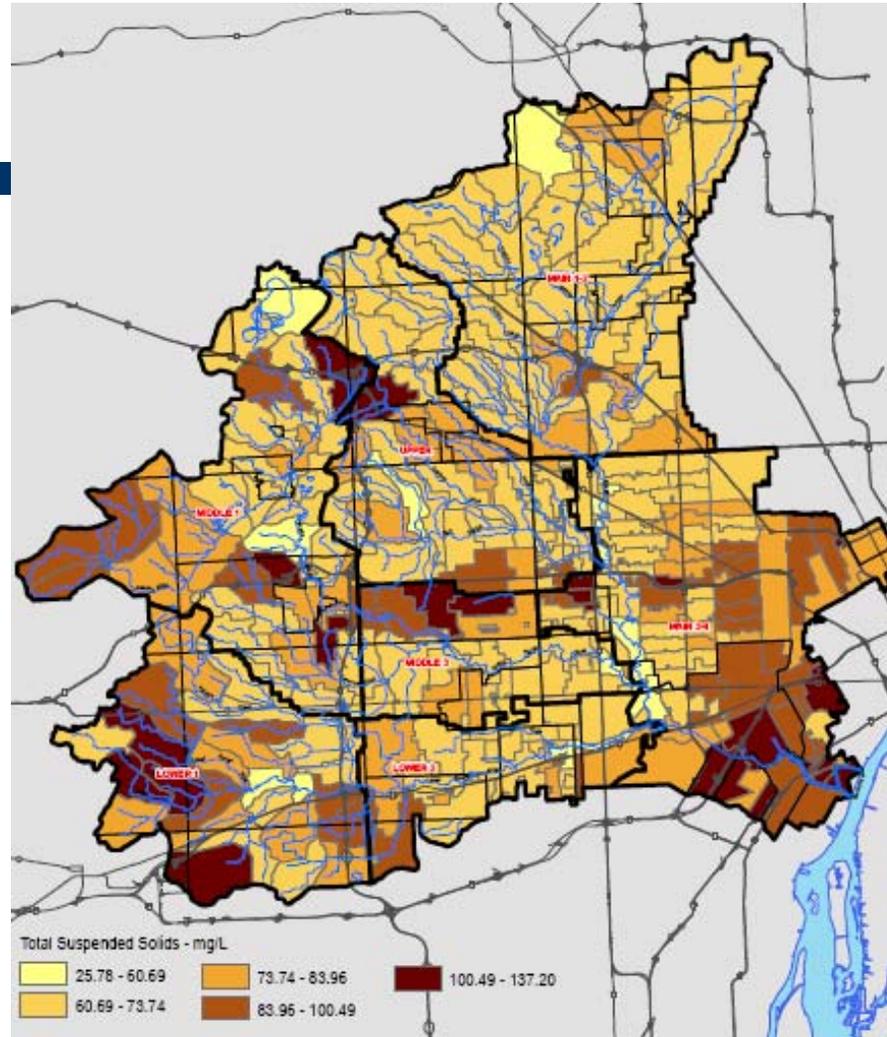


A watershed is
the land area that drains water to a particular stream, river, or lake.



Source:
Massachusetts
Watershed Initiative
www.mass.gov

Sediment contributions can be modeled or monitored



ALLIANCE OF ROUGE COMMUNITIES

OURS TO PROTECT

Mixing together, making the difference



DRAFT
Rouge River Watershed Total Suspended Solids Map

0 1 2 4
Miles

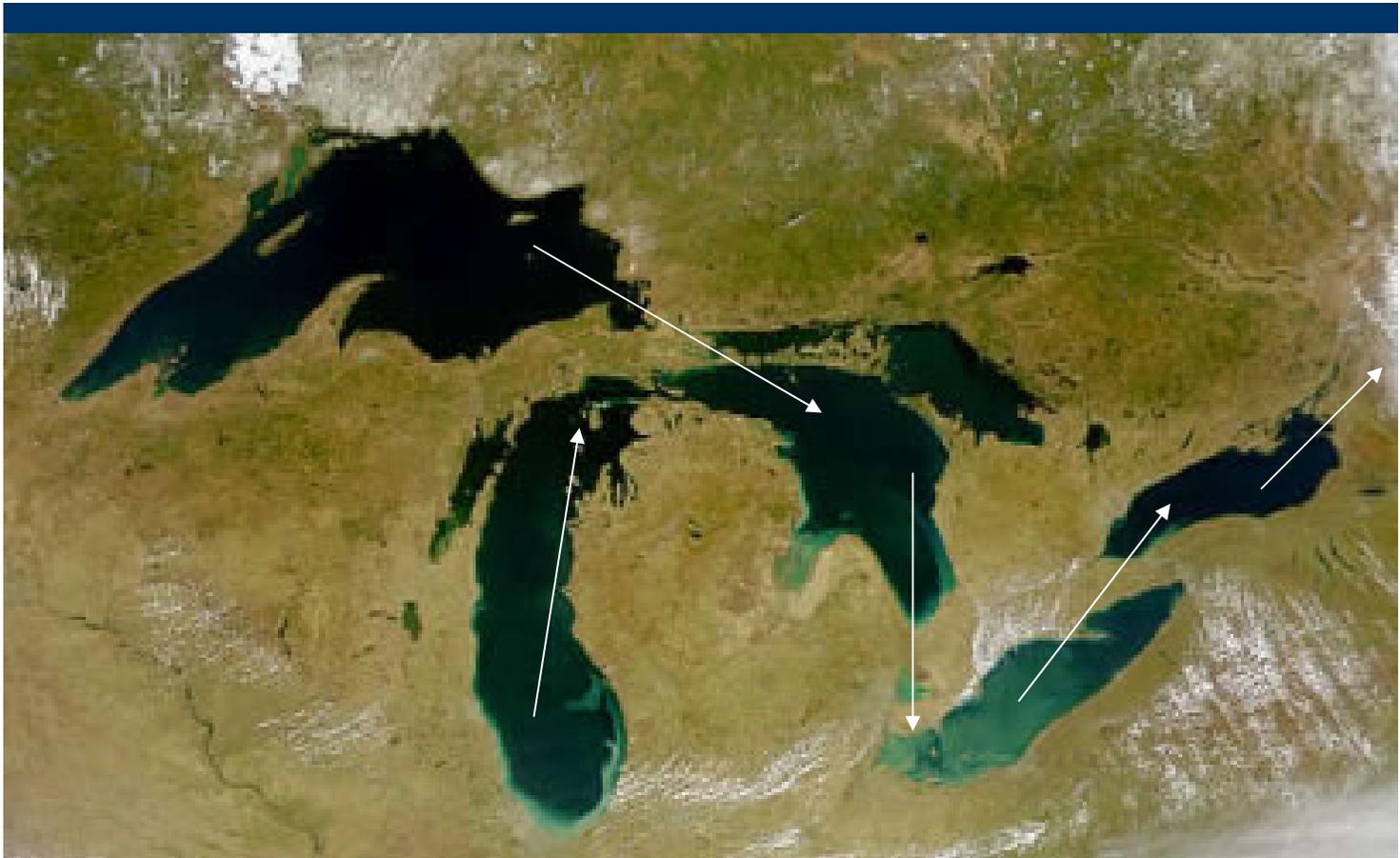
Rouge River Watershed Management Plan

Rouge River Sediment Discharge



Photo by R. Burns,
Detroit Riverkeeper

Great Lakes Sediment Movement



Overview

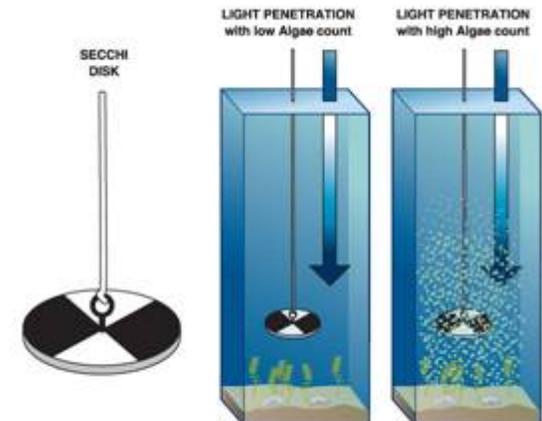
- Where does sediment come from?
- How is sediment from land transported to a waterbody?
- How do we measure sediment in water?
- What are the benefits of keeping excess sediment out of the water?
- What are regulations govern discharges of sediment from roads and lots to waterbodies?

How do we measure sediment in water?

- Turbidity
- Tools to measure turbidity
 - Light meter
 - Filtration of a water sample – total suspended solids
 - Secchi disk



Source: www.svid.org



Source: MI Sea Grant

Overview

- Where does sediment come from?
- How is sediment from land transported to a waterbody?
- How do we measure sediment in water?
- What are the benefits of keeping excess sediment out of the water?
- What are regulations govern discharges of sediment from roads and lots to waterbodies?

Preventing Water Pollution

- Sediment often transports contaminants:
 - PCBs
 - Fertilizers
 - Pesticides
 - Metals
 - Oils
 - Greases



Photo by J. Bristoff

Clean Drinking Water



Recreation



Photos: K. Kuban, FOTR.

Preventing Clogged Storm Sewers & Flooding



Protecting
Aquatic Life



To avoid being swept away in the current, lay low...

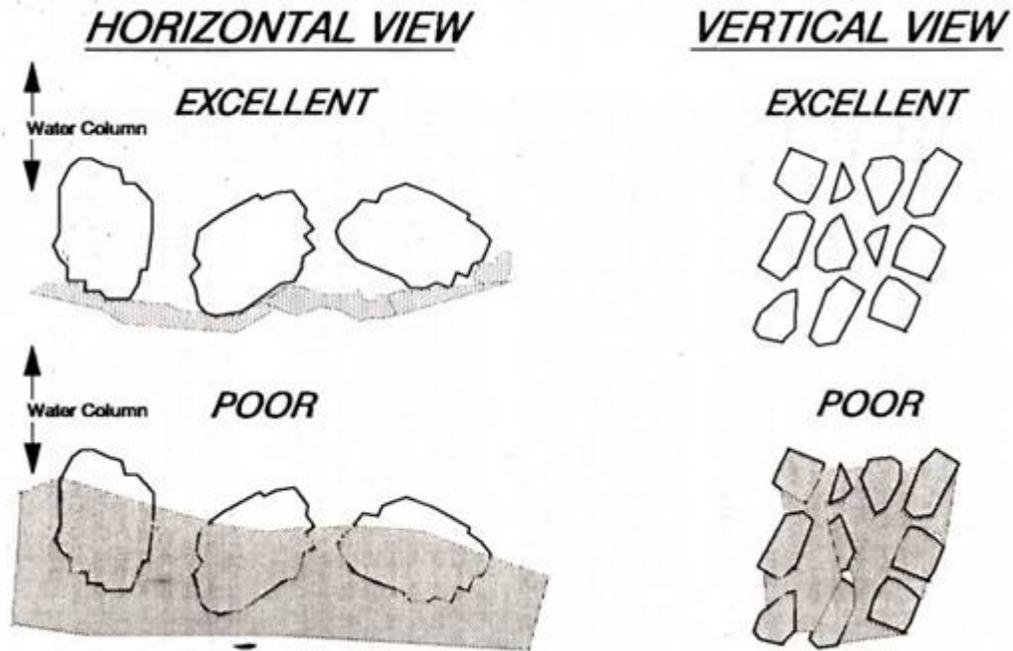


Water penny beetle larva:
Psephenidae

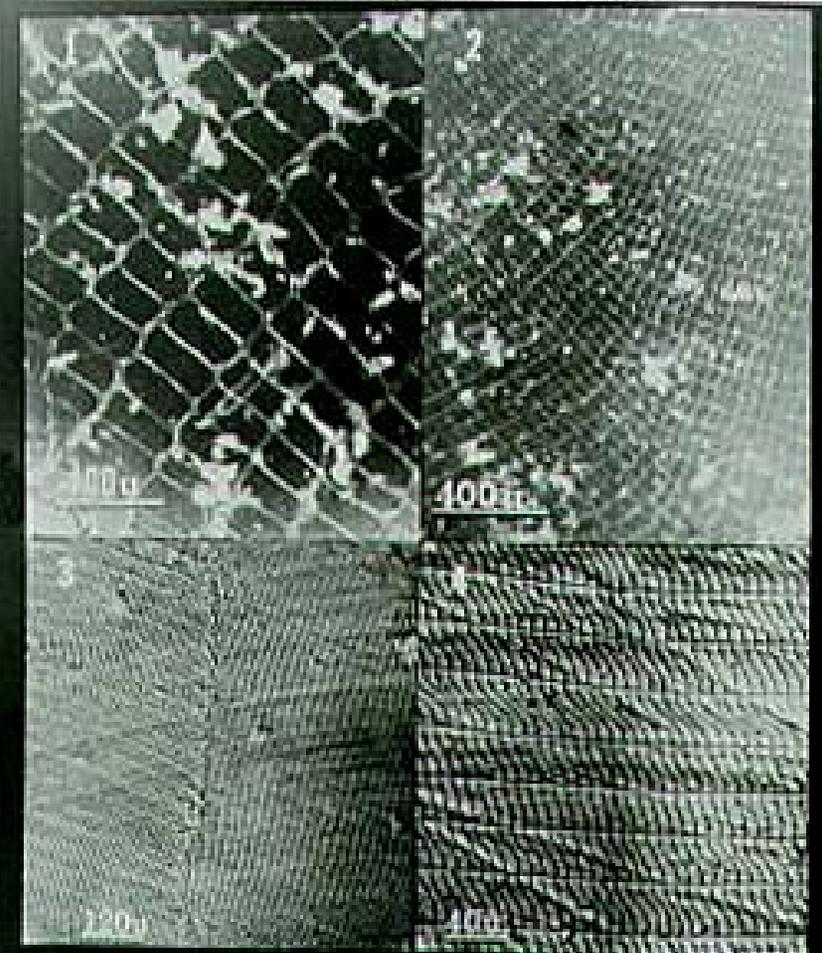
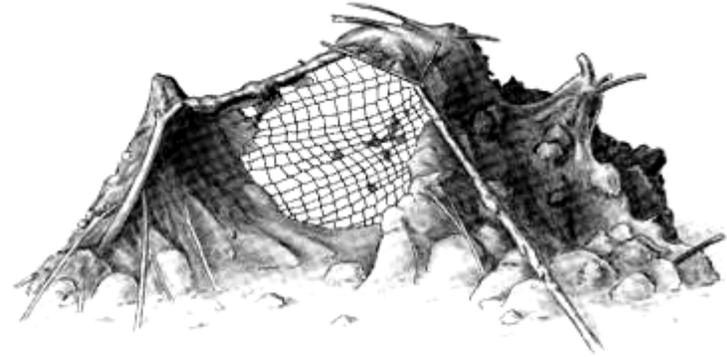


Flathead mayfly nymph:
Heptageniidae

Embeddedness

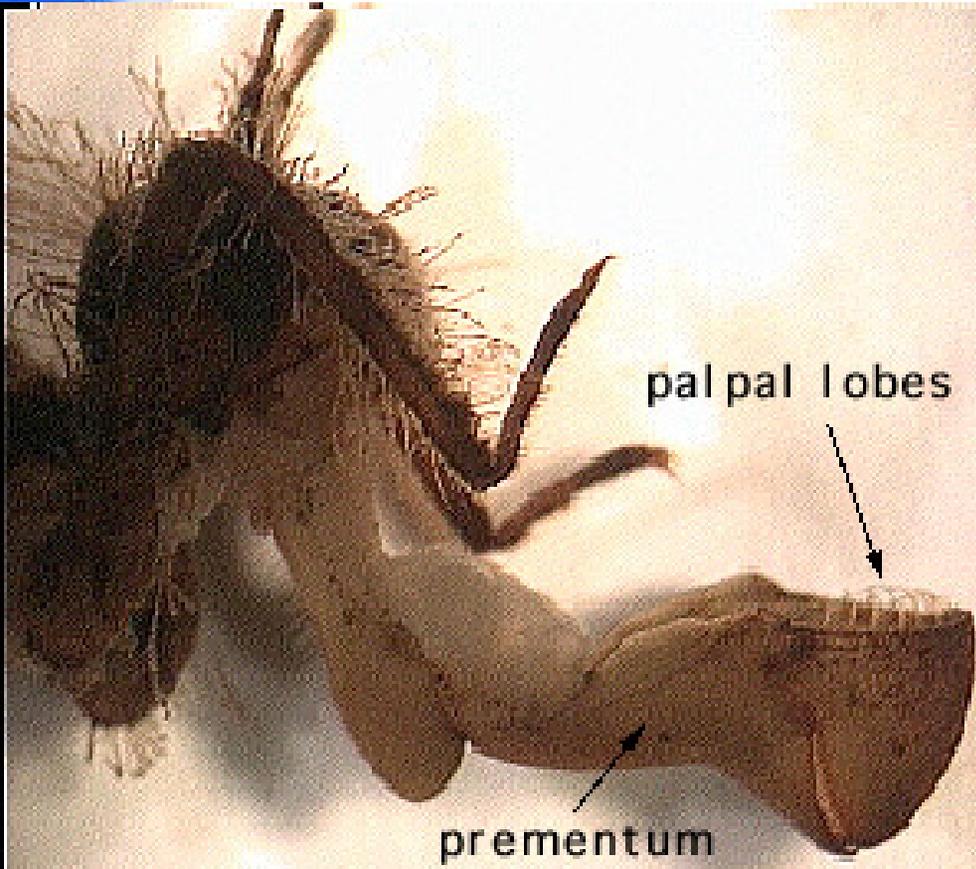


Enabling Feeding



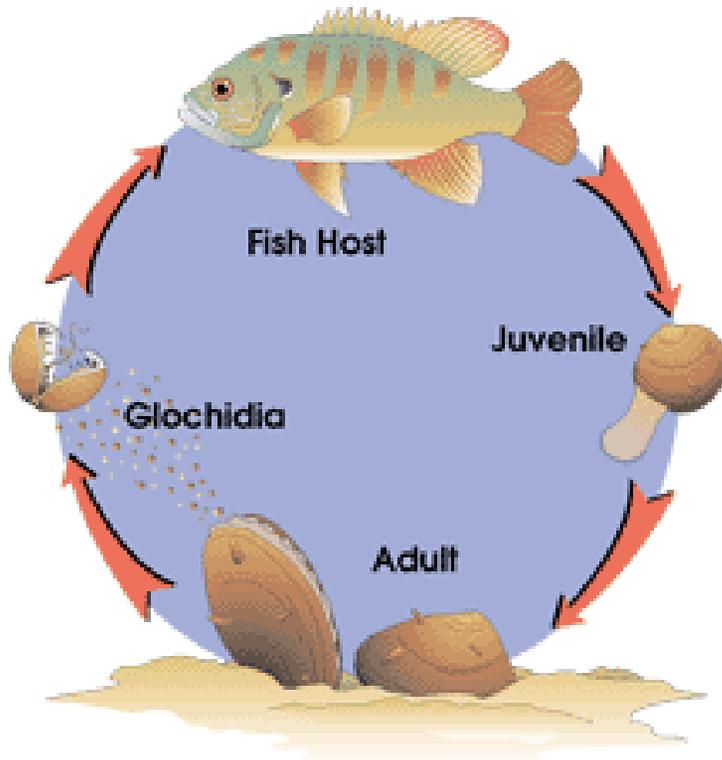
Caddisfly larvae: *Hydropsychidae*

Predaceous Dragonfly Nymphs



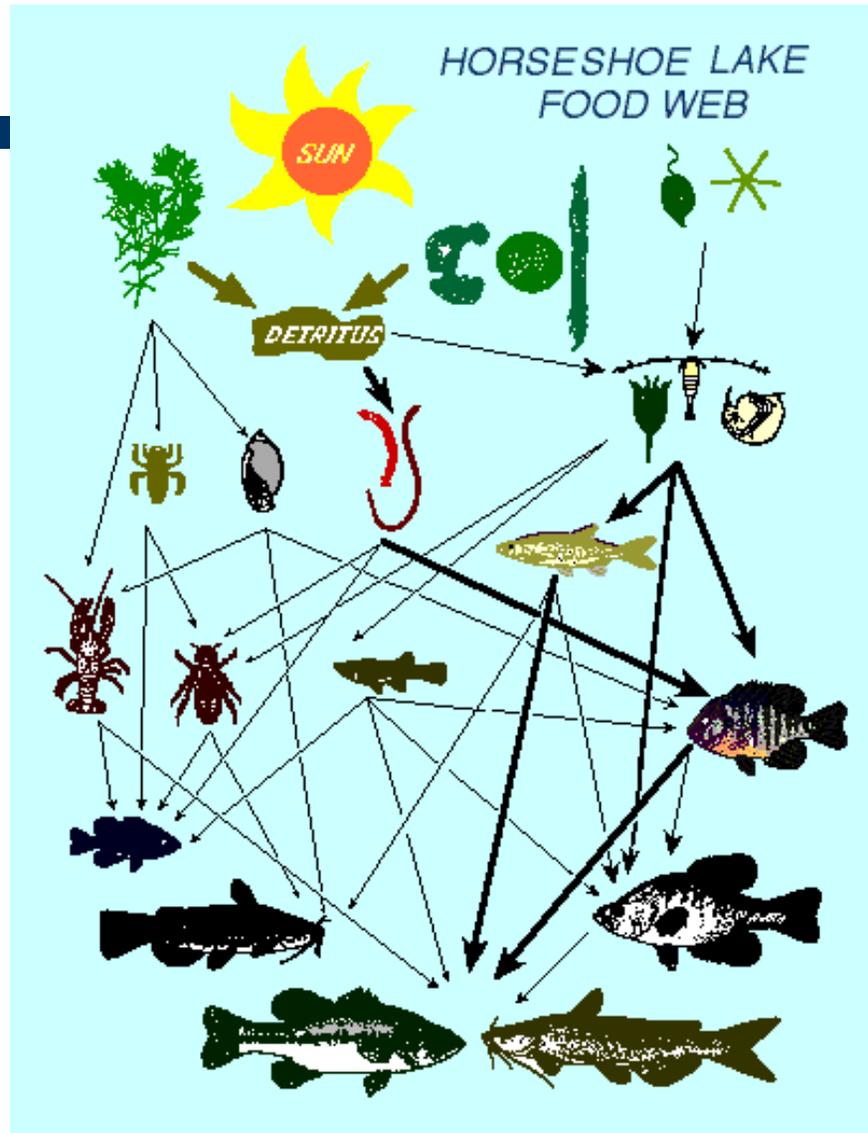
Enabling Reproduction

Mussels: Amazingly important water cleansers!



Images from: www.musselconservation.org/Adaptation.html

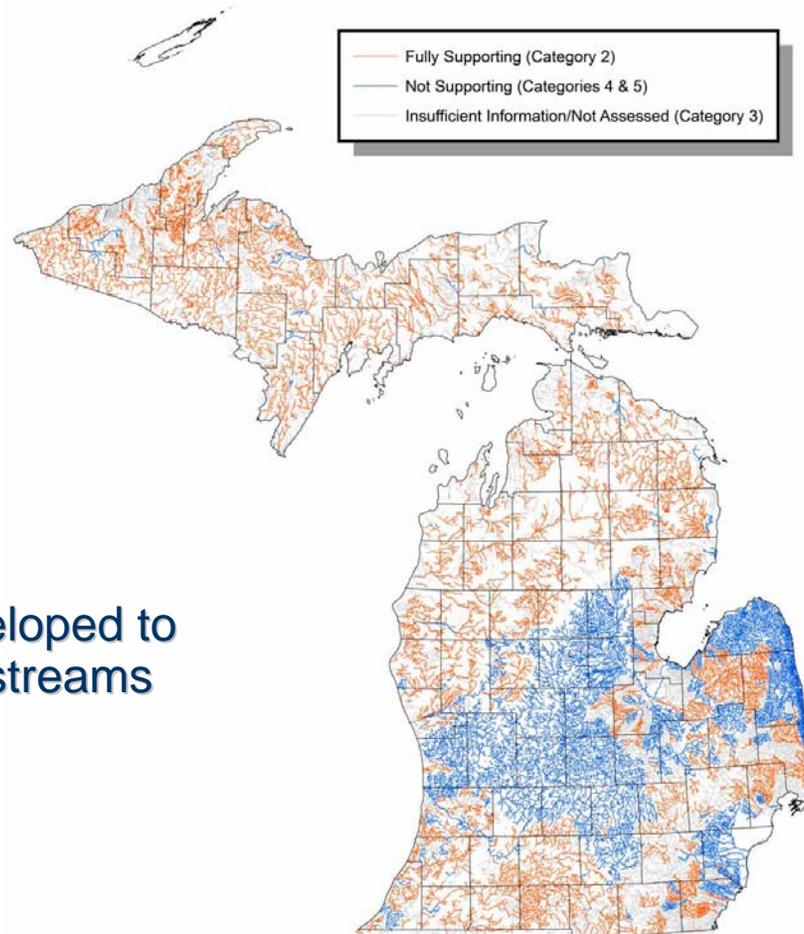
Protecting Aquatic Life



Is sediment impairing Michigan's water quality?



Aquatic Life Designated Use Support



■ TMDLs are developed to restore impaired streams

Overview

- Where does sediment come from?
- How is sediment from land transported to a waterbody?
- How do we measure sediment in water?
- What are the benefits of keeping excess sediment out of the water?
- What are regulations govern discharges of sediment from roads and lots to waterbodies?

Surface Water Discharge Regulation- delegated to MI in 1973

Purpose/Goals: Prevent the injurious discharge of pollutants (including sediment) to waters of the state.



What are waters of the State?

Part 31 includes both ground and surface waters of the state; surface waters include:

- a) Great Lakes and connecting waters;
- b) All inland lakes, rivers, streams, and impoundments;
- c) Open drains;
- d) Wetlands; and
- e) Other surface bodies of water

Surface Water Discharge Regulation

- Goal is to protect, preserve, and enhance the surface water quality.
- Michigan rules promulgated pursuant to Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).
 - Part 4, Water Quality Standards;
 - Part 8, Water Quality Based Effluent Limits for Toxic Chemicals; and
 - Part 21, Wastewater Discharge Permits of NREPA.



All surface waters of the state are designated for, and shall be protected for:

- Agriculture.
- Navigation.
- Industrial water supply.
- Public water supply at the point of water intake.
- Warmwater fishery.
- Other indigenous aquatic life and wildlife.
- Partial body contact recreation.
- Total body contact recreation from May 1 to October 31.



**Part 4
Rules**

Prohibited Discharges

Discharge into the waters of the state that is or may become injurious to any of the following:

- To public health, safety, and welfare.
- To domestic, commercial, industrial, agricultural, recreational, or other uses that are being made or may be made of such waters.
- To the value or utility of riparian lands.
- To livestock, wild animals, birds, fish, aquatic life, or plants or to the growth, propagation, or the growth or propagation thereof be prevented or injuriously affected; or whereby the value of fish and game is or may be destroyed or impaired.

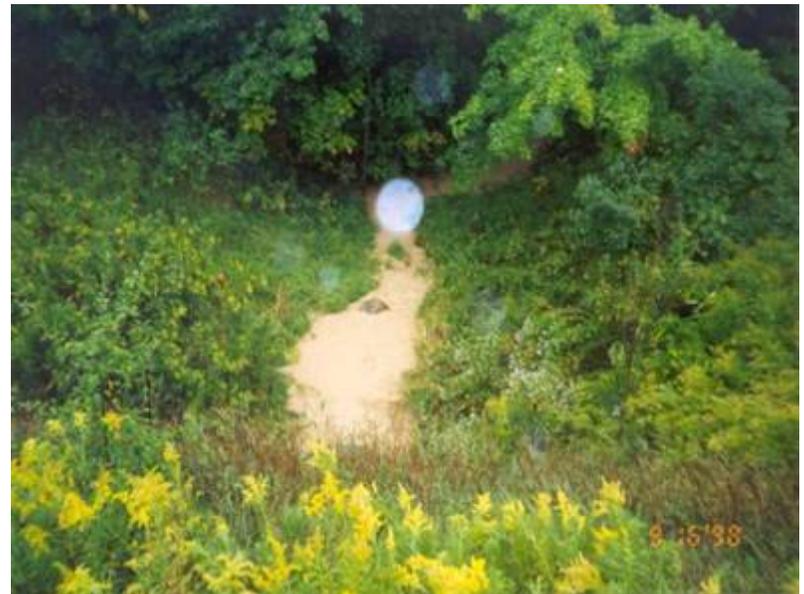


**Section 3109 (1) of
Part 31 of the NREPA**

Injurious Discharge Prohibition

Part 4, Water Quality Standards, Administrative Rules promulgated pursuant to Part 31 of the NREPA

- The waters of the state shall not have any of the following unnatural physical properties in quantities which are or may become injurious to any designated use:
 - Turbidity.
 - Color.
 - Oil films.
 - Floating solids.
 - Foams.
 - Settleable solids.
 - Suspended solids.
 - Deposits.



**Part 4
Rules**

Water quality standards shall be met in all waters of the state

- Narrative standard for TSS
- Waters of the state shall not have any of the following unnatural physical properties in quantities which are or may become injurious to any designated use:
 - turbidity, color, etc
- Permit writers take the narrative standard into consideration when deciding on appropriate limits.



**Part 4
Rules**

Related Water Bureau Regulatory Programs Related to Sediment and Road & Lot Management

- Storm Water Permitting
 - Industrial
 - Municipal
 - Construction
 - Soil Erosion and Sedimentation Control
- Wastewater Discharge Permitting
- Part 5 Rules/Pollution Incident Prevention Plan
- Groundwater Permitting





Michigan's Storm Water Program

Part 21, Wastewater Discharge Permits of NREPA.

Industrial Stormwater Permitting

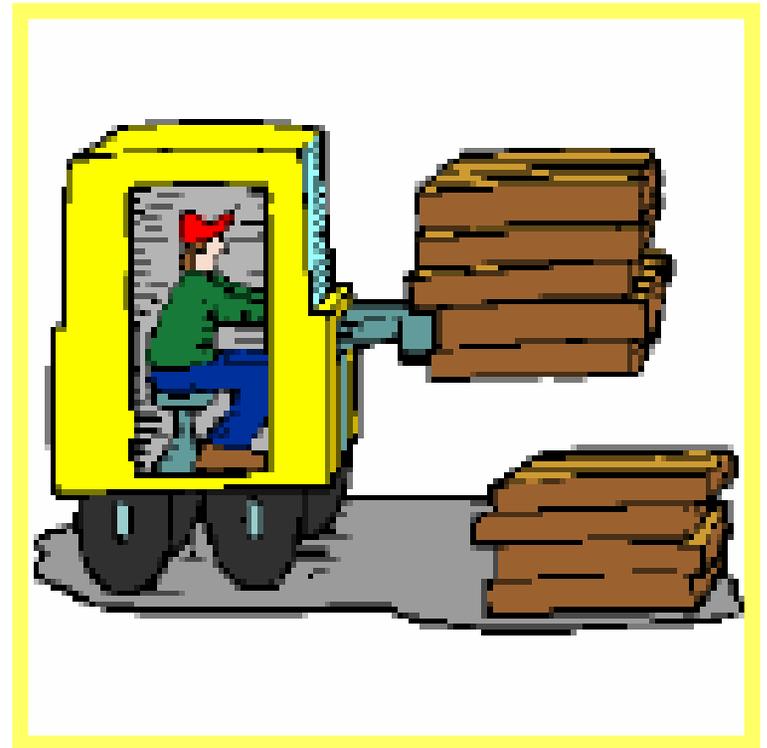
- Requires facilities with stormwater discharges associated with regulated industrial activity to obtain coverage



Photo by: FOTR

Industrial Stormwater Permit General Requirements

- Certified Operator
- Stormwater Pollution Prevention Plan
 - site map
 - non-structural controls
 - structural controls
- Illicit Discharge Elimination
- Potential pollutant identification



Industrial Stormwater Permit Requires:

- Evaluation of:
 - significant dust or particulate generating processes;
 - areas of exposed and/or erodible soils;
 - areas of significant material residues;
- Routine preventive maintenance, including cleaning of catch basins.
- Periodic site inspection
- Good housekeeping
- Proper storage
- Erosion and sedimentation control
- Employee training



Construction Stormwater Permitting

- DEQ implements 2 programs related to soil erosion & construction
 - Const SW – DEQ permits & inspects
 - SESC – Locals Permit & DEQ oversees & audits
- The intent is to prevent the discharge of sediment laden water in to waters of the state (including wetlands) and onto adjoining properties



What are the Permit-by-Rule Requirements?



- Develop an SESC plan.
- Properly maintain and operate SESC measures.
- Have SESC measures under the supervision and control of a certified storm water operator.
- Inspect the site weekly and within 24 hours of a precipitation event that results in a discharge.

Permit by Rule Requirements (continued):



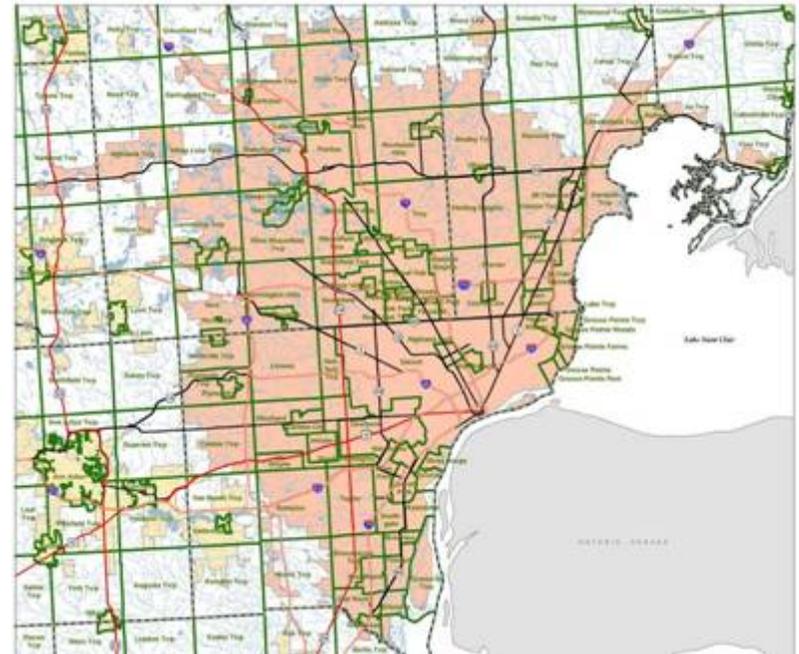
- Document all inspections and retain inspection reports for 3 years after project completion.
- Make available to the public or provide to the DEQ all inspection reports or logs.
- Be in compliance with SESC plan and SESC permit or approved SESC procedures (if an APA).

Permit by Rule Requirements (continued):

- Do not directly or indirectly discharge wastes such as construction materials, concrete truck washout, chemicals, lubricants, fuels, litter, or sanitary wastes.
- Ensure that all spills and wastes are reported and disposed of in accordance with applicable laws and regulations.

Municipal Separate Storm Sewer System (MS4) Permitting

- Separate storm sewers owned or operated by a state, city, village, township or other public entitythat discharge to waters of the state
- MS4s within the federally defined urbanized areas



What is an MS4?

- A drainage system (including roads, catch basins, curbs, gutters, parking lots, ditches, conduits, pumping devices, or man-made channels) that is :
 - Designated or used for collecting or conveying storm water



MS4 General Permit Requirements

- Develop a plan (SWPPI)
- Complete Progress Reporting
- Evaluate Effectiveness



MS4 Requirement: Construction Site Storm Water Runoff Control

- Notification requirements
 - Additional eyes and ears to boost effectiveness of local SESC and NPDES
- Ensure erosion and sed. controls on site plans
- Accept complaints/concerns from public

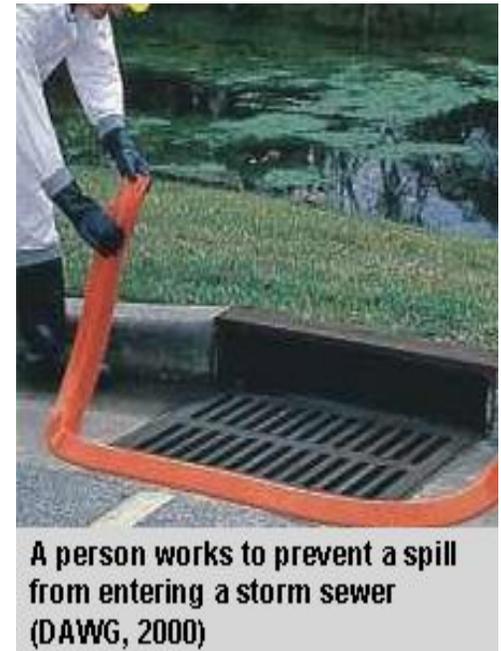


Stabilized construction entrances allow dirt to be removed from tire treads and collected as trucks leave construction sites



MS4 Requirement: Pollution Prevention & Good Housekeeping

- Minimize pollutant runoff from municipal operations to the maximum extent practicable
- Employee/Contractor Training
- Prevent the discharge of salt and sand from salt and sand storage facilities.
- Compliance with salt storage requirements of the Part 5 Rules



MS4 Requirement: Storm Water Pollution Prevention for Road Operations

- Construct, operate, and maintain roads and impervious infrastructure to reduce the discharge of pollutants, including pollutants resulting from snow removal practices.
- Prevent salt and sand from entering MS4s and receiving streams to the maximum extent practicable.
- Implement BMPs to control dust and suspended solids in runoff from unpaved roads and parking lots.
- No coal tar emulsions



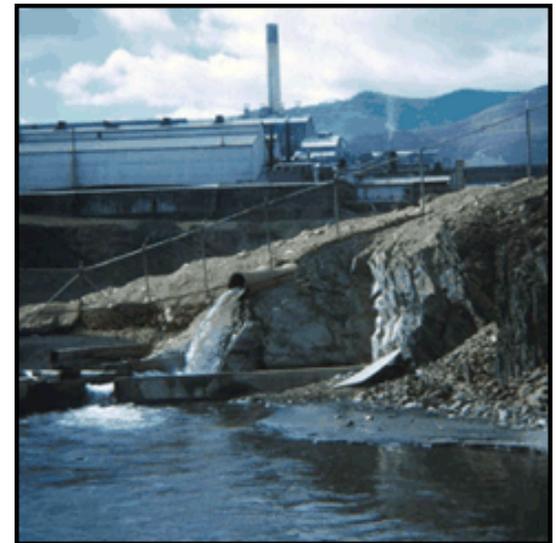
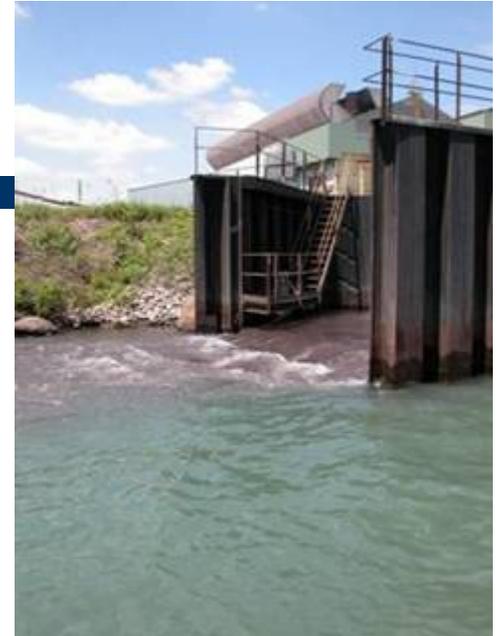
MS4 Requirement: Storm Water Pollution Prevention for Paved Roads

- Reduce the runoff of total suspended solids (TSS) from all of its paved surfaces to the maximum extent practicable.
 - TSS reductions may be achieved by any combination of pollution prevention (e.g., improved materials handling, or altered land uses or traffic patterns), removal (cleaning streets and catch basins), or treatment (settling filtration or infiltration).
- Estimate of the TSS loading reduction



Wastewater Discharge Permits

- Are required for discharge of wastewater
- Have a maximum 5 year permit life
- Often have TSS limits
- Are required if discharging waste / pollutants to waters of the State



GROUNDWATER DISCHARGE PROGRAM

- **Regulate discharges to groundwater**
 - **Discharge** – direct or indirect discharge of a waste, waste effluent, wastewater, pollutant, cooling water, or combination of these items, to the ground or groundwater.
 - **Waste** – include any substance that could pose a threat to groundwater.
- **MAC R 323.2201 thru R 323.2240 governed under Part 31 of NREPA**

Part 5 Rules

Spillage of Oil and Polluting Materials

Part 5 regulates facilities that use, store, or manufacture oil or polluting materials above threshold management quantities.

The regulated polluting materials and the threshold quantities are specified in the rules.



Part 5: Threshold Management Quantity

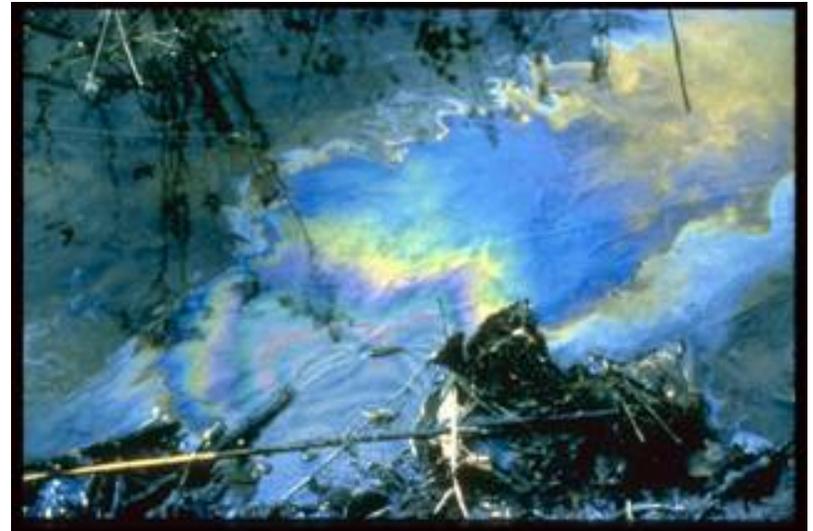
- Salt – Solid Form = 5 tons
- Salt – Liquid Form = 1000 gallons
- Other polluting materials, stored outside, 440 lbs
- Other polluting materials, stored inside, 2200 lbs
 - Dust suppressants?

Also:

- Oil, aboveground, single tank capacity > 660 Gallons
- Oil, aboveground, total capacity > 1320 Gallons

Part 5 Requirements

- Pollution Incident Prevention Plan
- Certification of Compliance
- Proper Storage
- Secondary Containment
- Surveillance
- Release Reporting



Spills



Remember, it's not just toxic to you

Get Water. Get Fossil.



Carefully store and dispose of household cleaners, chemicals, and oil

Did you know that many household products are dangerous to our kids, pets, and the environment?

These materials pollute our waterways if washed or dumped into storm drains or roadside ditches. Remember, storm drains lead to our lakes and rivers.

How can you help?
Follow the tips on the back of this card for simple ways you can help keep our water clean.

Pollution Emergency Alerting System (PEAS)

Within Michigan

1-800-292-4706

Outside of Michigan

1-517-373-7660