Overview of Stormwater Effects on Water Quality

wq-strm7-81

Stormwater Module 1

Minnesota Pollution Control Agency

Training goals

- Recognize the wide variety of pollutants in urban stormwater runoff that can impair receiving waters
- Identify how land use, management practices, and natural factors affect pollutant loading

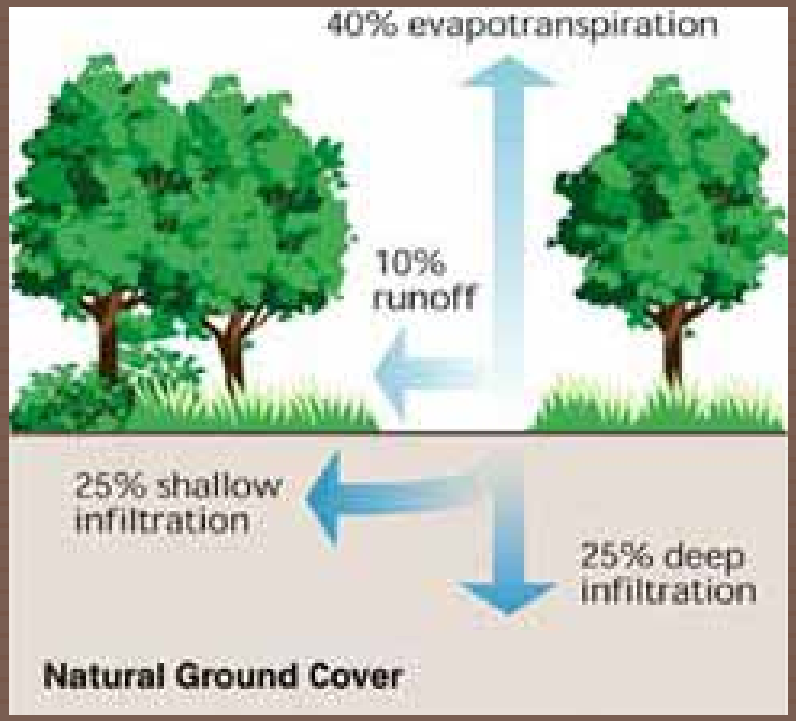
What is urban stormwater?

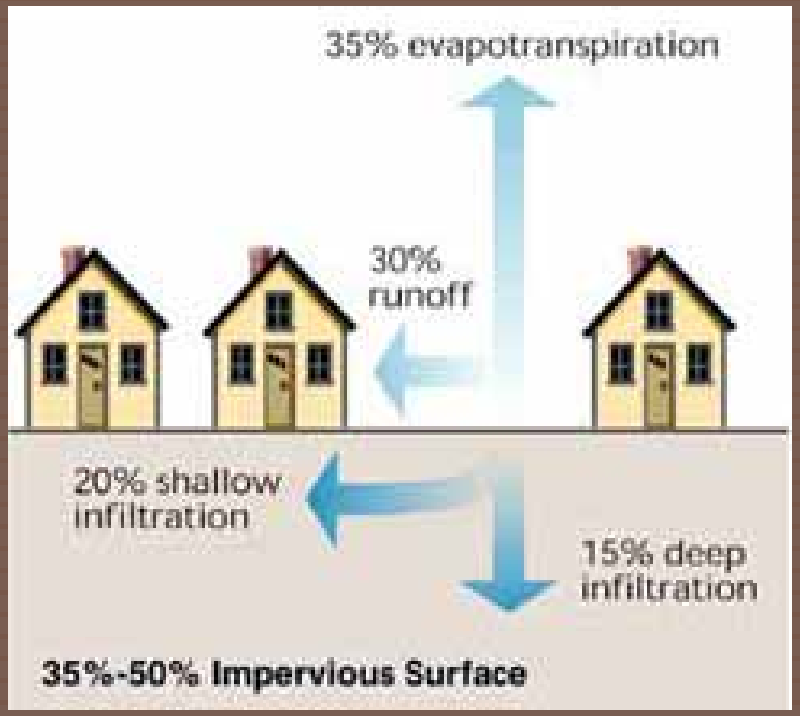
Water running off an urban land surface after a rainfall or snowmelt event

Urban areas have less infiltration and evaporation and more runoff than forested or grassland areas

Two most important factors:

1. amount of impervious surface
2. connectedness of impervious surface





Source for figure: http://duluthstreams.org/understanding/stormwater_hydrology.html

How do we affect the quality of stormwater?

Chemicals that we apply to the landscape are carried with runoff water to receiving waters

What environmental effects are associated with stormwater runoff?

- Stormwater usually discharges to a lake, river/stream or wetland
- Increased runoff may cause flooding
- Chemicals may be toxic to organisms
- Characteristics (habitat) of the receiving water body may change

Figure 2.2 Alteration in Riparian Condition and Land Use within a Watershed Can Lead to Accelerated Channel Erosion (Vermillion River)

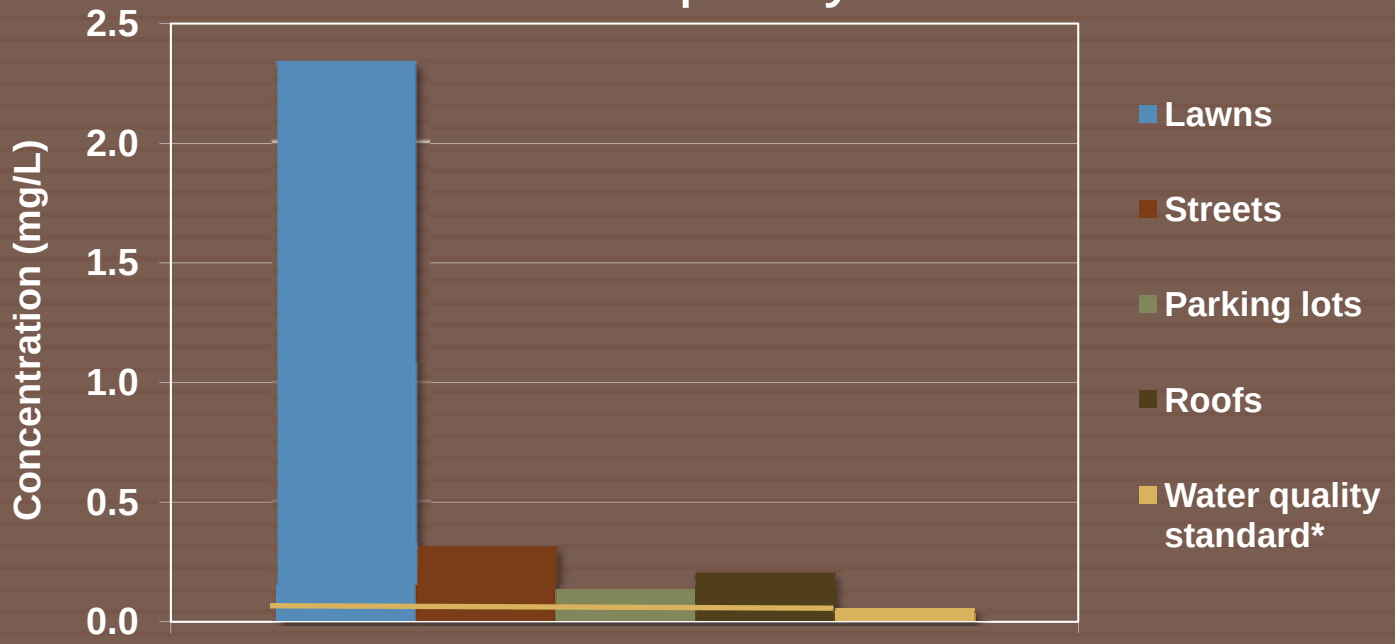
What water body impairments are associated with stormwater?

Lakes	nutrients (primarily phosphorus) and pathogens impair the lake for recreational use
Rivers / streams	nutrients, sediment, chloride, pathogens, and temperature impair the river / stream for aquatic vegetation, recreation, and habitat
Wetlands	nutrients and sediment impair wetlands for habitat

Phosphorus

Concentrations

- are greatest from lawns and residential areas with considerable tree canopy
- from all areas exceed water quality standard*



* Standard varies with area of state and characteristics of lake

Factors increasing phosphorus loading

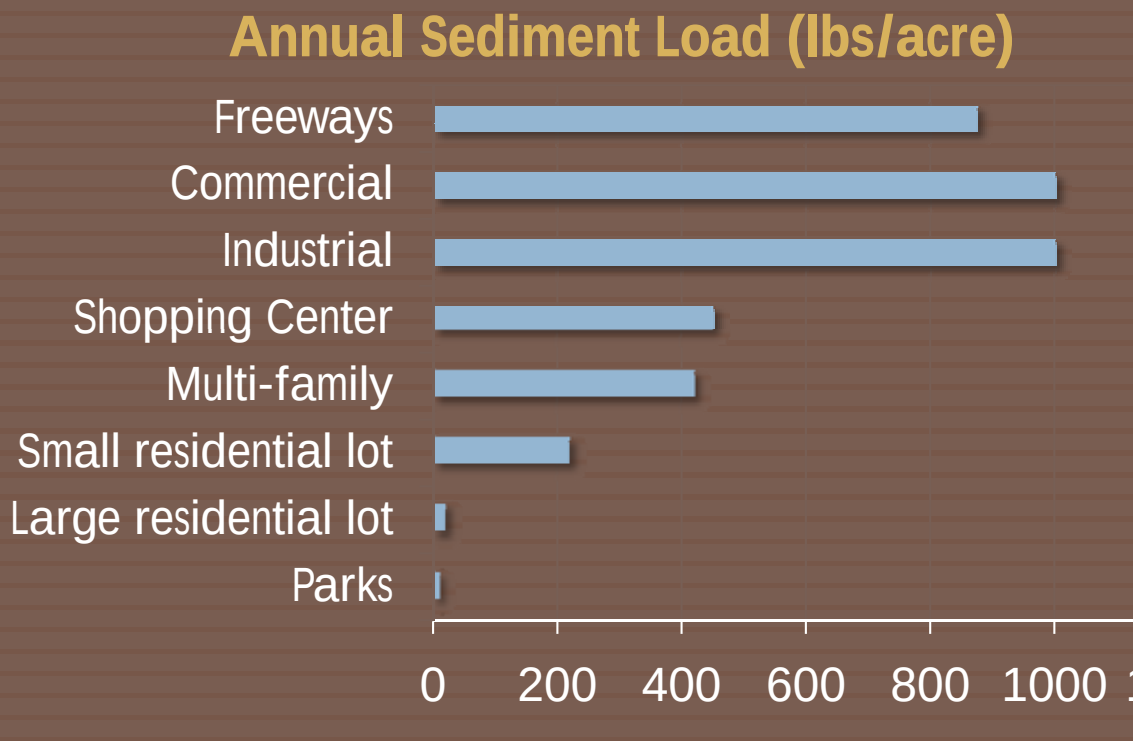
Increased

- impervious area
- connectivity of impervious area
- turfgrass and leaf contributions
- concentrations of soluble phosphorus
- soil erosion

Natural factors (rainfall, soil)

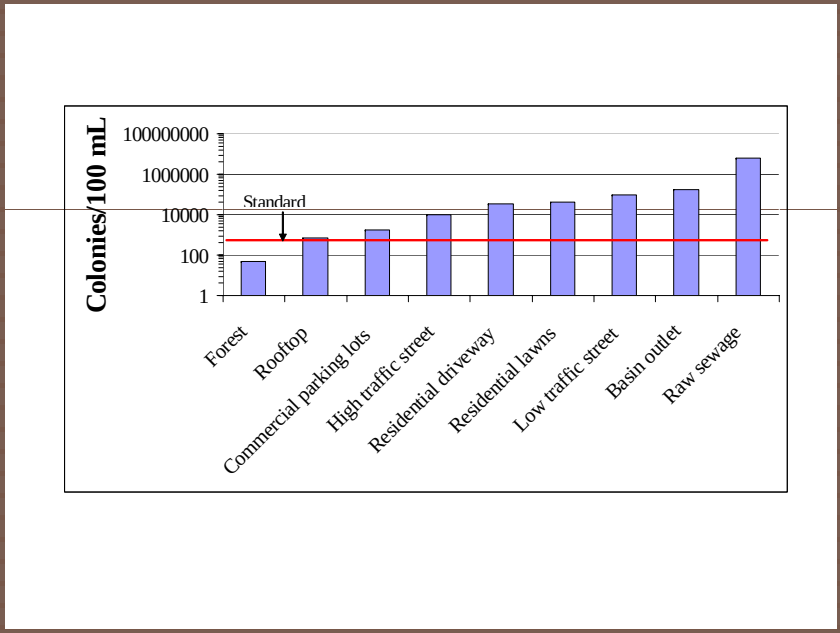
Sediment

- Most pollutants are associated with finer sediment
- Construction is a major source
- Varies with precipitation characteristics
- Affects biota



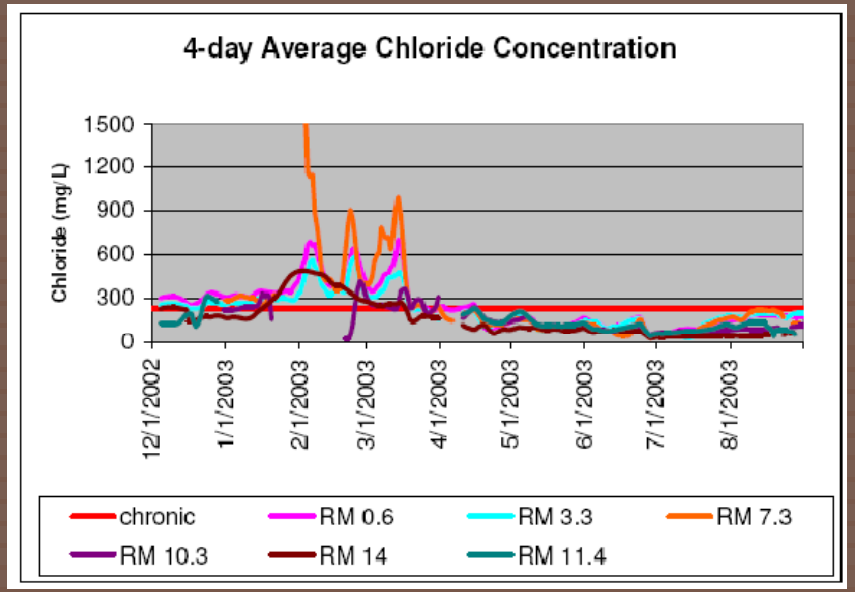
Pathogens

- Multiple urban sources, including illicit discharges, residential, internal loading
- Importance of different sources varies with precipitation
- Affects recreational use



Chlorides

- Major source is road salt
- Highest concentrations in winter
- Affects biota



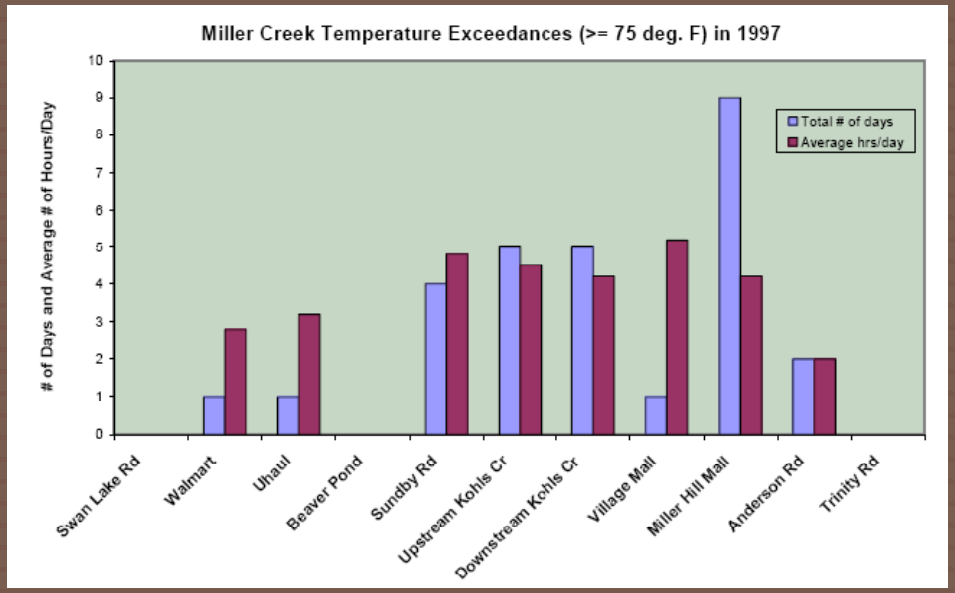
Data for Shingle Creek

Temperature

Varies

- with type of surface (e.g. asphalt, concrete, grass)
- during a rain event

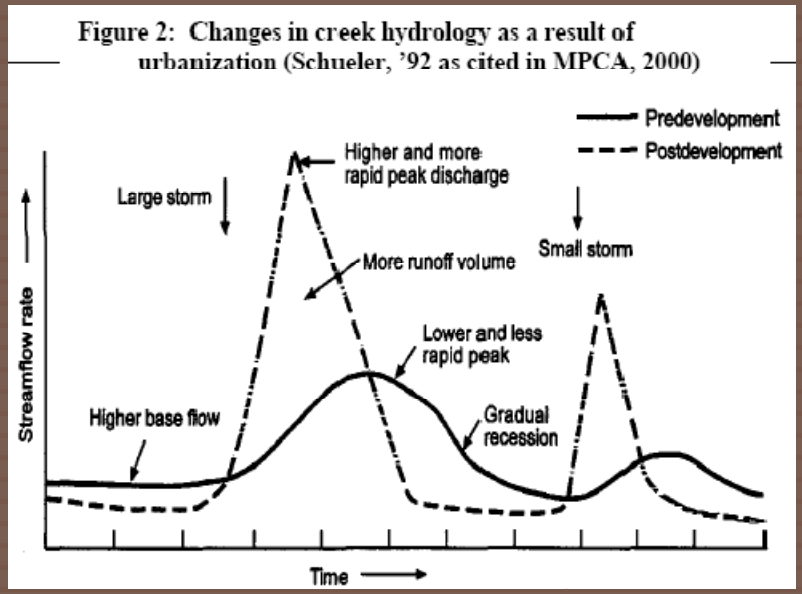
Effects biota



Data for Miller Creek

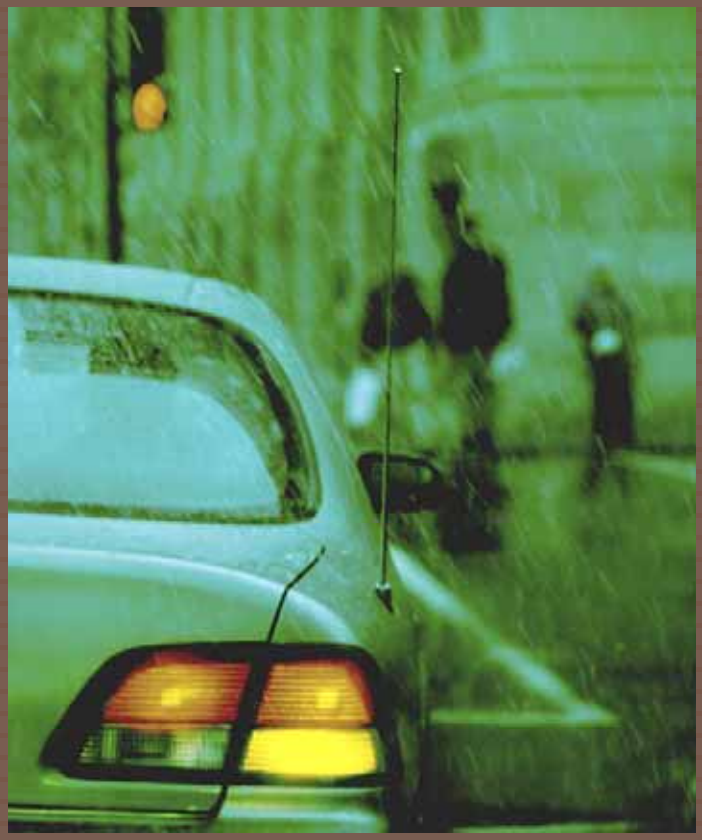
Flow

- Not an impairment by itself, but a surrogate for other pollutants
- A function of impervious surface and connectivity of drainage system
- Affects loading of most pollutants; biota



Metals, organics, nitrogen

- Waters are currently not assessed for these
- Concentrations are elevated in urban runoff
- Characteristics and effects vary with each pollutant



Summary

- Urban areas have more runoff and less infiltration and evaporation than forested or grassland areas
- Urban runoff contains many pollutants that can affect a receiving water body
- Natural and man-induced factors affect the amount of pollutant loading that results from urban stormwater runoff