

Urban Erosion and Sediment Pollution

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Urban Sprawl is # 1 source of soil sedimentation along east coast
(based on the Chesapeake Bay study report)

Urbanization in U.S. :

3.2 million new acres of land per year (5000 sq. miles)

Equivalent to: 1.8 mile wide corridor from New York to L.A.

OR an area from (N-S) Moberly to Jefferson City
(E-W) Columbia to Concordia

Additional water runoff (assume 20% reduction in soil permeability)

@ 36 in / yr precipitation → Avg. water use by city of Columbia for the
next 489 yrs.

Additional water quality concerns:

40% of new development / construction in U.S. are in areas *NOT* connected
to centralized sewer system.

Specifications for Sediment Fence *(North Carolina Field manual 1991)*

Physical Property	Minimum Requirement
Filter Efficiency	85%
Tensile Strength @ 20% (max elongation)	
➤ Standard Strength	30 lb/ linear inch
➤ High Strength	50 lb/ linear inch

Maximum Land Slope and Distance for Sediment Fence or Straw Bales *(North Carolina Field manual 1991)*

Land Slope %	Minimum Slope Distance (ft) (above fence or straw bales)
< 2	100
2 - 5	75
5 - 10	50
10 - 20	25
> 20	15

Polyacrylamide (PAM)

Soil stabilizer used for more than 50 years based on numerous formulations

Used as a water soluble anionic PAM:

- Treat potable water supplies
- Manufacture of sugar from sugar beets
- Making paper packaging for food

Characteristics of PAM:

- Quickly removed from stream flow (adsorbed by soil)
- No significant movement below root zone
- Material tends to degrade over time.

Application to bare soil:

- Increases soil's available pore volume through flocculation, hence reduces runoff.
- Flocculation of suspended particles reducing turbidity.

BMP for Soil Erosion Protection using PAM (*Washington State regulation*)

- Application rate per acre: 0.5 lbs / 1000 gal water
- Only applied to actively worked bare areas
- Used in conjunction with other BMPs not in place of them.
- Only applied with wet applications.
- Not used on slopes directly draining into streams or wetlands.
(Pass through sediment basin prior to discharge to surface waters)
- NO direct dry application to water discharging from site.
- For drainage areas ≥ 5 acres, must drain to sediment pond.
- Can be applied directly to wet soil but less sediment loss when applied to dry soil.
- DO NOT apply PAM on saturated soil or when raining.
- Granular PAM loses effectiveness in 3 months after exposure to sunlight and air.
- PAM combined with water very slippery.
- If soil of applied area remains undisturbed, reapplication may be required after 2 months.
- PAM may be reapplied on actively worked areas after a 48 hr period. Maximum number of 7 applications over a 30 day period.
- More applications may be required for steep slopes, silty and clayey soils, long grades, and high precipitation areas.
- If applied area covered with straw, reapplication may be unnecessary for several months.

EPA rules on storm water runoff control program regulations

Nov 1990 Phase I

- municipal storm sewer systems of over 100,000 people
- construction sites > 5 acres

Current Phase II

- municipal storm sewer systems of populations *under* 100,000 people located in urbanized areas:

Requires:

National Pollutant Discharge Elimination System (NPDES) permit

Examples of storm water controls needed:

- ▶ public education programs
- ▶ storm sewer inspections for illegal connections
- ▶ ordinances to control construction site runoff

(permit flexibility for storm sewer systems of < 10,000 people)

Controlling Impacts of Development:

Requires operators of construction sites disturbing 1 to 5 ac to obtain NPDES permit.

Construction sites:

- ◇ Sediment runoff rate 20 - 150 tons/ac-yr
- ◇ Single largest cause of impaired water quality in rivers
- ◇ Third largest cause of impaired water quality in lakes
- ◇ Phase II goal: 97 % of land disturbed by construction sites will be controlled under a storm water permit