

NDDOT Erosion & Sediment Control – Construction Course

Module 1: Introduction & Overview of Erosion & Sediment Control



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Partners



DEPARTMENT OF CONSTRUCTION
MANAGEMENT AND ENGINEERING



NDSU UPPER GREAT PLAINS
TRANSPORTATION INSTITUTE



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Housekeeping

- Agenda
- Breaks
- Restrooms
- Lunch
- Courtesies
- Course Materials



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Participant Expectations

Attendance:

Required

Written Exam:

Open Book

80% Pass

Remediation

Certification Requirements:

Project Engineer

Prime Contractor

Sub-contractor

4 years

Recertification:

TBD



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Participant Introductions

What is your name?

Where are you from?

What is your job?

Water Pollution

Water is the “Universal Solvent”

Human caused

Point Source vs. Nonpoint Source

Point Source Pollution from Construction

Removal of surface vegetation

Stripping and stockpiling topsoil

Placement of erodible soil on or near streets

Pumping water from excavations

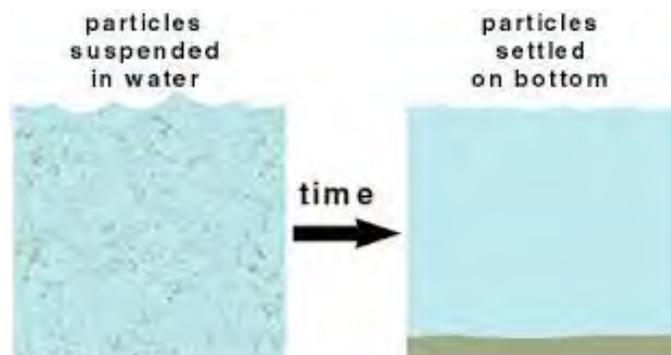
Vehicle tracking



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Sediment/Sedimentation

Particles suspended in construction runoff water that settle out and can be harmful to fish, wildlife, and aquatic species.



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Other Impacts:

Changes in water chemistry

Influx of poisonous chemicals

Growth of undesirable plants/algae

Flattening of streambed channels

Increased possibility of flooding

Erosion Mechanisms



Erosion Mechanisms



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Erosion Mechanisms

Two main types of soil erosion experienced on construction sites are:

- Water
- Wind

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Erosion Mechanisms

Levels of Water Erosions:

- Raindrop (splash)
- Interrill (sheet)
- Rill
- Gully
- Stream & channel bank

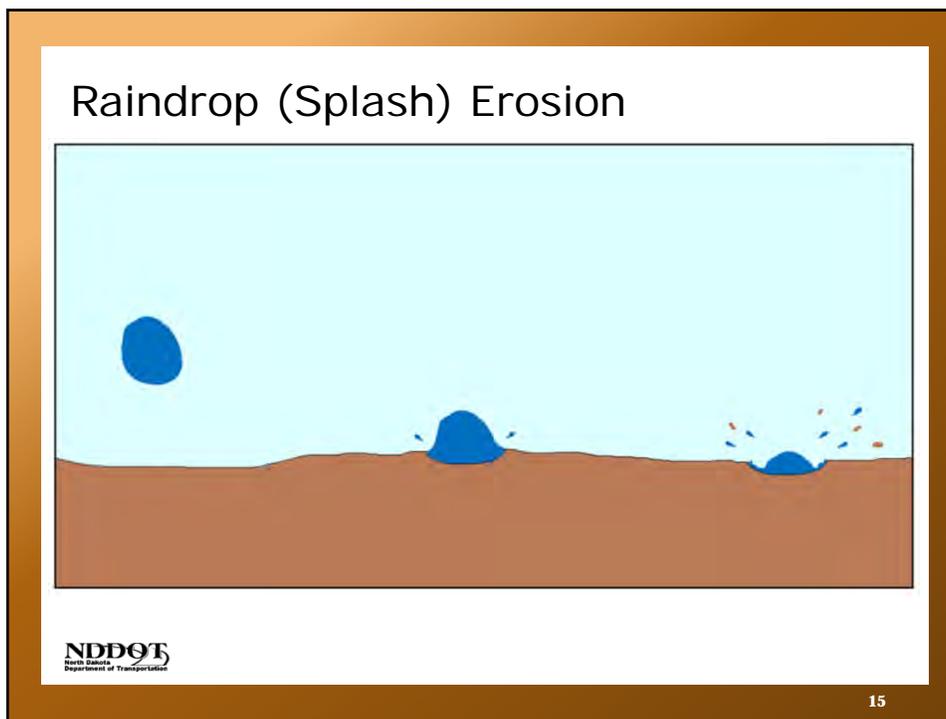


Erosion Mechanisms

Raindrop (Splash) Erosion:

A ¼" diameter raindrop can impact the ground at speeds up to 20 mph

Approximately **80%** of erosion problems on construction sites are a result of raindrop impacts



Erosion Mechanisms

Interill (Sheet) Erosion:

- Runoff over the site as a thin, uniform layer
- Approximately 1/16" to 1/8" deep
- Will typically pick up and transport soil particles dislodged by raindrop impacts

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Rill Erosion



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Erosion Mechanisms

Gully Erosion:

A larger channel caused by concentrated flow of surface and storm water over unprotected, erodible soil

Typically formed by multiple rills joining together

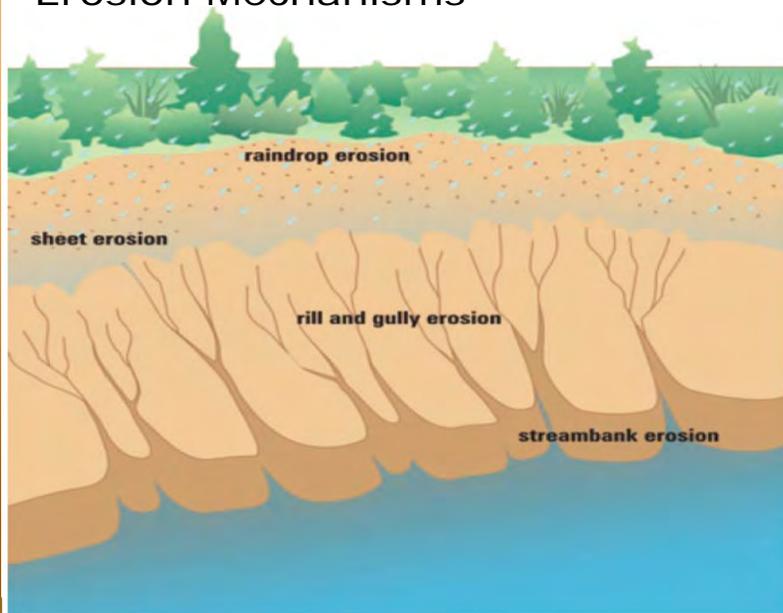
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Gully Erosion



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Erosion Mechanisms



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Sedimentation

The settling or deposition of eroded material after it has been transported

Bed Load:

Soil particles that are dragged or rolled along the bed of the channel

Saltation:

Soil particles are skipped or bounced along the bottom

Sedimentation

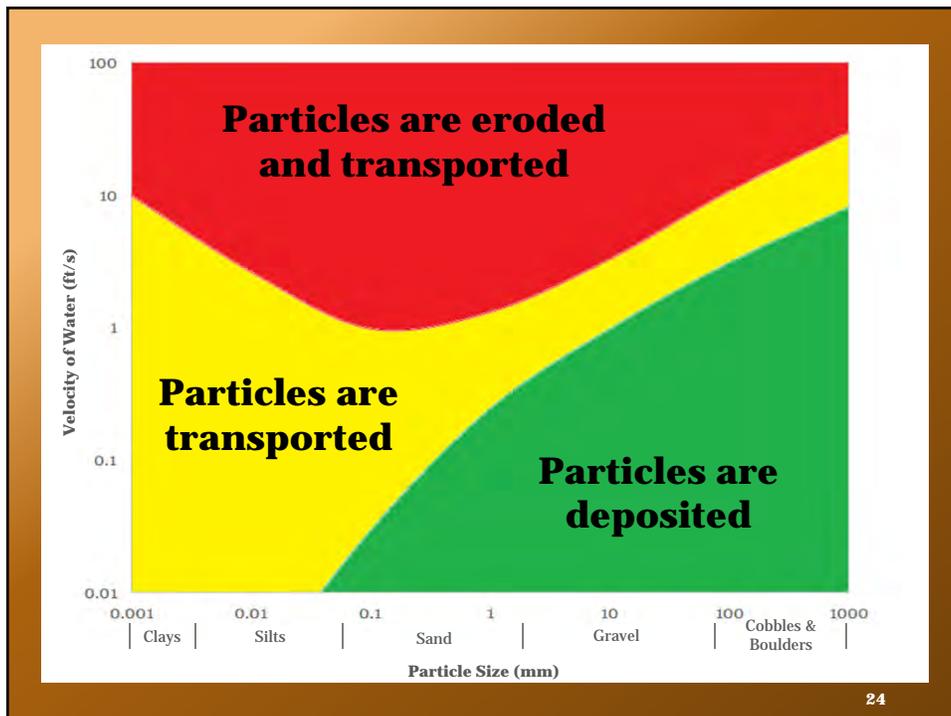
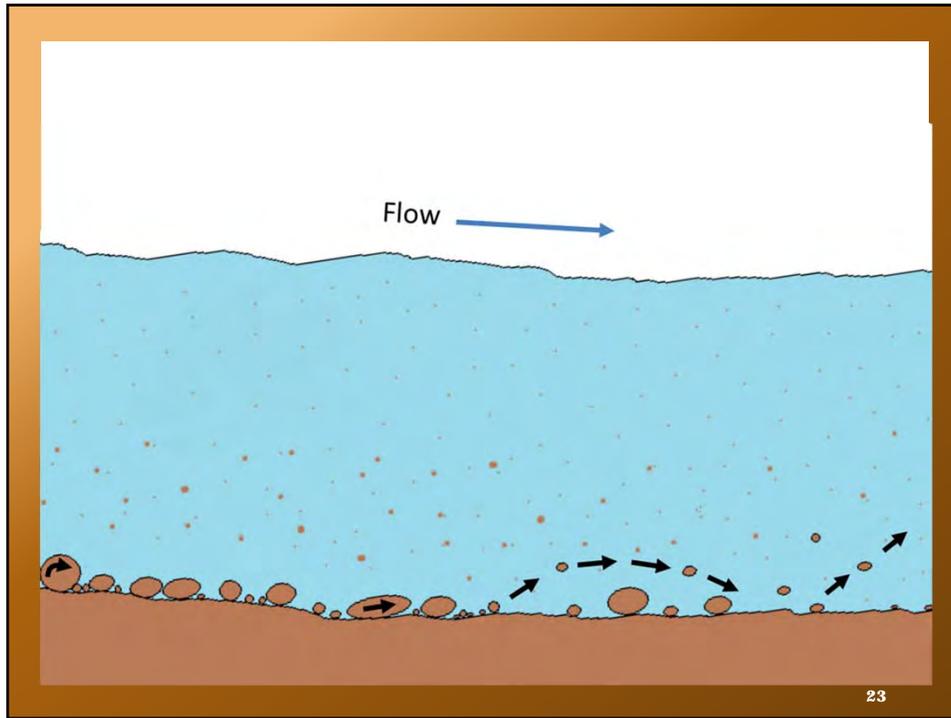
Suspension:

Particles are picked up by current and carried long distances

Fine and light soil particles (silts and clays)

Colloidal Suspension:

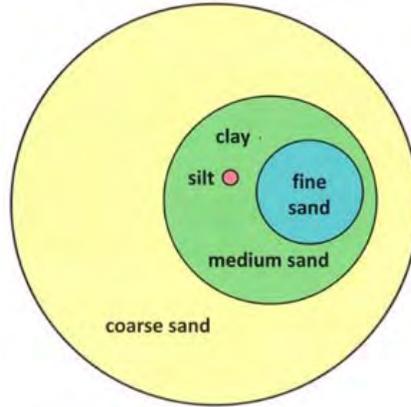
Includes fine colloidal soil particles that may never settle to the bed



Erosion Mechanisms (USDA and Colorado State Ext.)

Soil particles come in various shapes and sizes

Soil Size Classification	Soil Particle Diameter (mm) [in]
Coarse Sand	0.5-1 [0.020-0.039]
Medium Sand	0.25-0.5 [0.010-0.020]
Fine Sand	0.08-0.1 [0.001-0.004]
Silt	0.002-0.05 [7.87E-05-0.002]
Clay	<0.0001 [3.94E-06]



Soil Size Classification	Settling Velocity	Time to Settle 1 ft
Gravel	1.67 – 3.33 ft/sec	0.3 – 0.6 seconds
Sand	0.008 – 0.33 ft/sec	3 – 120 seconds
Silt	0.02 – 0.03 ft/min	30 – 60 minutes
Clay	0.005 – 0.010 ft/day	100 – 200 days
Colloids	0.02 – 1.6 ft/year	>200 days

Wind Erosion

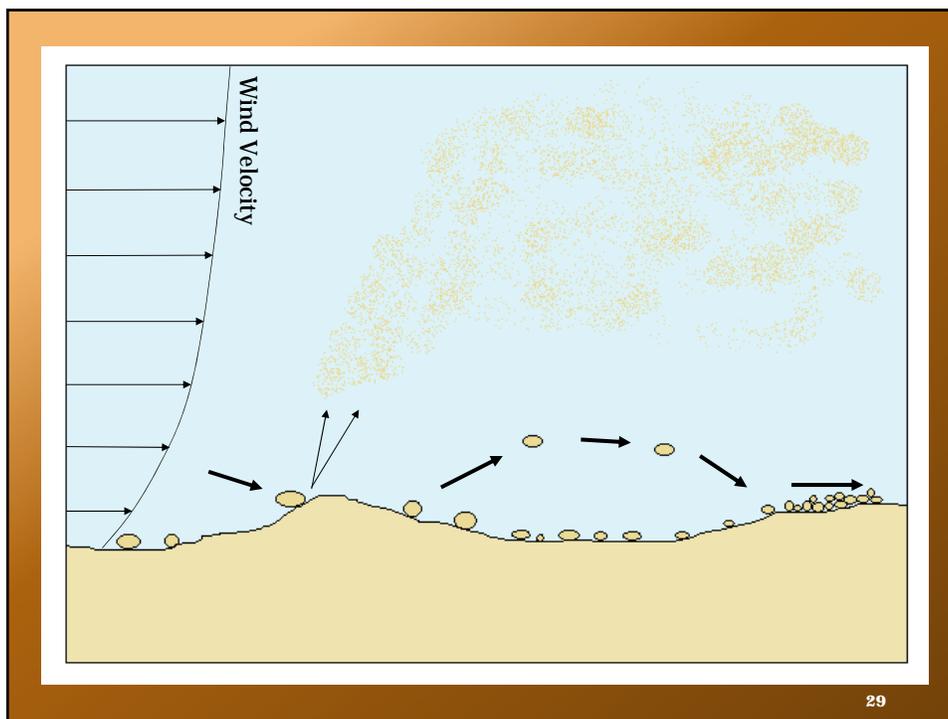
Wind erosion is similar to water erosion except the movement of air is responsible for the movement of the soil

Disturbing the soil with equipment and vehicles can cause soil particles to become dislodged and more easily transported by wind

Wind Erosion

Wind erosion is influenced by multiple factors:

- Wind velocity
- Surface roughness
- Surface cover
- Moisture level of the top layer of soil



Erosion Facts (USDA NRCS Soil Quality – Urban Technical Note No. 1 “Erosion and Sedimentation on Construction Sites”)

**Construction sites can erode at a rate of 100 to
500 tons/acre/year**

- 100 times greater than cropland
- 2,000 times greater than woodlands

Questions?