

# EROSION CONTROL RESEAECH AND TRAINING CENTER – AN OVERVIEW

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# Erosion Control Research and Training Center

- Established in 2010 to conduct research and education on erosion and sediment control
  - Training
  - Research



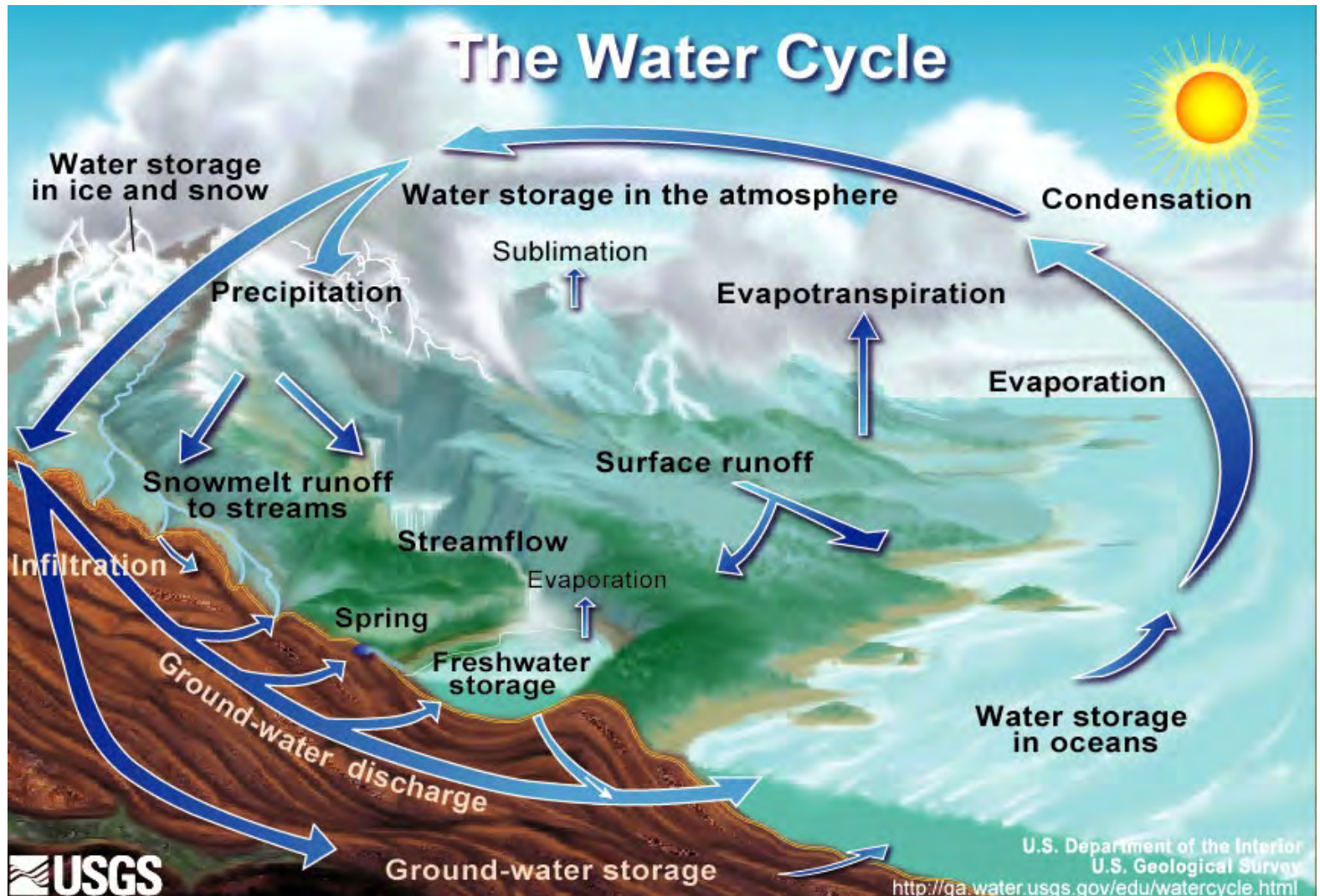


# Training Activities

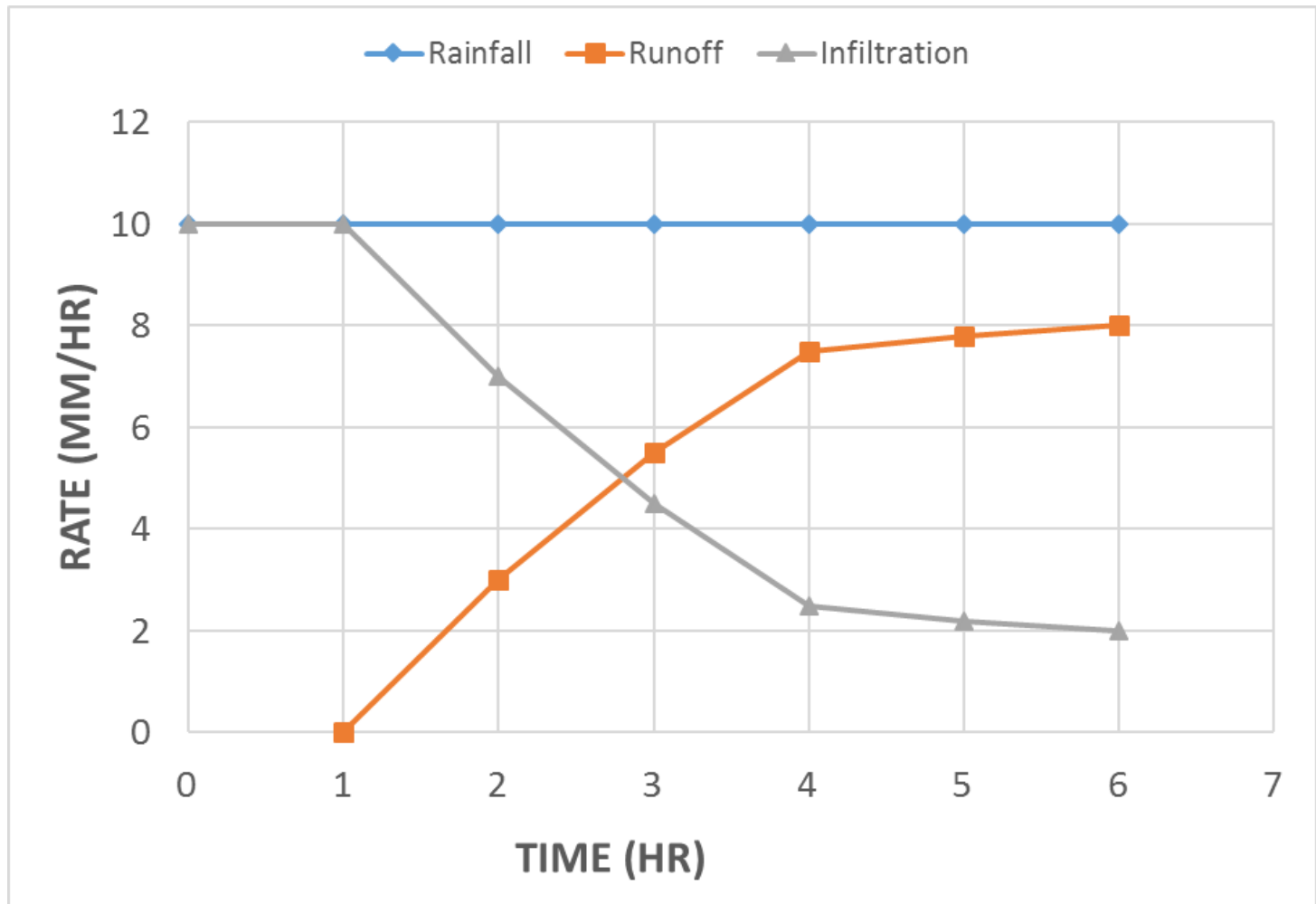
- Module I: Fundamentals of Storm Water Pollution and Erosion and Sediment Control
- Module II: Erosion and Sediment Control Planning and Design
- Module III: Inspection of Erosion and Sediment Control Best Management Practices (BMPS)



# Hydrologic Cycle



# Runoff and Infiltration





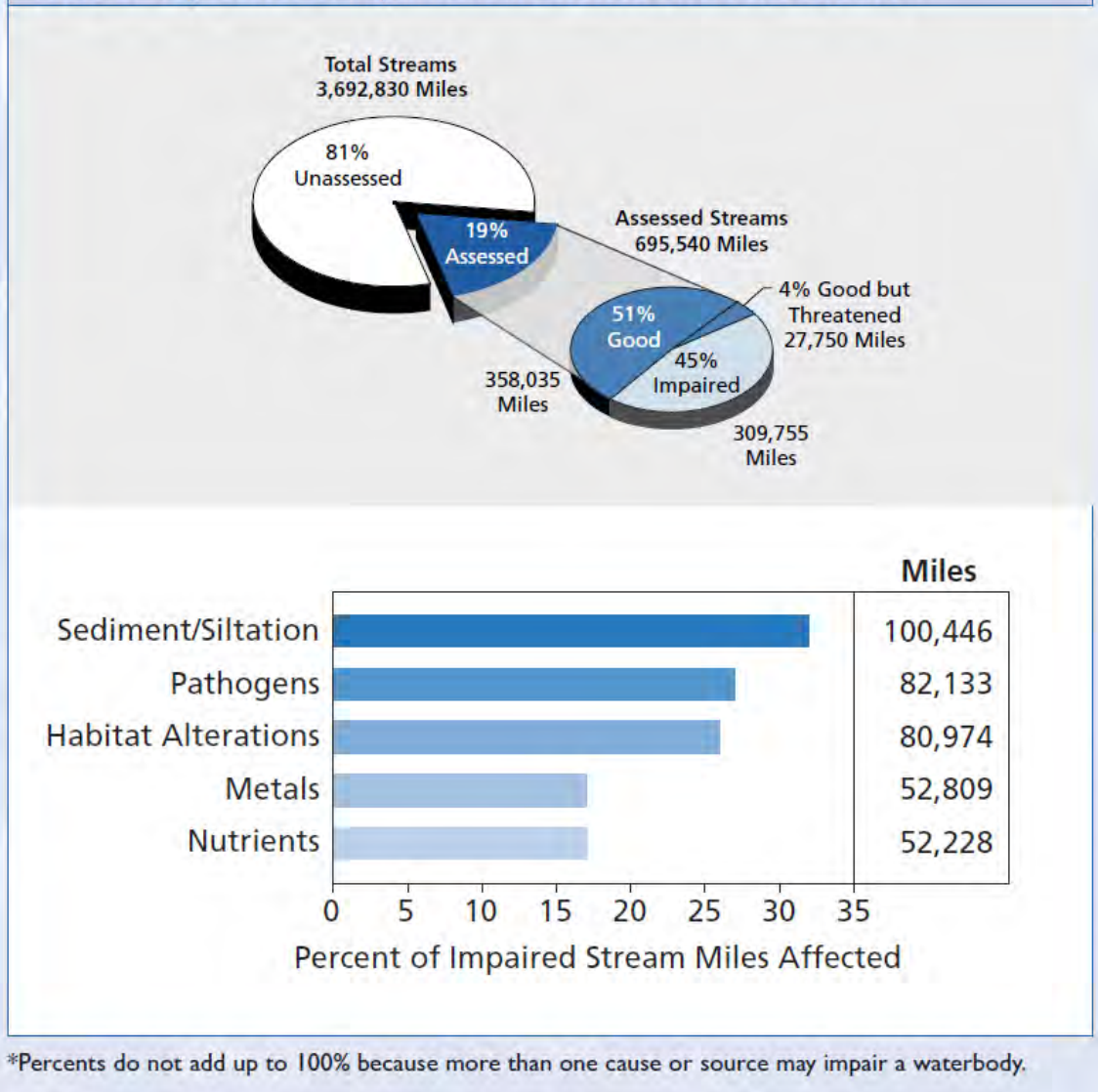
# Soil Erosion

- Breakdown, transport, and redistribution of soil particles by the forces of water or wind.
- Understanding and managing these processes has important long term implications.
- Land area globally affected:
  - *1094 million ha* by water erosion,  
*549 million ha* by wind erosion  
(Lal, 2003)
- Significant economic burden
  - US - 44 billion dollars/year (Pimentel et al., 1995).
  - EU - 38 billion euros/year  
(Montanarella, 2007)



<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/crops/erosion/>

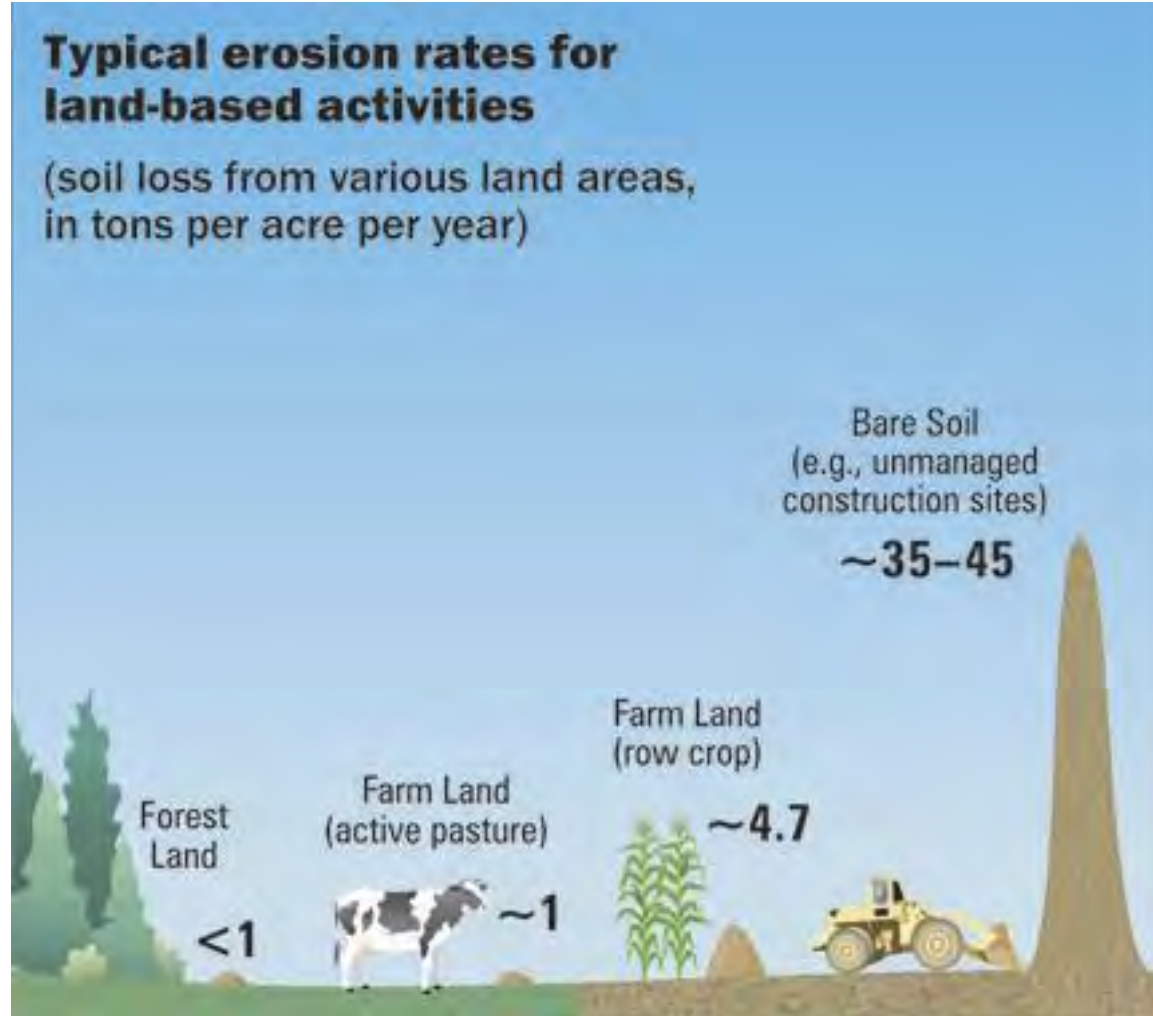
**Table 2. Top Causes of Impairment in Assessed Rivers and Streams\*.**



EPA (2007) National Water Quality Inventory

# Soil Erosion

# Soil Erosion



<http://www.epa.gov/owow/NPS/MMGI/Chapter4/ch4-3a.html>



# Consequences of Soil Erosion

## Loss of soil health

- Depletion of nutrients and organic matter
- Aggregate instability
- Reduced plant vigor and health

## Environmental degradation

### Water quality

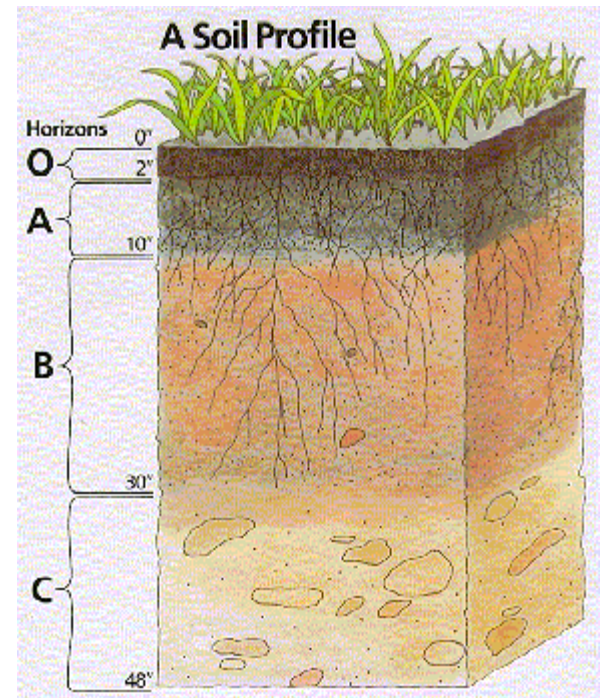
- Point and Non-point source pollution
- Impacts to plant and animal life
  - Aquatic & Terrestrial

### Air quality

- Point and Non-point source pollution
- Impacts to human health and safety

## Economic impact

Notice of Violation (NOV) \$\$\$\$\$\$\$\$\$\$



*It takes 100-600 years to form an inch of topsoil*

# Types of Soil Erosion

## Water erosion

- o Splash/raindrop erosion
- o Sheet erosion
- o Rill erosion
- o Gully erosion

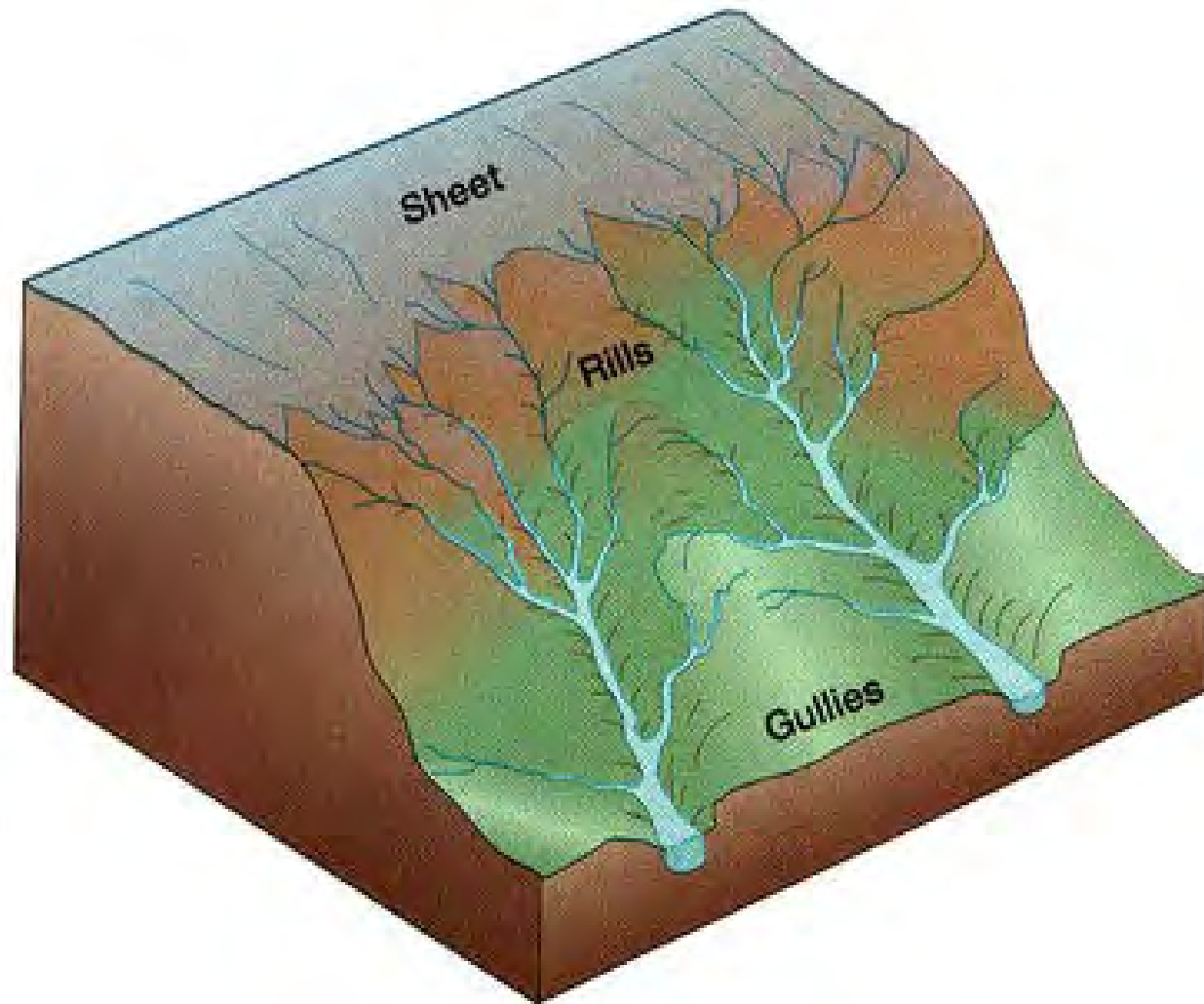


## Wind erosion

- o Suspension
- o Saltation
- o Creep



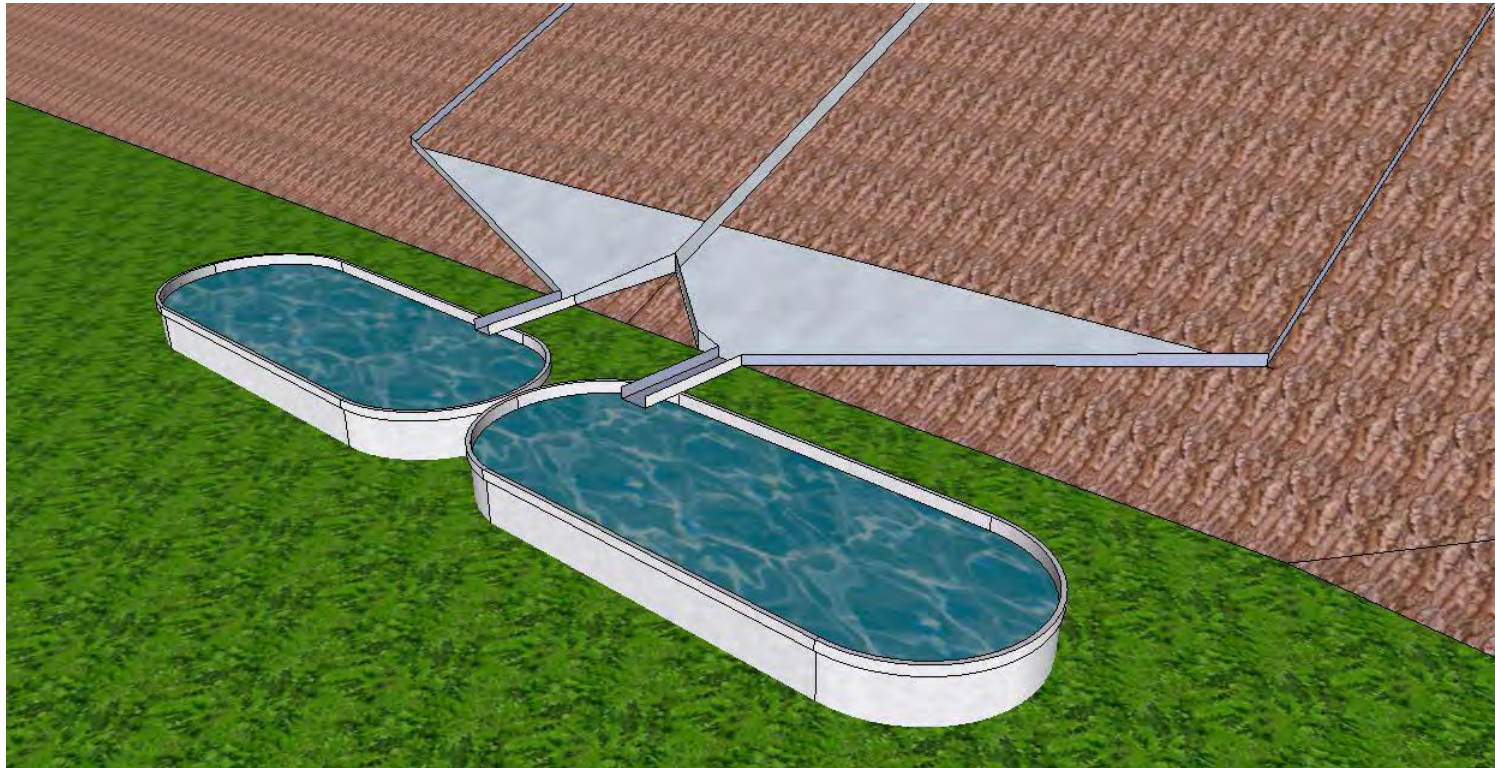
# Water Erosion





# Erosion and Sediment Estimation

## 1. Measure for the real world conditions



# Factors Affecting Soil Erosion

Rainfall – intensity and duration

Soil type (soil amendments)

Slope length

Steepness

Land cover – grass, mulch, etc.

Conservation practices

***What factors can the designers/contractors change for a construction site?***

# Research Activities

- Evaluation of various erosion and sediment control products for IDOT
  - Ditch checks
  - Inlet protection devices
  - Perimeter barrier products





# Vegetation Cover Evaluation

- Test vegetation establishment under 5 cover practices (one bare)



Hydroseed-Mulch



Hydroseed



Compost



Mulch

- Document growth of vegetation and erosion patterns
- Collect biomass samples of vegetation





2011-03-04

(Hydroseed-Mulch, Hydroseed, Compost, Mulch, Bare)





2011-05-12

(Hydroseed-Mulch, Hydroseed, Compost, Mulch, Bare)

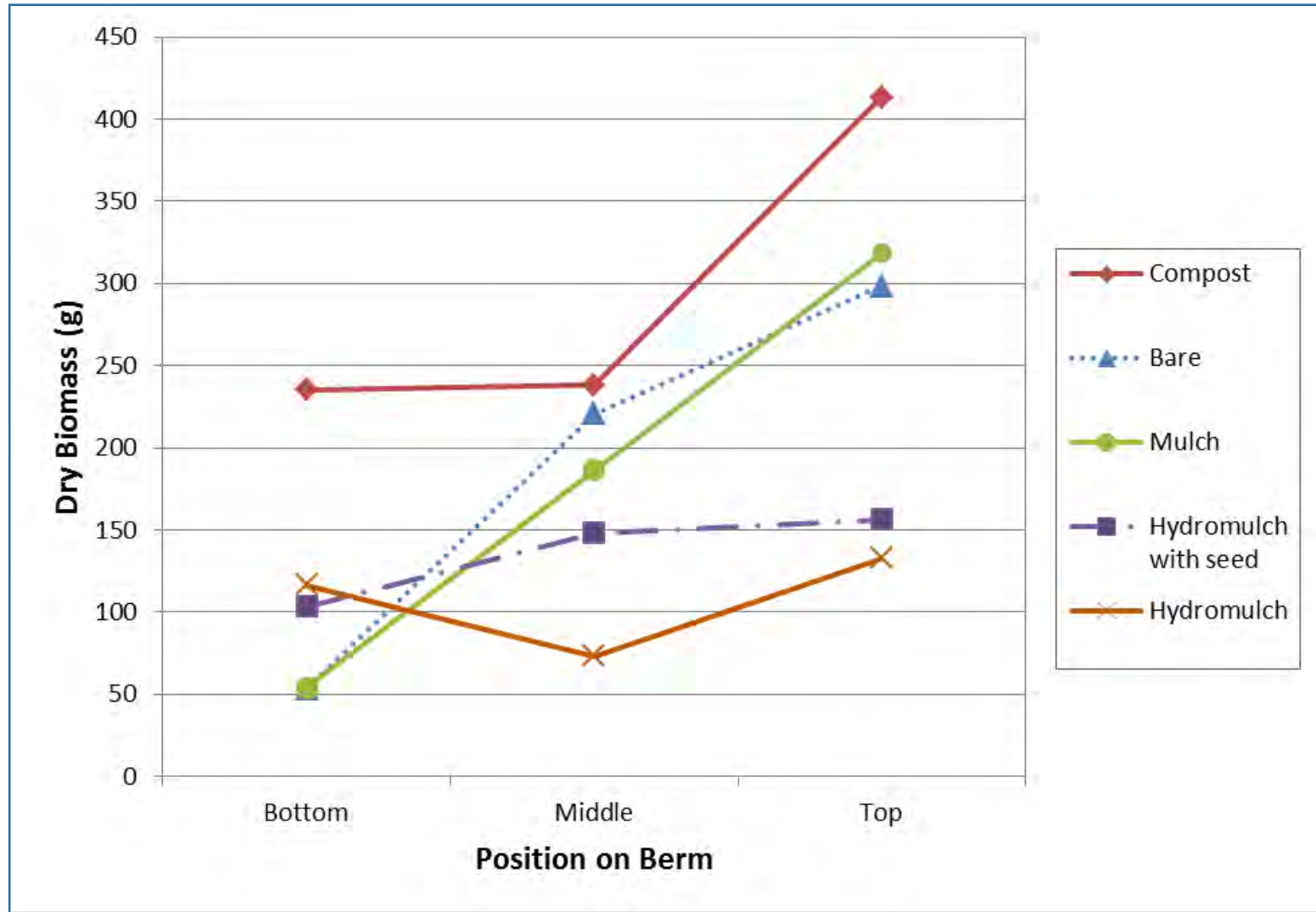




2011-05-31

(Hydroseed-Mulch, Hydroseed, Compost, Mulch, Bare)

# Vegetation Cover Evaluation





# Compost Covers for Rill Erosion Protection

- ❑ Four 3H:1V plots, 35' long by 8' wide
- ❑ Three cover materials and one control
  - ❑ Mushroom compost
  - ❑ Screened garden compost
  - ❑ Premium shredded hardwood mulch
  - ❑ Bare soil (control)





# Compost Covers for Rill Erosion Protection



Bare soil



# Compost Covers for Rill Erosion Protection



Screened garden compost



# Compost Covers for Rill Erosion Protection



Shredded hardwood mulch

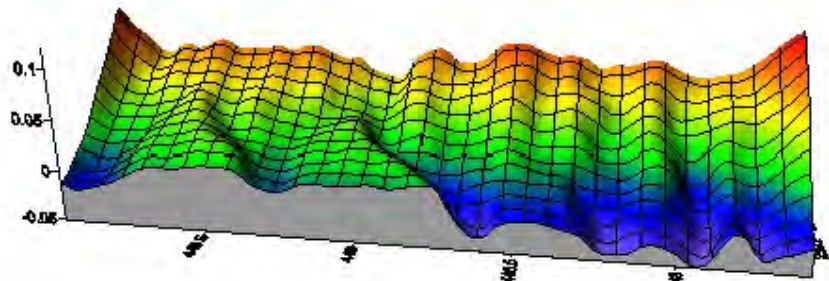


# Compost Covers for Rill Erosion Protection

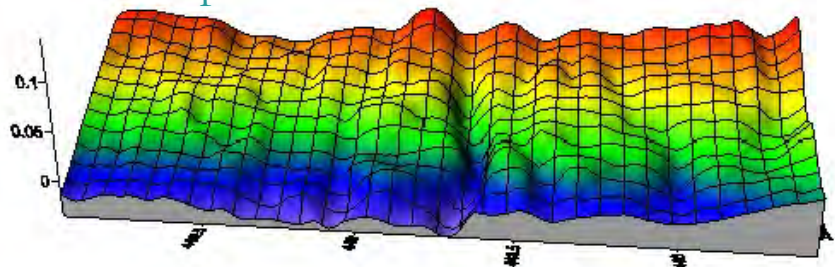


Mushroom compost

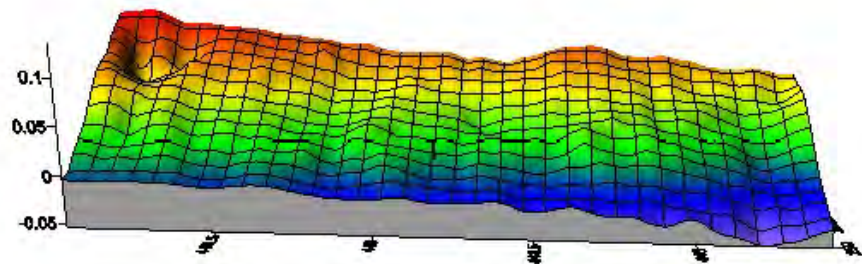




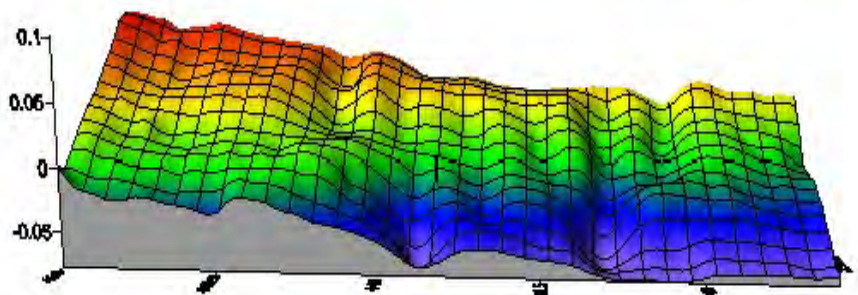
1. Bare plot



2. Garden compost



3. Mulch



4. Mushroom compost



1. Bare plot



2. Garden compost

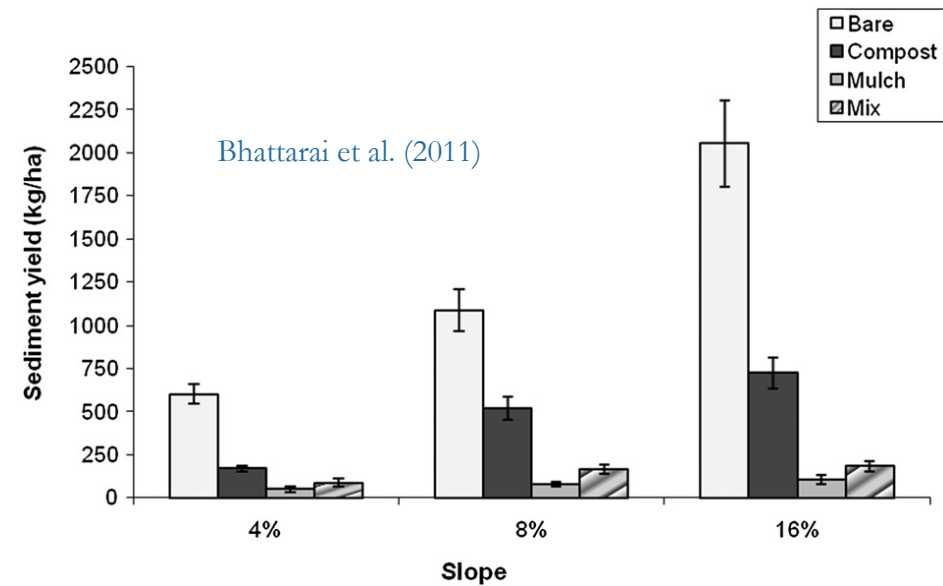
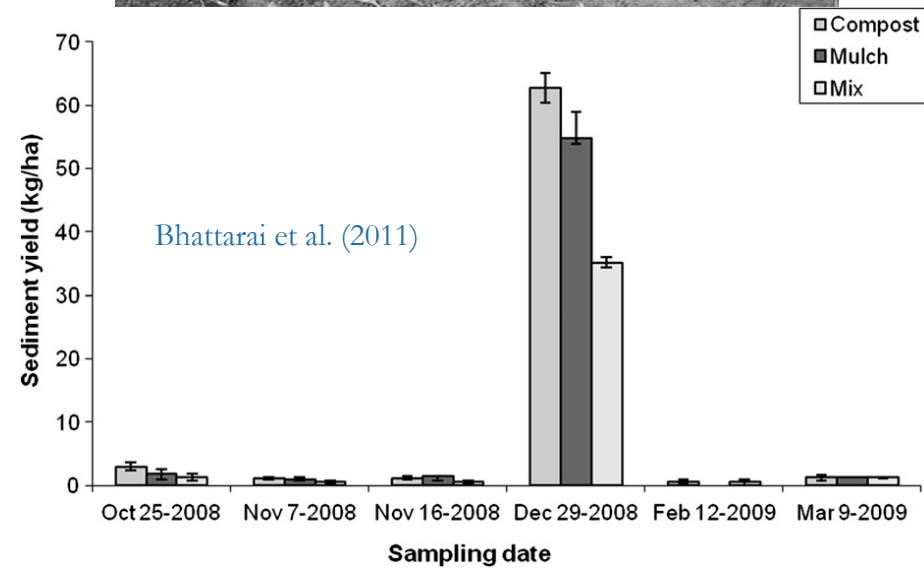


3. Mulch



4. Mushroom compost

# Compost Cover for Erosion Control





# Erosion Control Blanket Evaluation

- Test ECBs under 4 in/hr rainfall intensity for 30 minutes and compare to control condition (bare plot)
- Record runoff rates, sediment concentrations, and erosion patterns
- Determine overall soil loss



# Erosion Control Blanket Evaluation

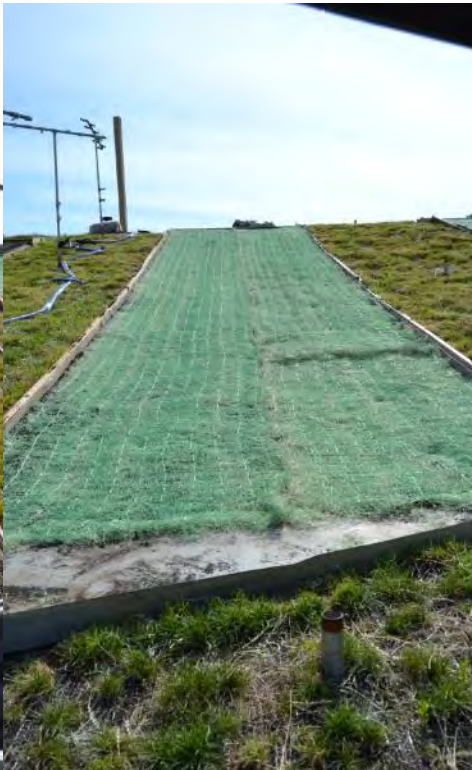




# Erosion Control Blanket Evaluation



Control plot



Curlex I



DS-75



SC-150

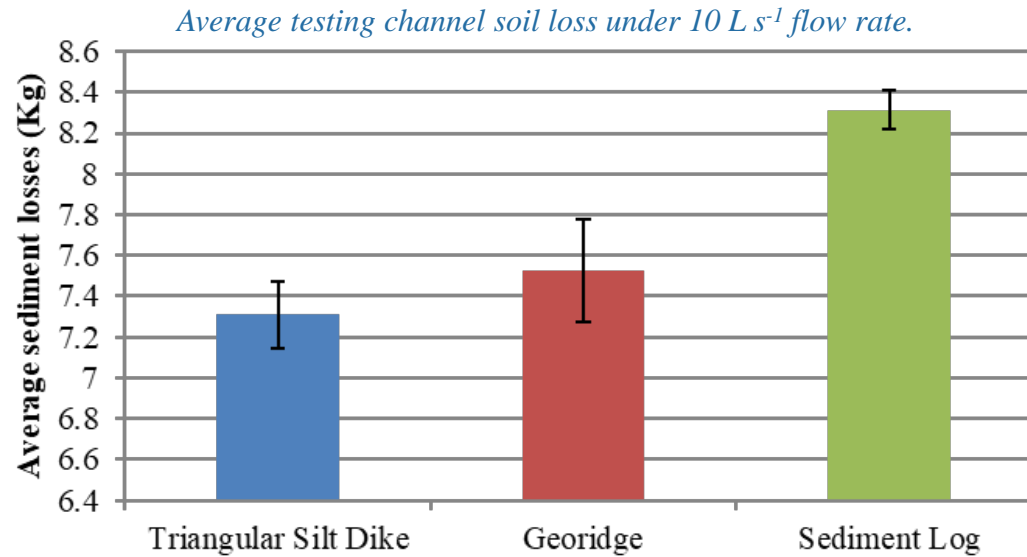
# Ditch Check Evaluation

- Test ditch checks under 3 flow conditions (5, 7.5, and 10 L/s)
- Record erosion patterns and sediment accumulation
- Collect the water samples for turbidity and sediment concentration measurement



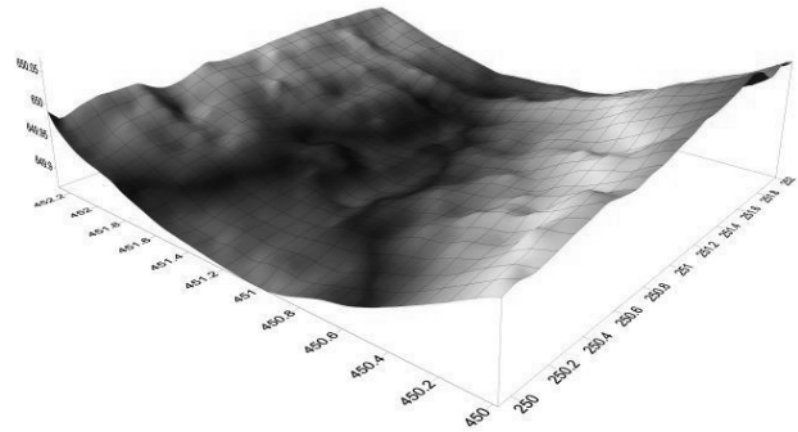


# Ditch Check Evaluation





# Ditch Check Evaluation



# Inlet Protection Product Evaluation

- Test inlet protection products under two flow conditions (5 and 10 L/s)
- Record channel disturbance and observe any performance issues/failures
- Collect water samples for turbidity and sediment concentration measurement



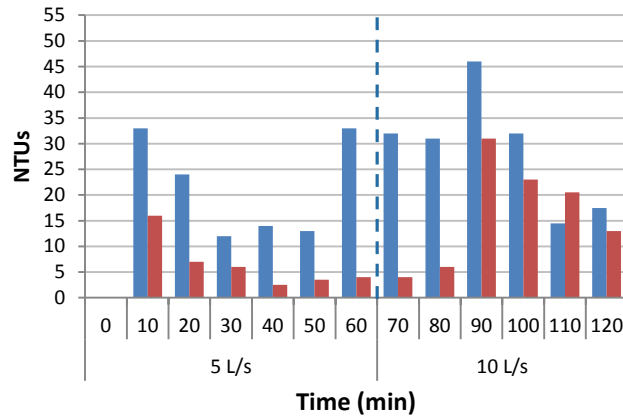
Silt Fence



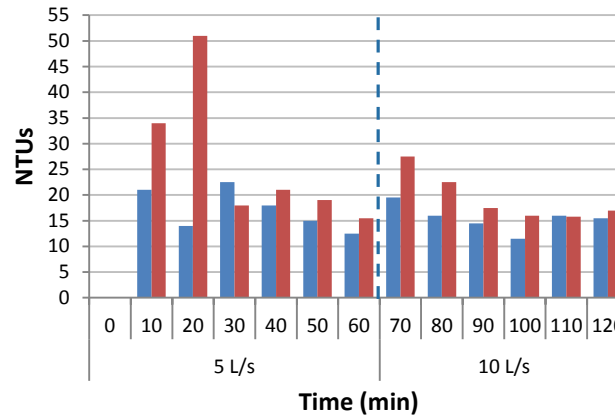
Welded wire with woven fabric

# Inlet Protection Product Evaluation

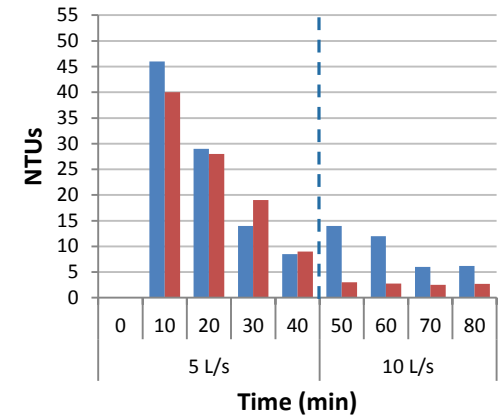
**Silt Fence**



**Welded Wire (Around Concrete)**



**Welded Wire (Around Grate)**



Bhattacharai et al. (2016)





# Sediment Control Product Evaluation

## ➤ Evaluation of curb and gutter inlet protection products



Frame & Grate



Dandy Curb Sack



Erosion Eel



SediGuard

## ➤ Evaluation of flared-end inlet protection products



# Evaluation of Perimeter Barrier Products

## ❑ woven monofilament geotextile



## ❑ compost log (Filtrexx Siltsoxx)



## ❑ ERTEC ProWattle (HDPE)





# Evaluation of Perimeter Barrier Products

## ❑ Siltworm (Dried Hardwood)



## ❑ Curlex Sediment Log (Aspen Excelsior)



## ❑ coconut coir log (Coir Fiber)



# Questions??

