

## Erosion and Sediment Control Fundamentals



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## Erosion and Sediment Control

- **Manage the following**

- Communication
- Work
- Water
- Erosion
- Sediment

.....in that order!

"Five Pillars" - Barry Fagan, PE; Alabama DOT

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## Communication

- **"The Best Management Practice"**

- External Communication
- Internal Communication
- Contractor Communication

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## Work

- **“Inspect what you expect.”**
  - Contractor still works for client.
  - Does contract adherence = compliance?
  - All responsibilities should be on the table.



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## Water

- **“clean water in, clean water out”**
  - Manage
    - Raindrop
    - Runoff
    - Run on
    - Flow - through
    - Dewatering



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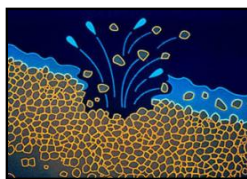
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## Erosion

- **Raindrop impact and shear forces from runoff must be minimized – cover it up and slow it down.**



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### Sediment

- Fast water carries more sediment than slow water. If you can't keep it, slow it down.



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### Exercise

- What are the five pillars of erosion and sediment control management and provide in the correct order of importance?

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### Operational BMPs

- Follow the SW/E&SC Plan
- Re-emphasize protection of critical areas
- Minimize amount and duration of exposure
- Inventory materials
- Implement concurrent with clearing and grubbing
- Implement in phases (clearing/grubbing and mass grading)
- Good housekeeping
- Maintain BMP measures

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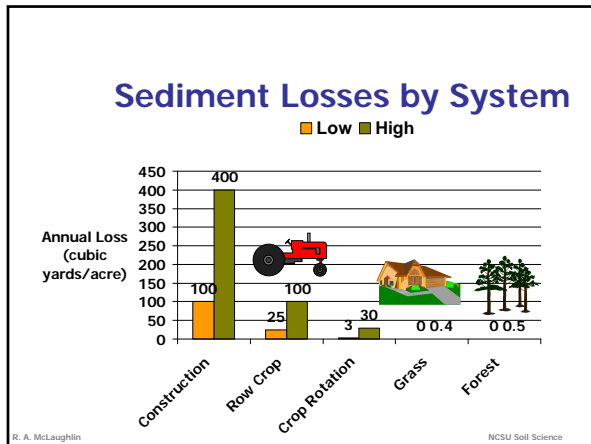
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### Erosion and Sedimentation Defined

- **Erosion** is the wearing away of soil caused by the action of water, wind, ice, gravity or other geological agents.
- **Sedimentation** is the deposition of that eroded soil

\*Source: NCDENR Erosion and Sediment Control Planning and Design Manual

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### Soil Erosion: Two Phases

- **Detachment:** individual particles are loosened from the soil mass.
  - Rainsplash > running water > wind
- **Transport:** water or wind carries the detached particles downslope or downwind.

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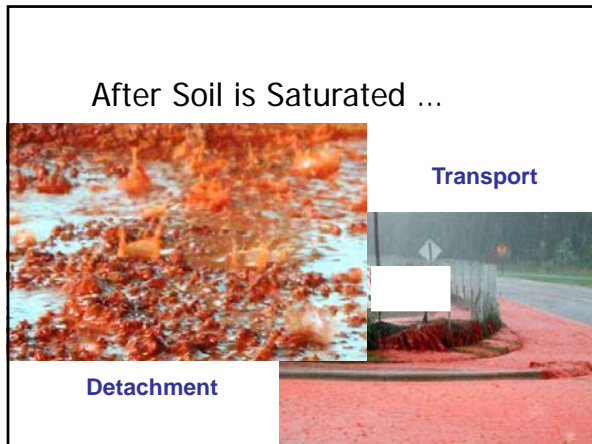
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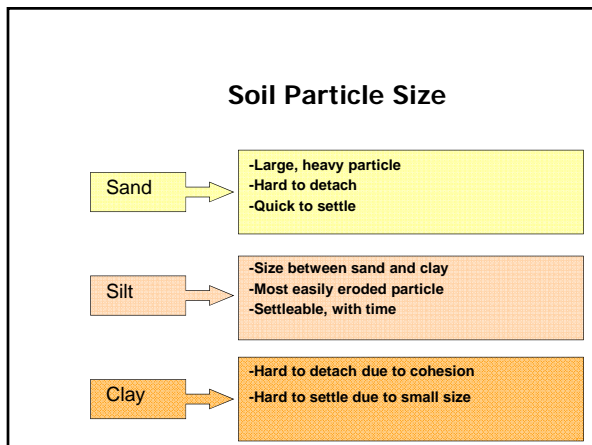
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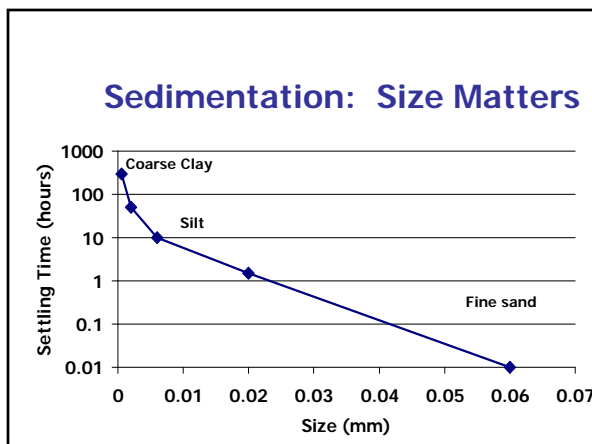
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## Turbidity

- Turbidity is the measure of relative water clarity
- Measured in NTU's – Nephelometric Turbidity Units



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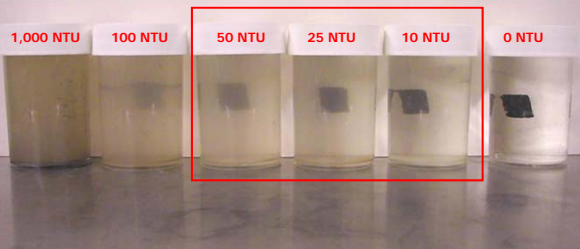
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- 50 NTU\* for regular streams
- 25 NTU for lakes and reservoirs
- 10 NTU for trout waters



\*NTU = Nephelometric Turbidity Unit

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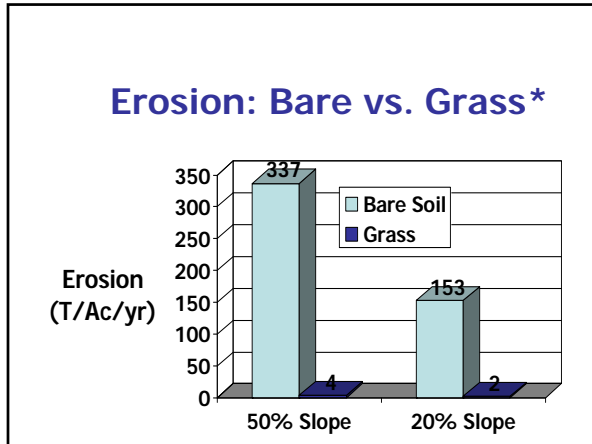
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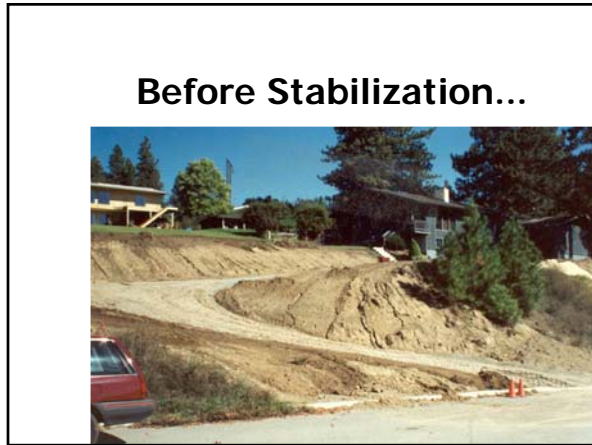
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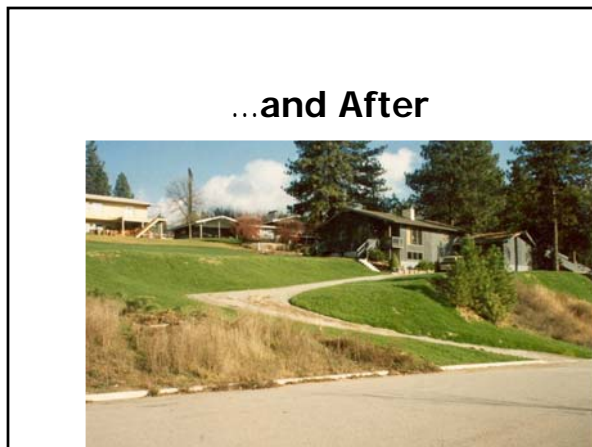
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### Review Questions

- In general, erosion (increases/decreases) with increasing rainfall and (increases/decreases) with increasing vegetative cover.
- List general soil types (clays, silts, sands, gravel) in order from most erodible to least erodible.

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### Construction Site Focus Areas

- Gravel Construction Entrance
- Silt Fence on perimeter
- Managing site runoff
- Protect I/O of pipes/culverts
- Constructing stable slopes
- Quick Groundcover
- Highest protection near streams
- Keep mud on your property

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### Gravel Construction Pads



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### Review Questions

- What is the primary purpose of a gravel construction entrance?
- Your construction entrance has to be sweetened daily due to unstable base material. A cost effective solution is...?

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### Summary

- **Install at beginning of job**
- **Maintain for effectiveness**

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### Perimeter Protection



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### Review Questions

- Good erosion control results in good sediment control. T/F and why?
- Good sediment control results in good erosion control. T/F and why?
- Silt fences are very effective sediment control practice when used in concentrated flows such as ditch lines or culvert inlet? T/F and why?

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Summary

- **Perimeter protection**
- **Avoid concentrated flow**
- **Maintain after rainfall**

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**Managing Runoff**



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### Review Questions

- Bale barriers are an effective method for sediment control? Why?
- Implementing erosion control methods while road construction activities are occurring is not cost effective. T/F and why?

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### Summary

- **Plan for sediment control at discharges**
- **Use velocity control**
- **Stabilize quickly w/correct erosion control materials**

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**Protecting Pipe Culverts  
and Swales**



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### Review Questions

- What are some other stabilization materials that can substitute just as effectively and could be more economical in drainage swales/ditches instead of rip rap?
- My ditch is just a little too steep to be stabilized with seeding and mulching alone; what my next best selection?

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### Summary

- **Stabilize pipe inlets and outlets**
- **Perform as soon as pipe is installed**
- **Hard armor for swales w/steep gradients**

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### Constructing Stable Slopes



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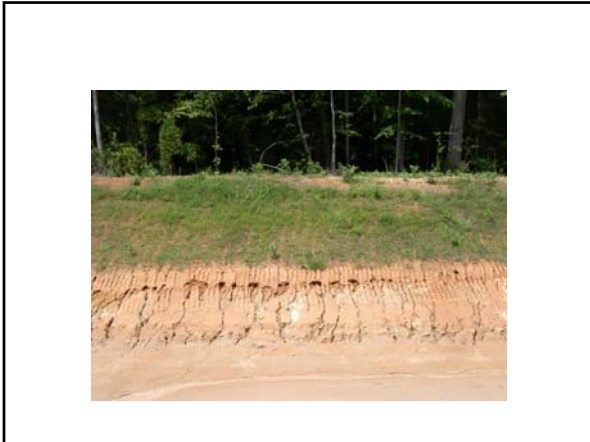
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**Review Questions**

- What two topographic factors have the greatest impact on the magnitude of erosion?
  
- What are some of the factors that contribute to roadway fill sloughing?

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Summary

- **Compaction in lifts**
- **Construct at angle that can be stabilized w/matting and vegetation**
- **Stabilize in stages**

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Timely Groundcover



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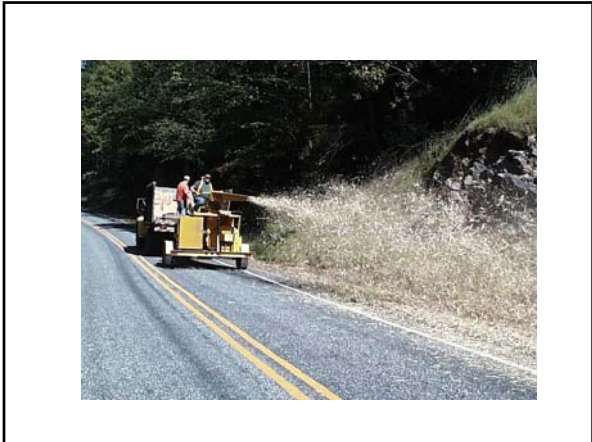
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**Review Questions**

- What BMP can reduce erosion up to 90-95% on disturbed sites?
  
- I have a one-half mile haul road through rolling topography; what is a simple construction method to minimize sediment loss?

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**Review Questions**

- What BMP can reduce erosion up to 90-95% on disturbed sites?
  - Groundcover
  
- I have a one-half mile haul road through rolling topography; what is a simple construction method to minimize sediment loss?
  - Construct and stabilize in phases

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### Summary

- As soon as grading completed or after any phase of idle activity
- Good site prep and seed bed prep
- Attention to detail on seeding/hydroseeding

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### Stream Buffers



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### Summary

- **Observe buffers and setbacks**
- **Provide highest level of protection**
- **Monitor these high risk areas for needed maintenance**

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### Access Roads



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**Review Questions**

- Most construction site erosion will result from r\_\_\_\_\_ and r\_\_\_\_\_?
  
- Erosion is the displacement of soil particles by the actions of w\_\_\_\_\_ and w\_\_\_\_\_?

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### Review Questions

- What BMP can reduce erosion up to 90-95% on construction projects?
- I have a one-half mile haul road through rolling topography; what is a simple construction method to minimize sediment loss?

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### Summary

- **Get to know the property**
- **Planning critical**
- **Follow design guidelines**
- **Construct and stabilize**

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### Finished Product



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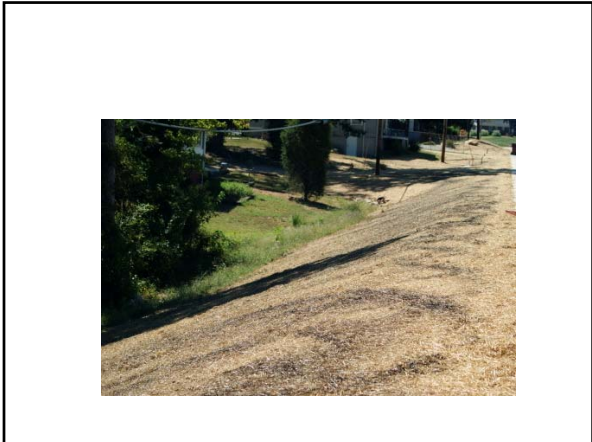
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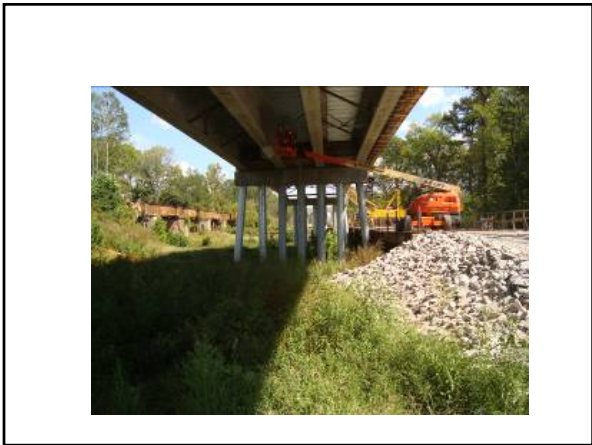
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**Review Questions**

- This addition to sediment impoundment measures greatly improves trapping efficiency?
  
- My project is being built near and drains to several high quality streams. What BMP or treatment can I use to minimize water quality impacts from my stormwater runoff ?

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**Erosion and Sediment Control  
BMP Summary Questions**

- **BMPs for controlling surface water runoff**
- **BMPs for outlet/discharge points**
- **BMPs for controlling velocity in ditch lines**
- **BMPs for use at stream crossings**
- **BMPs for tie ins at public roads**

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**Erosion and Sediment Control  
BMP Summary Questions**

- **BMPs for controlling surface water runoff**
  - berms, diversions, slope drains, level spreaders
- **BMPs for outlet/discharge points**
  - Pits, basins, wattles, rock dams
- **BMPs for controlling velocity in ditch lines**
  - Wattles, rock check dams, ditch blocks
- **BMPs for use at stream crossings**
  - Silt fence, rip rap aprons
- **BMPs for tie ins at public roads**
  - Construction entrance pads

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**Summary**

- **Follow the plans and permits**
- **Ask questions if needed**
- **Be proactive!**

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**Questions?**



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