

Where the Water Goes – Day 2

Hydrology for Inspectors

6 Contact Hours – Both sessions are required



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Your Instructors

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Agenda – Day 2

8:30 – 9:15	Module 4 - Hydrology and Land Disturbance
9:15 – 10:00	Module 5 - Water and Slopes
10:00 – 10:15	Break
10:15 – 11:00	Module 6 - Water and Our ESC (Construction - C-BMPs) and Stormwater (Post-Construction - P-BMPs)
11:00 – 12:00	Module 7 - Inspection issues



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WTWG – Hydrology



What is Hydrology?

The study of the distribution and movement of water both on and below the Earth's surface, as well as the impact of human activity on water availability and conditions.

National Geographic



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WTWG - Hydrology

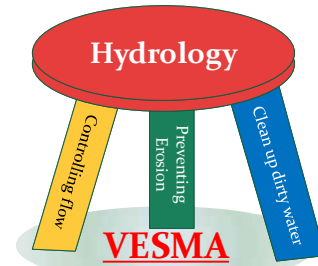
Hydrology for Inspectors

In ESC and Stormwater, the movement of water in relation to a construction site and construction activity.



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Our Three- Legged Stool of Hydrology



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Module 4

Hydrology and Land Disturbance



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Hydrologic Changes and Land Disturbance



Local



Regional



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Hydrologic Changes and Land Disturbance



Pre



During

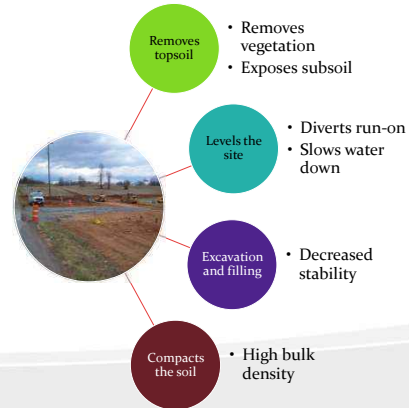


Post



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Construction and the Hydrologic Consequences



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Removing Vegetation & Topsoil

- Exposes the top/sub soil to raindrop impact
- Exposes the soil to rill erosion
- (Don't forget wind erosion!)



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Removing Vegetation & Topsoil Countermeasures:

Perimeter Controls

- Silt fences (Silt fence, straw bales, wattles)
- Temporary diversions
- Diversions
- Sediment traps and basins

Temporary Stabilization

- Mulch/mats – Stabilization, not vegetation
- When disturbed for only 1 growing season use annuals - Annual Ryegrass or Millet.
- When not disturbed for multiple growing seasons consider permanent vegetation – perennials.



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Don't forget

- Construction sequence!
- Staging of projects
- Phasing of (larger) projects



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Level the Site



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Unexpected Run-on



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Level the Site Countermeasures:

- Check and enforce the grading plan
- Perimeter controls
- Stabilization
- Inspection
- Maintenance



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Excavation and filling

- Fill is inherently unstable
- Slope failure
- Excavated area = subsoil = highly erodible



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Excavation and filling



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Remember:



Silt fence on
top of a cut
& fill slope
does not
work!



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Excavation and filling Countermeasures:

During construction

- Temporary Fill Diversions
- Temporary Diversion
- Temporary Slope Drains



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Excavation and filling

Countermeasures:

- Slope stabilization:

- Tracking
- Blankets
- Seeding/mulch
- Terracing

- Retaining walls



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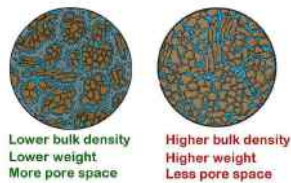
Soil Compaction

Increase in Bulk Density

- Decrease in infiltration
- Decrease in pore space
- Decrease in percolation



Soils Class



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Soil Compaction

Increase in Bulk Density

- Increased runoff
- Root penetration problems/plant establishment
- Increased raindrop impact
- Increased rill erosion/gully erosion



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Soil Compaction

Increase in Bulk Density

Bulk density is an indicator of soil compaction. It is calculated as the dry weight of soil divided by its volume. This volume includes the volume of soil particles and the volume of pores among soil particles. Bulk density is typically expressed in g/cm³.

USDA Natural Resources Conservation Service



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Soil Compaction Countermeasures:

Protect areas used for SW infiltration BMPs

- Construction sequence
- Rip/plow/till
- Use topsoil
- Organic matter



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Inspectors

Best Plans

- May still fail
- When not followed
- When the site is not graded correctly
- Fill soils not compacted
- MS-1 is not complied with
- Most ESC measures are designed for 1 year/24-hour storms

Plan Reviewers are not Perfect

- You may need to do additional plan review while inspecting
- Make changes in the field (red line or go back through plan review)
- Be flexible and realize that water will find a way down to a lowest point and erode!



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ESC Plans can be Changed!

§ 62.1-44.15:55.


C. The VESCP authority may require changes to an approved plan in the following cases:

1. Where inspection has revealed that the plan is inadequate to satisfy applicable regulations




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Hydrologic Changes and Land Disturbance



Local




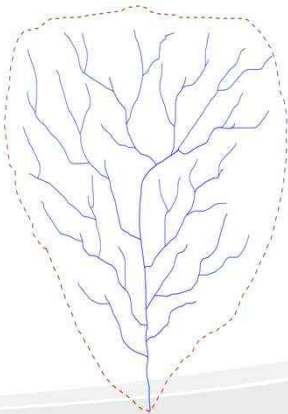
Regional



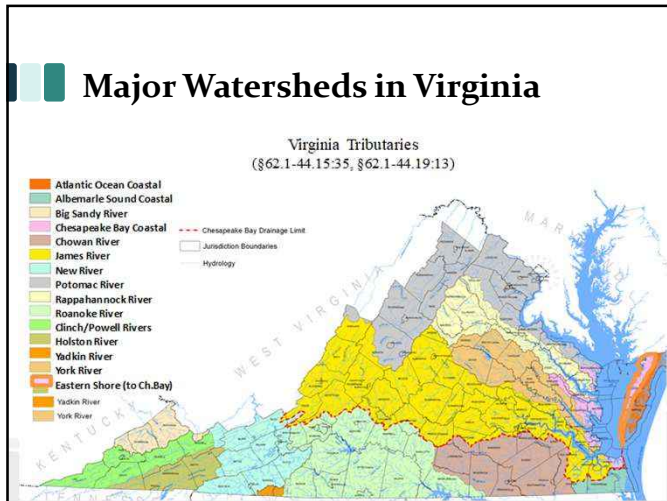
DEQ
VIRGINIA DEPARTMENT OF
ENVIRONMENTAL QUALITY

Watershed

A.K.A.: A **drainage basin** or **catchment basin** is an extent or an area of land where all surface water from rain, melting snow, or ice converges to a single point at a lower elevation, usually the exit of the basin, (or where the waters join another body of water, such as a river, lake, reservoir, estuary, wetland, sea, or ocean).

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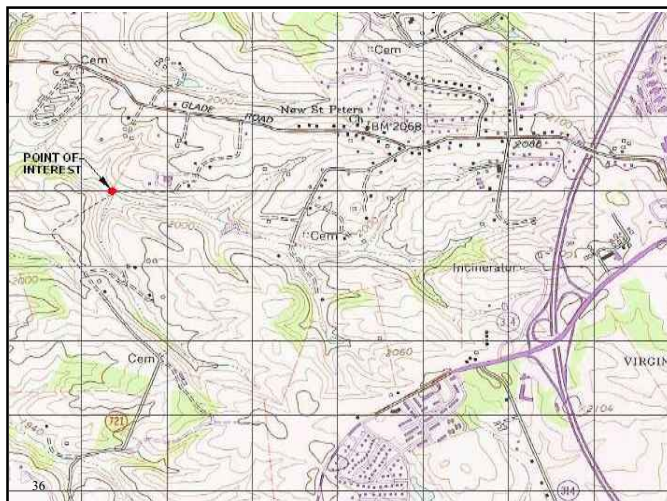
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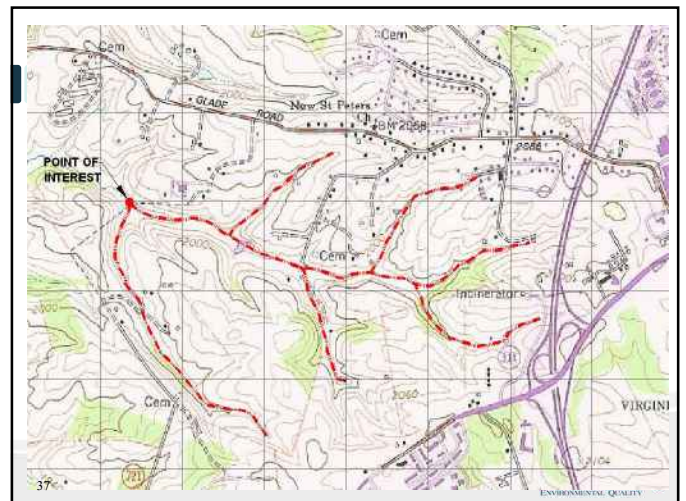
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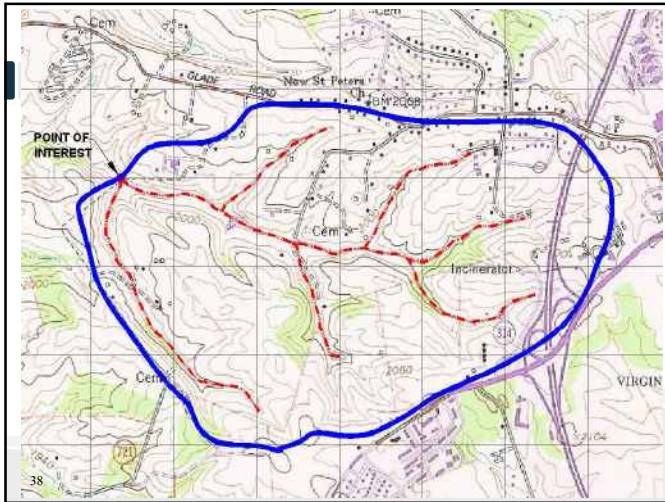
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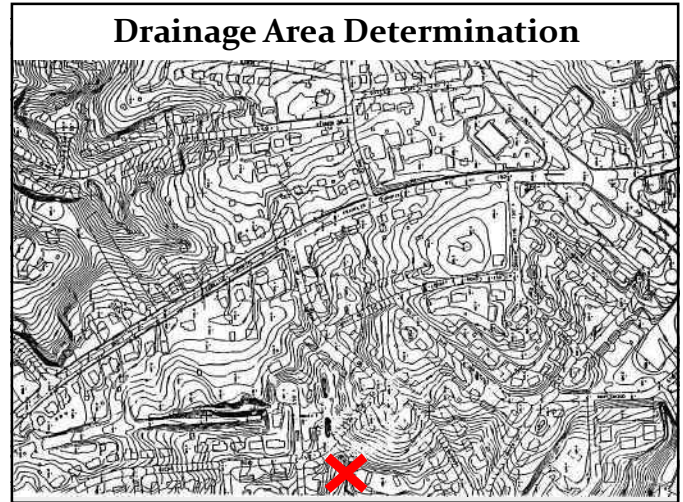
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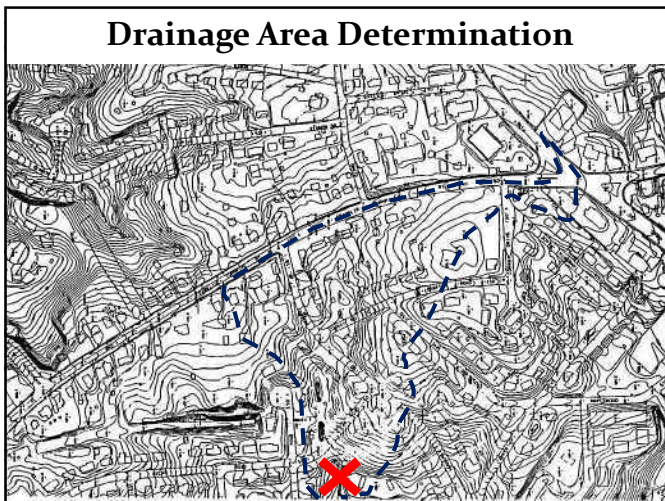
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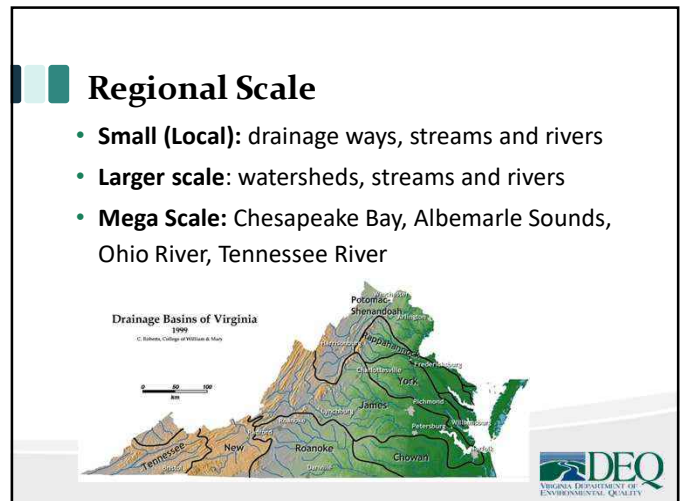
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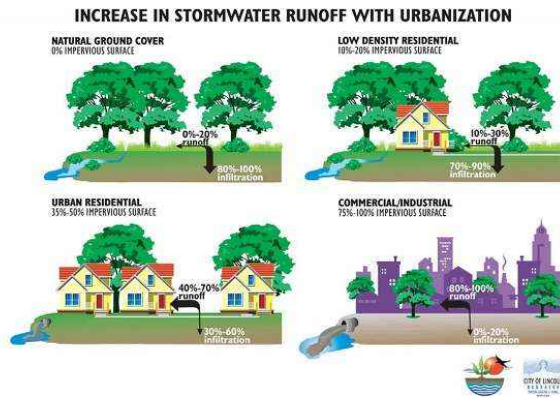


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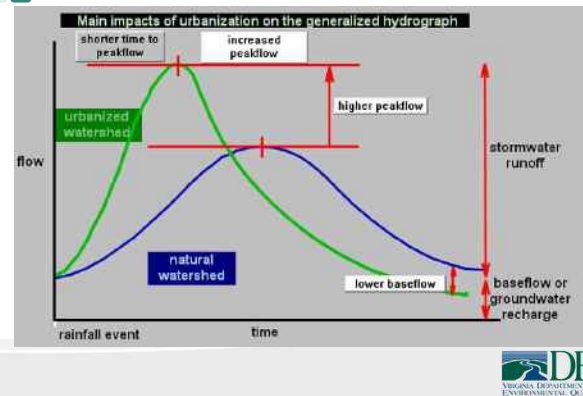
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Collective Impact on Hydrologic Cycle



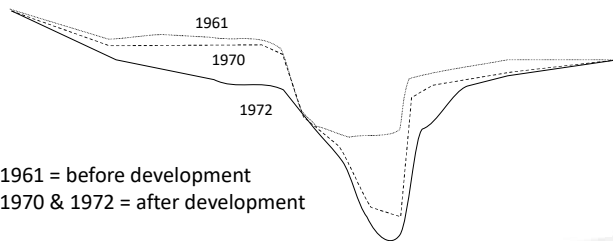
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Stream Flow Changes



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Stream channel changes as a result of increased imperviousness



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Example: Negative Effects of Water from Roads in Tigray, Ethiopia



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Sediment in Stream



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Algae Bloom on the Bay



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