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Erosion and Sediment Control Basic Course



Module 6

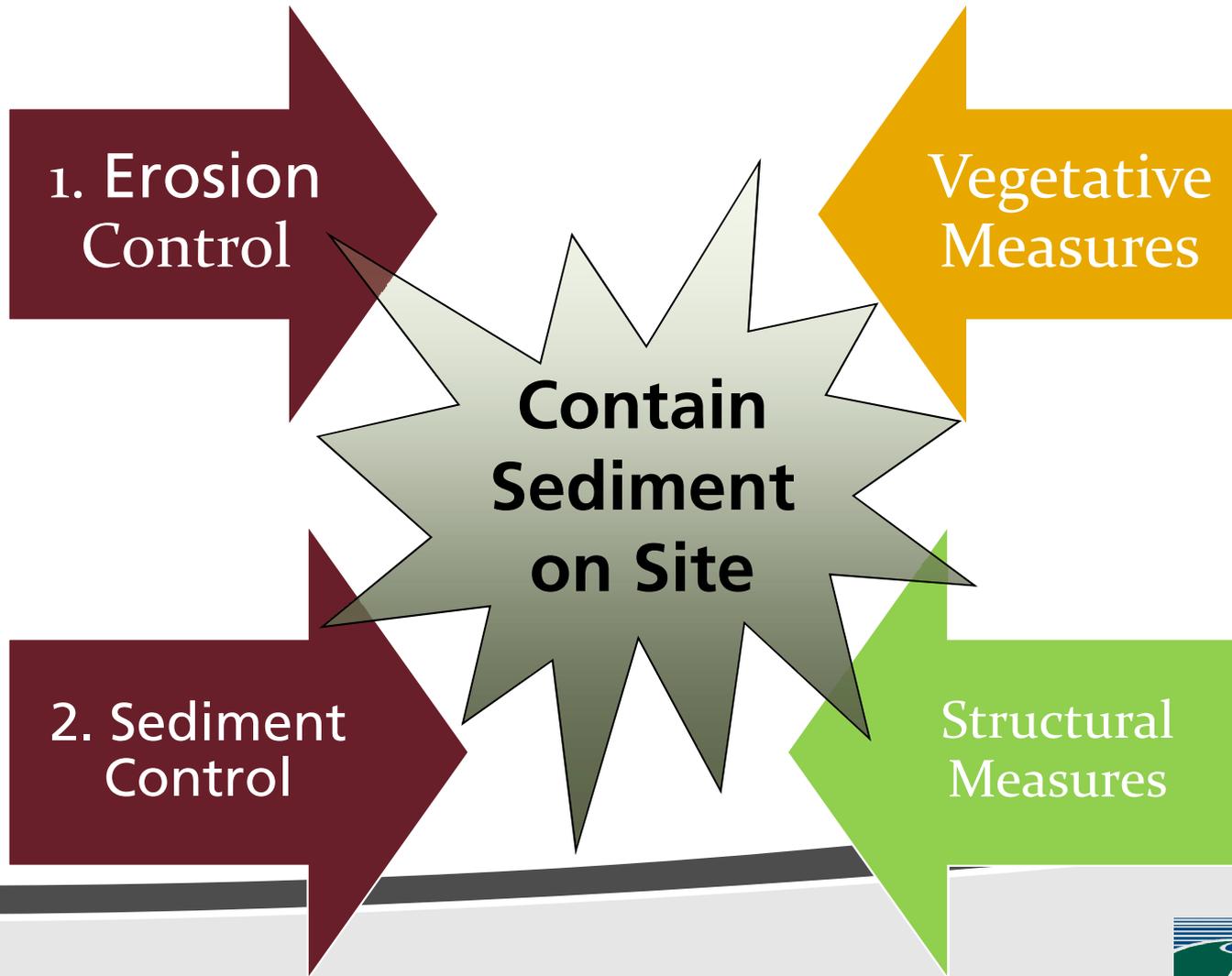
The Erosion & Sediment Control Planning Process



6a.

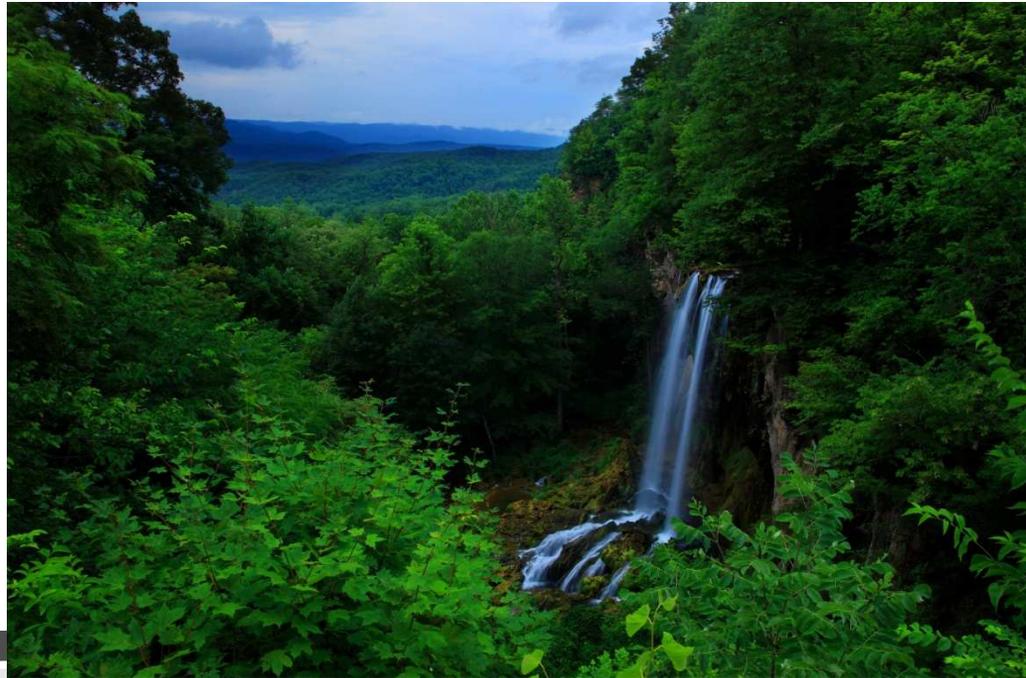
Introduction

Principles of Erosion & Sediment Control



Principles of Erosion & Sediment Control

*"Although there is vegetation on the site, it is still eroding..."
the potential for erosion..."*



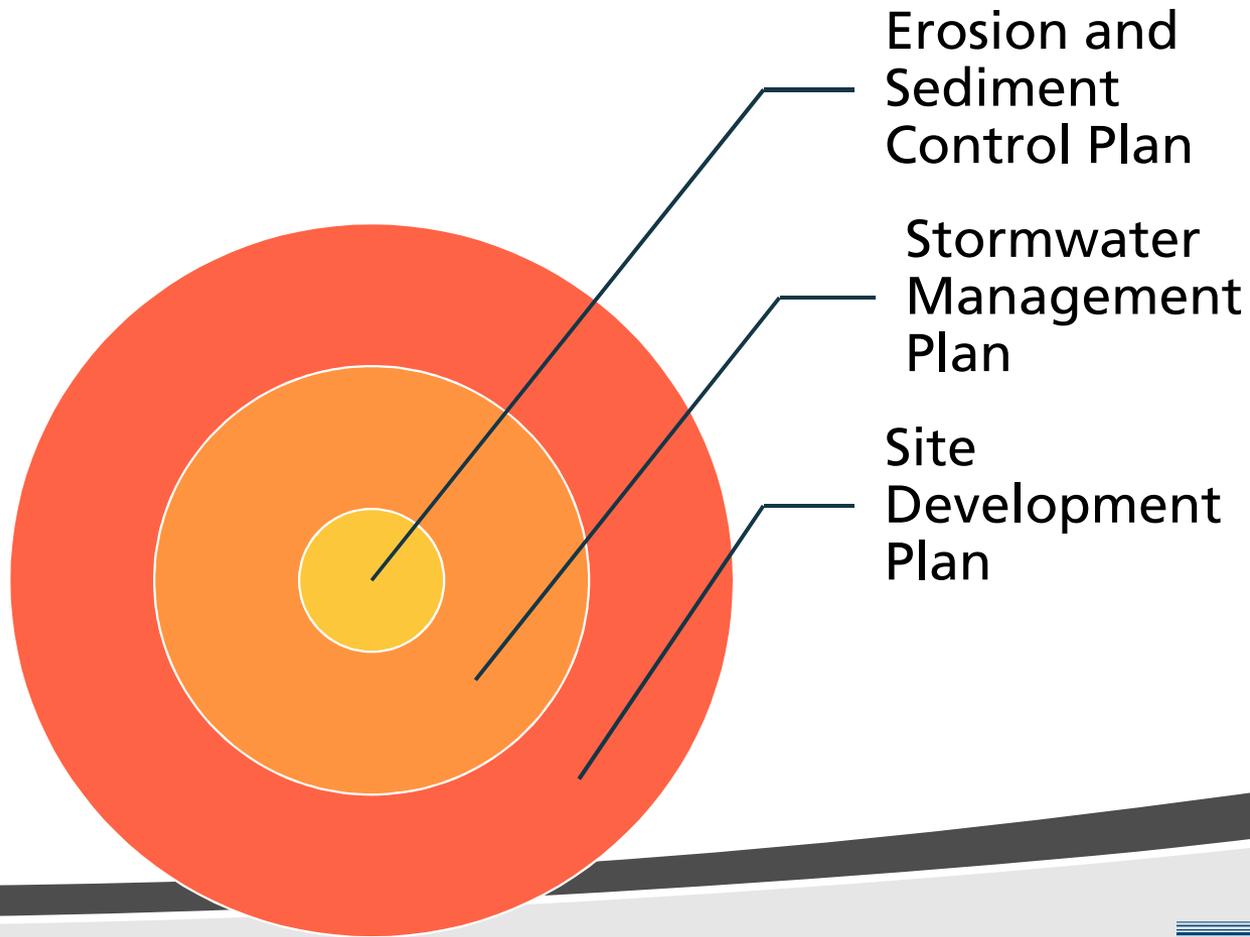


6b.

Comprehensive Site Planning

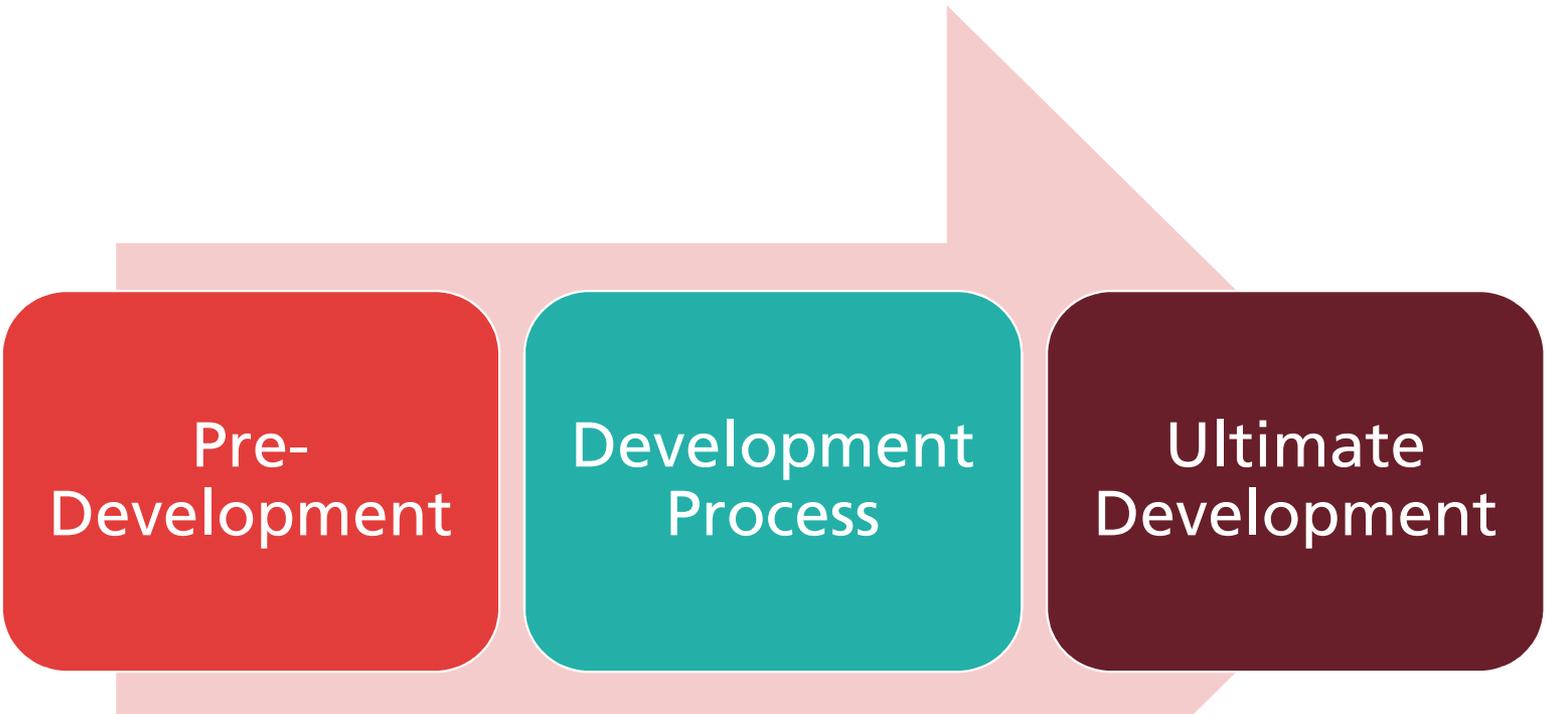


Comprehensive site planning





Planning Process



Pre-
Development

Development
Process

Ultimate
Development



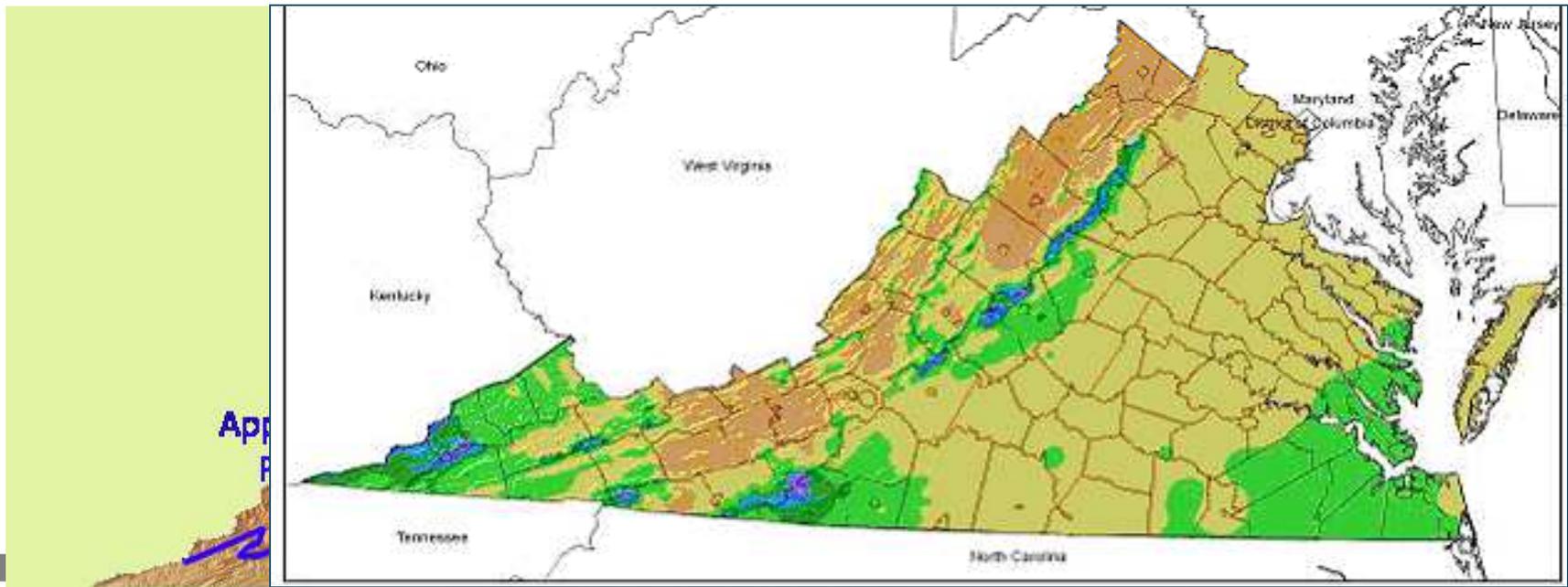
Planning Process

- a) What is the current land use of the property?**
- b) Have surrounding properties (especially down gradient) been considered?**
- c) What is the ultimate development condition?**
- d) What is the development or construction sequence?**

Planning Process

a. Predevelopment Condition

- Geographic location →
Climate/topography/slope/geology/soil/vegetation





Region Climatic Differences

- Southern and Eastern Virginia are part of the “Transitional Zone”
- Temperature and moisture regimes
- Latitude, altitude, and bodies of water

Seasonal effect

Winter

- Frost heaving destroys soil structure resulting in increase erodibility
- Sloughing of soils
- Establish vegetation before winter
- Mulch



Summer

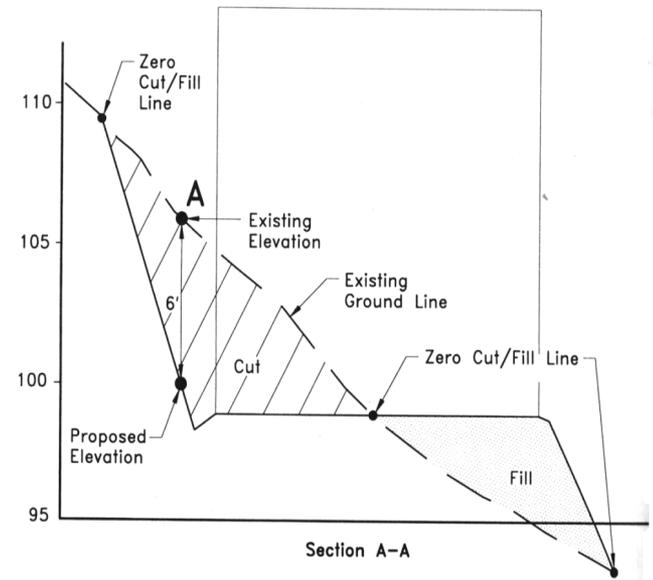
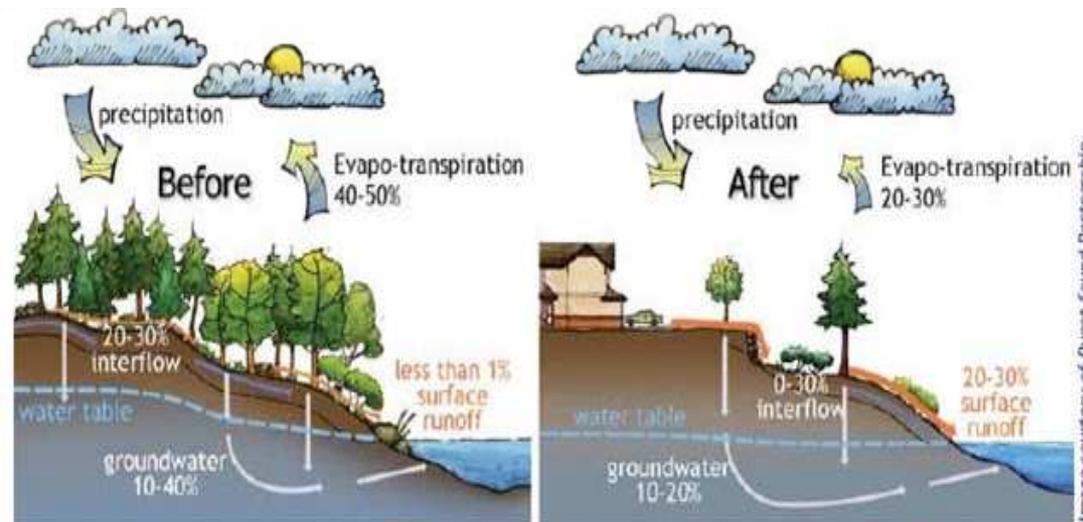
- Thunderstorms (large drops + high intensity)
- Keep as little soil exposed as possible (temporary seeding and/or mulch)



Planning Process

a. Predevelopment Condition

- Current land use + stormwater considerations





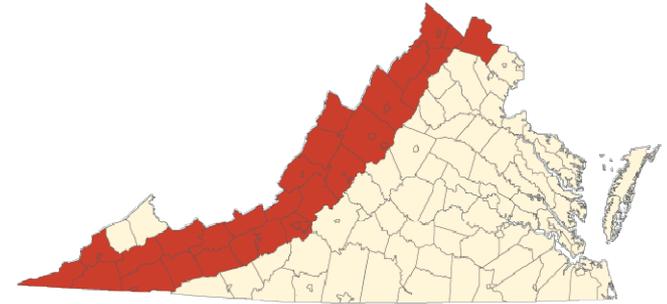
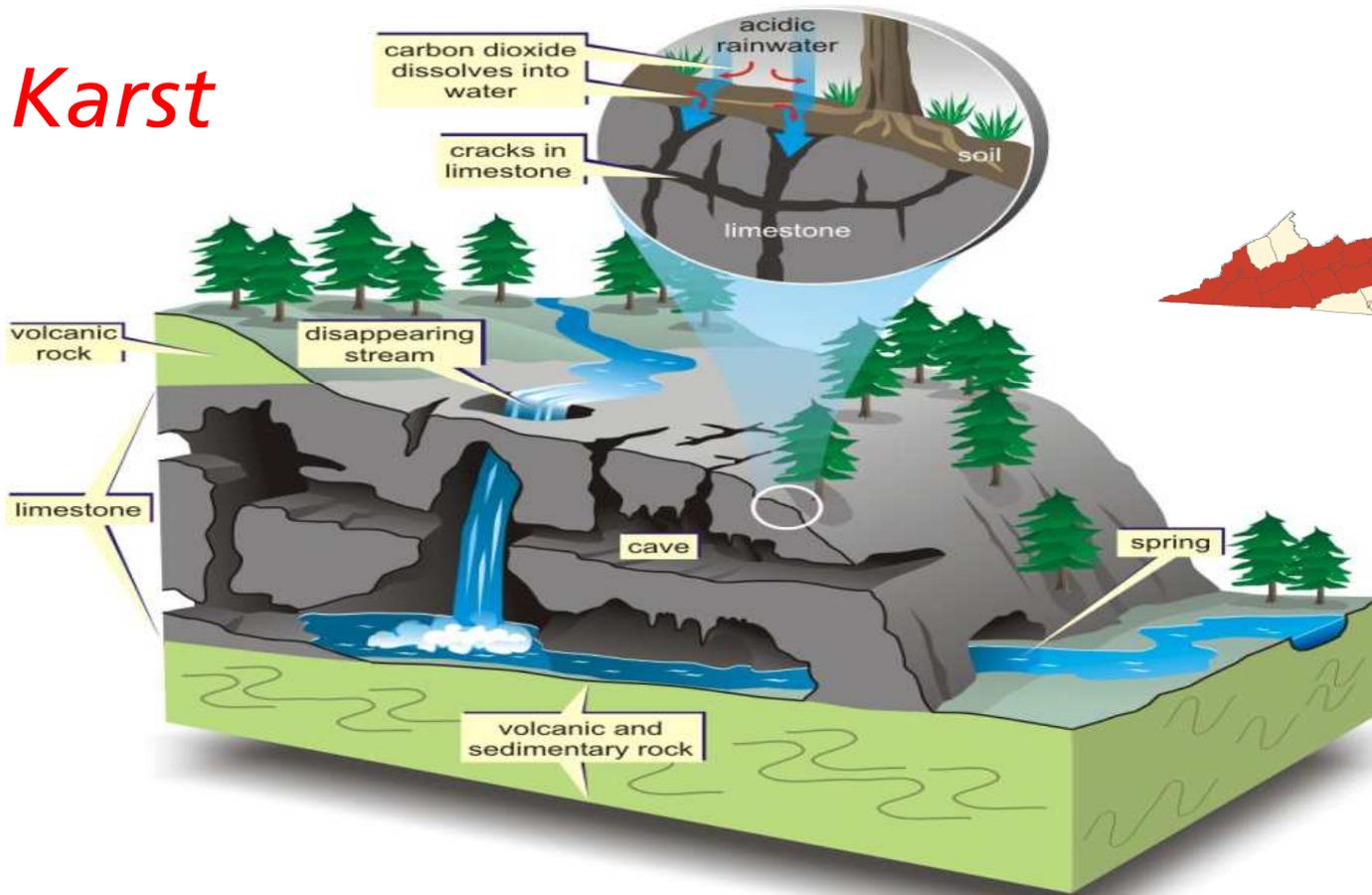
Planning Process

b. Surrounding properties

- **State waters**
- **Steep slopes**
- **Threatened/endangered species or their habitat**
- **Sink holes, particularly in karst areas**

Planning Process

Karst



Planning Process

c. Ultimate development condition



High Maintenance



Low Maintenance



Planning Process

c. Ultimate development condition

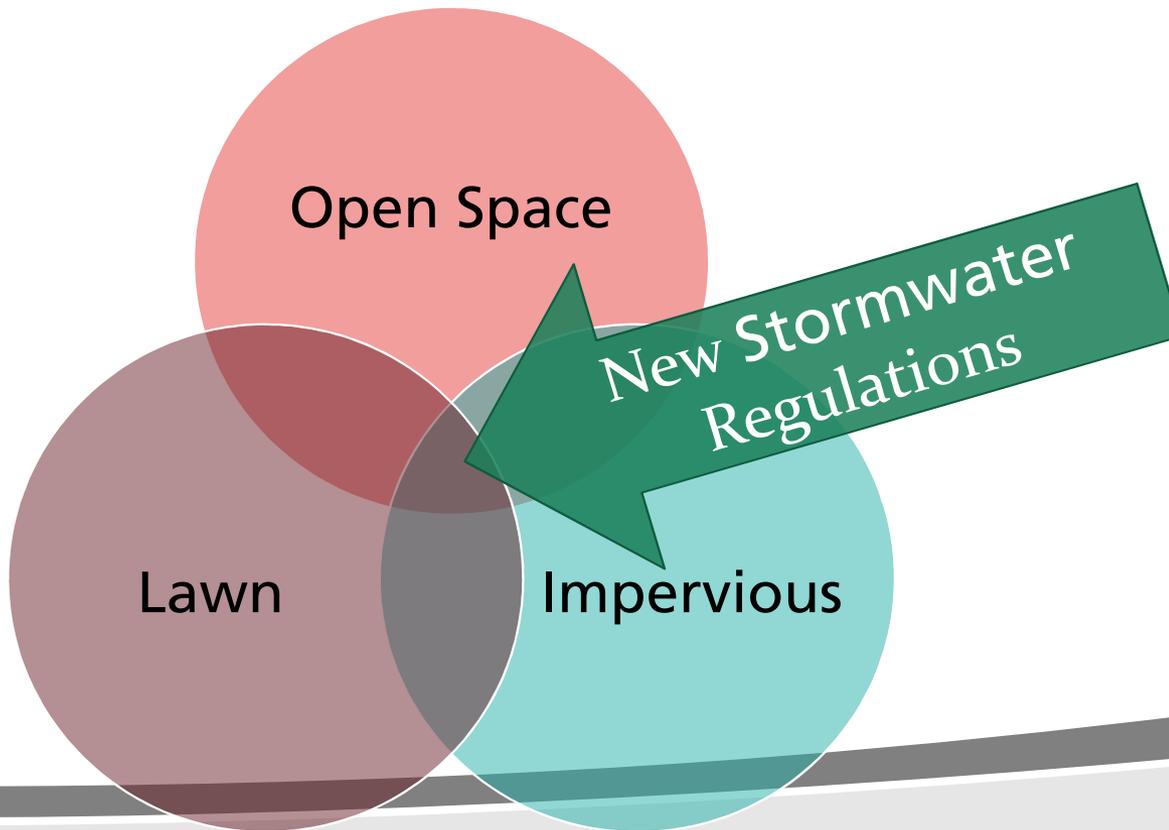


High Maintenance?



Planning Process

c. Ultimate development condition





Planning Process

d. Development phasing and sequencing

- ***Careful scheduling reduces:***
 - ***clearing & grading***
 - ***time of exposure of denuded soil***



Planning Process (cont.)

- e) Where are the potential erosion and sedimentation critical areas?**
- f) What practices to prevent erosion on site and sediment from leaving the site?**
- g) Has stormwater runoff been considered?**
- h) Maintenance during and post construction identified?**



Planning Process

e. Critical areas include:

- steep slopes, wetlands, endangered species area, waterways, cut and fill areas, etc.**

- Knowledge of - is crucial**



Planning Process

f. Practices should

- **Prevent erosion and transport of sediment offsite**
- **Preserve existing vegetation**
- **Stabilization (seeding & mulching)**



Planning Process

g. Stormwater Considerations

- **Prevent damage to downstream property**
- **Discharge into an adequate channel**
- **Verify channel adequacy at the point(s) of discharge from the project.**

Planning Process

1% rule

- Channel may be assumed to be adequate when the total drainage area at the point of analysis is one hundred times greater than the contributing drainage area from the project

Natural Channel

- 2-year storm does not overtop bed and banks
- 2-year storm does not cause erosion of bed and banks

Man-Made Channel

- 10-year storm does not overtop bed and banks
- 2-year storm does not cause erosion of bed and banks

Stormwater Infrastructure (pipes)

- Be able to contain the capacity of a 10-year storm



Planning Process

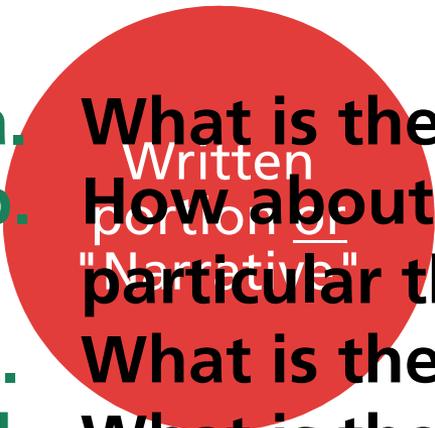
h. Maintenance

- **Frequency during & post-construction**
- **Is structure temporary (MS 18) or converted to permanent structure?**
- **If a permanent structure, LT & recorded maintenance agreement....**



6c.

The Erosion and Sediment Control Plan

- 
- 
- 
- 
- 
- a. What is the current status of the property;
 - b. How about the surrounding properties, in particular those down gradient;
 - c. What is the ultimate development condition;
 - d. What is the development or construction sequence;
 - e. Where are the potential erosion and sedimentation hot spots;
 - f. Practices to prevent erosion on site and sediment from leaving the site;
 - g. Stormwater runoff considerations; and
 - h. Maintenance during and post construction.

Written
portion of
"Narrative"

Illustrative
portion of
Plan

ESC
Plan



6d.

Vegetative Control Practices



Benefits of Vegetation

- **Good vegetative cover is about 90-99% effective**
- **Protects against raindrop impact**
- **Slows runoff velocity & filters sediment**
- **Roots bind the soil surface & enhance filtration**
- **Increased organic matter improves soil structure**
- **3 X less expensive than structural controls**



Preservation of Existing Vegetation

- Minimize cost of development
- Native vegetation
- Buffers
- Does not disturb soil → infiltration





ESCH Vegetative Control Practices

29-30 Seedbed Preparation

- Surface roughening
- Top soiling

31-34 Vegetation Establishment

- Temporary seeding
- Permanent seeding
- Sodding
- Bermuda and zoysiagrass establishment

35-36 Mulches

- Mulching
- Soil stabilization, blankets and matting

37-38 Other Vegetative Controls

- Trees, shrubs, vines and ground covers
- Tree preservation and protection

39 Dust control



Plant Selection

MS-1 Permanent or **temporary** soil stabilization shall be applied to denuded areas within **seven** days after final grade is reached on any portion of the site.

Temporary soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than **14** days.

Permanent stabilization shall be applied to areas that are to be left dormant for more than one year.

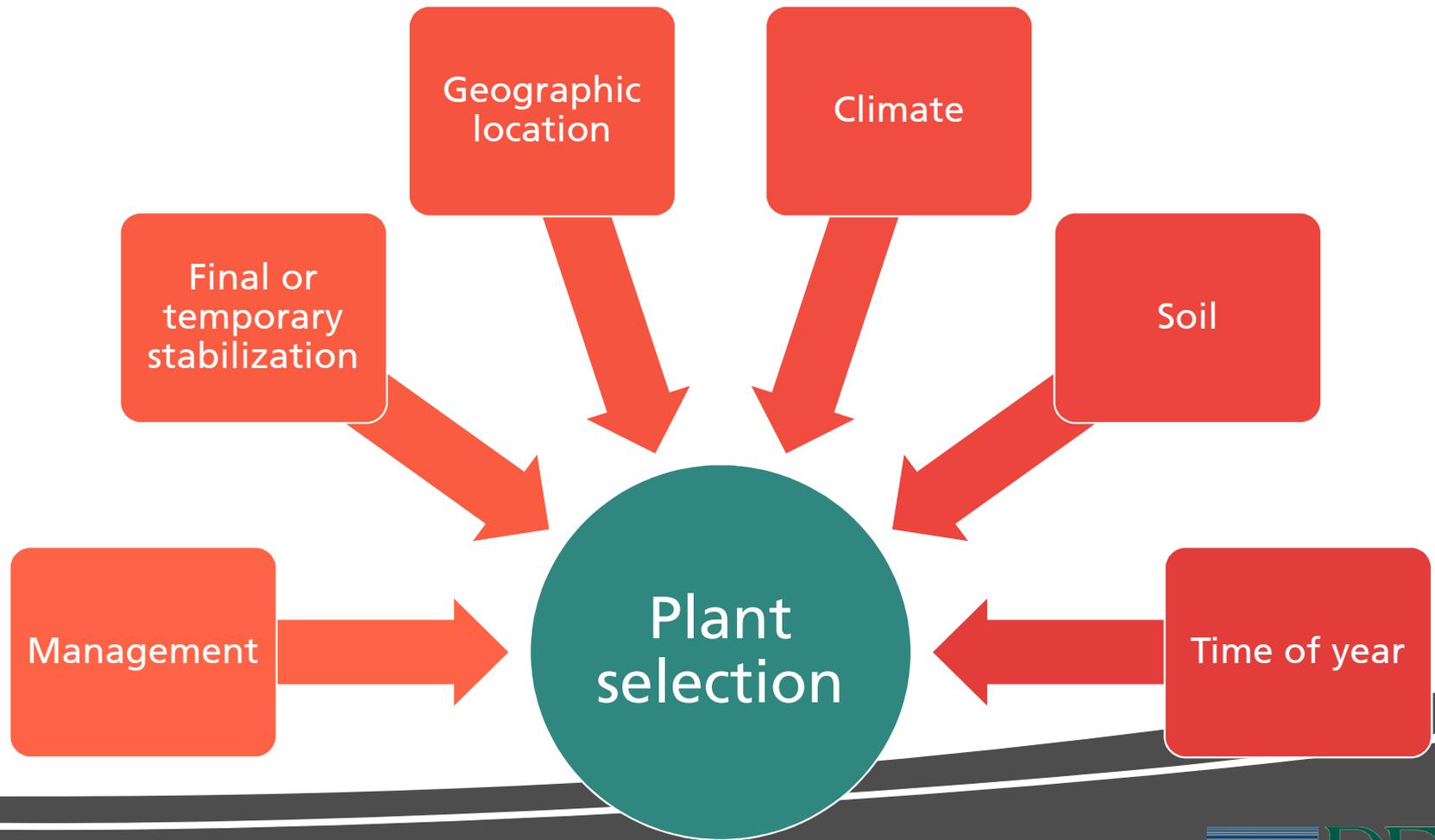


Plant Selection

MS-3 A **permanent** vegetative cover shall be established on denuded areas not otherwise permanently stabilized.

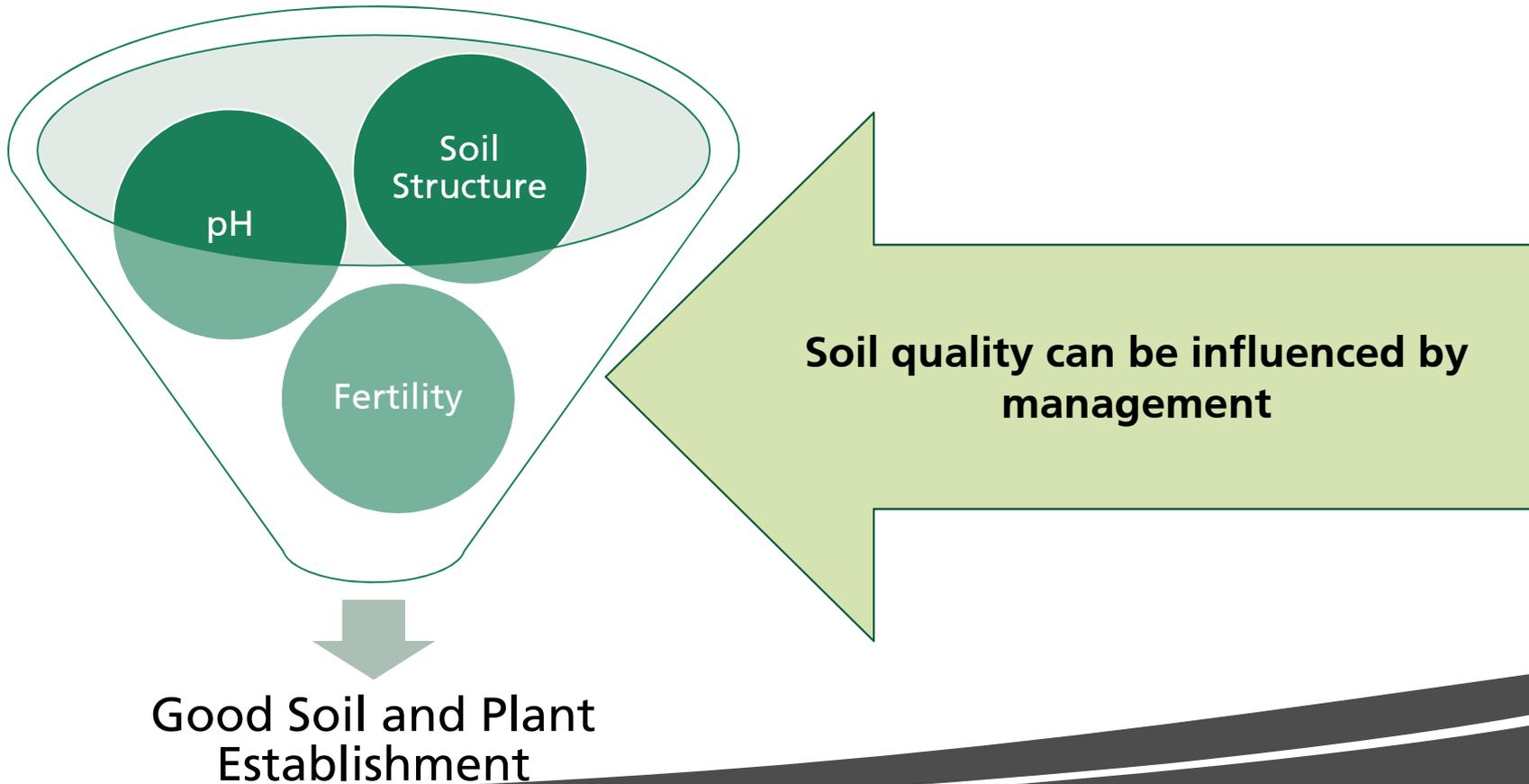
Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

Plant Selection





Plant Establishment



Soil Testing

- Determine soil texture, pH and nutrient content
- Samples are collected & sent for testing
- Helps to properly establish vegetation

Virginia Tech
Soil Testing Laboratory
Publication 452-125
Revised 2013

Soil Sample Information Sheet for Home Lawns, Gardens, Fruits, and Ornamentals

Please Print (Form expires January 2015)

INSTRUCTIONS: See other side for sampling instructions. For a recommendation, be sure to fill in the plant code number. Place check marks (✓) where appropriate. Use another form for commercial crop production. Send samples, forms, and payment to Virginia Tech Soil Testing Lab, 145 Sanyh Hall (MC 0465), 185 Ag Quad Ln, Blacksburg VA 24061, in a sturdy shipping carton weighing less than 37 pounds. Processing will be delayed if soil is not received in an official sample box. See www.soiltest.vt.edu for more information.

Your Name: _____ Date sampled: _____
 E-mail: _____ Phone: _____ MM/DD/YY
 Mailing Address: _____
 City: _____ ZIP Code (required): _____
 Country Where Soil is Located (required): _____
 Copy Report To (Consultant, etc.): _____
 Their E-mail: _____

Office Use only
 Extension Unit Code: _____

SAMPLE IDENTIFICATION	PLANT TO BE GROWN	PLANT CODE LIST
Your Sample Box Number or Name (Up to 5 digits)	Insert Plant Code # from list at right	Lawn: Kentucky Bluegrass, Fescue, or Ryegrass
□ □ □ □ □	□ □ □ □	201 Establishing New Lawn 202 Maintaining Lawn, Repair of Bare Spots
SOIL INFORMATION		Non-Acid-Loving Shrubs and Trees
Last Lime Application		245 Shrub - Lilac, Forsythia, Boxwood, etc. 246 Trees - Pine, Maple, Oak, etc.
Months Previous	Pounds per 1,000 sq. ft.	Fruits
<input type="radio"/> -	<input type="radio"/> 0	220 Apples
<input type="radio"/> 0 - 6	<input type="radio"/> 10 - 50	221 Blackberries
<input type="radio"/> 7 - 12	<input type="radio"/> 51 - 100	222 Blueberries
<input type="radio"/> 13 - 18	<input type="radio"/> 101 - 150	223 Currants
<input type="radio"/> 19+		224 Gooseberries
		225 Grapes
		226 Nectarines
		227 Peaches
		228 Pears
		229 Plums
		Garden
		210 Vegetable Garden
		211 Flower Garden
		212 Roses

SOIL TESTS DESIRED AND COMMENTS:

Routine (soil pH, P, K, Ca, Mg, Zn,
 Organic Matter - Determines percent
 Soluble Salts - Determines if fertilizer

Send in payment along with soil sample

Virginia Cooperative Extension Service
 VIRGINIA TECH AND VIRGINIA STATE - VIRGINIA'S LAND GRANT UNIVERSITIES

SOIL TEST REPORT

LAB ID: 12764 ED/ST/RY '11 UNIT: VPI & SU CAMPUS NOTES: X 17

O W N A P E R

C F
 0 0
 P R
 V

SAMPLE NO.	NO OF AC	SOIL TYPE	SLOPE	USE PLO GROUP	LAST CROP			LAST CROP FERTILIZATION, R.A.		LAST LIME APPLICATION	
					NAME	YIELD	N	P ₂ O ₅	K ₂ O	% P ₂ O ₅	TA
LABR		CLAYEY									

LAB TEST RESULTS

SOIL pH	Buffer pH	P	Ca	Mg	Zn	Cu	Mn	Mo	NO ₃ -N	Za	Mn
ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
7.3		58	514	2400	240						
		H-	VH	VH	VH						

FERTILIZER AND LIMESTONE RECOMMENDATIONS

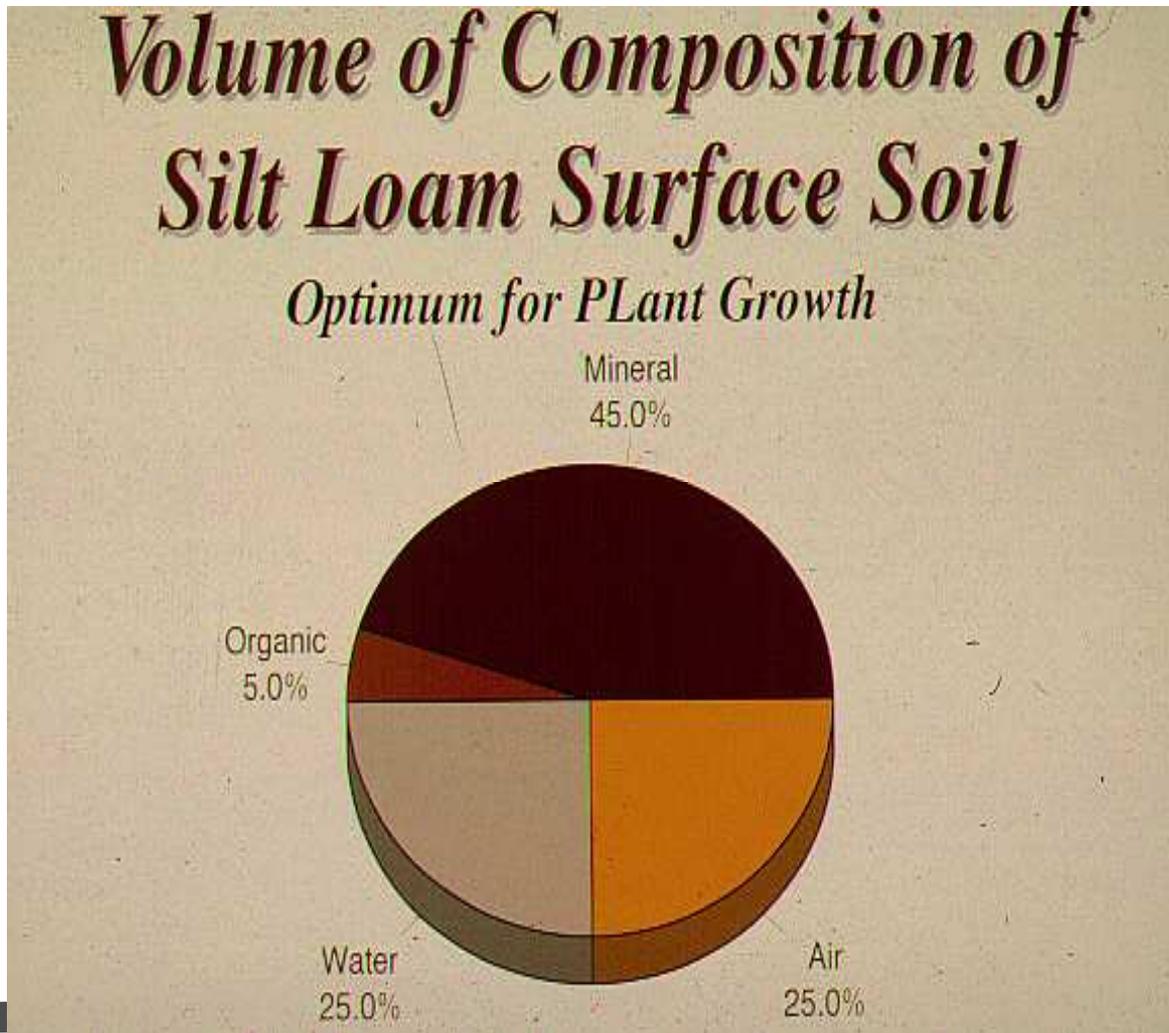
*** PICK UP

CROP: LAWN MAINTENANCE - BLUEGRASS, FESCUE

*205. FERTILIZER RECOMMENDATIONS: USE ANY COMPLETE "TURF-TYPE" FERTILIZER ACCORDING TO THE INSTRUCTIONS IN THE ENCLOSED NOTE ON LAWN FERTILIZATION. (A COMPLETE FERTILIZER CONTAINS THE NUTRIENTS NITROGEN, PHOSPHORUS AND POTASSIUM.)

*210. LIME RECOMMENDATIONS: NONE NEEDED.

Bulk Density



Bulk Density

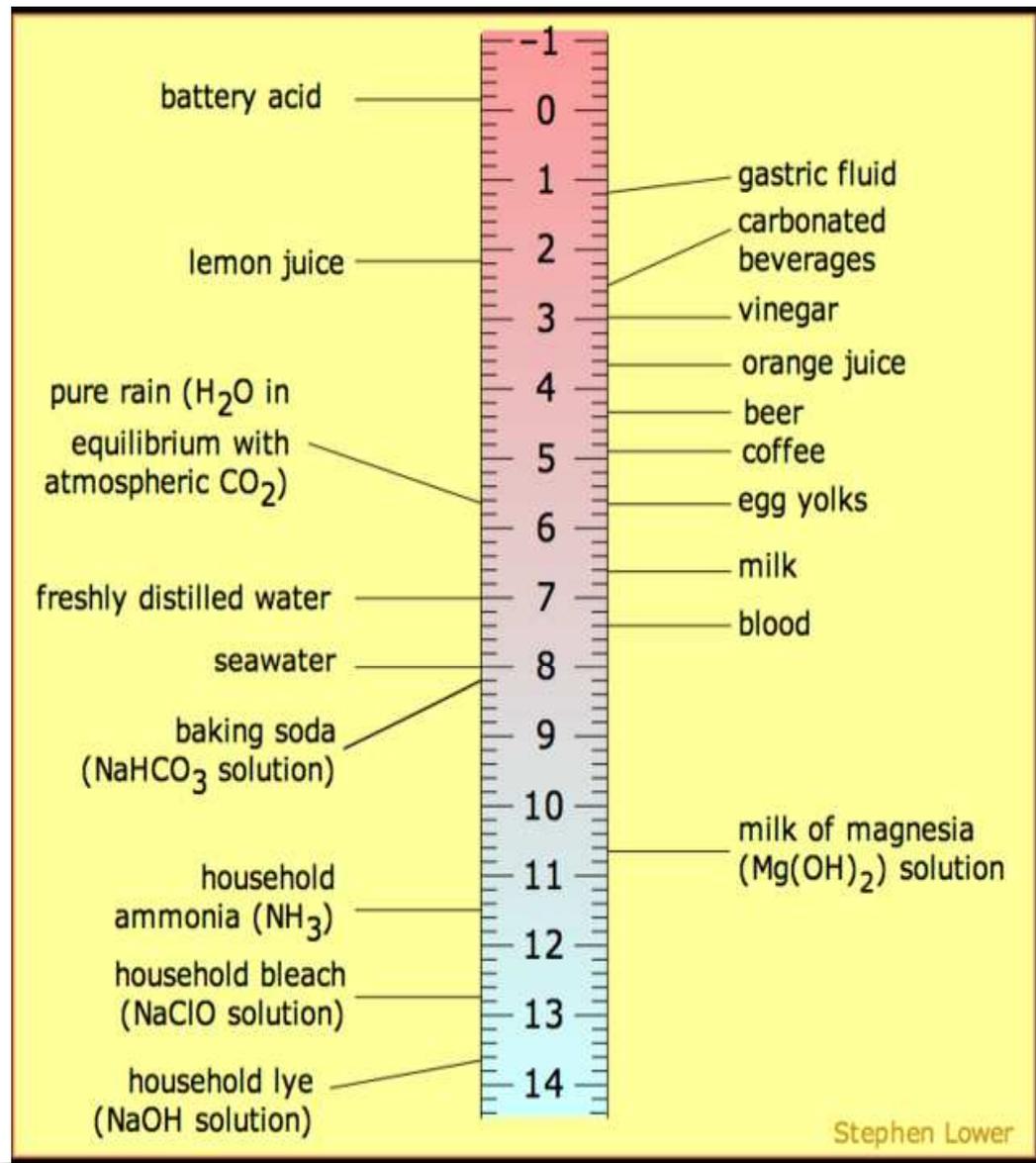


Common Bulk Density Measurements

Land Surface/Use	Bulk Density
Undisturbed Lands Forest & Woodlands	1.03 g/cc
Residential Neighborhoods	1.69 to 1.97 g/cc
Golf Courses - Parks Athletic Fields	1.69 to 1.97 g/cc
Concrete	2.2 g/cc

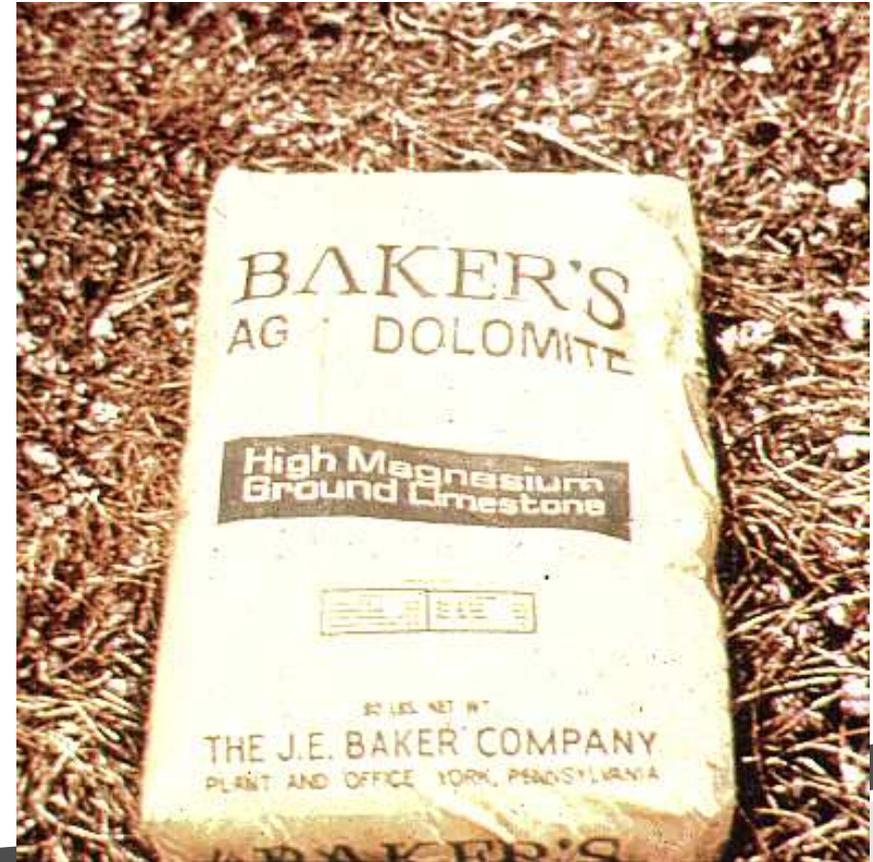
pH

- Determine pH before liming
- Range 0 - 14
- Neutral pH = 7.0
- Statewide avg. pH 4.0 - 8.0
- Turfgrasses prefer 6.0 - 6.5



Application of Lime

- Insoluble in water
- Must be incorporated in soil
- Applied according to soil test results

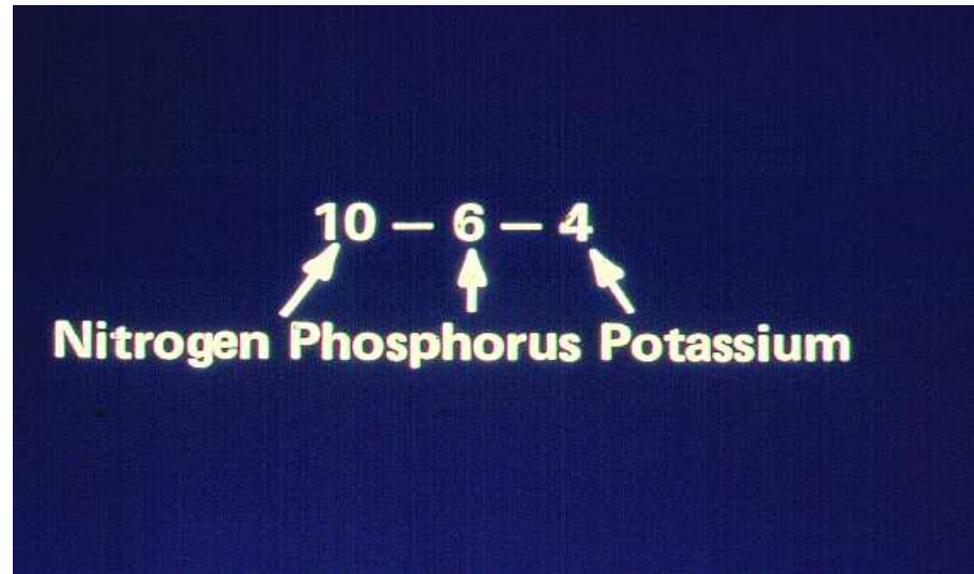


Statewide Soil Fertility

- **N needed; P typically needed**
- **Lime almost always needed**
- **Soils in Coastal Plain and sandstone areas need K**



Application of Fertilizer





Fertilizer

A 150 lb. bag of 10-6-4 fertilizer contains how many pounds of nitrogen?

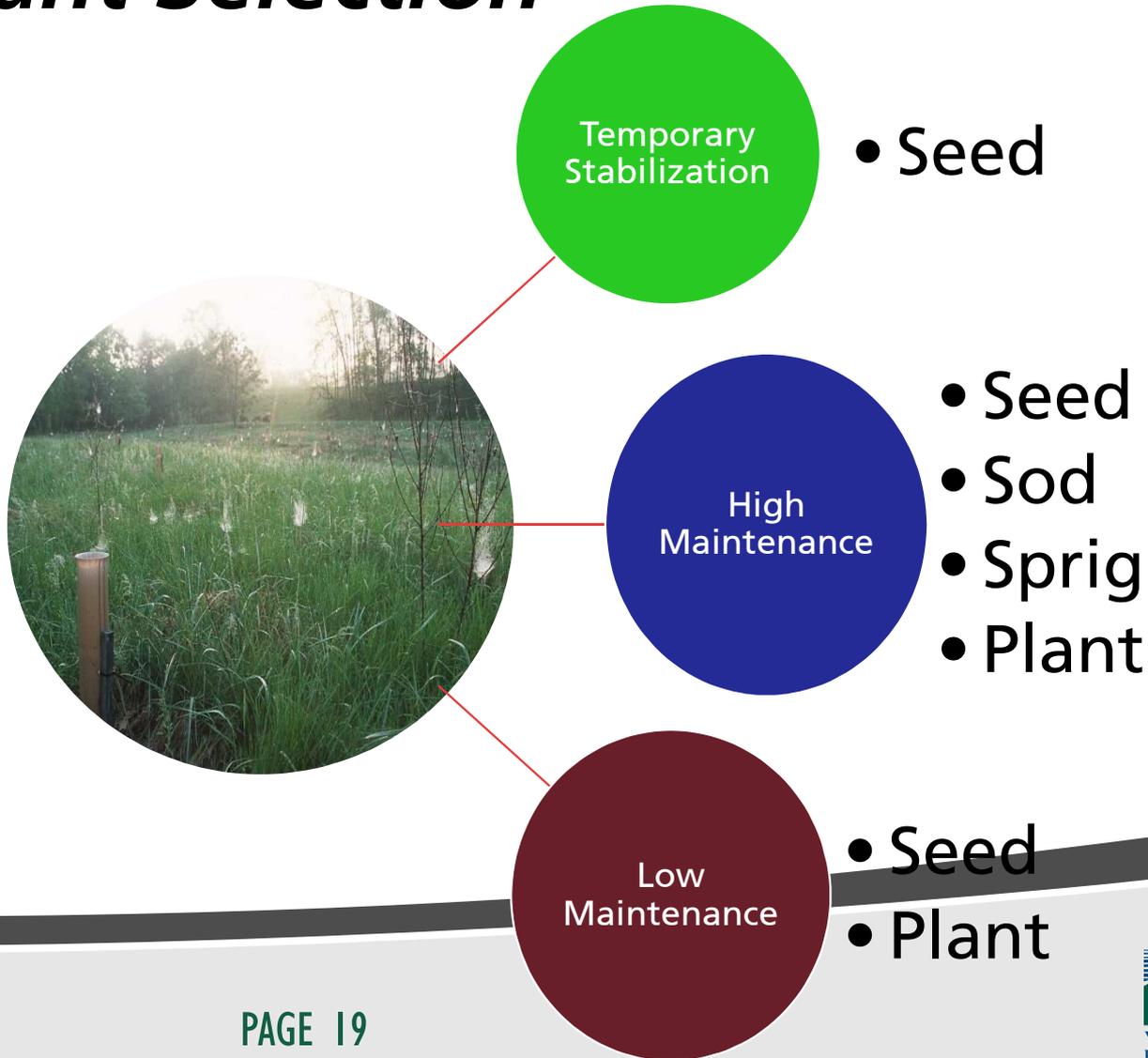
10% of 150, or $0.10 \times 150 = \underline{15 \text{ lbs.}}$

Soil Conditioners (fertilizer)

- Fertilizer & lime as per soil test results
- Incorporate into soil 4 to 6 inches where possible



Plant Selection





Planting Methods

Seeding

- Temporary → annuals
- Permanent → perennials
- *Land use*
- *Certified seed*
- *Seed mix*
- *Time of year requirements*

Sodding

- Permanent
- *VCIA Certified*
- *Planted within 36 hours of harvesting*



Planting Methods

Sprigging / Plugging

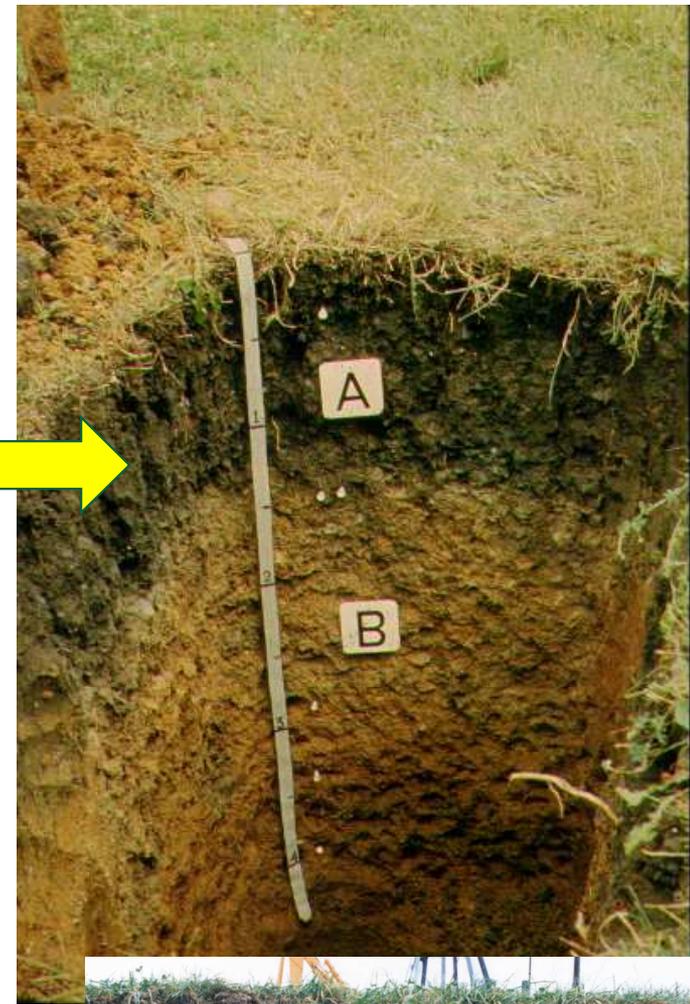
- Permanent warm season grasses → Bermuda grass and Zoysiagrass
- *VCIA Certified*
- *Planted within 36 hours of harvesting*

Planting

- Containerized
- Ball and burlap
- Bare Root

Topsoil

- Surface layer of the soil profile
- Darker due to more organic material
- The major zone of root development
- Location of nutrients and water

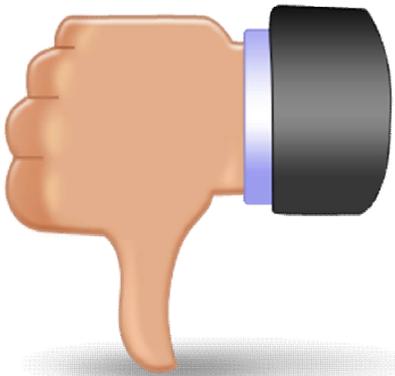


Topsoil



- Original soil
- Soil (micro)organisms
- Good growing medium
- Nutrients
- High water holding capacity
- Low bulk density
- Organic matter

Topsoil



- Stock piling (takes up space)
- Requires more time to strip, stock pile and reapply
- Increased exposure time of denuded areas
- Weed seeds

Topsoiling

- **Strongly recommended for high maintenance turf areas**
- **Good for areas where the soil is shallow, or soils that contain toxic materials and critically low pH**





Topsoiling

- **Stockpiles should be located out of the work area and stabilized**
- **Spread at a compacted depth of 2-4 inches**
- **Allow sufficient time for spreading & bonding**
- **Not to be applied on subsoil of contrasting texture, unless scarified.**

Proper Seedbed Preparation

- Critical in successful vegetation establishment.
- Involves removal of debris, roots, and deleterious materials.
- Provides a good growing medium for vegetation.



Proper Seedbed Preparation

- Determine requirements for lime & fertilizer
- Apply soil conditioners regardless of vegetation establishment method (seed/sod)
- Slope steepness/orientation



Permanent vs. Temporary Seeding

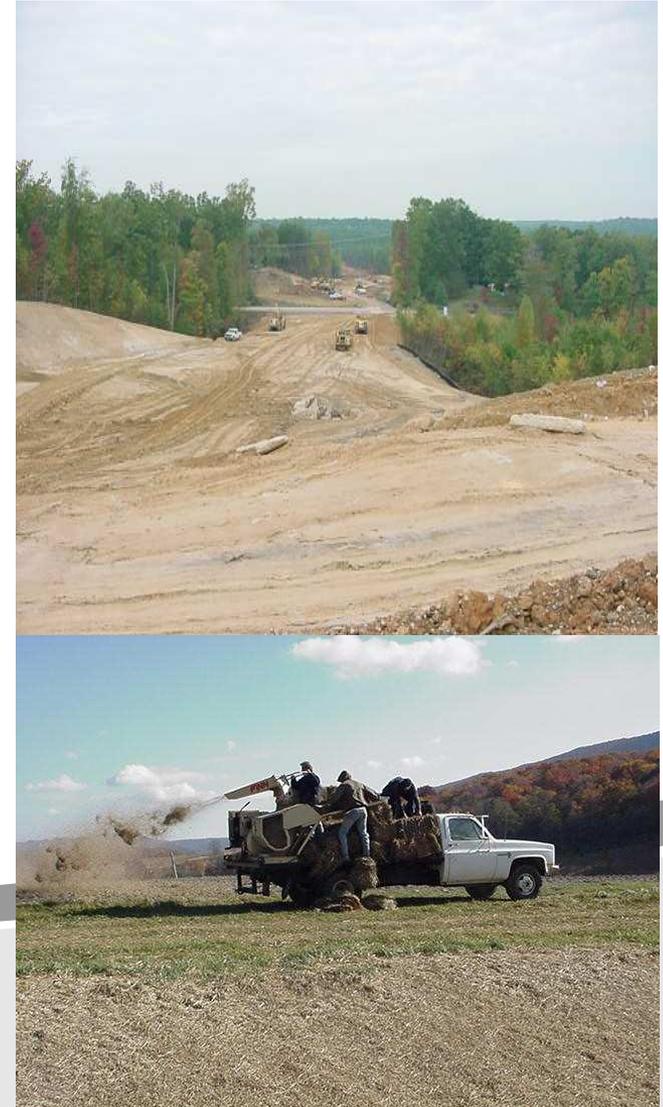
Seeding is typically the last activity

- Often considered a cosmetic operation
- Should be the principle tool to control erosion
- Disturbed areas should be brought to final grade early and seeded, or stabilized when not disturbed for more than **14 days**



Temporary Seeding

- **Inexpensive and effective tool for controlling erosion**
- **Applicable where exposed areas will not be disturbed for long periods of time**
- **May reduce landscaping & maintenance costs**





Temporary Seeding

- Done with annuals
- Vegetation should be quick to germinate & grow
- Noncompetitive to perennial plants
- May be used as nurse crops

Areas for Temporary Seeding

- *Soil stockpiles (unless sediment trapping barrier and/or ongoing activity)*



Areas For Temporary Seeding

- *Diversion dikes*



Areas For Temporary Seeding

- *Sides of excavated sediment basins*



Areas For Temporary Seeding

- *Rough graded areas not to be fine graded for > 14 days*





Temporary Seeding

Species	Summer Planting	Fall/Winter Planting	Spring Planting	Remark
Oats	No	No	Yes	
Rye	No	Yes	No	
German Millet	Yes	No	No	
Annual Ryegrass	No	Yes	Yes	
Weeping Lovegrass	Yes	No	No	Short lived perennial
Korean Lespedeza	Yes	No	Yes	

Temporary seeding is *recommended* for areas that will not be at final grade for 14 days to 1 year

Temporary Seeding

German Millet (VIII-23)

- **Warm season annual grass**
- **Germinates quickly**
- **Dies at first frost**
- **Good for summer seeding**





Areas To Be Permanently Seeded

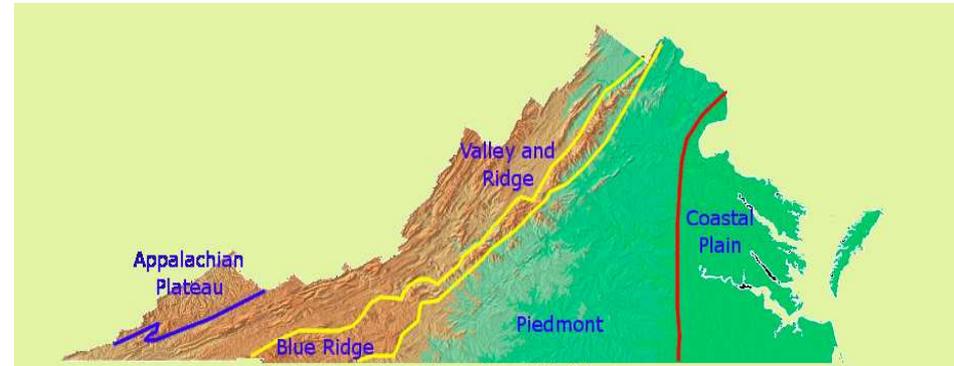
Most common problems to consider are:

- Amount of available water
- How dry is the area?
- How wet is the area?
- How steep are the slopes?

Choice of Plant Materials

Most common items to consider are:

- Geographic region
- Specific location
- Intended land use
- Maintenance level





Choice of Plant Materials

Most common items to consider are:

- **Do you need a sod forming or bunching type permanent vegetation?**
- **Is the plant available as seed, sod, plugs or other?**
- **Will the plant be temporary or permanent?**
- **Adaptability to steep slopes, wet areas, region, etc.**

Seeding

- Use certified seed
- Seed mixtures are revised yearly



Seeding

- Firm surface - seed/soil contact
- Surface - shallow uniform depressions
- Tracking, grooving etc.
- Evenly distribute
- Mulch - every operation
- Water



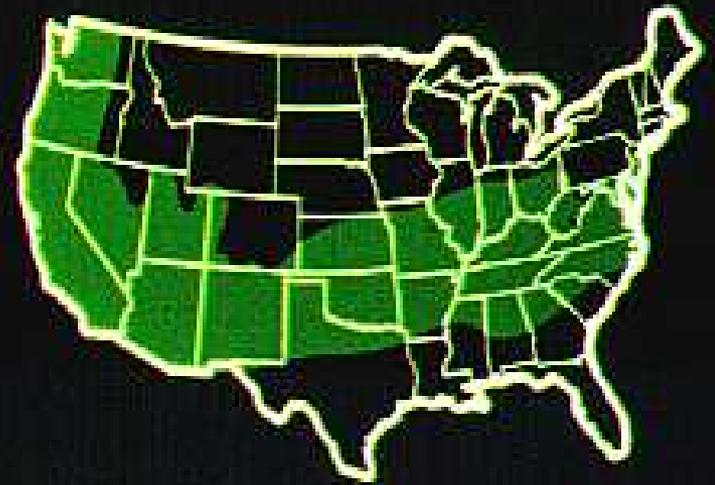
Grasses for Erosion Control

Tall Fescue (VIII-27)

- Recreational areas, stabilization of waterways, slopes, cuts and fills
- Cool season deep rooted bunch grass
- pH 6.0 - 7.0
- Limited more by moisture



Tall Fescue



Grasses for Erosion Control

Red Fescue (VIII-28)

- Lawns, athletic fields, and playgrounds, stabilize waterways, slopes, cut and fills
- Cool season perennial
- Sod former, Shade and drought tolerant
- pH 4.5 to 6.0



Grasses for Erosion Control

Kentucky Bluegrass (VIII-28)

- Long lived cool season perennial sod former
- Dormant in summer heat
- Well drained, fertile soil
- pH range 6.0 to 7.0
- Lawns, playgrounds, slopes, waterways



Kentucky Bluegrass



Grasses for Erosion Control

Red Top (VIII-29)

- Stabilize ditches and channels
- Grassed waterways
- Coarse cool season
- Short lived with rhizomes
- Better in cool humid areas
- pH 4.0 - 7.5 - low fertility



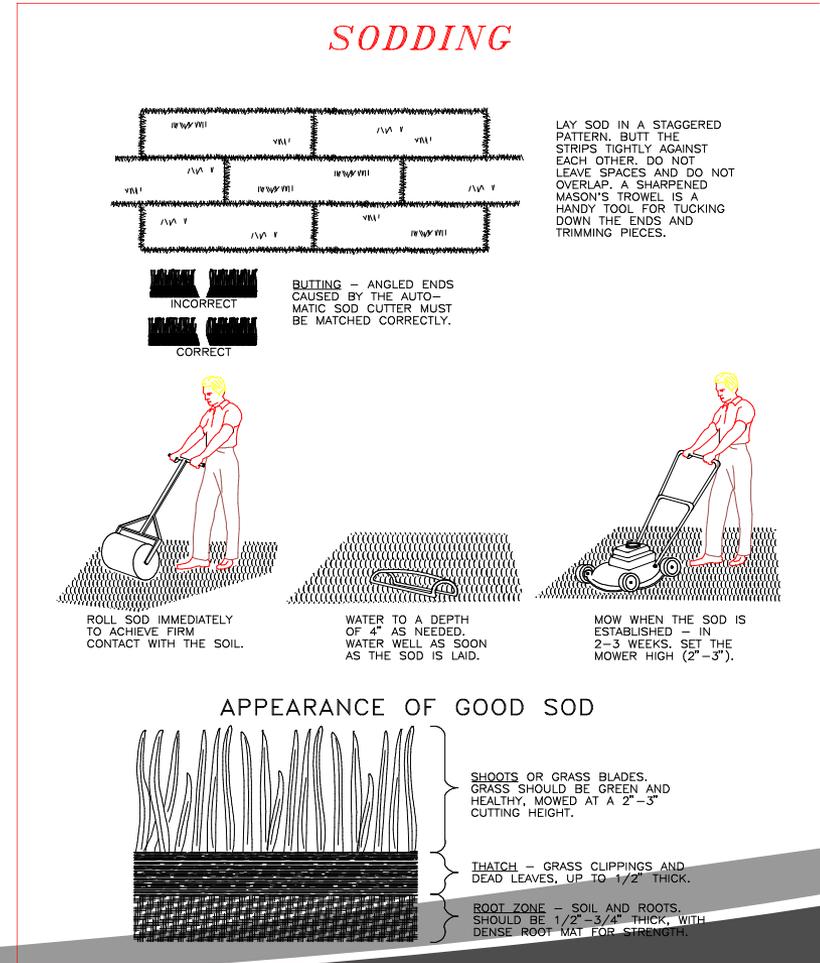
Sodding

- High quality/VCIA
- Cut and lay within 36 hours
- Lime and fertilize same as seeding
- No air pockets
- In hot weather water before application



Sodding

- Laid in staggered rows
- Water after laying
- Mow in 2 to 3 weeks
- Pegged or stapled in critical areas
- Sod swales and ditches
- All year round - as long as the ground is not frozen



SOURCE: VA. DSWG

PLATE: 3.33-1



Seeding vs. Sodding

Seeding

- **Positive**
 - Low cost
 - Wide range of species selection
 - Low labor requirement
 - Easy establishment in areas with low accessibility

Seeding

- **Negative**
 - High initial erosion potential
 - Area unusable early on
 - Establishment may be poor (reseeding)
 - Weeds
 - Seasonal limitations
 - Watering required for germination
 - Quality of seed & vegetation uncertain

Sodding

- **Positive**
 - Immediate results/ erosion, dust, mud control
 - Can be established almost year-round
 - No weeds
 - Area can be used quickly
 - Less prone to failure

Sodding

- **Negative**
 - Limited species selection & diversity
 - Expensive
 - Difficult to sod inaccessible places
 - Warm soil in summer may reduce establishment of cool season grasses
 - Watering required for establishment

Sprigging

- Bermuda grass/Zoysia grass
- Establish grasses with plant parts
- Short lengths of stems (stolons)
- Planted or broadcast



Plugging

- Plugs are small sod sections
- Pressed into holes



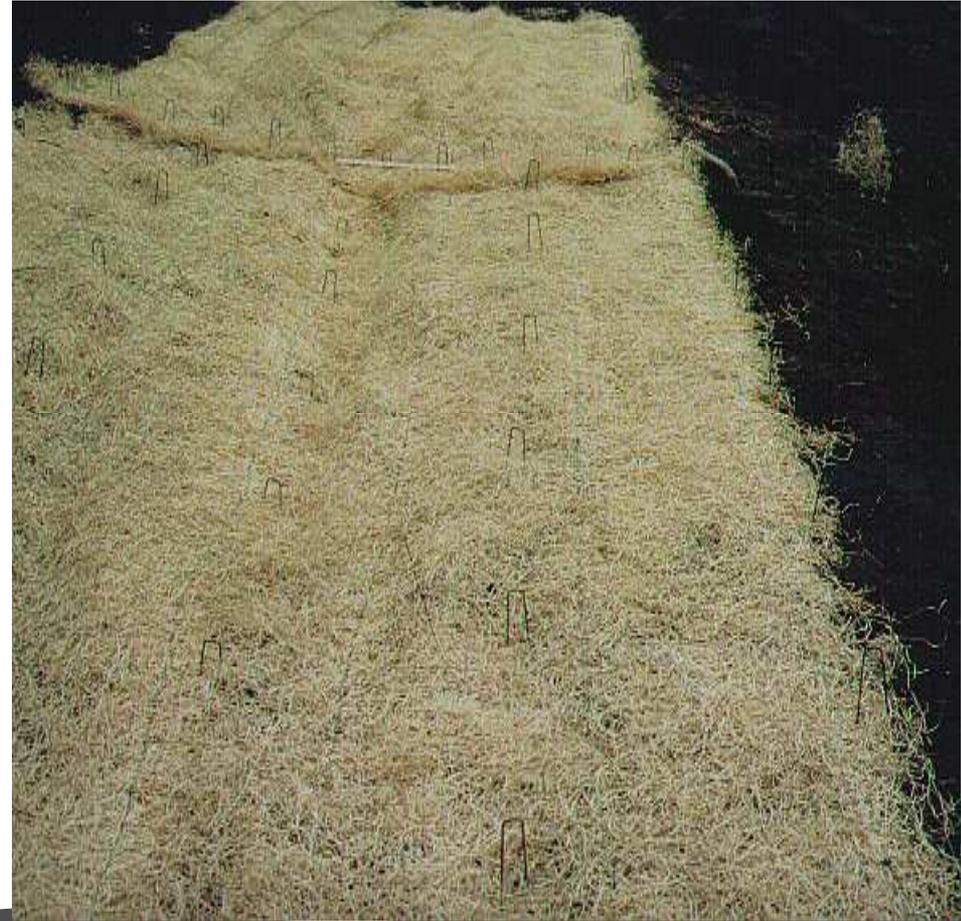


Mulch

- **Plant residue (organic materials)**
 - *Straw*
 - *Wood chips*
 - *Wood fiber*
 - *Bark*
- **Hydroseeding using chemical binder as a mulch (not sufficient for winter)**
- **Straw mulch should be applied at 2 tons per acre during winter**

Nets and Mats (Fiber Products)

- Treatment 1 and 2
- ex. Jute, Excelsior, etc.
- Need good contact with soil
- Must be anchored
- Use in channels and on slopes



Mulching & Netting

Protect the soil from raindrop impact

Prevents soils crusting

Increases the infiltration rate of the soil

Reduces soil moisture loss

Modifies soil temperatures

Provides a suitable microclimate for seed germination and plant establishment

Provides organic matter to the soil





22 11:47 AM



4 9:53 AM





JUN 17 2004

Native vs. Invasive Vegetation

- *See Appendix (p. 36 module 6a)*
- *Some of the plants recommended by the VESCH are considered “invasive”*
- *Selection of non-invasive should be considered wherever possible*
- *Some areas for consideration:*
 - *Low maintenance areas*
 - *Wildlife habitat areas*
 - *Open/Green spaces*





Native vs. Invasive Vegetation

- ***Invasives?***
 - Chinese lespedeza
 - Birdsfoot trefoil
 - Orchard grass
 - Redtop
 - Weeping Lovegrass
 - Crownvetch
 - Tall fescue
- ***Selection of non-invasive should be considered wherever possible (probably best in low maintenance areas):***

Roundheaded bushclover	Side oats grama
Partridge pea	Switch grass
Butterfly weed (Milkweed)	Broom sedge
Joe-pye weed	Deertongue
Orange coneflower	Canadian wildrye
Big blue stem	Bottlebrush grass
Indian grass	Virginia wildrye