

# Module 5

## Planning/Plan Review



The logo for the Virginia Department of Environmental Quality (DEQ) is located in the bottom right corner of the slide. It features a stylized green and blue landscape with a river and trees, followed by the acronym 'DEQ' in a bold, sans-serif font. Below the acronym, the full name 'VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY' is written in a smaller, all-caps font.

## Planning Strategy for Vegetative Controls

- Planning for vegetative controls should be an integral part of the site-planning process
- Step by step guideline in Chapter VI of the ESC Handbook
- Use of appropriate site- specific vegetation must be considered



A photograph showing a person's hand holding a blue pen, drawing on a site plan or map. The drawing includes various lines and shapes representing a site layout. A calculator is visible in the background.



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## How do we use plants in site development?

1. Erosion and Sediment Control
2. Stormwater
3. Landscaping
4. Buffers
  - Sound
  - Visual
  - Pollutants



## How Vegetation Prevents Erosion

### *Benefits of Vegetation*

- Protection from raindrop impact
- Slows runoff velocity and filters sediment from runoff
- Roots bind the soil surface & enhance filtration
- Increased organic matter improves soil structure



## Cost Effectiveness of Vegetative Erosion Control

- Structural controls can be up to three times more expensive
- Effectiveness of a good vegetative cover is about 90-99%



## Effectiveness of various ground covers in preventing soil loss

<u>Full established stands of:</u>	<u>% Reduction</u>
Permanent Grasses	99
Perennial Ryegrass	95
Annual Ryegrass	90
Small Grains	95
Millet or Sudan	95
Field Bromegrass	97
Grass sod	99
Mulches (straw at 2 ton/ac.)	98



## Most cost effective

### Preservation of Existing Vegetation

- Incorporate native vegetation
- Careful scheduling reduces clearing & grading
- Also reduces time of exposure of denuded soil

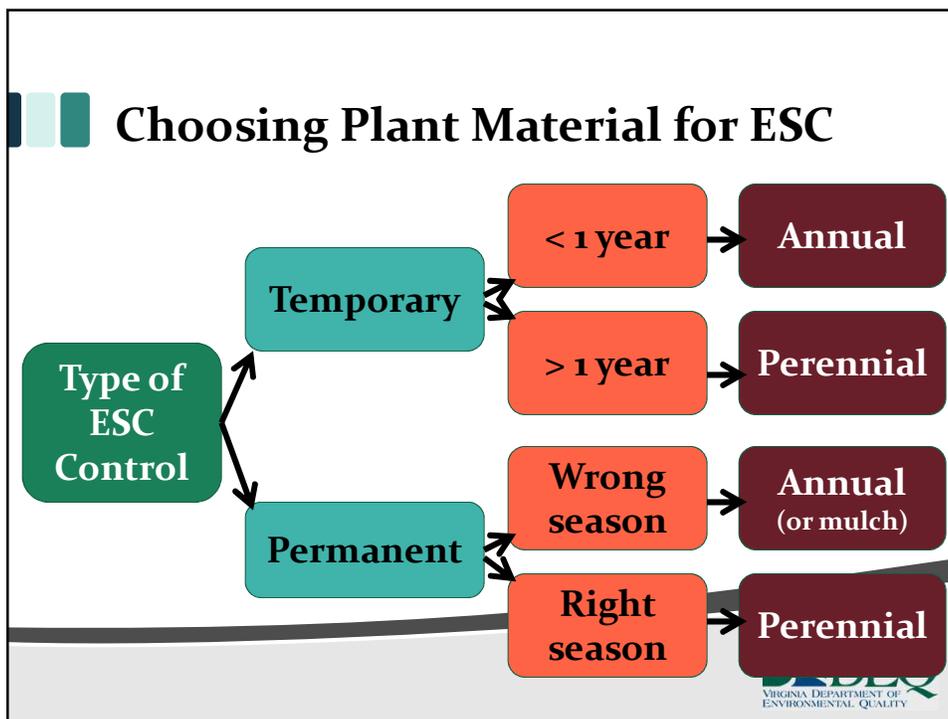



## Plants and ESC

### Two uses of plants:

- Temporary stabilization
  - Areas not at final grade but not disturbed for more than 14 days
  - Perimeter controls and other ESC measures left in place <1 year
  - Areas ready for permanent revegetation at the wrong time of year/season
  - Topsoil stock piles
- Permanent stabilization (aka landscaping)





## Temporary Stabilization

Done with annuals:

- MS-1
- MS-2
- MS-3
- MS-5

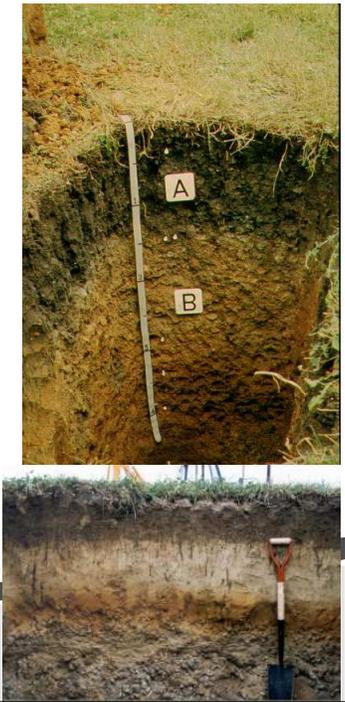
> 1 year use perennials

OATS ( <i>Avena sativa</i> )
RYE <sup>d</sup> ( <i>Secale cereale</i> )
GERMAN MILLET ( <i>Setaria italica</i> )
ANNUAL RYEGRASS <sup>c</sup> ( <i>Lolium multi-florum</i> )


  
 VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

## Topsoil

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

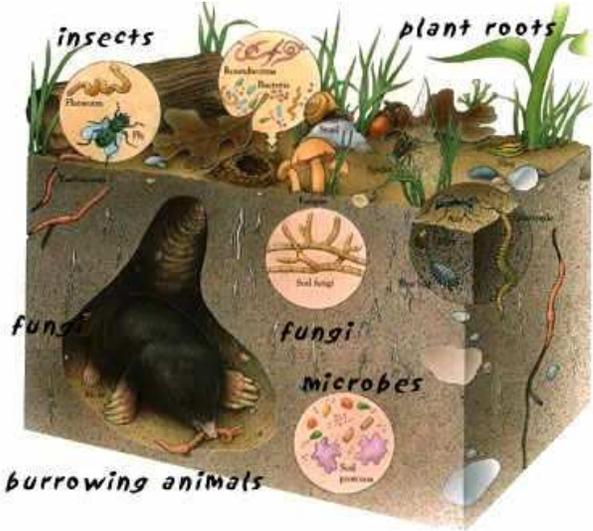


## Topsoil

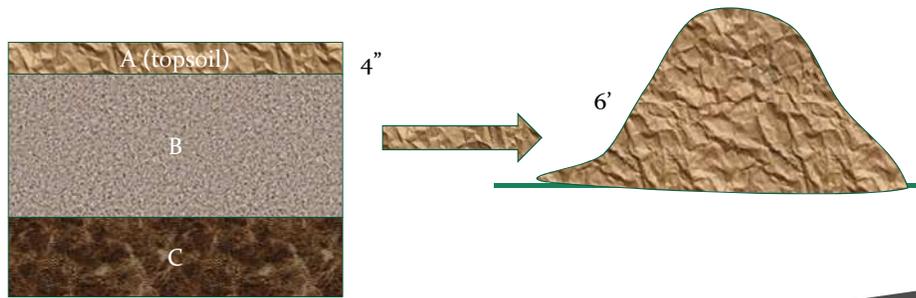
Topsoil stockpiles



Greatly reduced soil life



## Maintaining Soil Life in Topsoil Stock Piles

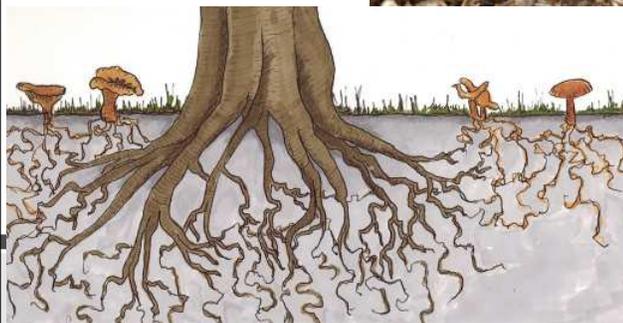


## Topsoil Stockpile

- Loss of Mycorrhizae
- Loss of nitrogen fixing bacteria
- Loss of other beneficial organisms



## Micorrhizal mushrooms



## Maintaining Soil Life in Topsoil Stock Piles

**To maintain native soil life (mycorrhizae and other life) we need:**

- Grow plants on the pile
- Best would be: native plants (native annuals???)
- In the past literature suggested a cover crop of buckwheat



Buckwheat



## Plants and ESC

### Two uses of plants:

- Temporary stabilization
  - Areas not at final grade but not disturbed for more than 14 days
  - Perimeter controls and other ESC measures left in place <1 year
  - Areas ready for permanent revegetation at the wrong time of year/season
  - Topsoil stock piles
- Permanent stabilization (aka landscaping)



## Planning for landscaping/planting

Plant selection considerations (the old days):

- Low Maintenance
- High Maintenance



## ■ ■ ■ Planning for landscaping/planting

Plant selection considerations (now):

- Forest and Open Space
- Managed Turf





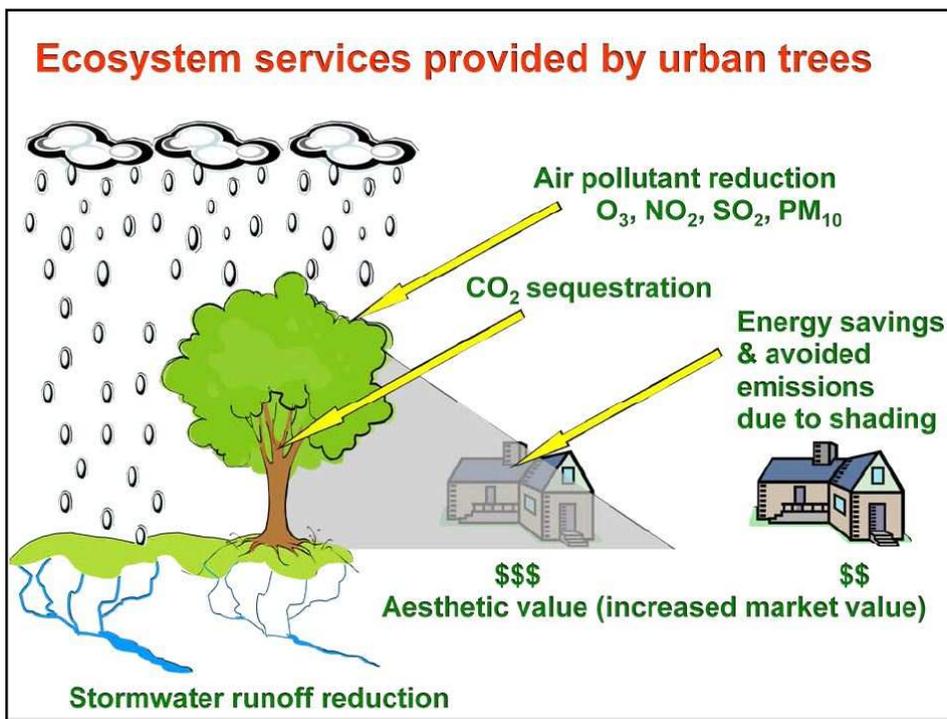
## ■ ■ ■ Planning for landscaping/planting

Plant selection considerations:

- Use
 

Recreation	Sports fields Lawns
Shade	
Privacy	
Beautification	
Wind screen	
Functionality	Stormwater Forestry Fruit orchard Wildlife/insects





## ■ ■ ■ Planning for landscaping/planting

Plant selection considerations:

• Light	Sun Part shade Shade	
• Soil	Deep Average Well draining	Sand Clay Poorly draining
• Nutrients	Acid Neutral Rich	Poor
• Water	Irrigation Wet Facultative Upland	Tolerant to Occasional inundation Drought tolerant Requires even moisture

## Soils ... you are what you eat



Good/fertile soil



Poor/infertile soil



## Topsoil

- Site stripping, stockpiling and reapplying topsoil may not be cost effective
- Can delay seeding or sodding operations
- May increase soil exposure time
- May contain weeds



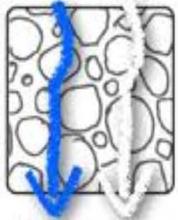
## Construction = Soil Compaction

1. Stripping of topsoil
2. Placement of equipment
3. Storage
4. Replacement of top soil?



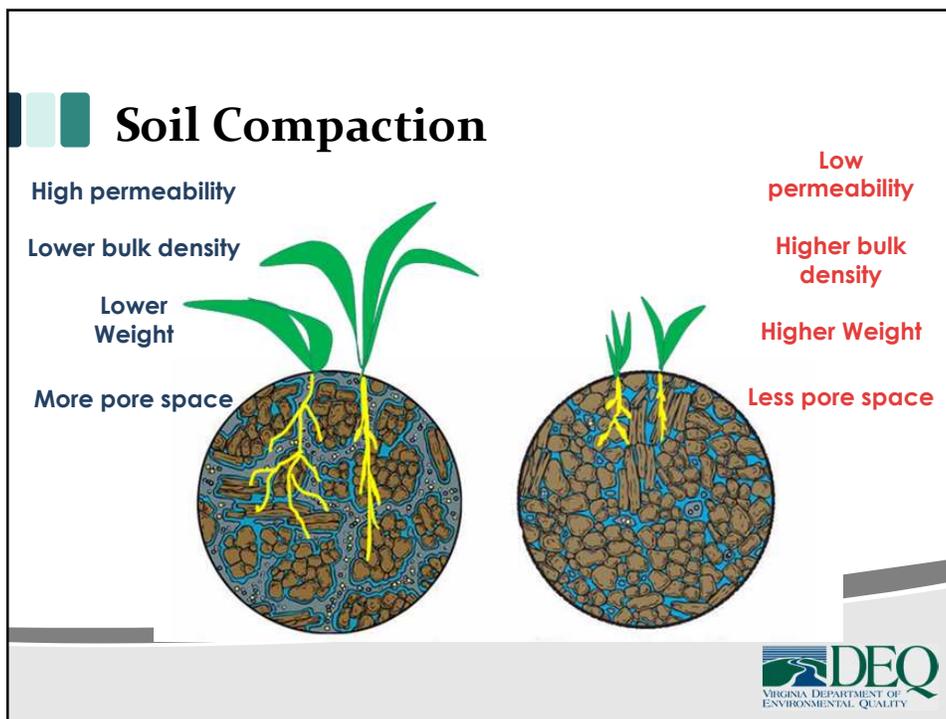
## Soil Compaction

Normal Soil



Water Air





## Soil

- Soil is the most important factor in establishing a good self sustaining plant community (MS-3).
- Soil quality can be influenced by management (planting bed preparation, liming, fertilization, organic amendments, watering).

## Plant nutrition: The essential nutrients

Biotic Nutrients	Nitrogen	-	Protein	Essential macro
	Sulphur	-	Protein	Essential macro
	Phosphorus	-	Protein	Essential macro
Basic Nutrients	Calcium	+	Metabolic	Essential macro
	Magnesium	+	Metabolic	Essential macro
	Potassium	+	Metabolic	Essential macro
	Sodium*	+	Metabolic	Beneficial
Minor Nutrients	Iron	+	Regulatory	Essential
	Manganese	+	Regulatory	Essential
	Copper	+	Regulatory	Essential
	Zinc	+	Regulatory	Essential
	Boron*	0	Regulatory	Essential
Incidental Nutrients	Aluminium*	+		Beneficial
	Nickel*	+		Essential
	Molybdenum	-		Essential
	Cobalt			Essential
	Silicon	0		Beneficial
	Selenium	-		Beneficial
Chlorine*	-		Essential	

\* may reach toxic/detrimental levels



## Soil Testing

- Soil texture, pH and nutrient content should be determined before application of lime and fertilizer
- Soil samples are sent for testing
- Small fee
- Saves time, money
- Will help to establish vegetation correctly

Virginia Tech  
Soil Testing Laboratory  
Publication 452-125  
Revised 2014

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

*Please Print (Form expires January 2017)*  
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 Smyth 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](http://www.soiltest.vt.edu) for more information.

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

<b>SAMPLE IDENTIFICATION</b> Your Sample Box Number or Name (1 to 5 digits) [ ][ ][ ][ ][ ]	<b>PLANT TO BE GROWN</b> Insert Plant Code # from list at right [ ][ ][ ]	<b>PLANT CODE LIST</b> Lawn: Kentucky Bluegrass, Escarp, or Ryegrass 201 Establishing New Lawn 202 Maintaining Lawn, Repair of Bare Spots Non-Acid-Loving Shrubs and Trees 245 Shrubs - Lilac, Forsythia, Boxwood, etc. 246 Trees - Pine, Maple, Oak, etc. Fruits 220 Apples 221 Blackberries 222 Blueberries 223 Currants 224 Gooseberries 225 Grapes 226 Nectarines 227 Peaches 228 Plums 229 Plants 230 Quince 231 Raspberries 232 Sour Cherry 233 Strawberries 234 Sweet Cherries Acid-Loving Shrubs 240 Aralacs 241 Andromeda 242 Camellias 243 Laurel 244 Rhododendron House Plants 250 Potted House Plants
<b>SOIL INFORMATION</b> Last Lime Application Months Previous: [ ] 0 [ ] 6 [ ] 12 [ ] 18 [ ] 19+ Pounds per 1,000 sq. ft.: [ ] 0 [ ] 10-50 [ ] 51-100 [ ] 101-150 [ ] 151+		

SOIL TESTS DESIRED AND FEES		TEST	COST PER SAMPLE
<input type="checkbox"/>	Routine (soil pH, P, K, Ca, Mg, Zn, Mn, Cu, Fe, B, and estimated CEC)	\$10.00	\$16.00
<input type="checkbox"/>	Organic Matter - Determines percentage in soil - no recommendation given	\$4.00	\$6.00
<input type="checkbox"/>	Soluble Salts - Determines if fertilizer salts are too high	\$2.00	\$3.00

Send in payment along with soil sample and form; make check or money order payable to "Treasurer, Virginia Tech."

## Topsoil

- Liming and fertilizing the subsoil may be a good growth medium for seeding
- Clay content makes moisture available
- Clay content deters leaching of nutrients



## 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



## **Simplified Construction Process**

1. Site survey & environmental review
2. Design/planning
3. Permitting
4. Contracting
5. Installation of perimeter controls (+ inspection of controls)
6. Site clearing and grading
7. Construction
8. Landscaping
9. Bond release and occupancy
10. Continued inspection of SWM BMPs



## **Planning for landscaping/planting**

Plant selection considerations:

- Use
 

Recreation	Sports fields Lawns
Shade	
Privacy	
Beautification	
Wind screen	
Functionality	<b>Stormwater</b> Forestry Fruit orchard Wildlife/insects



## Appendix E. Landscaping

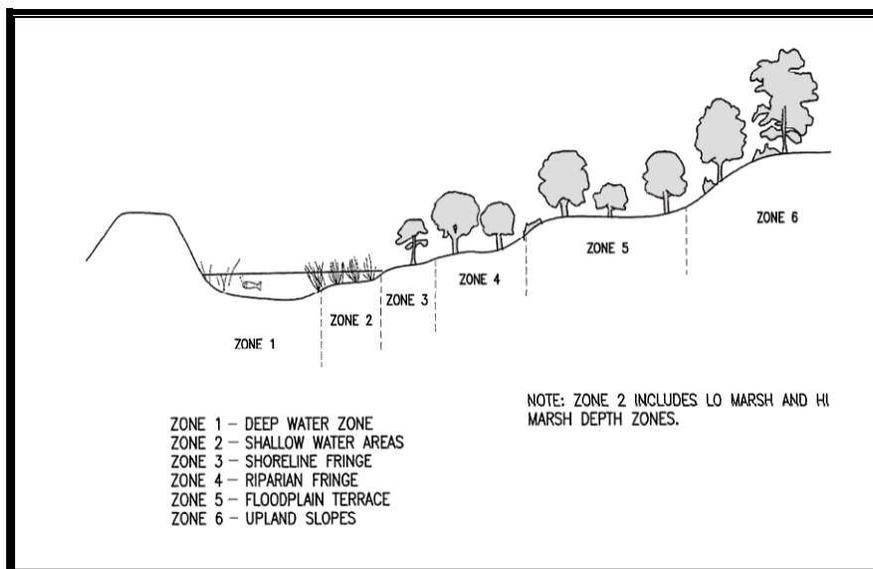


Figure E-2. Planting Zones for Typical Stormwater BMPs

## Stormwater Plant Requirements

So what are the commonalities?

- Able to withstand periodic flooding
- Able to withstand intermittent dry periods
- Should have a high light requirements
- Will be exposed to high temperature (also of runoff)
- May have size requirements

## Moisture Requirements

- Plants that grow in deep water
- Plants that grow in shallow water
- Plants that require constant moist soil
- Plant that tolerate alternate inundation and dry soil
- Plants that tolerate alternate inundation and extended dry periods



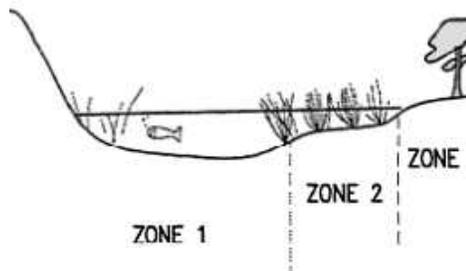
## Stormwater Plant Requirements

So what are the commonalities for plants in wet ponds/wetlands

- Obligate water depth
- Specific water depth requirement/tolerance



## Some Species that Require Inundation



- ZONE 1 – DEEP WATER ZONE
- ZONE 2 – SHALLOW WATER AREAS
- ZONE 3 – SHORELINE FRINGE
- ZONE 4 – RIPARIAN FRINGE
- ZONE 5 – FLOODPLAIN TERRACE
- ZONE 6 – UPLAND SLOPES



## Some Species that Require Inundation

**Figure E-1b. Native Wetland Plant Guide for Stormwater Management Areas in the Mid-Atlantic – USA Wetland Plants**

Wetland Plants	Zone	Form	Available	Inundation Tolerances	Wildlife Value	Notes
<i>Najas sarracenia</i>	2	Emergent	yes	up to 1 ft.	High, herbivores eaten by wood ducks.	Full sun to partial shade.
Arrowhead/Duck potato <i>Najas sarracenia</i>	2	Emergent	yes	up to 1 ft.	Moderate, tubers and seeds eaten by ducks.	Aggressive colonizer.
Broomrape <i>Andropogon virginicus</i>	2,3	Perennial	yes	up to 3 in.	High, songbirds and brooders. Winter food and cover.	Tolerant of fluctuating water levels and partial shade.
Cattail <i>Typha</i> spp.)	2,3	Emergent	yes	up to 1 ft.	Low, except in cover.	Aggressive. May dominate other species. Volunteer. High pollutant treatment.
Crooktail <i>Ceratophyllum demersum</i>	1	Submergent	no	yes	Low, food, good habitat and shelter for fish and invertebrates.	Free floating SAV. Shade tolerant. Rapid growth.
Common Three Square <i>Scirpus pungens</i>	2	Emergent	yes	up to 6 in.	High, seeds, cover, waterfowl, songbirds.	Fast colonizer. Can tolerate periods of dryness. Full sun. High metal removal.
Duckweed <i>Lemna</i> sp.)	1,2	Submergent	yes	yes	High, food for waterfowl and fish.	May bioaccumulate metals beyond concentrations found in water.
Leard's Tail <i>Sagittaria arifolia</i>	2	Emergent	yes	up to 1 ft.	Low, except wood ducks.	Rapid growth. Shade tolerant.
Marsh Hibiscus <i>Hibiscus moscheutosus</i>	2,3	Emergent	yes	up to 3 in.	Low, nectar.	Full sun. Can tolerate periodic dryness.
Pickeringweed <i>Pontederia cordata</i>	2,3	Emergent	yes	up to 1 ft.	Moderate, ducks, nectar for butterflies.	Full sun to partial shade.
Pond Weed <i>Potamogeton pectinatus</i>	1	Submergent	yes	yes	Extremely high, waterfowl, marsh and shorebirds.	Removes heavy metals.
Rice Cutgrass <i>Leersia oryzoides</i>	2,3	Emergent	yes	up to 3 in.	High, food and cover.	Full sun, although tolerant of shade. Shoreline stabilization.
Sedges <i>Carex</i> spp.)	2,3	Emergent	yes	up to 3 in.	High, waterfowl, songbirds.	Many wetland and several upland species.

**\*Zone 1: Submergent Aquatic Vegetation**  
**\*Zone 2: Shallow Water Bench - 6-12 inches Deep**  
**\*Zone 3: Shoreline Fringe - Regularly Inundated Area**  
**\*Zone 4: Riparian Fringe - Periodically Inundated Area, Wet Soils**  
**\*Zone 5: Floodplain Terrace - Intermittently Inundated, Moist Soils**  
**\*Zone 6: Upland Slopes - Some Species that Require Inundation**



Common three square



## Some Species that Require Inundation

Table E-1b (cont.)						
Wetland Plants	*Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Sedges ( <i>Carex</i> spp.)	2,3	Emergent	yes	up to 3 in.	High, waterfowl, songbirds.	Many wetland and several upland species.
Soft-stem Bulrush ( <i>Scirpus validus</i> )	2,3	Emergent	yes	up to 1 ft.	Moderate, good cover and food.	Full sun. Aggressive colonizer. High pollutant removal.
Smartweed ( <i>Polygonum</i> spp.)	2	Emergent	yes	up to 1 ft.	High, waterfowl, songbirds, seeds and cover.	Fast colonizer. Avoid weedy aliens such as <i>P. perfoliatum</i> .
Spatterdock ( <i>Nuphar luteum</i> )	2	Emergent	yes	up to 1.5 ft.	Moderate, for food but high for cover.	Fast colonizer. Tolerant of fluctuating water levels.
Switchgrass ( <i>Panicum virgatum</i> )	2,3,4, 5,6	Perimeter	yes	up to 3 in.	High, seeds, cover. Waterfowl, songbirds.	Tolerates wet/dry conditions.
Sweet Flag ( <i>Acorus callamus</i> )	2,3	Perimeter	yes	up to 3 in.	Low, tolerant of dry periods.	Tolerates acidic conditions. Not a rapid colonizer.
Waterweed ( <i>Elodea canadensis</i> )	1	Submergent	yes	yes	Low.	Good water oxygenator. High nutrient, copper, manganese and chromium removal.
Wild Celery ( <i>Vallisneria spiralis</i> )	1	Submergent	yes	yes	High, food for waterfowl. Habitat for fish and invertebrates.	Tolerant of murky water and high nutrient loads.
Wild Rice ( <i>Zizania aquatica</i> )	2	Emergent	yes	up to 1 ft.	High, food. Birds.	Prefers full sun.



Soft-stem bulrush

\*Zone 1: Submergent Aquatic Vegetation  
 \*Zone 2: Shallow Water Bench - 6-12 inches Deep  
 \*Zone 3: Shoreline Fringe - Regularly Inundated Area  
 \*Zone 4: Riparian Fringe - Periodically Inundated Area, Wet Soils  
 \*Zone 5: Floodplain Terrace - Infrequently Inundated, Moist Soils  
 \*Zone 6: Upland Slopes - Seldom or Never Inundated, Moist To Dry Soils

Source: Native Plant Pondscaping Guide - Watershed Restoration Sourcebook, Natalie Karouna, MWCOG



## Some Species that Require Inundation (available from growers)

- Deep Water (>6")
  - Needle Spikerush (*Elocharis aricularis*)
  - Duckweed (*Lemna* species)
  - American lotus (*Nelumbo lutea*) →
  - Yellow pond lily (*Nuphar advena*)
  - White water lily (*Nymphaea odorata*)
  - Claspingleaf pondweed (*Potamogeton perfoliatus*)



## Some Species that Require Inundation (available from growers)

- Shallow Water (0"-6")
  - Soft rush (*Juncus effusus*)
  - Sweet flag (*Acorus americanus*)
  - Horse tail (*Equisetum hyemale*)
  - Blue flag iris (*Iris versicolor*)
  - Arrow arum (*Peltandra virginica*)
  - Pickerel weed (*Pontederia cordata*)
  - Bulltongue (*Sagittaria lanceifolia*)
  - Lizard tail (*Saururus cernuus*) →



## Some Species that Require Inundation (available from growers)

- Shallow Water (0"-6")
  - Three square (*Schoenoplectus pungens*)
  - Softstem bulrush (*Schoenoplectus tabernaemontani*)
  - Wool grass (*Scirpus cyperinus*) →
  - Burreed (*Sparganium americanum*)
  - Water millet (*Zizaniopsis millacea*)



## Plants that do not require standing water

Too many to mention:

**But:**

- Go native
- Consult guides, flora and growers on moisture requirements
- Be aware of growing/rooting habit



## Example

- Red maple (*Acer rubrum*):
  - Seems to have an affinity for foundations, septic lines and other drain lines
- An oak ≠ an oak ≠ an oak:
  - Red oak is an upland species,
  - Willow oak tolerates multiple moisture regimes,
  - Overcup oak grows in wetlands





# Plant selection

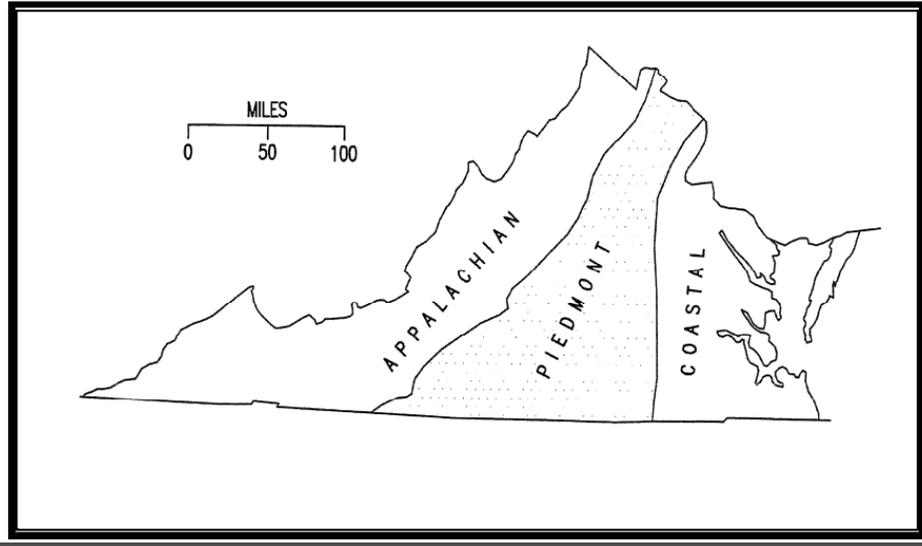


## Plant Selection

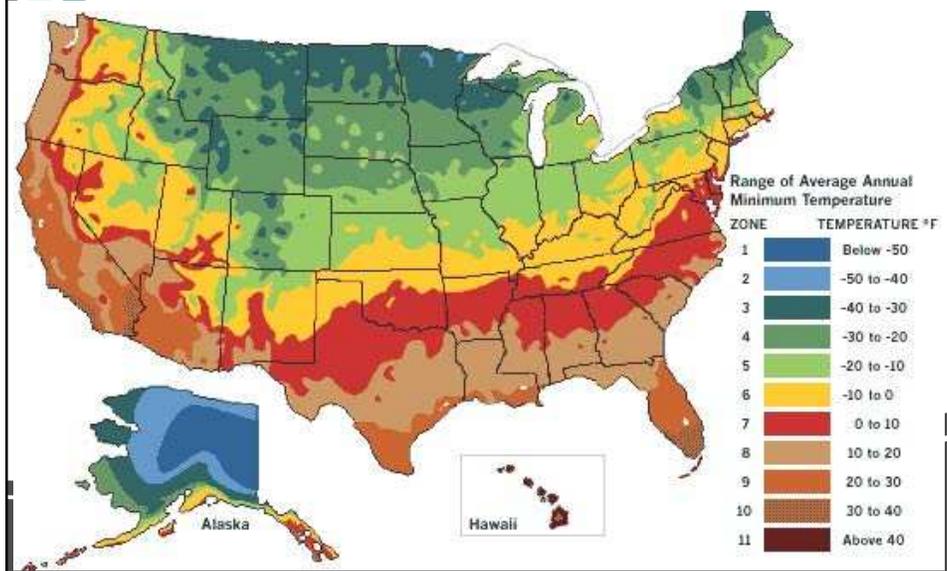
- Proposed use (ESC, SWM, landscaping)
- Proposed location in the landscape (wet, moist, dry, sun, shade, partial shade)
- Native vs. Non-native (watch out for invasive!)
- Source of plant materials (nursery, native grower, whole sale)
- Type of plant materials (seed, containerized, ball and burlap, sprigs, plug, bare root)



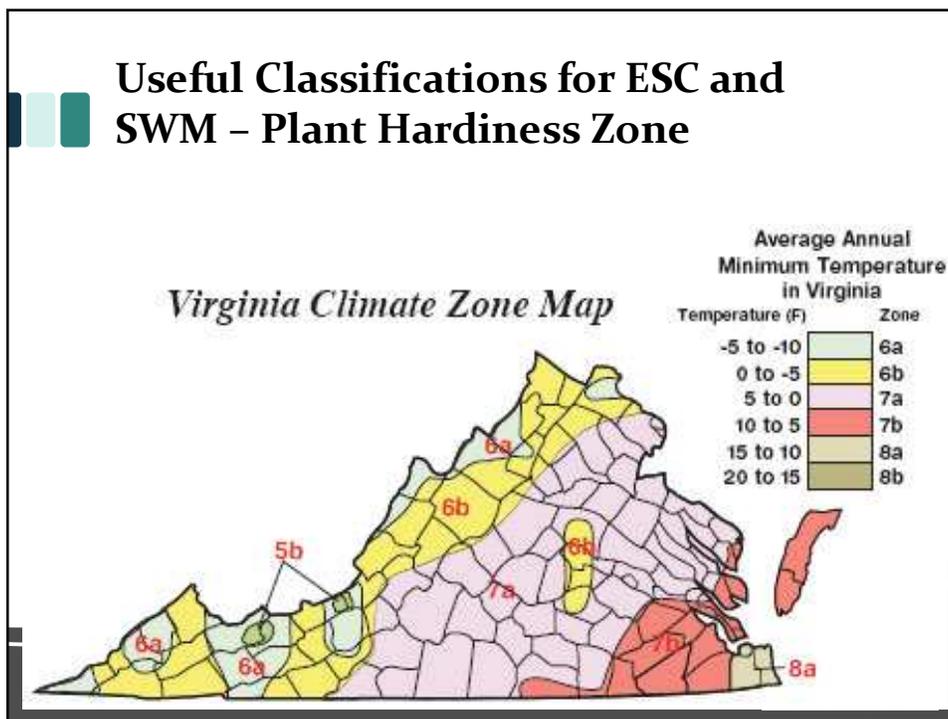
**Figure E-1. Virginia Physiographic Regions**



**Useful Classifications for ESC and SWM – Plant Hardiness Zone**



## Useful Classifications for ESC and SWM – Plant Hardiness Zone



## Plant Selection Example



Cardinal Flower – *Lobelia cardinalis*

<i>Lobelia cardinalis</i> Cardinal flower *	July – October. Brilliant scarlet red flowers arranged along tall stems attract hummingbirds and butterflies; biennial; will naturalize; long bloom period.	Light: ☀️ Moisture: M W Salinity: N Browse: M	H 24" – 48" S 12" – 24"
--	---	--	----------------------------



Light → Sun to part shade  
Moisture → Moist to wet  
Salinity → No  
Browse → Medium

Height → 24"-48"  
Spread → 12"-24"



http://nnpns.org/Go\_Native\_Grow\_Native\_files/NorthernNeckNativePlantGuide.pdf

## Plant Selection Example



*Lobelia cardinalis*

**Cardinal Flower**

Native plants of the Northern Neck

**Type:** Perennial

**Size:** Height 1-6 ft

**Flowers:** Red, July-Oct

**Light:** Full sun to part shade

**Soil:** Moist, rich clay, loam or sandy soils, not drought tolerant

**Habitat:** Grows in low areas, woodland edges, streambanks, roadsides and meadows.

**Benefits:** Attracts birds and butterflies. Depends on hummingbirds, which feed on the nectar, for pollination.



United States Department of Agriculture  
Natural Resources Conservation Service

## Plant Guide

### CARDINAL FLOWER

*Lobelia cardinalis* L.

Plant Symbol = LOCA2

Contributed by: USDA NRCS National Plant Data Center



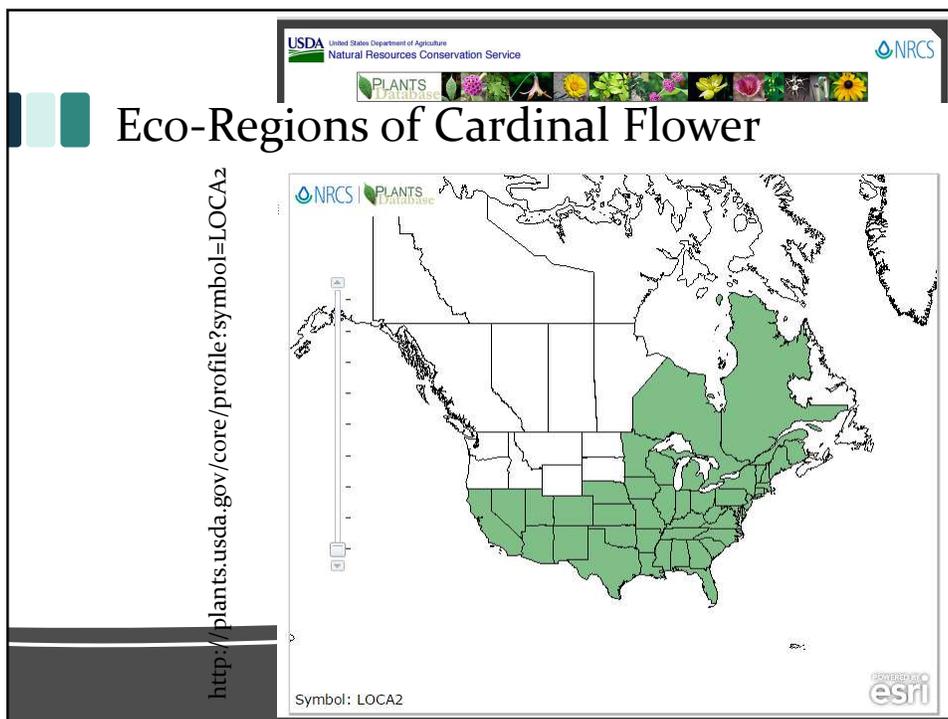
roots and flowers of cardinal flower in the composition of a love charm.

**Wildlife:** Hummingbirds are attracted to the nectar. Deer browsing often damages young plants.

**Status**  
Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status, such as, state noxious status and wetland indicator values.

**Description**  
*General:* Bellflower Family (Campanulaceae). This herbaceous perennial is 5 to 15 cm. tall with unbranched stems. The alternate leaves are toothed and oblong to lance-shaped and pointed at both ends. The irregular, two-lipped flowers are tubular with the upper portion two-lobed and the lower spreading and divided into three parts. The fire engine red flowers appear in long terminal racemes and they are from 30-45 mm. The anthers are at the end of a slender red filament tube extending out over the lower lip of the corolla. The corolla has a slit on each side near the base. The seeds come in a two-celled, many-seeded capsules opening at the top. They are small, less than 1 mm. and numerous.

**Distribution**  
This plant is found in wet soil from New Brunswick to Minnesota, south to the Gulf of Mexico. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.



## Lobelia cardinalis

<i>Kosteletzkya virginica</i>	Saltmarsh Mallow	SuperSize Plug	4/15/15	880
<i>Kosteletzkya virginica</i>	Saltmarsh Mallow	SuperSize Plug	9/1/15	1,760
<b><i>Lobelia cardinalis</i></b>	<b>Cardinal Flower</b>	<b>SuperSize Plug</b>	<b>3/1/15</b>	<b>1,796</b>
<i>Lobelia cardinalis</i>	Cardinal Flower	SuperSize Plug	4/15/15	2,232
<i>Lobelia cardinalis</i>	Cardinal Flower	SuperSize Plug	6/1/15	1,305
<i>Lobelia cardinalis</i>	Cardinal Flower	SuperSize Plug	6/1/15	1,760

<i>Lobelia cardinalis</i>	Cardinal Flower	SuperSize Plug	7/15/15	1,760
<i>Lobelia cardinalis</i>	Cardinal Flower	SuperSize Plug	8/15/15	1,760
<i>Lobelia cardinalis</i>	Cardinal Flower	SuperSize Plug	9/15/15	1,760
<i>Lobelia cardinalis</i>	Cardinal Flower	SuperSize Plug	10/15/15	1,760
<i>Lobelia cardinalis</i>	Cardinal Flower	SuperSize Plug	10/15/15	1,760
<i>Lobelia elongata</i>	Blue Lobelia	SuperSize Plug	4/15/15	708
<i>Lobelia elongata</i>	Blue Lobelia	SuperSize Plug	7/15/15	880
<b><i>Lobelia siphilitica</i></b>	<b>Big Blue Lobelia</b>	<b>SuperSize Plug</b>	<b>9/15/14</b>	<b>30</b>

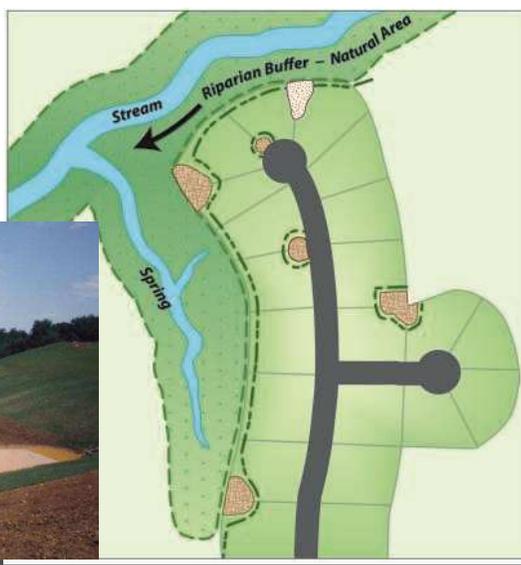
## Additional issues to consider in planning process

- Co-location of BMPs
- Phasing/timing of conversion
- Use topsoil or subsoil?
- Native plants are favored by deer



## Additional issues to consider in planning process

- Co-location of BMPs



## Additional issues to consider in planning process

- Phasing/timing of conversion
  - Plants may require irrigation
  - Timing of planting of species that require inundation is critical
  - Site needs to be stabilized before conversion

*Also important for inspectors*



## Additional issues to consider in planning process

- Use topsoil or subsoil?
  - Subsoil probably ok for forest/open space
  - Topsoil better for managed pasture
- Subsoil can be amended to create fertile planting bed
  - Compost
  - Fertilizer
  - Lime
  - Cultivation

*Soil analysis*



## Additional issues to consider in planning process

- Native plants are favored by deer/geese

