



Module 7

Plan Review and Inspection (or How to kill a plant)



Plan Review/Inspection

Plan Reviewers and Inspectors (and RLD/site supervisor) need to be able to read a landscaping plan

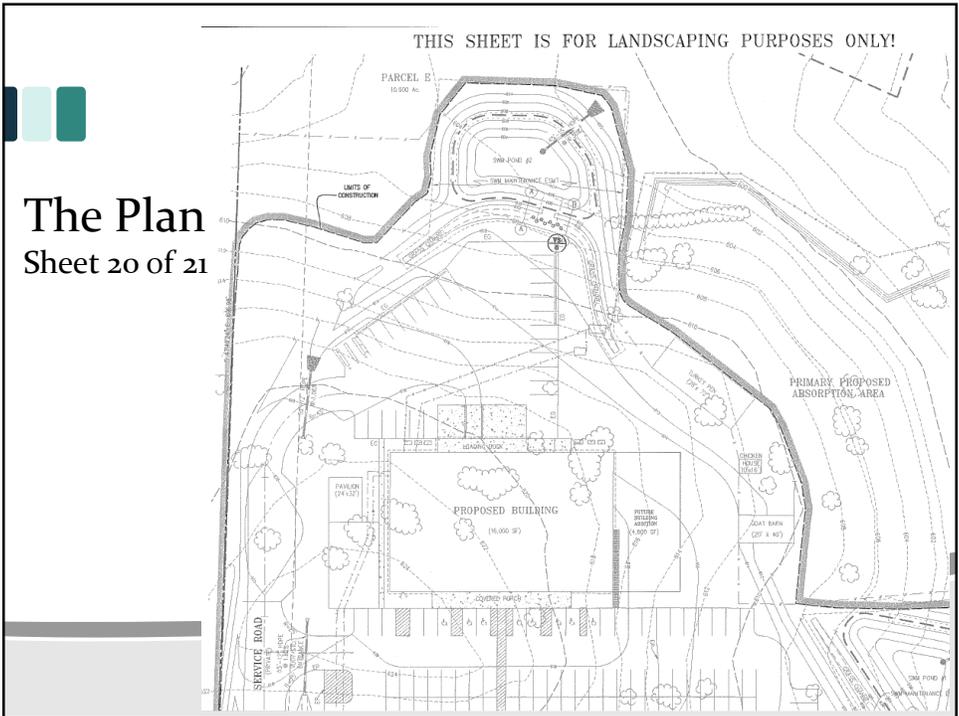
- Plan reviewers review a plan to make sure it meets the MS, that the plan is feasible, and that it will achieve the objective (ESC and SWM)
- Inspectors make sure that the plants are installed and maintained according to the plan



RAIN GARDEN LANDSCAPING SCHEDULE

KEY	QTY (EA)	BOTANICAL NAME	COMMON NAME	HEIGHT/SPACING	CALIPER	ROOT COND.
BIORETENTION 1 LANDSCAPING						
SMALL DECIDUOUS TREES						
BN	8	BETULA NIGRA	RIVER BIRCH		1" CAL	B&B
QB	4	QUERCUS BICOLOR	SWAMP WHITE OAK		1" CAL	B&B
SHRUBS						
HD	6	HYPERICUM DENIFLORUM	COMMON ST. JOHN'S WORT	36"-48"		CONT.
IV	7	LEX VERTICILLATA	WINTERBERRY	36"-48"		CONT.
MP	7	MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	36"-48"		CONT.
GROUND COVER						
PC	1280	PANICUM VIRGATUM	SWITCH GRASS	18" O.C.		PLUG
BIORETENTION 2 LANDSCAPING						
SMALL DECIDUOUS TREES						
BN	1	BETULA NIGRA	RIVER BIRCH		1" CAL	B&B
QB	1	QUERCUS BICOLOR	SWAMP WHITE OAK		1" CAL	B&B
SHRUBS						
HD	2	HYPERICUM DENIFLORUM	COMMON ST. JOHN'S WORT	36"-48"		CONT.
IV	2	LEX VERTICILLATA	WINTERBERRY	36"-48"		CONT.
MP	1	MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	36"-48"		CONT.
GROUND COVER						
PC	300	PANICUM VIRGATUM	SWITCH GRASS	18" O.C.		PLUG
BIORETENTION 3 LANDSCAPING						
LARGE DECIDUOUS TREES						
ZS	3	ZELKOVA SERRATA	JAPANESE ZELKOVA		2" CAL	B&B
SHRUBS						
HD	6	HYPERICUM DENIFLORUM	COMMON ST. JOHN'S WORT	36"-48"		CONT.
IV	6	LEX VERTICILLATA	WINTERBERRY	36"-48"		CONT.
MP	6	MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	36"-48"		CONT.
GROUND COVER						
PC	680	PANICUM VIRGATUM	SWITCH GRASS	18" O.C.		PLUG
BIORETENTION 4 LANDSCAPING						
SMALL DECIDUOUS TREES						
BN	12	BETULA NIGRA	RIVER BIRCH		1" CAL	B&B
QB	10	QUERCUS BICOLOR	SWAMP WHITE OAK		1" CAL	B&B
SHRUBS						
HD	15	HYPERICUM DENIFLORUM	COMMON ST. JOHN'S WORT	36"-48"		CONT.
IV	14	LEX VERTICILLATA	WINTERBERRY	36"-48"		CONT.
MP	15	MYRICA PENNSYLVANICA	NORTHERN BAYBERRY	36"-48"		CONT.
GROUND COVER						
PC	1900	PANICUM VIRGATUM	SWITCH GRASS	18" O.C.		PLUG

Example of a planting plan



The Plan Sheet 20 of 21



The Plan

Sheet 21 of 21

PLANT LEGEND

ER		<small>SMALL DECIDUOUS: CERVOIS CANADENSIS/EASTERN REDBUD</small>
RD		<small>SMALL DECIDUOUS: CORNUS SERICEA/REDOSIER DOGWOOD</small>
SB		<small>MEDIUM DECIDUOUS: AMELANCHIRE CANADENSIS/SERVICEBERRY</small>
RM		<small>LARGE DECIDUOUS: ACER RUBRUM/RED MAPLE</small>
VP		<small>MEDIUM EVERGREEN: PINUS VIRGINIANA/VIRGINIA PINE</small>
SP		<small>MEDIUM EVERGREEN: PINUS SYLVESTRIS/SCOTCH PINE</small>
IH		<small>SHRUB: ILEX GLABRA/INKBERRY HOLLY</small>
MV		<small>SHRUB: VIBURNUM DAVIDI/DAVID VIBURNUM</small>
VS		<small>SHRUB: ITEA VIRGINICA/VIRGINIA SWEETSPIRE</small>
WB		<small>SHRUB: ILEX VERTICILLATA/WINTERBERRY</small>

MAINTENANCE:
DEAD AND DYING TREES AND REPLACEMENTS.
THE APPLICANT SHALL REPLACE ANY TREES PLANTED ALONG THE FORESTED BUFFER THAT DIE WITHIN THREE (3) YEARS OF PLANTING. IF ANY TREES SHOWN ON THE APPROVED SITE PLAN TO BE PRESERVED OR PLANTED AS PART OF THE PERIMETER BUFFER BECOME DISEASED OR ARE DYING, THEN THE APPLICANT MAY REMOVE THOSE TREES. IF THE REMOVED TREES ARE PART OF THE SCREENING BUFFER AS SHOWN ON THE APPROVED LANDSCAPE/BUFFER PLAN, THEN THE APPLICANT SHALL REPLACE WITH SUCH NUMBER OF TREES AS ARE NECESSARY TO SATISFY THE SCREENING INTENT OF THE APPROVED LANDSCAPE/BUFFER PLAN. THE REPLACEMENT TREES MUST BE EQUIVALENT TO THAT SHOWN ON THE APPROVED PLAN.

PROTECTION:
THE APPLICANT SHALL BE RESPONSIBLE FOR AND EMPLOY REASONABLE EFFORTS FOR THE PROTECTION OF THE TOPS, TRUNKS AND ROOTS OF ALL EXISTING TREES, AS WELL AS OTHER VEGETATION ON THE SITE. PROTECTION DEVICES SHALL BE INSTALLED ALONG THE LIMITS OF CLEARING AND GRADING, PRIOR TO ANY CONSTRUCTION OCCURRING ON-SITE. SUCH PROTECTION SHALL BE MAINTAINED UNTIL ALL WORK IN THE VICINITY HAS BEEN COMPLETED, AND SHALL NOT BE REMOVED WITHOUT THE CONSENT OF THE ZONING ADMINISTRATOR.

SCALE: 1" = 30'

DATE: 03-01-14

REVISIONS:
04-18-14 COUNTY COMMENTS

SHEET 21 OF 21

FILE NO. 1189



The Plan

Sheet 21 of 21

PLANT LEGEND

ER		<small>SMALL DECIDUOUS: CERVOIS CANADENSIS/EASTERN REDBUD</small>
RD		<small>SMALL DECIDUOUS: CORNUS SERICEA/REDOSIER DOGWOOD</small>
SB		<small>MEDIUM DECIDUOUS: AMELANCHIRE CANADENSIS/SERVICEBERRY</small>
RM		<small>LARGE DECIDUOUS: ACER RUBRUM/RED MAPLE</small>
VP		<small>MEDIUM EVERGREEN: PINUS VIRGINIANA/VIRGINIA PINE</small>
SP		<small>MEDIUM EVERGREEN: PINUS SYLVESTRIS/SCOTCH PINE</small>
IH		<small>SHRUB: ILEX GLABRA/INKBERRY HOLLY</small>
MV		<small>SHRUB: VIBURNUM DAVIDI/DAVID VIBURNUM</small>
VS		<small>SHRUB: ITEA VIRGINICA/VIRGINIA SWEETSPIRE</small>
WB		<small>SHRUB: ILEX VERTICILLATA/WINTERBERRY</small>

MAINTENANCE:
DEAD AND DYING TREES AND REPLACEMENTS.
THE APPLICANT SHALL REPLACE ANY TREES PLANTED ALONG THE FORESTED BUFFER THAT DIE WITHIN THREE (3) YEARS OF PLANTING. IF ANY TREES SHOWN ON THE APPROVED SITE PLAN TO BE PRESERVED OR PLANTED AS PART OF THE PERIMETER BUFFER BECOME DISEASED OR ARE DYING, THEN THE APPLICANT MAY REMOVE THOSE TREES. IF THE REMOVED TREES ARE PART OF THE SCREENING BUFFER AS SHOWN ON THE APPROVED LANDSCAPE/BUFFER PLAN, THEN THE APPLICANT SHALL REPLACE WITH SUCH NUMBER OF TREES AS ARE NECESSARY TO SATISFY THE SCREENING INTENT OF THE APPROVED LANDSCAPE/BUFFER PLAN. THE REPLACEMENT TREES MUST BE EQUIVALENT TO THAT SHOWN ON THE APPROVED PLAN.

PROTECTION:
THE APPLICANT SHALL BE RESPONSIBLE FOR AND EMPLOY REASONABLE EFFORTS FOR THE PROTECTION OF THE TOPS, TRUNKS AND ROOTS OF ALL EXISTING TREES, AS WELL AS OTHER VEGETATION ON THE SITE. PROTECTION DEVICES SHALL BE INSTALLED ALONG THE LIMITS OF CLEARING AND GRADING, PRIOR TO ANY CONSTRUCTION OCCURRING ON-SITE. SUCH PROTECTION SHALL BE MAINTAINED UNTIL ALL WORK IN THE VICINITY HAS BEEN COMPLETED, AND SHALL NOT BE REMOVED WITHOUT THE CONSENT OF THE ZONING ADMINISTRATOR.

SCALE: 1" = 30'

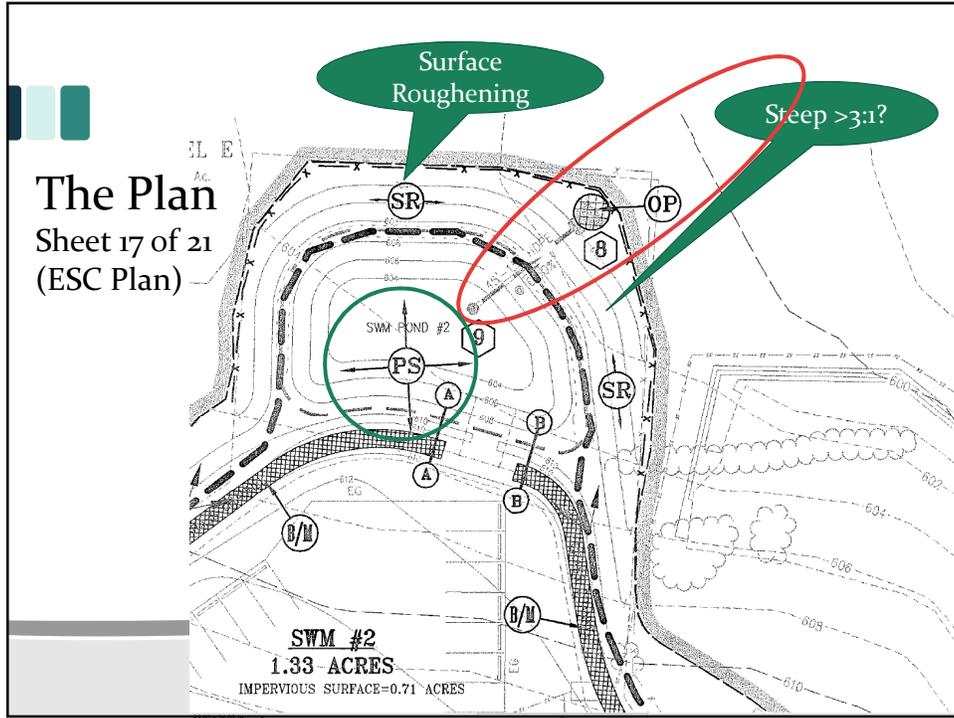
DATE: 03-01-14

REVISIONS:
04-18-14 COUNTY COMMENTS

SHEET 21 OF 21

FILE NO. 1189

??? No groundcover ???
Grasses/herbs



The Plan
Sheet 18 of 21
(ESC Plan)

Not on plan RLD?

TABLE 3.32-D
SITE SPECIFIC SEEDING MIXTURES FOR PIEDMONT AREA

	Total Lbs. Per Acre
Minimum Care Lawn	
- Commercial or Residential	175-200 lbs.
- Kentucky 31 or Turf-Type Tall Fescue	95-100%
- Improved Perennial Ryegrass	0-5%
- Kentucky Bluegrass	0-5%
High-Maintenance Lawn	
- Kentucky 31 or Turf-Type Tall Fescue	100%
General Slope (3:1 or less)	
- Kentucky 31 Fescue	128 lbs.
- Red Top Grass	2 lbs.
- Seasonal Nurse Crop *	20 lbs.
	150 lbs.
Low-Maintenance Slope (Steeper than 3:1)	
- Kentucky 31 Fescue	108 lbs.
- Red Top Grass	2 lbs.
- Seasonal Nurse Crop *	20 lbs.
- Crownvetch **	20 lbs.
	150 lbs.

* Use seasonal nurse crop in accordance with seeding dates as stated below:
 February 16th through April Annual Rye
 May 1st through August 15th Foxtail Millet
 August 16th through October Annual Rye
 November through February 15th Winter Rye

** Substitute *Sericea lespedeza* for Crownvetch east of Farmville, Va. (May through September use hulled *Sericea*, all other periods, use unhulled *Sericea*). If Flatpea is used in lieu of Crownvetch, increase rate to 30 lbs./acre. All legume seed must be properly inoculated. Weeping Lovegrass may be added to any slope or low-maintenance mix during warmer seeding periods; add 10-20 lbs./acre in mixes.

The Plan Sheet 21 of 21

SPECIFICATIONS FOR PLANTING

PLANT IDENTIFICATION: ALL PLANTS SHALL BE PROPERLY MARKED FOR IDENTIFICATION AND CHECKING.

LIST OF PLANT MATERIAL: THE CONTRACTOR WILL VERIFY PLANT QUANTITIES PRIOR TO BIDDING AND ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER. THE CONTRACTOR SHALL FURNISH AND PLANT ALL PLANTS REQUIRED TO COMPLETE THE WORK AS SHOWN ON THE DRAWINGS. SUBSTITUTIONS SHALL NOT BE MADE WITHOUT THE WRITTEN APPROVAL OF THE OWNER.

PLANT QUALITY: ALL SHRUBS SHALL BE DENSE, HEAVY TO THE GROUND, AND WELL GROWN, SHOWING EVIDENCE OF HAVING BEEN SHEARED REGULARLY, SHALL BE VIGOROUS, HEALTHY, AND OF GOOD COLOR. ALL PLANTS SHALL BE SOUND, FREE OF PLANT DISEASE OR INSECT EGGS, AND SHALL HAVE HEALTHY NORMAL ROOT SYSTEMS. PLANTS SHALL BE FRESHLY DUG AND NOT HELD-IN STOCK, NOR STOCK FROM COLD STORAGE. ALL PLANTS SHALL BE NURSERY GROWN. PLANTS SHALL NOT BE PRUNED PRIOR TO DELIVERY. THE SHAPE OF THE PLANT IN GENERAL SHALL CONFORM TO ITS NATURAL GROWTH PROPORTIONS, UNLESS OTHERWISE SPECIFIED. ALL PLANTS INCLUDING CONTAINER-GROWN SHALL CONFORM TO THE BRANCHING, CALIPER, AND HEIGHT SPECIFICATIONS OF THE VIRGINIA NURSERYMAN'S ASSOCIATION.

PLANT SPACING: PLANT SPACING IS TO SCALE ON PLAN. NO PLANTS EXCEPT ESPALIÉRED MATERIAL SHALL BE CLOSER THAN 30 INCHES TO BUILDINGS.

SOIL MIX: SOIL MIX WILL BE 2/3 EXISTING SOIL, 1/3 LEAF MOLD OR EQUAL ORGANIC MATERIAL, THOROUGHLY MIXED AND HOMOGENIZED.

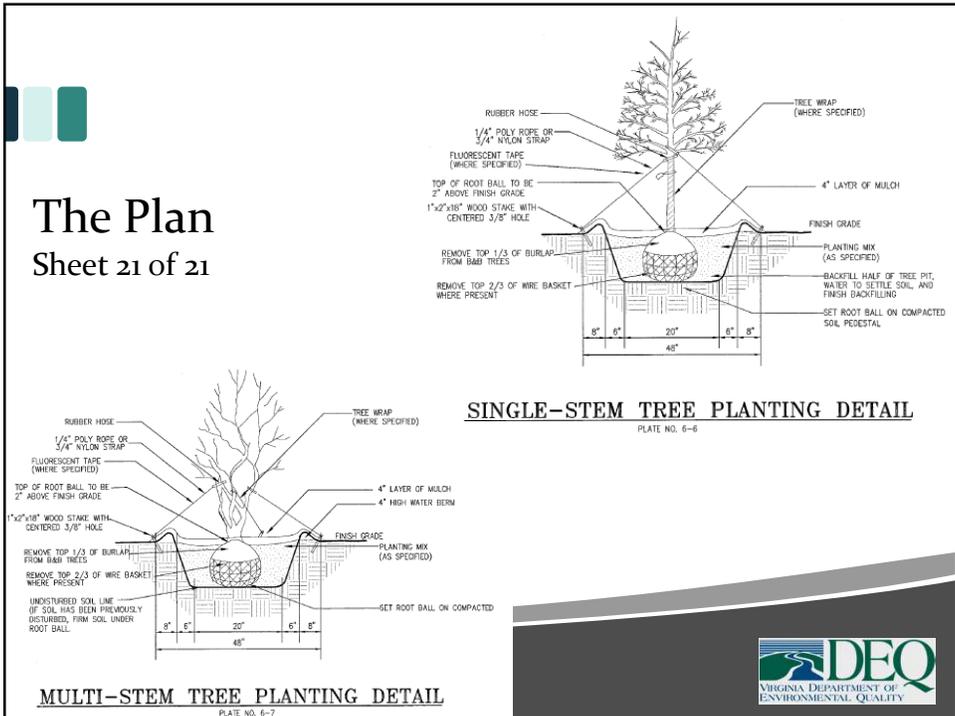
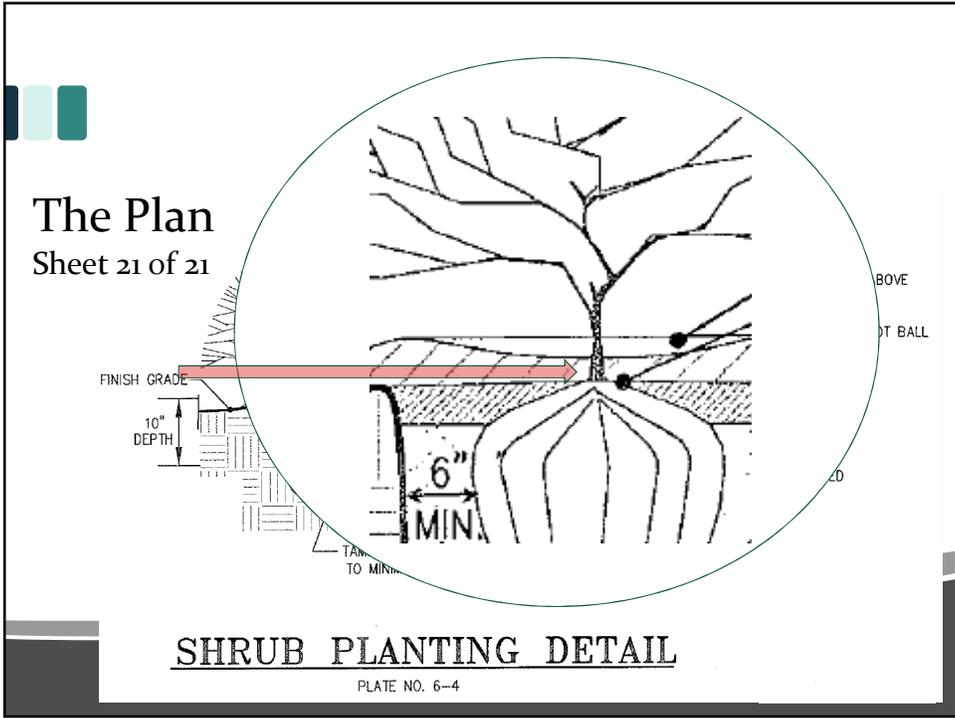
BALL SIZE: THE BALL SIZE SHALL CONFORM TO THE VIRGINIA NURSERYMAN'S ASSOCIATION.

EXCAVATION: HOLES FOR ALL PLANTS SHALL BE 18 INCHES LARGER IN DIAMETER THAN SIZE OF BALL OR CONTAINER, AND SHALL HAVE VERTICAL SIDES. HEDGES SHALL BE PLANTED IN A TRENCH 12 INCHES WIDER THAN BALL DIAMETER. BEDS FOR MASS PLANTING SHALL BE ENTIRELY ROTOTILLED TO A DEPTH OF 8 INCHES AND SHALL BE 18 INCHES BEYOND THE AVERAGE OUTSIDE EDGE OF PLANT BALLS. ORGANIC MATERIAL (I.E., LEAF MOLD) WILL BE INCORPORATED INTO PLANT BED BY TILLING AGAIN. PROPORTIONS OF SOIL TO ORGANIC MATERIAL WILL BE 2 PARTS TO 1 PART.

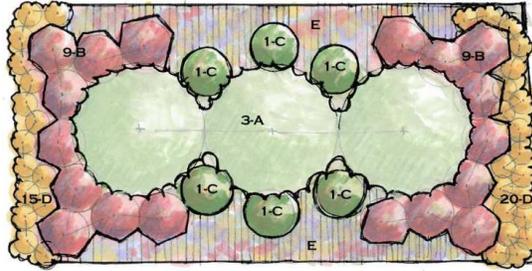
The Plan Sheet 21 of 21

- Plant Identification
- List of plant materials
- Plant quality
- Plant spacing
- Soil Mix
- Ball size
- Excavation
- Planting
- Transplanting trees by tree machine
- Transplanting existing trees
- Cultivation
- Maintenance
- Fertilizer
- Ground cover





Example Planting Plan for Raingarden in Coastal Plain for Bird Habitat (Sun/Part Shade)



- A - *Ilex opaca* (American Holly), 8' o.c.
- B - *Vaccinium corymbosum* (Highbush Blueberry), 3' o.c.
- C - *Rhododendron viscosum* (Swamp Azalea), or *Cornus sericea* (Redosier Dogwood), or *Ilex glabra nana* (Dwarf Inkberry)
- D - *Hemerocallis hybrids* (Hybrid daylilies e.g. 'Happy Returns'), 12" o.c. or *Phlox subulata* (Thrift), 12" o.c.
- E - Wildflower Mix, 85 SF, sample mix:
 - 50% *Rudbeckia hirta* (Black-Eyed Susan)
 - 20% *Echinacea purpurea* (Purple Coneflower),
 - 20% *Liatris spicata* (Blazing-Star),
 - 10% *Asclepias tuberosa* (Butterfly Weed)

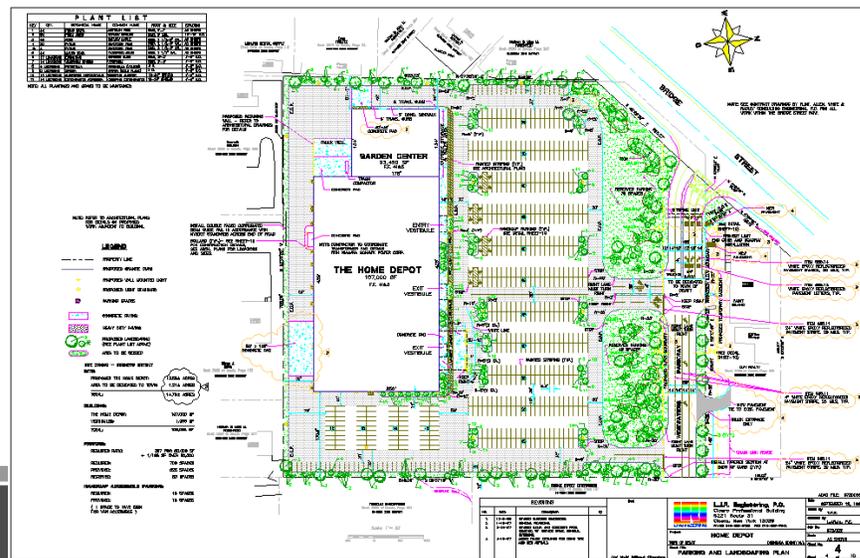
If using plants (vs. seed) for wildflowers, space 18" o.c. (19 - *Rudbeckia*, 8 - *Echinacea*, 8 - *Liatris*, 4 - *Asclepias*) -seeding is lower cost but higher maintenance option due to need for nurturing seedlings>
 note: o.c. = on center



FOR THE BIRDS RAINGARDEN
 450 SF
 Full Sun-Pt. Shade
 All zones
 Scale: 1/4"=1'



Landscaping plan





Seeding Mix proposed in a plan

Stream Stabilization Mix (To be applied as needed in disturbed riparian areas)

Botanical Name	Common Name	Indicator Status	Percent
<i>Elymus virginicus</i>	Virginia Wild Rye	FACW-	25%
<i>Panicum clandestinum</i>	Deer Tongue	FAC+	20%
<i>Schizachyrium scoparium</i>	Little Bluestem	FACU-	15%
<i>Panicum virgatum</i>	Switchgrass	FAC	15%
<i>Sorghastrum nutans</i>	Indian Grass	UPL	12%
<i>Tripsacum dactyloides</i>	Eastern Gamagrass	FACW	4%
<i>Lolium perenne</i>	Perennial Ryegrass	FACU-	4%
<i>Symphotrichum ericoides</i>	Heath Aster	FACU	2%
<i>Rudbeckia hirta</i>	Blackeyed Susan	FACU-	2%
<i>Mimulus ringens</i>	Monkey Flower	OBL	1%

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Useful Classifications for ESC and SWM

Wetland species classification:

Obligate (OBL) → almost always in wetlands (90+%)

Facultative Wet (FACW) → usually occur in wetland

Facultative (FAC) → can occur in wetland and upland

Facultative Upland (FACU) → usually occur in upland

Upland (UPL) → almost always in uplands



Seeding Mix proposed in a plan

Stream Stabilization Mix (To be applied as needed in disturbed riparian areas)

Botanical Name	Common Name	Indicator Status	Percent
<i>Elymus virginicus</i>	Virginia Wild Rye	FACW-	25%
<i>Panicum clandestinum</i>	Deer Tongue	FAC+	20%
<i>Schizachyrium scoparium</i>	Little Bluestem	FACU-	15%
<i>Panicum virgatum</i>	Switchgrass	FAC	15%
<i>Sorghastrum nutans</i>	Indian Grass	UPL	12%
<i>Tripsacum dactyloides</i>	Eastern Gamagrass	FACW	4%
<i>Lolium perenne</i>	Perennial Ryegrass	FACU-	4%
<i>Symphotrichum ericoides</i>	Heath Aster	FACU	2%
<i>Rudbeckia hirta</i>	Blackeyed Susan	FACU-	2%
<i>Mimulus ringens</i>	Monkey Flower	OBL	1%



Seeding Mix proposed in a plan

Stream Stabilization Mix (To be applied as needed in disturbed riparian areas)

Botanical Name	Common Name	Indicator Status	Percent
<i>Symphotrichum ericoides</i>	Heath Aster	FACU	2%
<i>Rudbeckia hirta</i>	Blackeyed Susan	FACU-	2%
<i>Mimulus ringens</i>	Monkey Flower	OBL	1%



© 2011 L. Green







The species is common throughout, and generally weedy, in fields, pastures, roadsides, and clearings.

Tidal freshwater marshes, calcareous fens and marshes, alluvial swamps, sandy or gravelly shores and bars, wet meadows, and various disturbed alluvial habitats. Frequent throughout.

Seeding Mix proposed in a plan

Stream Stabilization Mix (To be applied as needed in disturbed riparian areas)

Botanical Name	Common Name	Indicator Status	Percent
<i>Symphotrichum ericoides</i>	Heath Aster	FACU	2%



© 2009 k. chayka



Dry clearings, meadows, old fields, and roadsides over diabase, metabasalt, and other mafic rocks. Infrequent to rare in the n. Piedmont.



Seeding Mix proposed in a plan

Temporary and Permanent Wetland Seeding

Botanical Name	Common Name	Indicator Status	Plant Form	Percent
<i>Lolium multiflorum</i>	Annual ryegrass	FACU-	Seed	33.3%
<i>Dichanthelium clandestinum</i>	Deertongue	FAC+	Seed	13.3%
<i>Elymus virginicus</i>	Virginia wild-rye	FACW-	Seed	13.3%
<i>Panicum virgatum</i>	Switchgrass	FAC	Seed	13.3%
<i>Cafex vulpinoidea</i>	Fox sedge	OBL	Seed	10.0%
<i>Juncus effusus</i>	Soft rush	FACW+	Seed	6.7%
<i>Scirpus atrovirens</i>	Bulrush	OBL	Seed	6.7%
<i>Carex lurida</i>	Lurid Sedge	OBL	Seed	1.3%
<i>Glyceria striata</i>	Fowl manna grass	OBL	Seed	1.3%
<i>Leersia oryzoides</i>	Rice cut grass	OBL	Seed	0.8%

All *Lolium* species have been introduced from Europe

Cold season upland annual



Some problems that may be seen in the field

- Why plantings fail
- Why BMP fail to function properly





Why Plantings Fail

- Plant selection
 - The correct plant?
 - Planted correctly?
 - Plant selection
 - Wet vs. dry
 - Sun vs. shade
 - Rooting depth
 - Suitability zone
 - Predation/browsing
 - Competition
 - Age of plant materials/seed
- Site Suitability
 - Soil
 - Fertility
 - pH
 - Depth
 - Compaction
 - Moisture
 - Slope
 - Irrigation
 - Bad luck (weather)



Why Plantings Fail

Poor Plant Material → root bound plants



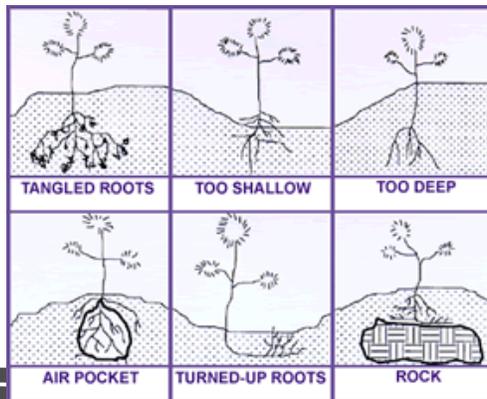
Why Plantings Fail

Poor Plant Material → root bound plants



Why Plantings Fail

- Bad planting techniques



Problems to avoid during tree planting.
Image courtesy of the California Dept. of Fish & Game.

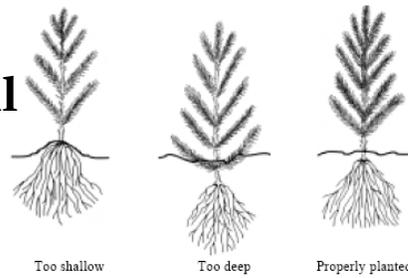
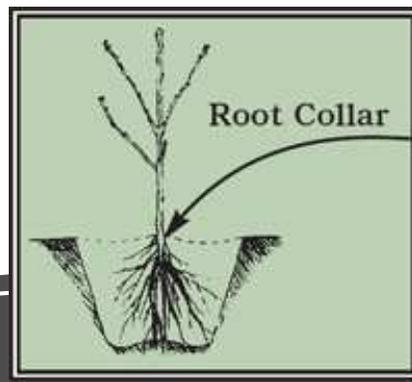
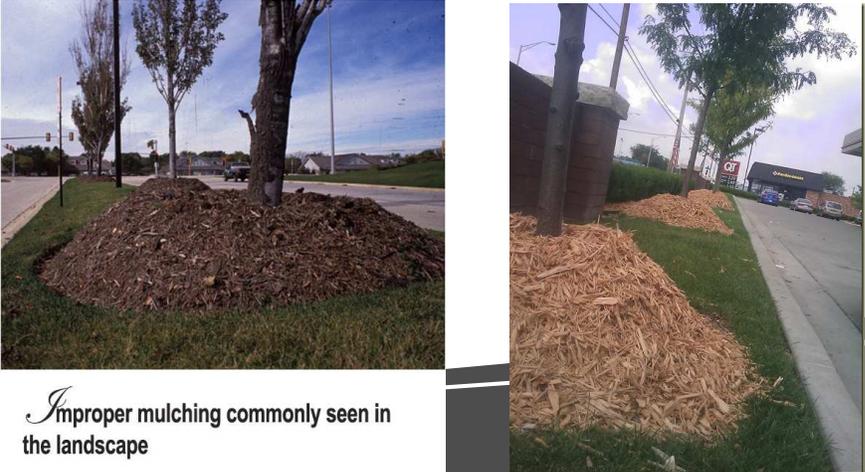


Figure 2. Planting a bare-root seedling.



Why Plantings Fail

Don't love your tree to death!

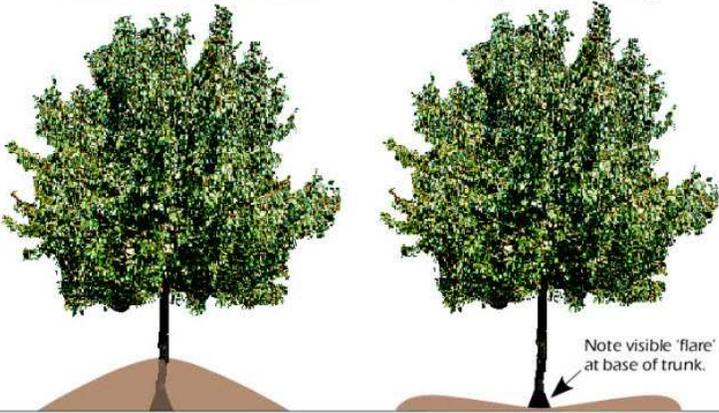


Improper mulching commonly seen in the landscape

Why Plantings Fail

Don't love your tree to death!

Mulch Volcano - BAD Proper Mulching



Note visible "flare" at base of trunk.



Why BMPs (Planting) fail

- Poor plant materials
- Poor planting techniques
- Wrong type of co-location (ESC basin and infiltration area)
- Compacted subsoil (storing of equipment and site operations)
- Conversion to early
- Wrong soil media
- Not enough or not correct organic matter
- Wash in of fine sediments (conversion or long term issue)
- Pollutant wash in (concrete washout, paint, other contaminants)



Why BMPs (Planting) fail

Aka:

- Water logged
- Restrictions
- Toxicity
- Underdrain plugged?

How do we test this?

- Soil samples



Why BMPs (Planting) fail

But the most important questions of all:

1. What is the hydrology of the design and is the site actually draining to the BMP?
2. Does the BMP actually receive the runoff that it was promised?

