Module 5: Erosion and Sediment Control Handbook (ESCH)

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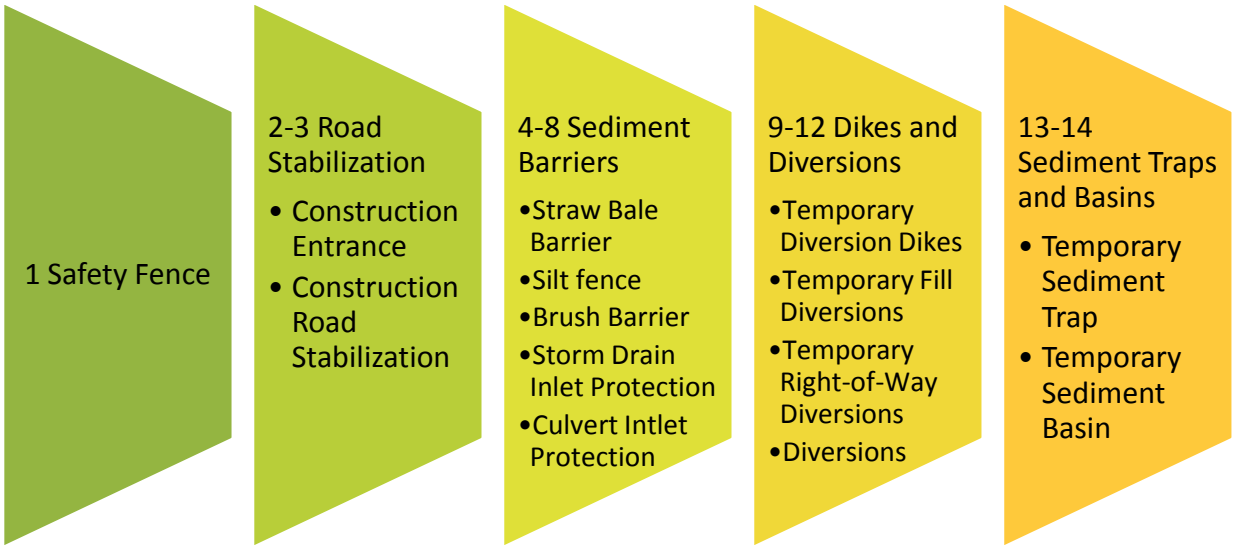
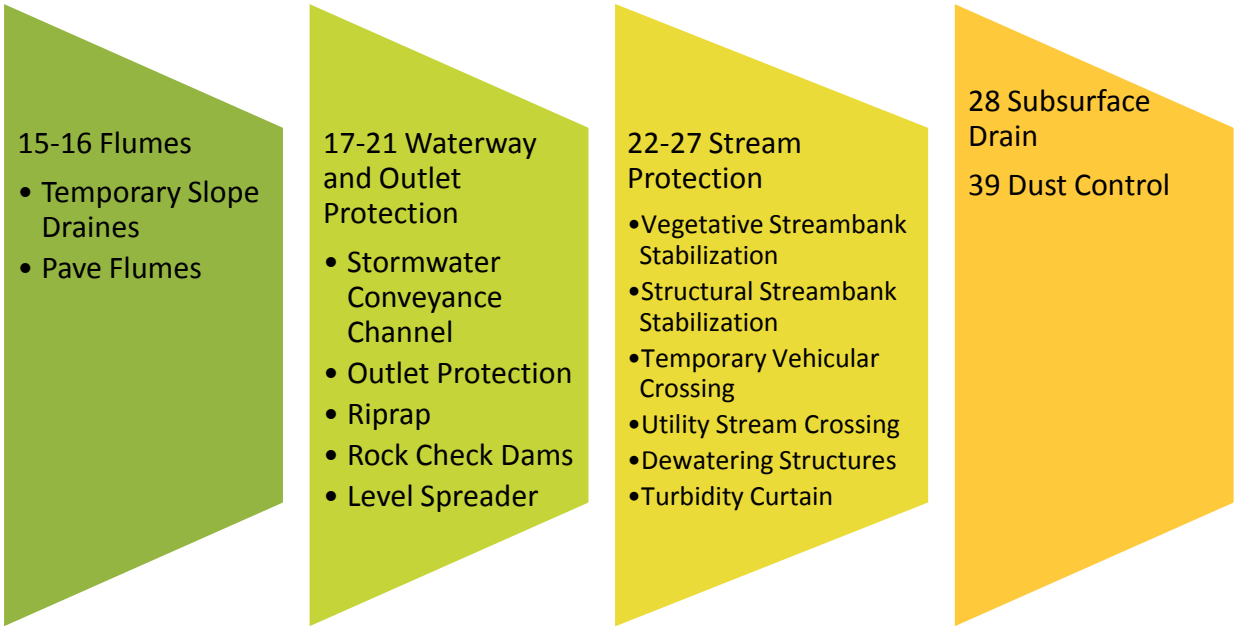
5a. Handbook overview

The Virginia Erosion and Sediment Control Handbook is a technical guide used for design, plan review and inspection of ESC measure or practices on construction sites. It contains specifications in Chapter 3 which are the typical erosion controls measures found on construction sites. The current handbook was published in 1992 and is still a relevant source for helping to contain sediment on site, filter runoff and prevent erosion. While still relevant, there are other practices that can be used on construction sites that are not listed in the current version. This participant guide only contains excerpts of the specifications.

5b. Structural Control Practices

Vegetative controls (ground cover) should be considered the first line of defense against erosion, structural controls can be considered the second line of defense. Structural controls are meant to filter sediment laden water before leaving a construction site and remove the sediments that could not be kept from eroding. They are in most cases these type of controls no more than 60% efficient in filtering sediment, and the smaller particles such as clays particles are very difficult to filter out. Structural controls are generally also more expensive than vegetative methods. Chapter 3 in the 1992 ESCHB is organized in such a way that it groups certain practices (below).





Road stabilization practices prevent the tracking of dirt onto public roads, while sediment barriers filter sediment laden water. Dikes and diversion either split up drainage area, reduce them in size or prevent stormwater from entering an area. Sediment traps and basins filter water prior to discharge. Flumes allow stormwater to safely flow down slopes. Waterway, outlet and stream protection protect onsite channels, outlets and off-site channels, respectively. Finally, excess water on a site can also be removed by subsurface drain.

Each chapter (practice) in Section 3 of the ESCHB is organized into a number of sections:

Definition

Purpose

Condition where practice applies

Planning considerations

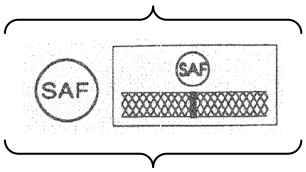
Design criteria

Construction specifications

Maintenance

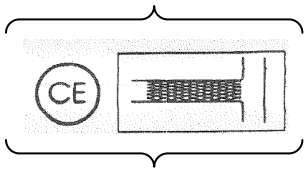
DEQ realizes that there are many more sediment control measures on the market. These measures are almost all proprietary and are not discussed in the ESCHB. The practices in the 1992 ESCHB are generic and non-proprietary. The following is a brief overview of some selected sediment control practices:

3.01 Safety Fence (SAF)



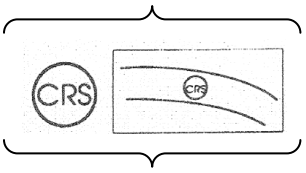
Safety fences are not a structural E&S practice. However, they are placed on the perimeter of a project to protect the public and prevent access to the project by the public. Increasingly it may be used to protect areas to be left undisturbed on a construction site.

3.02 Temporary Stone Construction Entrance (CE)



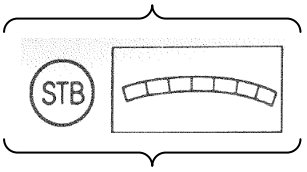
Construction entrances are stone pads located at the points of vehicular ingress and egress on a construction site. They are meant to reduce the transportation of soil onto public roads and other paved areas. In some cases a wash rack may be needed to improve the effectiveness of a construction entrance. This practice addresses MS-17, which requires that a project minimizes the transportation of sediment by vehicular traffic onto pave surfaces. MS-18 requires the removal of construction entrances after completion of a project.

3.03 Construction Road Stabilization (CRS)



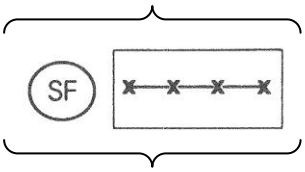
This practice is also used to address MS-17. During wet weather, temporary stabilization with stone would reduce the mud and potential erosion that would be generated and transported from recently graded access roads, subdivision streets, parking areas and other traffic areas.

3.04 Straw Bale Barrier (STB)



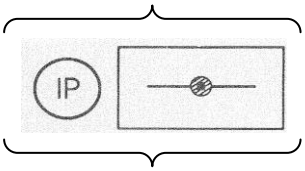
Straw bales are used to filter sediment contained in sheet flow from small drainage areas. As perimeter control they often installed as a first step measure (MS-4) and placed across or at the toe of a slope. Straw bales need to be entrenched and care needs to be taken that they are installed on contour in order to avoid undercutting. Straw bales and silt fences (Practice 3.05) have a total drainage area limitation of ¼ acre to 100 linear feet of barrier. The maximum effective life is 3 months and they need to be removed at the end of a project per MS-18. Finally, straw bales should not be used as check dam or in concentrated flow conditions.

3.05 Silt Fence (SF)



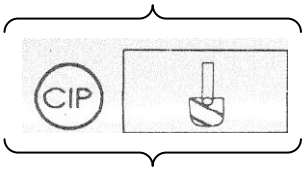
A silt fence is a temporary sediment barrier constructed of filter fabric and supported by posts and sometimes wire. Like straw bale barriers (3.04) they are used to intercept sheet flow from small drainage areas. As a perimeter control they often installed as a first step measure (MS-4) and placed across or at the bottom of a slope. Silt fences have a total drainage area limitation of ¼ acre to 100 linear feet of barrier. When silt fence is installed at the base of a slope greater than 7% it should be placed 5-7 feet beyond the base of the slope to help keep it from failing due to runoff velocity down the slope. They need to be removed at the end of a project per MS-18. Finally, although not recommended, a silt fence can be used in concentrated flows, under low energy situations of less than 1 cubic foot per second (cfs) and are generally not very effective in these conditions.

3.07 Storm Drain Inlet Protection (IP)



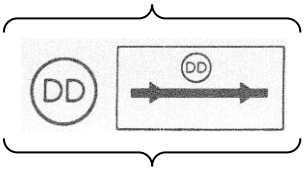
The 1992 ESCHB shows the specifications of numerous types of storm drain inlet protection including drop inlets and curb inlets. MS-10 requires that inlet protection is provided on all inlets that are operational before final/permanent stabilization of the area. Silt fence inlet protection is the most commonly used. A frequent issue of not entrenching the fabric 12 inches around a drop inlet is observed on many sites. Drainage area size limitation is 1 acre and inlet protection needs to be removed at the end of a project per MS-18.

3.08 Culvert Inlet Protection (CIP)



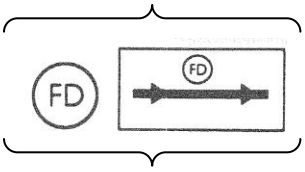
Culvert inlet protection includes a sediment filter in front of a culvert to prevent sediment from entering into the culvert. This includes protection around the culvert prior to final stabilization. Culvert inlet protection is required by MS-10 and needs to be removed at the end of the project (MS-18).

3.09 Temporary Diversion Dike (DD)



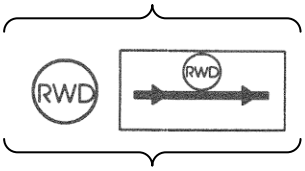
This is a ridge of compacted soil which is either used to divert water away from the project area, or divert water on-site to sediment trapping devises, water conveyances, or stabilized outlets (MS-11). Temporary diversion dikes can be constructed as first step measures (MS-4) or later on when site conditions change. They have a maximum drainage area size of 5 acre. These practices need to be stabilized immediately after construction (MS-5), and they have a maximum life of 18 months.

3.10 Temporary Fill Diversions (FD)



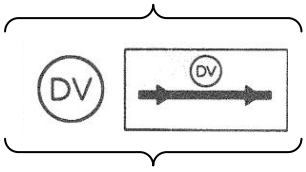
This is a diversion used for active (earth) fill areas. They address MS-7 in requiring stable fill slopes that are non-erodible and MS-8 which requires that any concentrated runoff be taken down the slope in a controlled fashion. Temporary fill diversions are typically constructed at the end of the work day; they have a maximum life span of one week, and therefore do not need to be stabilized. They are constructed in such a way that water is diverted from the slope to a stable outfall (MS-11).

3.11 Temporary Right-of-Way Diversions (RWD)



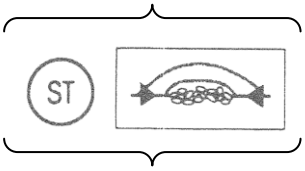
This is a ridge of compacted soil or loose gravel placed across a disturbed right-of-way. It is often seen on utility projects in hilly terrain. They are constructed to reduce the flow length and divert the water to a stable outlet (MS-11).

3.12 Diversion (DV)



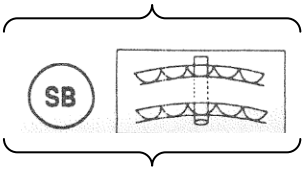
This is a permanent channel with a ridge on the lower (downslope) side. They are constructed to reduce slope length, divert stormwater runoff and are sometimes used as perimeter control. They must outfall in a stabilized outlet (MS-11) and must be designed to convey the runoff from a 10-year storm (MS-19). MS-5 requires that they are stabilized prior to being made operational.

3.13 Temporary Sediment Trap (ST)



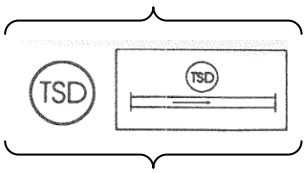
This is a small ponding area usually formed by constructing an earthen embankment along a slope or small drainage area less than 3 acres to detain sediment laden runoff . It has a volume area consisting of one half for dry storage and one half for wet storage. A stone weir/outlet is used to drain to drain this pond over a defined time. Per MS-6 they can only treat runoff from small drainage areas (less than 3 acres). They are generally used as part of the perimeter controls for the project (MS-4) and need to be stabilized before made functional (MS-5). Maximum lifespan is 18 months.

3.14 Temporary Sediment Basin (SB)



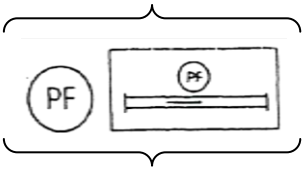
Sediment basins are used to treat sediment laden stormwater runoff from areas that are 3 acres or larger (MS-6). They consist of a temporary barrier or dam with an engineered outfall or stormwater release structure that releases the water in a controlled fashion. Sediment basins have a volume area for dry storage and wet storage. A properly constructed basin will maintain a permanent pool of water to the bottom invert of the de-watering orifice. The sediment removal effectiveness during large storms is at best only about 60%. The embankment is constructed across a drainage way at the low end of the project and should be designed by a qualified professional. They are generally used as part of the perimeter controls for the project (MS-4) and need to be stabilized before made functional (MS-5). Maximum lifespan is 18 months.

3.15 Temporary Slope Drain (TSD)



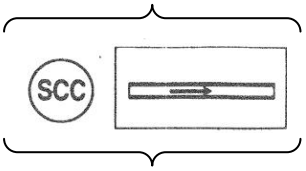
Temporary slope drains consist of flexible tubing that are installed on slopes and conduct concentrated runoff safely from the top to the bottom of the slope without causing erosion on or below the slope. They are required per MS-8.

3.16 Pave Flumes (PF)



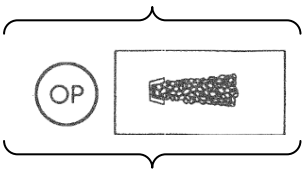
Paved flumes are permanently concrete lined channels constructed to conduct concentrated stormwater runoff from the top to the bottom of a slope without causing erosion on or below the slope. They are required per MS-8.

3.17 Stormwater Conveyance Channels (SCC)



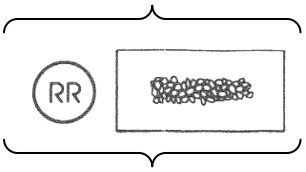
These are permanent channels designed to carry concentrated flow without erosion. They are sometimes designed in combination with (permanent) diversions (3.12). They are designed to convey the quantity of water expected form a 10-year storm (MS-19) and need to be stabilized before being made operational (MS-5). This practice is applicable to all man-made (improved) channels includes road-side ditches, and natural channels that are or need to be improved as a result of the land development project, with the exception of channels that were designed using natural channel design practices (MS-19).

3.18 Outlet Protection (OP)



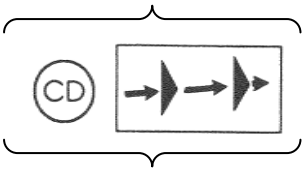
MS-11 requires outlet protection in areas where stormwater either leaves the project site or exits channels, stilling basins and/or (storm drain) outlets to reduce the erosive force of water by providing protection of the soil below the outfall and reduce flow velocities before water enters the receiving channel below these outlets.

3.19 Riprap (RR)



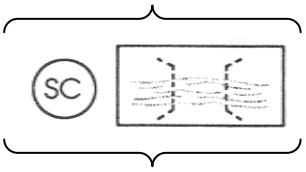
This is a permanent erosion-resistant ground cover of large, loose angular stone installed in situations where the erosive force of water turbulence and velocity cannot be controlled by other means including vegetative cover or netting and mats. Potential locations include drainage ways, channels and slopes. Once riprap is properly installed it requires very little maintenance.

3.20 Rock Check Dam (CD)



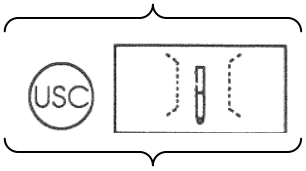
These are small temporary stone dams constructed across drainage ditches to reduce the velocity of concentrated flows and thus reducing the potential for erosion in swales and ditches while vegetation of the channel is being achieved. Although they are not intended as a sediment trapping or filtering device, sediment suspended in water will settle out on the up-stream side of the check dam and must be cleaned out if it reaches ½ the height of the check dam. Check dams are removed at the end of a project.

3.24 Temporary Vehicular Stream Crossing (SC)



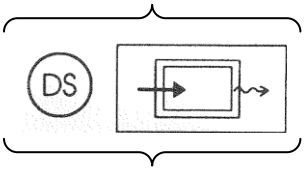
Temporary vehicular stream crossings are meant to provide access to construction activities on either side of the stream while protecting the stream from erosion and sedimentation by preventing damage to the stream's bed and banks. These temporary structures are constructed across live streams in compliance with MS-13.

3.25 Utility Stream Crossing (USC)



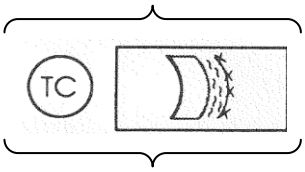
This is one of many possible strategies for crossing small waterways when in-stream utility construction is involved. It is done to minimize construction (disturbed area) in a stream; prevent sediment for entering the stream; and stabilize the disturbance footprint. If using a liner material to construct a utility stream crossing, any overlap of liner should must be at least 18 inches.

3.26 Dewatering Structure (DS)



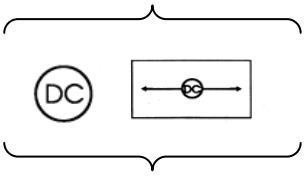
These are temporary settling and filtering devices for water that is discharged from dewatering (pumping) activities. These structures need to be designed according to pump capacity. The storage requirement is 16 times the pump capacity (in cubic feet).

3.27 Turbidity Curtain (TC)



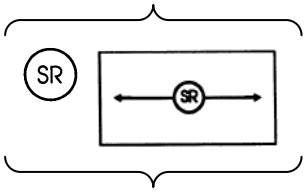
Turbidity curtains are floating geo-textile curtains that minimize the sediment movement from a disturbed area adjacent or in a body of water. It prevents sediment from contaminating the entire water body and can only be used in areas with little or no channel flow.

3.39 Dust Control (DC)



Dust Control is used to prevent air and surface movement of soil particles from exposed soil from being air-borne which may cause health hazards, safety problems or harm to plants or animals. Air-borne dust or soil particles may also cause damage to nearby existing structures and other properties. The most common method of dust control in Virginia is applying water to exposed soil surfaces. Mulch should not be used to control dust on areas of a site that has high traffic from construction vehicles.

3.29 Surface roughening (SR)



Surface roughening is a method of erosion control that is neither a structural or a vegetative control. However the method can be used to help establish some types of vegetation. Surface roughening an area such as a long slope or a steep slope helps to slow down runoff velocity thus reducing erosion. Surface roughening can be in the form of grooves cut across a slope (perpendicular to flows) tracking a slope with cleats or stair step cuts on steeper slopes. On stair stepped slopes soft soils and rocky soils present different conditions which must be adhered to so the potential for slope failure or erosion is minimized. In soft soils the verticle cuts shall not be more than 30 inches and not more than 40 inches for rocky soils.

5c. Vegetative Control Practices

The benefits of vegetative ground cover

When planning for erosion and sediment control, establishing ground cover should be one of the first steps that need to be considered in a land disturbance project. As previously mentioned, a good vegetative cover eliminates almost all potential for erosion. This is reflected in Minimum Standards 1, 3, and 5 which address this need to establish a ground cover directly. Minimum Standards 2 and 7 indirectly deal with groundcover (site stabilization) as well.

Benefits of vegetative cover:

Relatively inexpensive to establish and maintain compared to structural methods

Slows runoff and filters sediment

Protects the soil from raindrop impact

Plant roots bind the soil particles and enhance filtration and infiltration of runoff Dead plant materials get incorporated in the soil as organic matter, which improves soil structure and infiltration of runoff

These minimum standards directly or indirectly deal with the establishment of vegetative cover on a site:

- MS-1 Stabilizing areas that are dormant
- MS-2 Stabilizing topsoil stock piles
- MS-3 Permanent stabilization
- MS-5 Stabilization of earthen structures
- MS-7 Stabilization of cut and fill slopes

Chapter 3 of the Erosion and Sediment Control Handbook classifies practices 29 through 39 as vegetative (or erosion) control practices.

Preserving Existing Vegetation

The most cost effective measure in controlling erosion from a site is to preserve existing vegetation. This can either be done in perpetuity by incorporating it in the post construction landscape design or for a shorter period and carefully planning the phasing of a project.

Advantages of leaving undisturbed areas include:

- Minimization of development (clearing and grading) cost
- Native vegetation is likely already mature and adapted to the local environment
- Leaving a vegetative buffer strip around a project helps filter any runoff before it leaves the property
- Soils that are not disturbed and not compacted have higher infiltration rates than surrounding areas that have been cleared

Therefore, these undisturbed areas can be used as an inexpensive tool to assist in the management of erosion by reducing the total area that is disturbed, by filtering some of the runoff and serving as areas where stormwater can infiltrate instead of running off and causing erosion. Eventually, these areas are also valuable as infiltration areas post construction.

What influences plant selection?

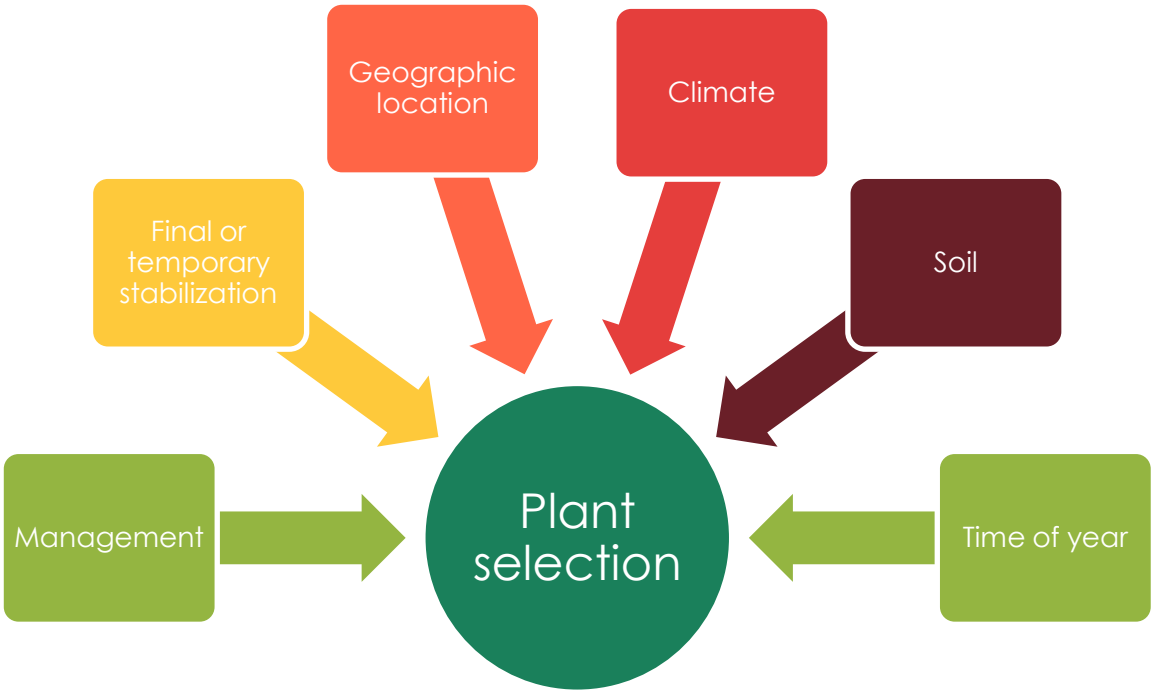
MS-3 A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

As MS-3 states, all areas not otherwise permanently stabilized need have some kind of vegetative cover on them to prevent erosion. The "otherwise stabilized" includes buildings, roads, walkways, driveways, etc, in other words areas where you can see the bare soil need to be stabilized with a vegetative cover.

In reagrds to establishment of vegetation, we can divide sites into two categories; **High Maintenance Areas** and **Low Maintenance Areas.** High maintenance areas generally can be expected to receive high foot traffic and/or are frequently mowed. These are typically areas of managed turf. They are often heavily fertilized and management may include the application of pesticides and

herbicides. Low maintenance areas are managed less intensively. Plant selection for these two types of land uses will be very different.

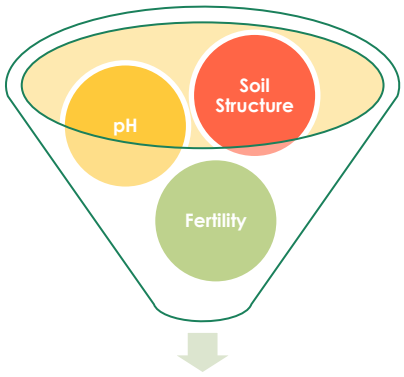
Factors influencing plant selection



What influences plant establishment?

Once the proper plant species are selected for the intended post development land use, it is time to get them established. This can be done by seeding, sodding, sprigging or planting (Practices 31, 32, 33, 34, and 37 in the Erosion and Sediment Control Handbook).

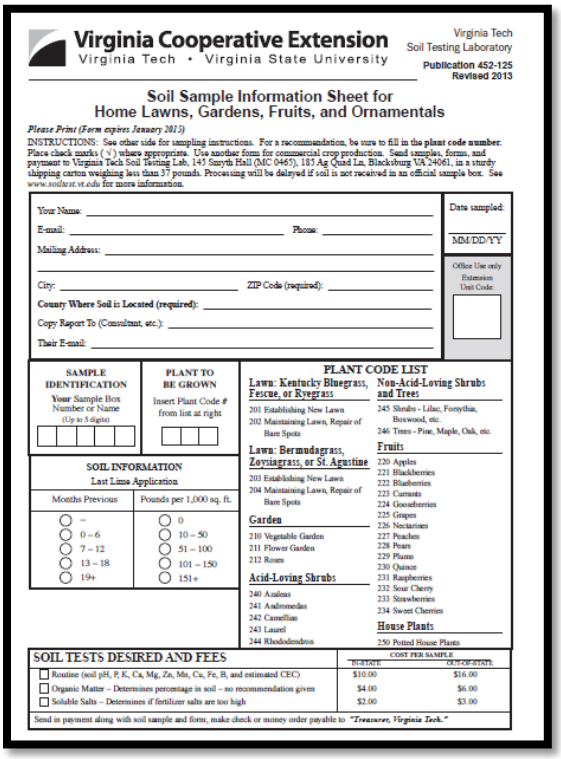
The overriding factor in getting proper plant establishment is providing a good growing medium (or soil).



Good Soil and Plant Establishment

Soil testing: Soil testing is one of the most important steps in getting plants established (http://www.soiltest.vt.edu/Files/testing-process-and-fees.html). Virginia Tech analyzes the "routine tests packages for pH (or soil acidity), phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Zinc (Zn), Manganese (Mn), Copper (CU), Iron (FE), Boron (B), and Cation Exchange Capacity (CEC), and it will give a fertilizer and lime recommendation.

Example of the order form for the soil analysis by the Cooperative Extension Service at Virginia Tech.



Virginia Cooperative Extension
Virginia Tech • Virginia State University

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 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 for more information.

Your Name: _____
E-mail: _____ Phone: _____
Mailing Address: _____
City: _____ ZIP Code (required): _____
County Where Soil is Located (required): _____
Copy Report To (Consultant, etc.): _____
Their E-mail: _____

Date sampled: MM/DD/YY

Office Use only
Extension Unit Code:

SAMPLE IDENTIFICATION
Your Sample Box Number or Name (Up to 5 digits)

PLANT TO BE GROWN
Insert Plant Code # from list at right

SOIL INFORMATION
Last Lime Application

Months Previous	Pounds per 1,000 sq. ft.
○ –	○ 0
○ 0 – 6	○ 10 – 50
○ 7 – 12	○ 51 – 100
○ 13 – 18	○ 101 – 150
○ 19+	○ 151+

PLANT CODE LIST

Lawn: Kentucky Bluegrass, Fescue, or Ryegrass
201 Establishing New Lawn
202 Maintaining Lawn, Repair of Bare Spots

Lawn: Bermudagrass, Zoysiagrass, or St. Agustine
203 Establishing New Lawn
204 Maintaining Lawn, Repair of Bare Spots

Garden
210 Vegetable Garden
211 Flower Garden
212 Roses

Acid-Loving Shrubs
240 Azaleas
241 Andromedas
242 Camellias
243 Laurel
244 Rhododendron

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 Pears
229 Plums
230 Quince
231 Raspberries
232 Sour Cherry
233 Strawberries
234 Sweet Cherries

House Plants
250 Potted House Plants

SOIL TESTS DESIRED AND FEES	COST PER SAMPLE: In-State	Out-of-State
☐ Routine (soil pH, P, K, Ca, Mg, Zn, Mn, Cu, Fe, B, and estimated CEC)	$10.00	$16.00
☐ Organic Matter – Determines percentage in soil – no recommendation given	$4.00	$6.00
☐ 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."*

Proper preparation of the soil prior to planting is essential for good plant establishment!

pH or Acidity of the Soil: Soils in Virginia are generally acidic, meaning they have a low pH (Figure 4). They generally range between 4.0 and 8.0; however, the majority of Virginia's soils are between 5 and 6.5; the average pH of soils in forested areas in Virginia was reported to be below 5.0*. Agriculture crops and our landscaping plants grow best when the soil pH is between 5.8 and 6.8. The pH range which is best for topsoil used on construction sites is between 6.0 and 7.5.

The application of lime is the best method to adjust the pH of the soil.

Fertility: Plants need nutrients to grow. While a lot of these nutrients are available in the soil, the three macro-nutrients Nitrogen (N), Phosphorus (P) and Potassium (K) are often in short supply in the soils and need to be added as fertilizer. Addition of these nutrients should be based on recommendations resulting from a soil analysis.

All fertilizers have three numbers on the bag like this one. These numbers stand for the total percentage N, P, and K (or N-P-K). **The bag is always numbered in this order.** This bag has 12% Nitrogen (by weight), 3% Phosphorus and 10% Potassium. A 50 lbs bag of this fertilizer will therefore have 6 lbs of nitrogen, 1.5 lbs Phosphorus and 5 lbs of Potassium.

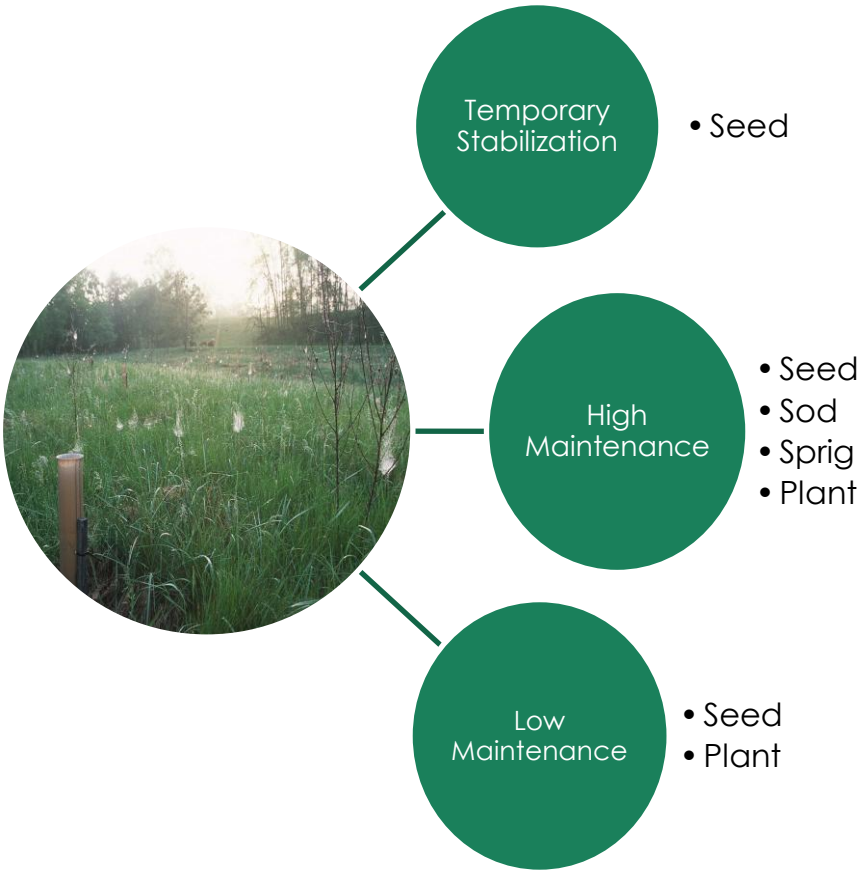
* (A.K. Ross. 2006. Soil Conditions Across Virginia, 2000-2002, http://fhm.fs.fed.us/posters/posters06/soil_cond_va.pdf).

Plant Selection and Planting Method

As we have seen previously plant selection depends on a multitude of factors, including: management, whether we are considering final or temporary stabilization, geographic location, climate, soil, and time of year of planting. The following two figures show some of the planning considerations when selecting plants. For example, temporary stabilization is usually accomplished by seeding, while permanent stabilization has methods available to achieve final stabilization. However, one of the first considerations with permanent stabilization will be

whether we have a high or low maintenance area. Low maintenance areas generally require less input from the developer, unless the plan calls for the planting of trees and shrubs.

If an area cannot be seeded within the time required by MS-1 for reasons such as: frost, or drought; the site must still be stabilized. The "go to" method in these cases is mulch.



When considering seeding of grasses we need to choose between annuals or perennials and between cold season and warm season grasses. Annuals live for one year or one season and are usually used with temporary seeding. If an area is not at final grade but will be left dormant for

more than one year it needs to be seeded with perennial plants (MS-1). Under normal conditions, perennials live more than one year.

Warm season species are species that go dormant during the winter and cannot be sown or planted when frost is possible within 12 weeks of seeding. Cold season grasses may go dormant in the hot summer months because of the heat and when there is a lack of irrigation.

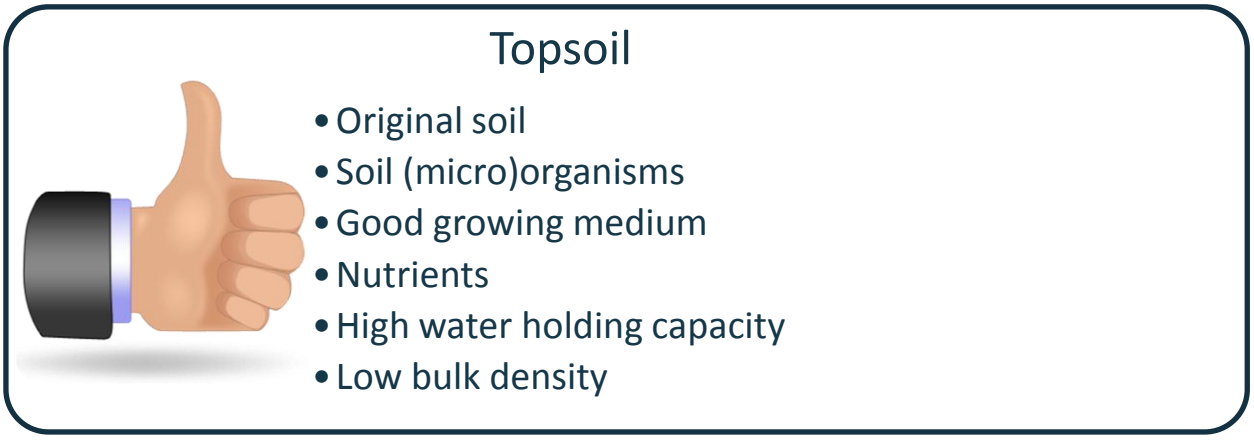
Sodding is typically done with cold season grasses; warm season grasses are either established through seeding, sprigging or plugging. Note that is both cases the plants need to by planted within 36 hours of harvesting.

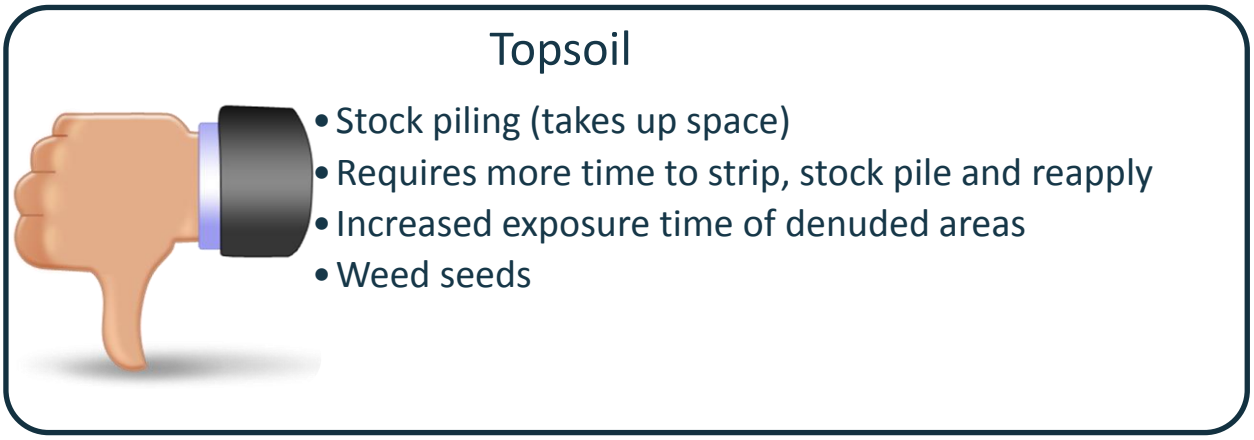
Seeding	•Temporary → annuals •Permanent → perennials •*Land use* •*Certified seed* •*Seed mix* •*Time of year requirements*
Sodding	•Permanent •*VCIA Certified* •*Planted within 36 hours of harvesting*
Sprigging/ Plugging	•Permanent warm season grasses → Bermuda grass and Zoycha grass •*VCIA Certified* •*Planted within 36 hours of harvesting*
Planting	•Containerized •Ball and burlap •Bare Root

Top Soil and Seedbed Preparation

Topsoil is the surface horizon (layer) of the soil profile. It is generally characterized by a darker color, than the subsoil. This is due to the organic matter accumulation in the topsoil. The topsoil is the layer of the soil with most biological activity, water and nutrients required for plant establishment. Organic matter in soil influences characteristics such as cohesiveness, structure and permeability of the soil. Topsoil is therefore recommended for use in high maintenance areas.

As an alternative, when properly limed and fertilized, the subsoil can serve as a good substitute for topsoil, particularly for low maintenance areas. Below is a list of some of the advantages and disadvantages of topsoil use.





When topsoil is being used we need to make sure that:

- The sub-soil is scarified to a depth of 5 inches before spreading topsoil
- We have a place to store the topsoil and stabilize it during construction, per MS-2;
- We have enough topsoil to spread a layer that is 2 to 4 inches deep;
- We allow time for spreading and bonding; and
- We do not place it on a subsoil with too much of a contrasting texture (subgrade must be scarified to a depth of 2 inches before spreading the topsoil)
- Must contain at least 1.5% organic matter

Seedbed/planting bed preparation is an important step in getting the soil ready for planting. Seedbed or planting bed preparation is the most important item in plant establishment, regardless whether we spread topsoil or not. Seedbed or planting bed preparation includes tilling, fertilizing, liming, adding organic amendments, seeding, planting and mulching. Soils should be crumb like after tilling, and not too powdery or too hard. Fertilizing and liming should be done per recommendation from the soil test. The addition of organic amendments or other soil conditioners is optional, but is strongly recommended in some cases in particular when seeding in subsoil, or very heavy, compacted soil. Seeding can be done by broadcasting the seed, with a seed drill, or with a hydro-seeder. Mulching is generally done with straw (**2 tons per acre**). Other mulches include wood chips, wood fiber and bark, although these are usually used in perennial planting beds. When seeding is done with a hydro-seeder, the mulch maybe included in the mixture; in that case mulch consists of a poly acrylamide, a gum, or a cellulose-like material that contains a binder. These materials are also known as tackifiers.

Organic amendments and soil conditioners include:

- Peat
- Sand
- Vermiculite
- Raw manure
- Rotted saw dust
- Treated sewage
- Compost

Establishing vegetation (seeding) on slopes may require varying techniques depending on the steepness. Slopes are generally more erosive and have three dedicated Minimum Standards that address stabilizing them. Seedbed preparation of slopes include tracking up and down to create small depressions that slow down the runoff and allow seeds to germinate.

This slope has been tracked in the correct way and is now ready to be seeded and mulched (surface roughening)

Minimum Standards that address slopes and slope stability:

MS-7 CUT & FILL SLOPES
MS-8 CONCENTRATED RUNOFF
MS-9 Water Seeps

Slope orientation or aspect also affects erosion. South and southwest facing slopes are usually warmer and drier because of sun exposure and exposure to warmer winds. Therefore, the vegetation on these slopes may be sparser, and establishment of new vegetation on south and southwest facing slopes is usually more difficult than establishing vegetation on northern slopes. Conversely, northern slopes are cooler, less exposed to the sun, and usually moister; therefore they have different challenges in establishing vegetation on northern slopes. This may also dictate plant species choice for final stabilization after a project is completed

Temporary seeding

Temporary seeding is usually done with annuals, meaning plants that live from one growing season to one year maximum. Annuals germinate very quickly and may establish a ground cover within one or two weeks (and protect the soil from the erosive forces of raindrop impacts). Annuals are more opportunistic and can get established and survive under more adverse conditions (lower soil pH, drier conditions, in subsoil, or when permanent seeding is not possible). Moreover, they are very inexpensive to purchase. This is why temporary seeding

is therefore a great tool to use on construction sites on areas that are not at final grade but left dormant for more than 14 days as required by MS-1 (see side box).

Because of these benefits, temporary seeding is a great tool in protecting topsoil stock piles (MS-2), any of the sediment control practices that leave bare soil, such as diversions, traps and basins (MS-5), and areas that will not be disturbed for extended periods (MS-1).

★**Remember:** temporary seeding can generally be less expensive than the cleaning out of sediment traps and basins, or the repair and cleaning of a breach in a silt fence or a diversion.

Section 3.31 in the Virginia Erosion and Sediment Control Handbook provides the standards and specifications for temporary seeding. The table below lists the species in the 1992 Handbook.

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	

Weeping lovegrass and Korean lespedeza are listed by the U.S. Department of Agriculture as potentially non-native invaders and may need to be used with some caution see: (http://www.plants.usda.gov/factsheet/pdf/fs_ercu2.pdf and http://www.plants.usda.gov/factsheet/pdf/fs_kust.pdf). Please refer to the illustration on the next page of this chapter for some general recommendations on native species that can be used in place of these invasive species.

Potential alternative/additional native species for use in low maintenance areas

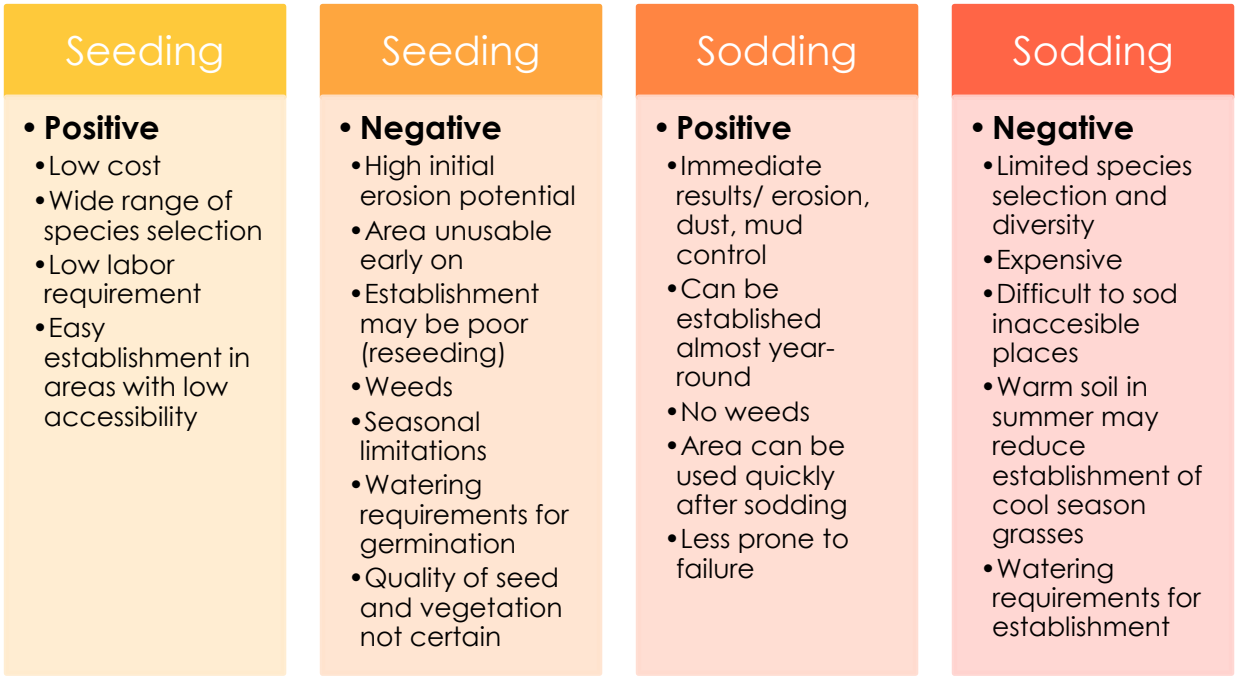
Permanent seeding

Permanent seeding is usually done per recommendation from the landscape architect or planner of the project; it is usually very land use specific. Section 3.32 in the ESCHB provides a list of potential species that can be used in planning a landscape. Some of the more common species are: tall fescue, Kentucky bluegrass, perennial ryegrass, red fescue, red top and others. These some of the high maintenance or turf type grasses. There are many more species of grasses suitable for establishing permanent vegetation than are listed in the current edition of the handbook. Please note that some of the species or cultivars mentioned in the 1992 Virginia

Erosion and Sediment Control Handbook may have been discontinued; may have been improved; seed mixtures may have been changed. We recommend that when in doubt you consult your local extension office or soil and water conservation district for an up-to-date recommendation for species selection.

Sodding

Sodding is usually only done only in high maintenance areas or areas that require immediate ground cover including ditches and swales. Soil preparation, liming and fertilizing for sodding is very similar as for seeding. However, soils need to be smooth, free of rocks, boulders and other pieces of debris. Sod needs to be place within 36 hours of harvesting at the sod farm. When placing the sod, soils should not be soggy, excessively dry, hot or frozen. When placing sod on a slope or in a waterway it needs to be placed in staggered rows and stapled. The figure below provides a comparison between seeding and sodding.



Bermudagrass and Zoysiagrass

Both Bermuda and Zoysia are warm season grasses. They are usually planted using sprigs, stolons or plugs. Once planted, they form a dense mat in 8 to 12 weeks. Therefore, being a warm season grass they need to be planted between May 1 and July 15. Planting outside these dates will result in insufficient establishment or complete failure. We therefore recommend seeding with a temporary cover to carry the site over until these grasses can be planted.

Mulching

Mulches may be defined as non-soil substances that are applied to the soil to conserve desirable soil properties and/or promote plant growth. Mulch helps to protect the soil from raindrop impact, helps foster plant growth by increasing available moisture and provides a favorable micro-climate for seed germination. Materials used for mulch are often plant based including:

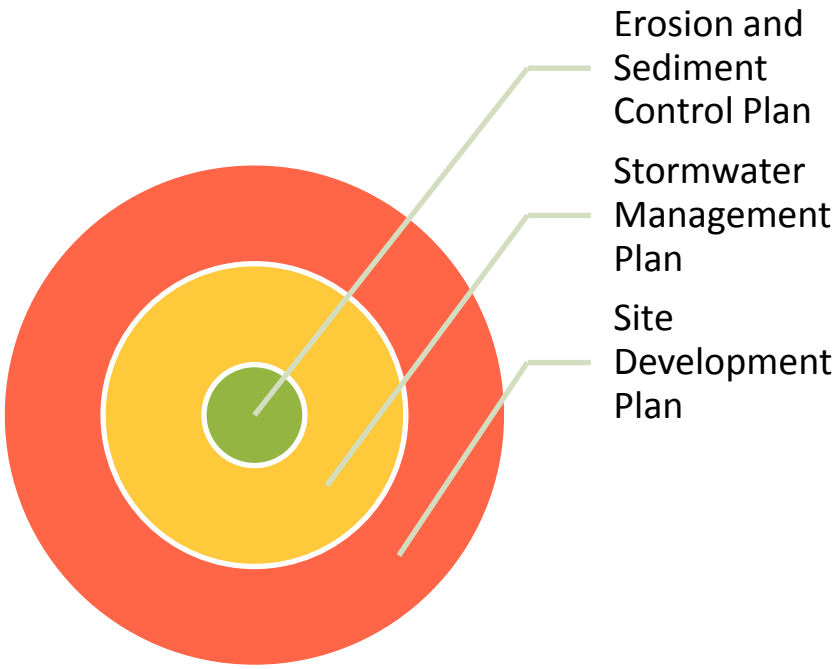
- Straw (most commonly used)
- Hay
- Corn stalks
- Wood chips
- Shredded bark/bark chips
- Fiber products

Additional materials include blankets and netting.

Chemical binders are best used to anchor the organic mulches since they have been found to be ineffective in providing these advantages.

5d. Erosion and sediment control plan elements

Erosion and sediment control planning should be an integral part of site planning and not an afterthought. An ESC plan should be part of an entire development plan and may include: detailed drawings, architectural details, framing details, traffic studies, and stormwater considerations. (Note: this is not a detailed list containing all submittals; however, the ESC plan should be a standalone plan for use in the field.)



An erosion and sediment control plan should be stand-alone component of the entire site development plan

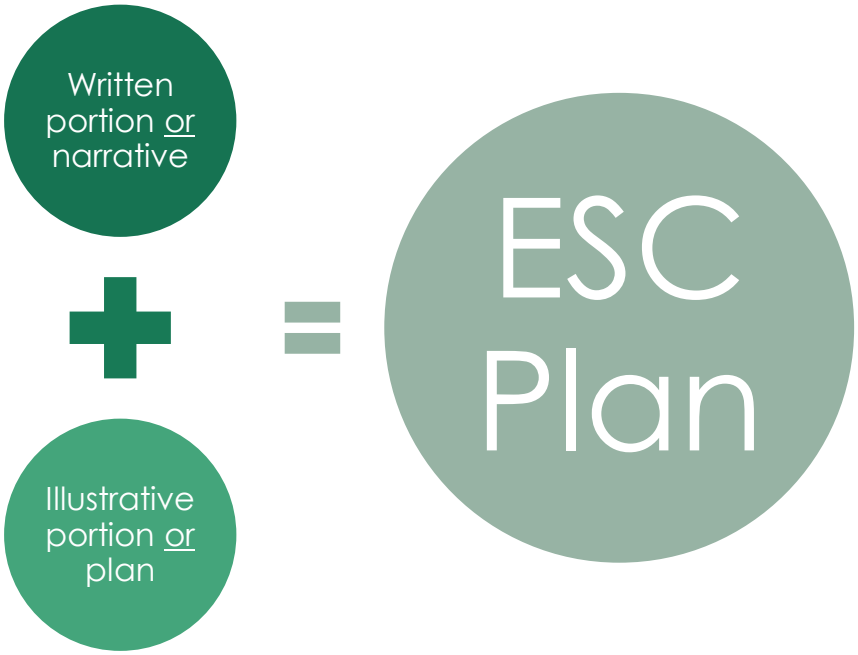
The plan preparer needs to understand that an ESC plan should be a stand-alone document for the entire site development plan. Plans such as the building construction drawings, building details and structural drawings should not be incorporated with ESC plans. The plan reviewer, inspector, site supervisor and/or RLD should be able to use the ESC plan to determine how the

site is being developed without needing to consult the more detailed working or construction drawings. The ESC plan should illustrate how the site is being developed, what is being proposed for the site and the sequencing or phasing of the construction. The ESC plan should not be bogged down with details that might not be relevant to erosion and sediment control.

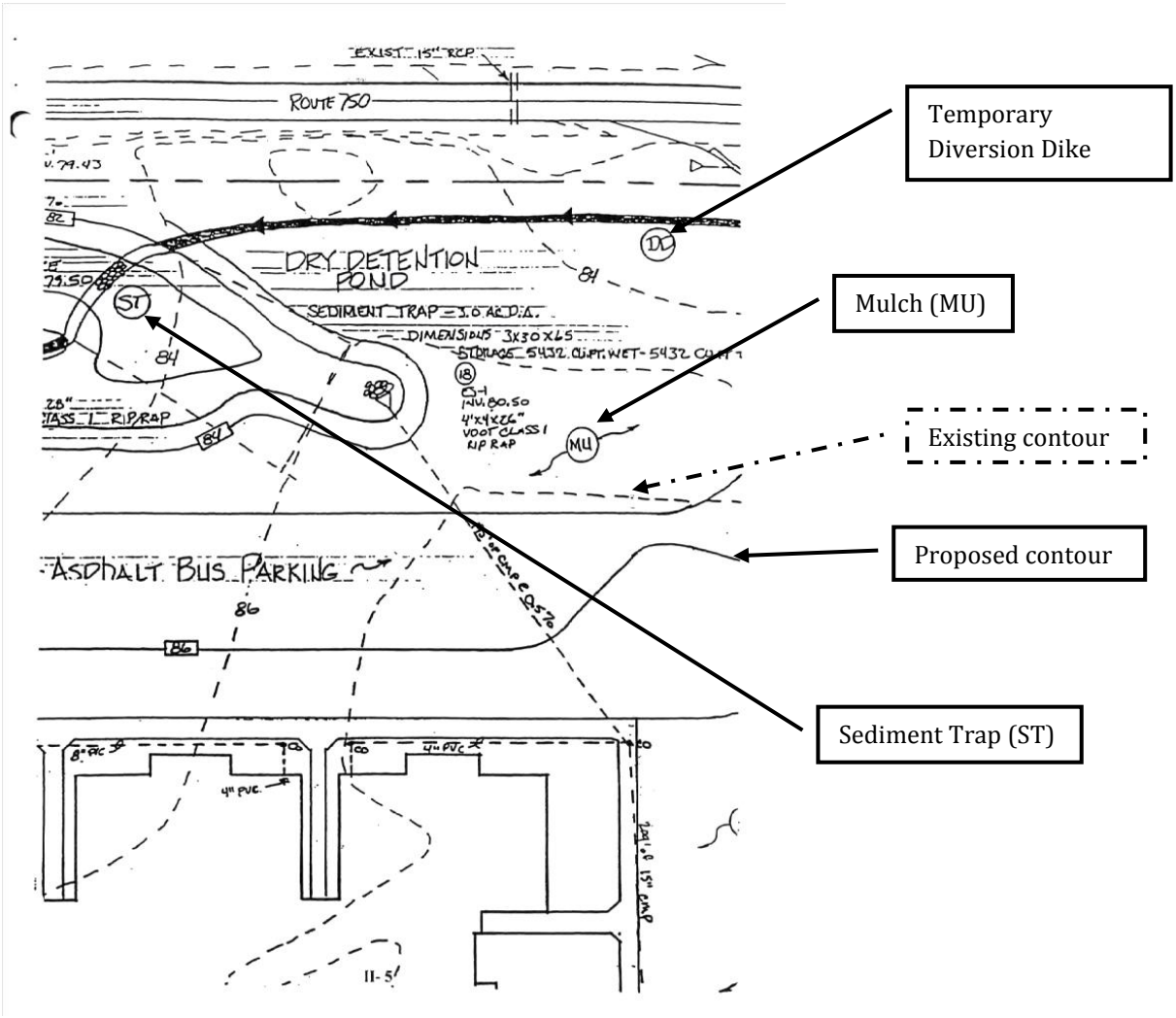
The Erosion and Sediment Control Plan consists of two parts:

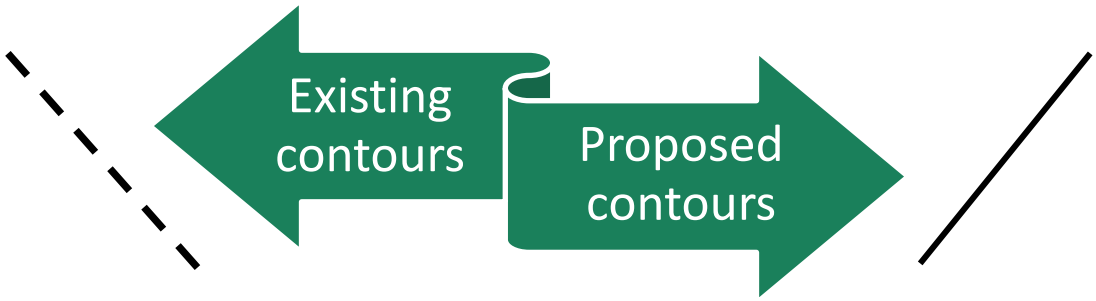
- Written portion or narrative
- Illustrative portion or the plan

Components of the erosion and sediment control plan



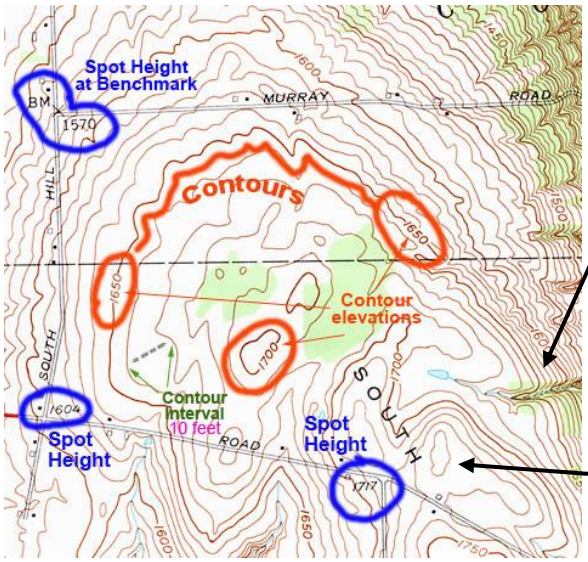
In order to be able to review the illustrative portion (or Plan) we need understand some of the common elements of the plan and develop our plan reading skills.





Contour line: a line on a map connecting points on a land surface that are the same elevation above sea level.

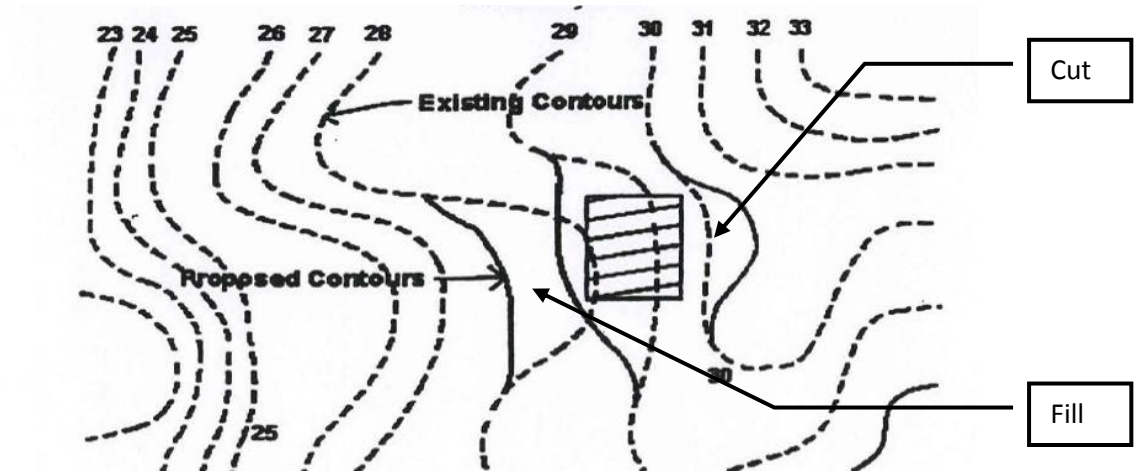
Contour interval: the interval between contour lines on a map, or the altitude the interval represents

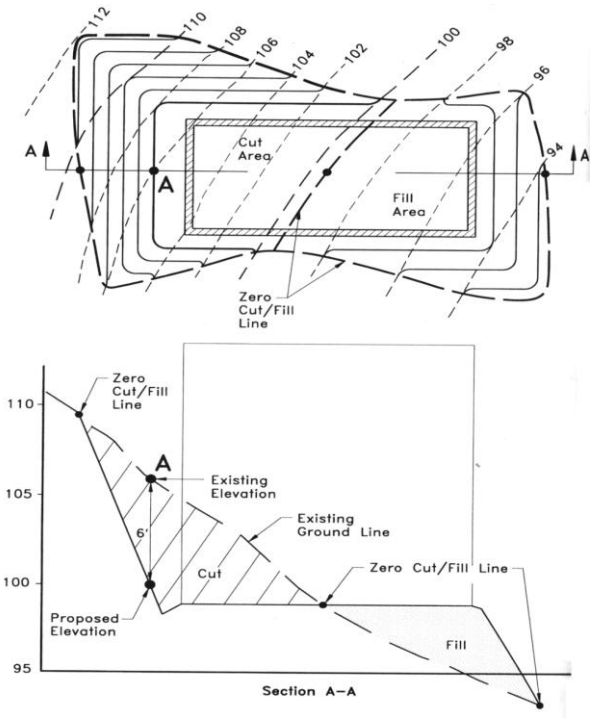


Contour lines close together (small contour interval) = steep slope

Contour lines further apart (large contour interval) = not as steep

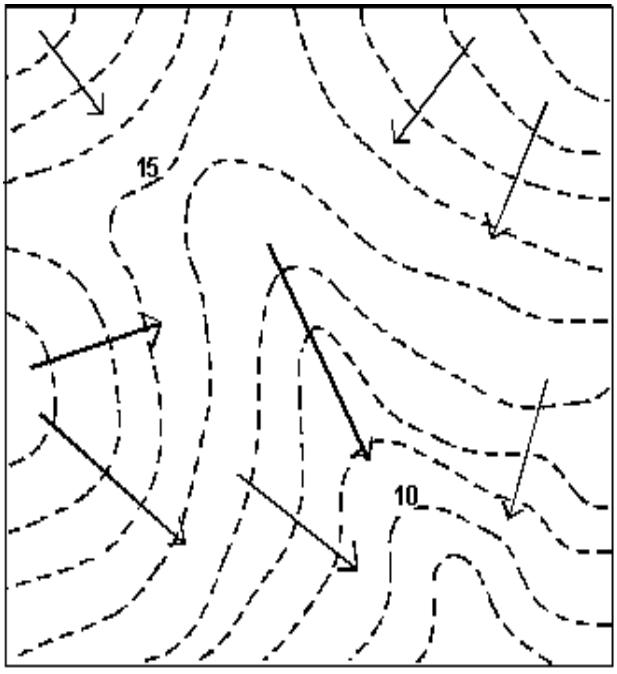
Cut and fill: the excavating of material in one place and the depositing of it nearby



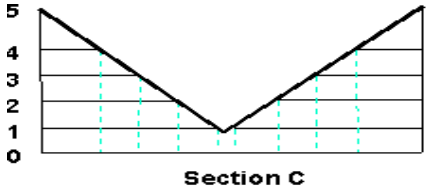


Cut and fill

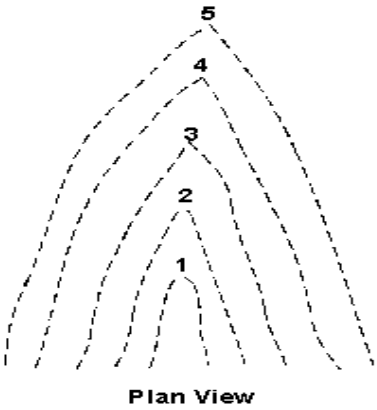
Drainage: always flows perpendicular (at a right angle) to the contour



Valleys and Swales: a long low area of land, often with a drainage way, river or stream running through it, which is surrounded by higher ground

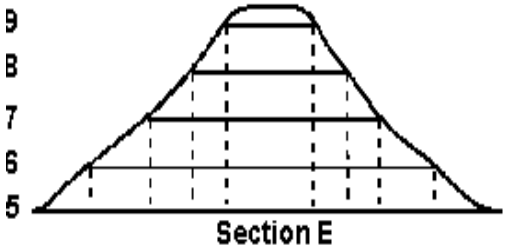


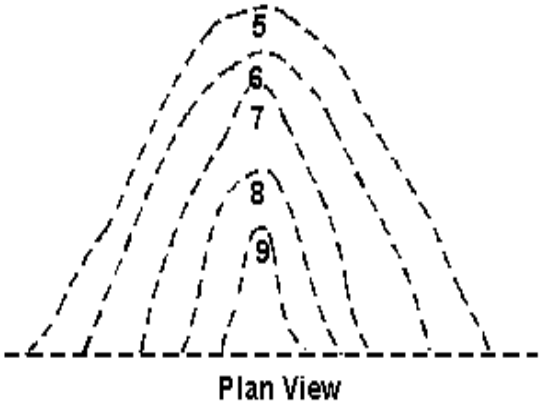
Stormwater runoff and therefore sediment leaves our site through drainage ways in swales or valleys



A valley or a swale is represented by contours that point towards the higher numbers.

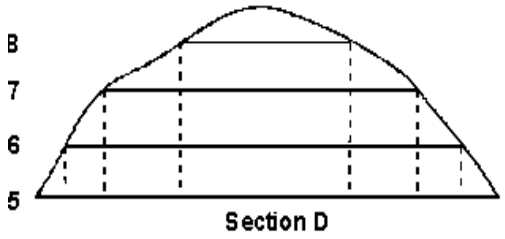
Ridge: a long narrow hilltop or range of hills

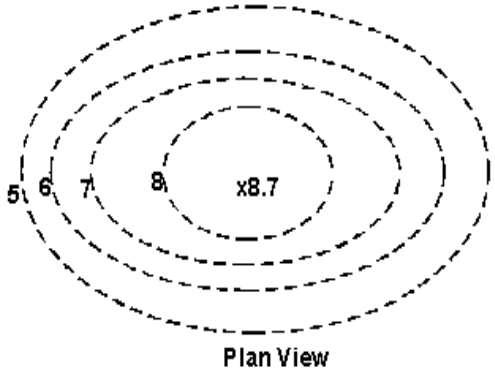




A ridge is represented by contours that point towards the lower numbers.

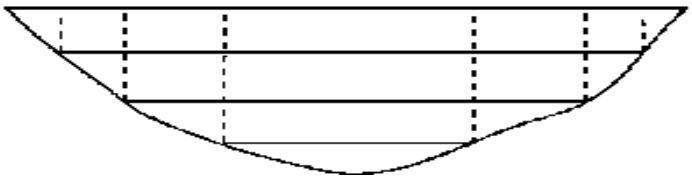
Summit: the highest point or top of something, especially a mountain or hilltop

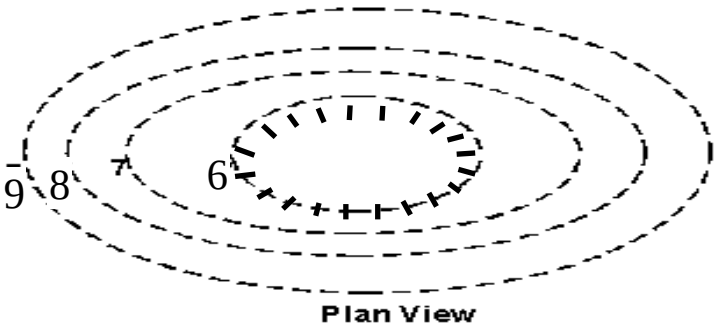




Summits usually have a spot elevation for the highest point; depressions may not have a spot elevation

Depression/Sinkhole: a low area in a landscape without a clear drainage way, sinkholes may drain through an underground system (karst system)





What is an "Adequate" Plan?

A plan must contain enough information to satisfy the plan approving authority that the problems of erosion and sediment control have been adequately addressed.

An adequate plan will meet the following criteria:

- The requirements of the Virginia Erosion and Sediment Control Regulations in particular the minimum standards, unless a variance has been applied for and has been granted
- Any more stringent standards applicable to the locality;
- The standards and specifications published in the Erosion and Sediment Control Handbook (ESCH)(Chapter 3)
- It contains sufficient information to ensure the plan approving authority potential problems of erosion and sedimentation have been adequately addressed

Note: new, innovative and/or proprietary practices may also be used; however, these practices need to be thoroughly described to the satisfaction of the plan approving authority

Whatever practices are used they need to titled, numbered and drawn as shown in the ESCH.