

## Stream Diversion Channel (SDC)



### Practice Description

A stream diversion channel is a temporary practice to convey stream flow in an environmentally safe manner around a construction site while a permanent structure or conveyance is being installed in the stream channel.

### Typical Components of the Practice

- Site Preparation
- Erosion and Sediment Control
- Excavation
- Lining Placement
- Stream Diversion
- Construction Verification

### Construction

Prior to the start of construction, stream diversion channels are required to be designed by a qualified design engineer registered in the State of Alabama. In-stream projects of this nature are subject to the rules and regulations of the U. S. Army Corps of Engineers for in-stream modifications (Clean Water Act Section 404 permit) and if applicable, ADEM CWA Section 401 water quality certification. The stream diversion channel should be planned and installed in such a manner and time (dry season) that the impact to fisheries and the aquatic environment is minimized. A pictorial representation of a stream diversion channel is shown in Figure SDC-1. If a temporary stream crossing (TSC) is

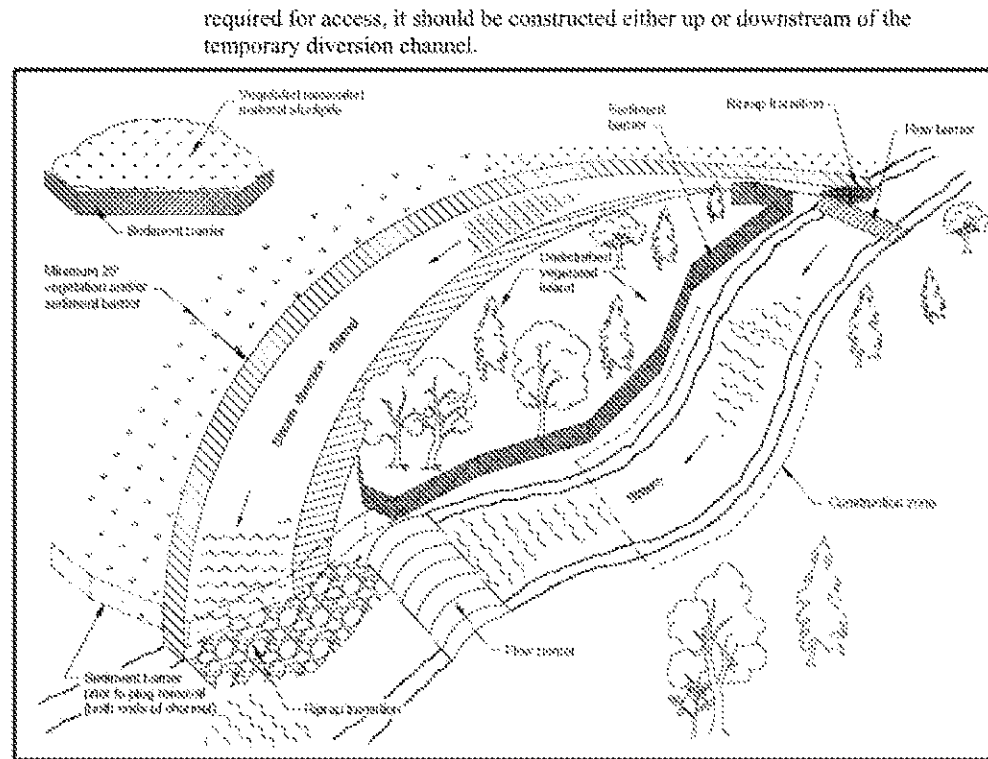


Figure SDC - 1. Typical Stream Diversion Channel Layout.

### Site Preparation

Determine exact location of underground utilities.

Maintain vegetation around the stream until the stream diversion channel has been fully completed including vegetation. Clear only enough of the stream diversion channel area for the next day's work.

The centerline of the stream diversion channel should be established in the plans or by the responsible engineer. Slope and grade stakes should be established for use during excavation.

### Erosion and Sediment Control

Sediment barrier or other sediment control practices to protect the stream from the construction of the diversion channel should be installed prior to any land disturbance. The stock pile for excavated material should be located well away from the work area with sediment control practices installed prior to placement of stockpiled materials. All construction areas should be seeded and mulched as soon as work is complete. Maintain a minimum 25 ft. vegetated grass filter around the stream diversion channel.

### Excavation

A 25 foot undisturbed plug should be left at the exit and entrance of the stream diversion channel until the diversion channel itself has been finished. The stream diversion channel should be excavated according to the dimensions and grade shown in the construction plans beginning at the downstream end next to the plug and continue in an upstream direction. The grade of the stream diversion channel should be uniform and continuous in order to tie into the existing stream bottom elevations without any over falls that would create turbulence. Construction equipment should not be allowed to operate in flowing waters. Construction equipment should be well maintained to prevent drip leaks of oil, hydraulic fluid, etc. Water that collects in the stream diversion channel excavation should be pumped as necessary to a settling basin prior to its discharge. The excavated material should be hauled to the stockpile location.

### Lining Placement

Different lining materials can be specified for the stream diversion channel. Install the selected linings according to the construction specifications.

When rolled products like polyethylene film or geotextile fabric are specified for use as a channel lining, the product should be placed so that one width of material will cover the entire channel bottom and slopes while also providing enough material for a minimum 6 inch anchorage at the top of the bank. The upstream end of the material shall be buried at least 2 feet from top of bank to top of bank with additional trench anchorages of at least 1 ft. x 1 ft. at 50 foot intervals. Upstream sections of material shall overlap downstream sections by at least 2 feet and occur at a trench anchorage location. Polyethylene film shall be at least 6 mil thick and be capable of maintaining strength against the effects of ultraviolet light for a period of at least 60 days.

Pre-manufactured products like turf reinforcement mats (TRM), cellular blocks, and other similar products shall be designed and installed according to the manufacturer's recommendations.

Block sod shall be covered with erosion control netting and staked at minimal 3 ft. x 3 ft. spacing and also at the upstream edge of each piece of sod.

Generally, class 1 non-woven geotextile fabric is used underneath riprap linings.

Additional protection such as riprap may be needed at the entrance and exit portion of the stream diversion channel to ensure scour does not occur in the existing stream bed or bank.

### Stream Diversion

After the lining between the upstream and downstream plugs have been installed, the downstream plug should be removed first and the transition installation completed. Next, the upstream plug should be removed and the transition installation completed. Finally, the stream flow should be diverted into the stream diversion channel using an upstream flow barrier as specified in the plans and in such a manner to minimize sediment delivery into the stream. Allow time for the stream to drain so that aquatic organisms have an opportunity to move or migrate downstream. The downstream flow barrier, if required, can then be installed so that work can commence for the installation of the permanent structure.

### Construction Verification

Check finished grades and cross sections throughout the length of the stream diversion channel.

Verify the stream diversion channel cross section dimensions at several locations to confirm plan specifications.

### Common Problems

Consult with a qualified design professional if any of the following occur:

- The topography of the site does not allow the practice to function as intended and changes in the plan are needed.
- The design specifications for materials cannot be met and substitutions may be necessary. Unapproved substitutions could result in an unstable diversion channel.

### Maintenance

Inspect the stream diversion channel at regular intervals and especially after storm events, check for lining displacement, erosion of the lining, and erosion at the transition areas.

Repair damaged lining and erosion promptly.

Once the permanent structure has been completed, flow can be diverted into the new conveyance structure and the stream diversion channel decommissioned. The decommissioning should occur in such a manner to minimize erosion and sediment runoff into the stream system. Lining materials should be recycled or disposed of properly.

## STREAM DIVERSION CHANNEL

1 DETAIL  
SCALE: N.T.S.

## Permanent Seeding (PS)



### Practice Description

Permanent seeding is the establishment of perennial vegetation on disturbed areas from seed. Permanent vegetation provides economical long-term erosion control and helps prevent sediment from leaving the site. This practice is used when vegetation is desired and appropriate to permanently stabilize the soil.

### Typical Components of the Practice

- Scheduling
- Seedbed Preparation
- Applying Soil Amendments (lime and fertilizer)
- Planting
- Mulching or Installation of Erosion Control Blanket
- Inspection

### Installation

Prior to start of construction, plant materials, seeding rates and planting dates should be specified by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Permanent seeding should be made during the specified planting period whenever possible. When sites are only available for planting outside of the recommended planting period, either an out-of-season permanent seeding, a temporary seeding, mulching or chemical stabilization will be more appropriate than leaving the surface bare for an extended period. If lime and fertilizer application rates are not specified, take soil samples during final grading from the top 6" in each area to be seeded. Submit samples to a soil testing laboratory for lime and fertilizer recommendations.

### Scheduling

The schedule for work at the site should consider the recommended planting period and whenever practical the site work should accommodate seeding during the recommended planting period.

### Seedbed Preparation

Grade and loosen the soil to a smooth firm surface to enhance rooting of seedlings and reduce till erosion. Break up large clods and loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions. Operate the equipment on the contour.

For broadcast seeding and drilling, tillage, as a minimum, should adequately loosen the soil to a depth of at least 6", alleviate compaction, and smooth and firm the soil for the proper placement of seed.

For no-till drilling, the soil surface does not need to be loosened unless the site has surface compaction.

Incorporate lime and fertilizer to a depth of at least 6" with a disk or rotary tiller on slopes of up to 3:1. On steeper slopes, lime and fertilizer may be applied to the surface without incorporation. Lime and fertilizer may be applied through hydroseeding equipment; however, fertilizer should not be added to the seed mixture during hydroseeding. Lime may be added with the seed mixture.

### Liming

Follow the design plan or soil test recommendation. If a plan or soil test is not available, use 2 tons/acre of ground agricultural lime on clayey soils (approximately 90 lbs/acre) and 1 ton/acre on sandy soils (approximately 45 lbs/acre). Exception to situation without a design or a soil test: If the cover is tall fescue and clover, use 2 tons of agricultural lime (approximately 135 lbs/1000 ft<sup>2</sup>) on both clayey and sandy soils.

Spread the specified amount of lime and incorporate into the top 6" of soil after applying fertilizer.

### Fertilizing

Apply a complete fertilizer at rates specified in the design plan or as recommended by soil tests. In the absence of soil tests, use the following as a guide:

### Grass Alone

Use 8-24-24 or equivalent - apply 400 lbs/acre (approximately 9 lbs/1000 ft<sup>2</sup>) starting. When vegetation has emerged to a stand and is growing, 30 to 40 lbs/acre (approximately 0.8 lbs/1000 ft<sup>2</sup>) of additional nitrogen fertilizer should be applied.

### Grass-Legume Mixture

Use 8-24-24 or equivalent - apply 400 lbs/acre (approximately 9 lbs/1000 ft<sup>2</sup>). When vegetation has emerged to a stand and is growing, 30 to 40 lbs/acre (approximately 0.8 lbs/1000 ft<sup>2</sup>) of additional nitrogen fertilizer should be applied.

### Legume Alone

0-20-20 or equivalent - apply 500 lbs/acre (approximately 11.5 lbs/1000 ft<sup>2</sup>) at planting.

Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.

### Planting

Plant the species specified in the plan at the rate and depth specified. In the absence of plans and specifications, plant species and seeding rates may be selected by qualified persons using Figure PS-1 and Table PS-1.

Apply seed uniformly using a cyclone seeder, drop-type spreader, drill, outpacker seeder or hydroseeder.

When using a drill seeder, plant grasses and legumes 1/2" to 3/4" deep. Calibrate equipment in the field.

When planting by methods other than a drill seeder, cover seed by raking, or dragging a chain, brush or mat. Then firm the soil lightly with a roller. Seed can also be covered with hydro-mulched wood fiber and tackifier. Legumes require inoculation with nitrogen-fixing bacteria to ensure good growth. Purchase inoculum specific for the seed and mix with seed prior to planting.

When using a drill seeder, plant grasses and legumes 1/2" to 3/4" deep. Calibrate equipment in the field.

### Mulching

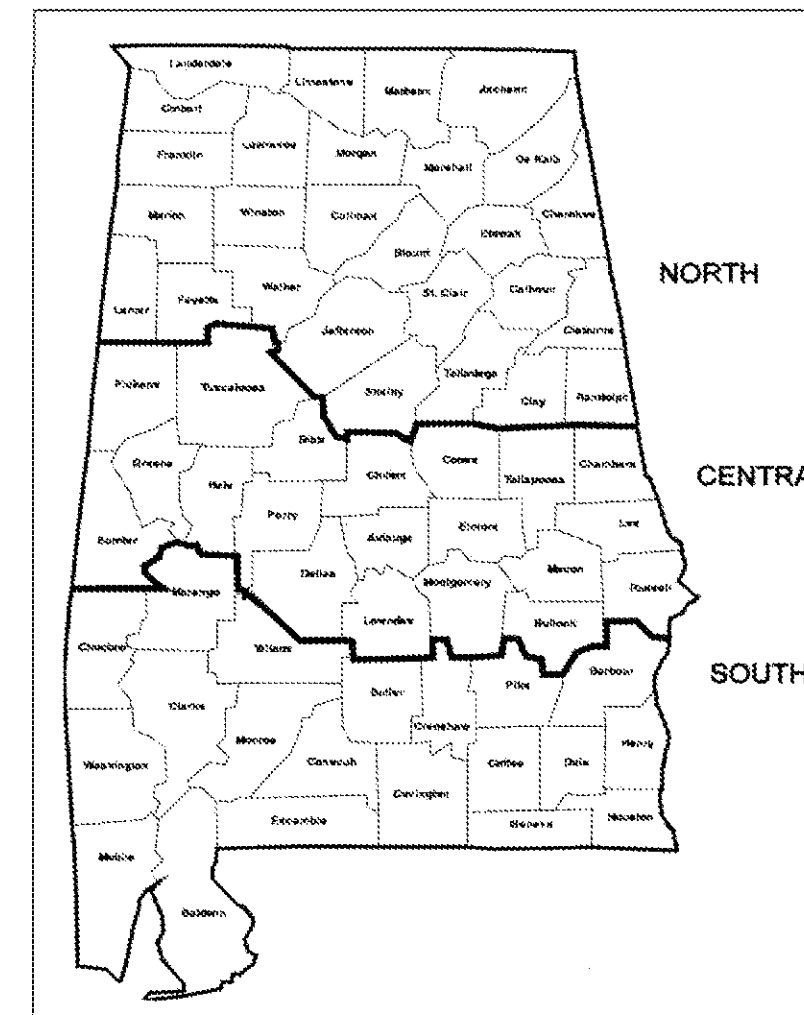


Figure PS-1 Geographical Areas for Species Adaptation

Cover 65% to 75% of the surface with the specified mulch materials. Mulching is extremely important for successful seeding in many situations and whether the mulching material is straw or a manufactured product, the material needs to be applied properly (see Mulching practice for more details).

Table PS-1 Commonly used Plants for Permanent Cover with Seeding Rates and Dates

| Species                           | Seeding Rates/Ac PLS <sup>1</sup> | North          | Central        | South                    |
|-----------------------------------|-----------------------------------|----------------|----------------|--------------------------|
| Bahiagrass, Pensacola             | 40 lbs                            | ---            | Mar 1-July 1   | Feb 1-Nov 1 <sup>2</sup> |
| Bermudagrass, Common              | 10 lbs                            | Apr 1-July 1   | Mar 15-July 15 | Mar 1-July 15            |
| Bahiagrass, Pensacola             | 30 lbs                            | ---            | Mar 1-July 1   | Mar 1-July 15            |
| Bermudagrass, Common              | 5 lbs                             | ---            | Mar 1-July 1   | Mar 1-July 15            |
| Bermudagrass, Hybrid (Lawn Types) | Solid Sod                         | Anytime        | Anytime        | Anytime                  |
| Bermudagrass, Hybrid (Lawn Types) | Sprigs 1/sq ft                    | Mar 1-Aug 1    | Mar 1-Aug 1    | Feb 15 - Sep 1           |
| Fescue, Tall                      | 40-50 lbs                         | Sep 1-Nov 1    | Sep 1-Nov 1    | ---                      |
| Sericea                           | 40-60 lbs                         | Mar 15-July 15 | Mar 1-July 15  | Feb 15-July 15           |
| Sericea & Common Bermudagrass     | 40-60 lbs 10 lbs                  | Mar 15-July 15 | Mar 1-July 15  | Feb 15-July 15           |
| Switchgrass, Alamo                | 4 lbs                             | Apr 1-Jun 15   | Mar 15-Jun 15  | Mar 15-Jun 15            |

<sup>1</sup> PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and 10% inert material, 10 lbs PLS = 10 lbs / (% live seed = 10 / 0.70 = 14.3 lbs).

<sup>2</sup> Fall planting of Bahia should contain 45 lbs. of small grain to provide cover during winter months.

<sup>3</sup> Legume seeds should be treated with the inoculum specific for the species of legume.

### Hydroseeding

Surface roughening is particularly important when hydroseeding, as roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Smooth seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as a slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or cane fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. Use the correct legume inoculant at 4 times the recommended rate when adding inoculant to a hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor.

Fertilizer may be applied with a hydroseeder as a separate operation after seedlings are established.

Agricultural lime is usually applied as a separate operation and spread in dry form. It is not normally applied with a hydraulic seeder because it is abrasive and, also, may clog the system. On the other hand, liquid lime is applied with a hydraulic seeder but because of cost is used primarily to provide quick action for benefit of plants during their seedling stage with the bulk of liming needs to be provided by agricultural lime. Dry lime may be applied with the fertilizer mixture.

### Installation Verification

Check materials and installation for compliance with specifications during installation of products.

### Common Problems

Consult with a qualified design professional if the following occurs:

- Design specifications for seed variety, seeding dates or mulching cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.
- Seeding at the wrong time of the year results in an inadequate stand. Reseed according to specifications of a qualified design professional (see recommendations under Maintenance).
- Inadequate mulching results in an inadequate stand, bare spots or eroded areas-prepare seedbed, reseed, cover seed evenly and tack or tie down mulch, especially on slopes, ridges and in channels (see recommendations under Maintenance).

### Maintenance

Generally, a stand of vegetation cannot be determined to be fully established until vegetative cover has been maintained for 1 year from planting.

### Re seeding

Inspect seedlings monthly for stand survival and vigor. Also, inspect the site for erosion.

If stand is inadequate identify the cause of failure (choice of plant materials, lime and fertilizer quantities, poor seedbed preparation or weather) and take corrective action. If vegetation fails to grow, have the soil tested to determine whether pH is in the correct range or nutrient deficiency is a problem.

Stand conditions, particularly the coverage, will determine the extent of remedial actions such as seedbed preparation and reseeded. A qualified design professional should be consulted to advise on remedial actions. Consider drill seeding where possible.

Eroded areas should be addressed appropriately by filling and/or smoothing, and reapplication of lime, fertilizer, seed and mulch.

### Fertilizing

Satisfactory establishment may require re-fertilizing the stand in the second growing season. Follow soil test recommendations or the specifications provided to establish and maintain the planting.

### Mowing

Mow vegetation on structural practices such as embankments and grass-lined channels to prevent woody plants from invading.

Other areas should be mowed to complement the use of the site.

Certain species can be weakened by mowing regimes that significantly reduce their food reserves stored for the next growing season; fescue should not be mowed close during the summer; sericea should not be mowed close in late summer.

Bermudagrass and bahiagrass are tolerant of most mowing regimes and can be mowed often and close, if so desired, during their growing season.

## PERMANENT SEEDING

2 DETAIL  
SCALE: N.T.S.

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