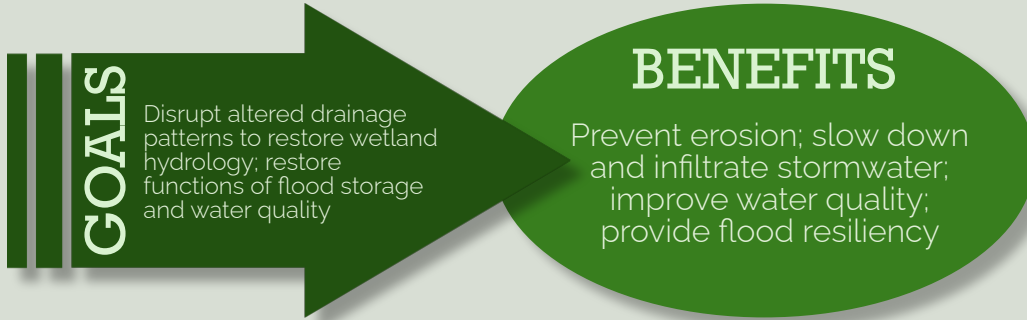


3.4 Ditch Plugs

Ditches confine water, lower the water table, and route water quickly through wetlands. Wetlands with artificial drainage patterns have diminished capacity to slow down and store flood waters. Restoring a portion of a ditch to the natural ground level with an earthen wall can impound water, flood the ditch, and reconnect it with the surrounding wetland. These ditch plugs can be a quick and inexpensive hydrologic restoration practice for artificial drainageways but are not appropriate for stream channels, and care must be taken to ensure hydrology is not altered off site.



- 1 Determine Plug Material
- 2 Identify Plug Locations
- 3 Identify Staging and Access
- 4 Construct Plugs
- 5 Stabilize Site
- 6 Monitor for Success

DEFINITIONS

Organic soil: Soils formed from sedimentation and primarily composed of organic matter (i.e. plant materials).

Mineral Soil: Soils formed from weathering of rocks and contains little organic matter.

Hydrology: The movement of water both on and below the ground surface.

Ditch Plug Example



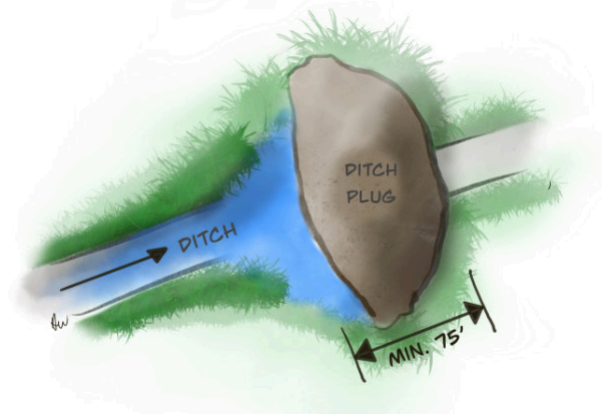
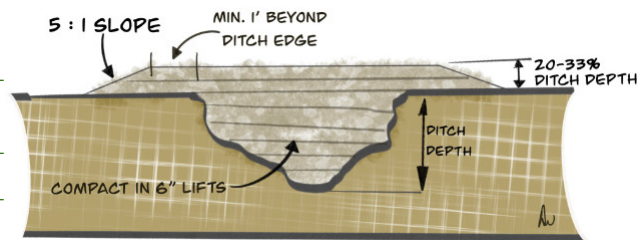
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Ditch Plug Specification

Ditch plugs are made from soil, which can be either sourced on site or imported from clean off site material.

Length	75'-150'+
Side Slope	5 : 1
Material	Soil collected on-site, or imported
	Mineral Soil- i.e. clay soils
	Plug at least 75' of ditch
	Compact in lifts of 4-6"
	Rise 20% of ditch depth above surrounding ground
	Organic Soil- i.e. peat soils
	Plug at least 150 ft of ditch
	Compact in lifts of 4-6"
	Rise 33% of ditch depth above surrounding ground



Shorter plugs can be used with shallower ditches, generally less than 2' in depth. A length of less than 50' is not recommended.

Pre-Construction Planning

Identify Plug Material

Look for spoils from the original ditching along either side of the ditch. Additional sources of on-site material can come from other restoration practices (i.e. depression excavations). If importing soil, use clean fill from a location where non-native invasive species (NNIS) are not found.

Determine Plug Locations

A single plug can work in a relatively flat/level site. Locate the plug at the downstream edge of the desired wetland restoration area. Multiple plugs are needed on sloped sites. Locate one plug at the lowest elevation of the restoration area with additional plugs moving upslope. Spacing or stepping the plugs every one to three feet of vertical rise is recommended to reduce excessive pressure between the plugs.

Identify Staging Location

Find an onsite upland staging location for temporary storage of imported soils (as needed) and parking of equipment.

Identify Access Routes

Use of existing roads and trails without improvement is allowed. Temporary use of swamp mats is also allowed if removed within one growing season, provided their use meets the US Army Corps of Engineers General Permit conditions ([see Chapter 5](#)).

Select a Contractor & Equipment

Choose a contractor with previous experience working in wetlands and use low ground pressure equipment such as an excavator with wide tracks. Meet with the contractor to review project details including site access and staging location, the specifications for plug material and plug installation, and NNIS control/management procedures ([see Invasive Species Control and Management](#)). Plan work for dry field conditions with no/minimal flow present in the ditch.



Construction Sequencing

1. Stock pile imported soils in staging area. Use erosion control measures if storing for more than a week, or heavy rain is predicted.
2. Stake out location of plugs along ditch. Stakes at both ends of the plug will guide the contractor and prevent over/under filling.
3. Strip existing material from where the plug will be installed in the ditch. Remove all vegetation, roots, organic matter and unsuitable sediments. Depending on field conditions the stripping could be done by hand or with the machine.
4. Install depending on fill material per specifications above. Replace organic soils removed from the ditch as topsoil on the plug.
5. Securely stabilize the site through appropriate erosion control measures. Seed and mulch all disturbed soils ([see Erosion Control](#)).




Plug in process, Ryan Crehan, USFWS

Challenges and Solutions

- Controlling impacts to upslope and downslope ditch property owners: If the subject ditch is not confined to the project property, do not place plugs where hydrology changes will affect neighboring land and no closer than within 25' of the property line. This will buffer the neighboring property from any unanticipated impacts from the ditch plugs.
- Settling of fill material: Overfilling the ditch is intended to offset settling, but addition of fill may be necessary over time.
- Erosion of the ditch plug before vegetation reestablishment: Timing of construction during low flow conditions and quick attention to seeding and mulching when construction is complete will assist with vegetation establishment and stability of the site.
- Introduction of invasive species: If work crews are used, ask them to clean tools and boots, and to power-wash equipment before entering the restoration site. Work with your contractor to minimize soil disturbance.

Complementary Practices:

 Additional permitting may be required for the construction of new access roads or trails, for the stockpiling of soil in a wetland or wetland buffer, or for the addition of fill to a floodplain.

