

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**WETLAND RESTORATION  
(ACRES)**

**CODE 657**

**DEFINITION**

A rehabilitation of drained or degraded wetland where the soils, hydrology, vegetative community, and biological habitat are returned to the natural condition to the extent practicable.

**PURPOSE**

To restore hydric soil conditions, hydrologic conditions, hydrophytic plant communities, and wetland functions that occurred on the disturbed wetland site prior to modification to the extent practicable.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies only to sites with hydric soil which were natural wetlands that have been previously degraded hydrologically and/or vegetatively.

Upon completion of the restoration the site will meet the current NRCS soil, hydrology, and vegetation criteria of a wetland.

This practice is applicable only if natural hydrologic conditions can be approximated by modifying drainage and/or artificial flooding of a duration and frequency similar to natural conditions.

If the presence of hazardous waste materials in the sediment or fill is suspected, soil samples will be collected and analyzed for the presence of hazardous waste as defined by local, state, or federal authorities. Sites containing hazardous waste will not be restored under this standard.

This practice does not apply to: a Constructed Wetland (656) intended to treat point and non-point sources of water pollution; Wetland Enhancement (659) intended to rehabilitate a degraded wetland where specific functions and/or values are enhanced beyond original conditions; or Wetland Creation

(658) for creating a wetland on a site location which historically was not a wetland or was formerly a wetland but will be replaced with a wetland type not naturally occurring on the site.

**CRITERIA**

General Criteria

The landowner shall obtain necessary local, state, and federal permits that apply before restoration.

Water rights are assured prior to restoration if required.

Establishing vegetative buffers on surrounding uplands to reduce the movement of sediment and soluble

sediment-attached substances carried by runoff.

The soil, hydrology and vegetative characteristics existing on the site and the contributing watershed shall be documented before restoration of the site begins.

#### Criteria for Hydric Soil Conditions

Restoration sites will be located on hydric soils.

If the hydric soil is covered by fill, sediment, spoil, or other depositional material, the material covering the hydric soil shall be removed only to the surface of the buried (or original) hydric soil.

Reestablish an approximation of the original soil microtopography.

#### Criteria for Hydrology Restoration

Hydrologic restoration should make adequate water available approximating the needs of the wetlands. The hydrology of the site is defined as the rate, path, and timing of inflow and outflow; duration, frequency, and depth of flooding, ponding or saturation.

The maximum hydrology and the overall hydraulic variability of the restored site will approximate the conditions that existed before alteration, e.g., dynamic and static water levels, soil saturation.

A desired hydrologic regime shall be identified for each restoration site. Assumptions regarding premanipulation hydrology shall be based upon aerial (repeat) photograph interpretation, NRCS approved drainage models, soils data, or suitable reference site data. A soil

investigation shall be performed to determine conditions needed to minimize seepage loss, construction suitability, and water supply.

Based on the watershed evaluation, a water budget shall be calculated to document existing hydrologic conditions in the restoration site and to predict the hydrologic influence of restoration practices. Existing drainage systems will be modified as needed to achieve the practice purpose. The schedule of implementation for planned hydrology restoration techniques will be made in consideration of the tolerances of the wetland vegetation to be established.

Hydrology altered by field drains and ditches which will not be destroyed during land preparation, may be restored by constructing ditch plugs utilizing water control structures or filling to the original ground level.

All field ditches one foot or less in depth that will not be destroyed during normal land preparation will be filled to natural ground level for a minimum distance of 50 feet. The fill material shall be compacted by routing the equipment over the area in such a manner that the entire surface will be covered by at least one pass of the wheel or track of the equipment. This practice will reduce the rate of surface runoff. For ditches greater than one foot in depth, a "ditch plug" may be used.

Ditch plugs may be used to alter hydrology in existing drainage systems. These plugs may be of two types: (a) A broad "earthen plug" designed for water to flow over the top in a uniform flow, or (b) a "rock plug" designed for water to flow through and over the top. Ditch plugs will be designed to be stable under expected flow conditions, and meet the following

minimum specifications: Earthen plug may be used for site with less than 100 acres of drainage area and will be designed with the following minimum specifications: remove accumulated sediment and vegetation from ditch and banks at the plug site. Slope ditch banks to a minimum of 2:1; construct core trench and earthfill as required in dam construction; the top width of the plug will be a minimum of 30 feet wide parallel to the flow. It shall be constructed level and to an elevation below top bank that will block 75% of the existing ditch depth. The remaining cross-sectional area between the top of the plug and top bank shall at least equal to 40% of the existing ditch cross-sectional area. It may be necessary in some cases to widen the top width of the channel at the plug site. A 3:1 upstream and a 8:1 downstream transition will be constructed when widening a channel; the upstream face will be no steeper than 5:1 and the downstream face will be no steeper than 20:1; no spillway will be required; consideration should be given to armor-plating the plug if soil strength and erodibility is a concern.

Rock plugs are constructed to retard or decrease the efficiency of the existing drainage system. They shall be designed with the following minimum specifications: prepare site for an earthen plug; the top width of the rock plug will be a minimum of 10 feet wide parallel to the flow. It shall be constructed level and to an elevation below top bank that will block 75% of the existing ditch depth. The remaining cross-sectional area between the top of the plug and top bank shall at least equal to 40% of the existing ditch cross-sectional area. It may be necessary in some cases to widen the top width of the channel at the plug site. A 3:1 upstream

and a 8:1 downstream transition will be constructed when widening a channel; the upstream and downstream slopes shall be no steeper than 3:1.

The gradation of the rock shall be:

Individual Stone Weight (pounds) <sup>1/</sup>	Percent by Weight
190 to 230	0 – 10
65 to 190	40 – 60
25 to 65	20 – 40
0 to 25	0 – 15

<sup>1/</sup> The solid weight of stone shall be at least 150 pounds per cubic foot.

Broken concrete conforming to the above gradation requirements may be used, provided its solid weight is at least 130 pounds per cubic foot and free from any protruding reinforcement; the least dimension of an individual stone or concrete piece shall be at least one-third its maximum dimension; no spillway will be required.

To mimic the more, extensive, longer duration flooding/inundation, dikes and water control structures should be utilized. Existing structures (i.e., levees, pumps etc.) which protect the site from backwater shall be altered (i.e., breeched, removed etc.) in a manner, and within a time frame, to compliment the intended function of the restored wetland. Breeches should be of sufficient size and design to allow for water movement without erosion of the remaining levee. Spillways shall be designed for the peak discharge from a 10 year, 24 hour storm.

The standards and specifications for Dike (356) and Structure for Water Control (587) will be used as appropriate. Refer to the Engineering Field Handbook, Chapter 13, "Wetland Restoration, Enhancement,

and Creation,” and Chapter 6, “Structures,” for additional design information. Existing drainage systems will be utilized, removed, or modified as needed to achieve the intended purpose.

#### Criteria for Vegetation Restoration

The vegetation shall be restored as close to the original natural plant community as the restored site conditions will allow. Determination of the original plant community’s species and percent composition shall be based upon reference wetlands within the restoration site’s watershed of the type being restored or suitable technical reference. Such technical reference could include the U.S. Forest Service Agriculture Handbook No. 271, “Silvics of Forest Trees of the United States”, La. Department of Wildlife and Fisheries/The Nature Conservancy – La. Field Office, “Atlas of the Vascular Flora of Louisiana”, LSU Sea Grant Publication No. LSU-T-79-003 “Common Vascular Plants of the Louisiana Marsh”, and individual parish soil surveys.

Plantings, seeding, or other types of vegetative establishment will be comprised of native species that occur on the wetland type being restored. The only exception to the use of native species would be for specialized purposes such as wildlife food plantings and/or to address critical areas for soil stabilization. The standard and specifications for Wetland Wildlife Habitat Management (644), Tree and Shrub Establishment (612) and Critical Area Planting (342) should be used as appropriate. These uses should not justify the introduction of invasive exotic species.

Preference shall be given to native wetland plants with localized genetic material.

Plant materials collected or grown from material collected within a 200-mile radius from the site is considered local.

In soils where seed banks realistically exist, or where natural colonization of selected native species (identified from reference wetlands) will dominate within 5 years, then natural regeneration can be allowed. Specific guidelines that consider soil, seed source, and species will be developed by the states.

Adequate substrate material and site preparation necessary for proper establishment of the selected plant species shall be included in the design. The kind and intensity of land preparation will depend on species to be planted, ground cover, soil type, flooding regimes, etc. Fields can be disked in their entirety, strips disked, prescribe burned, treated with approved herbicides, or bushhogged. For herbicide use, all associated labels should be read thoroughly. It is illegal to use any pesticide in a manner which is inconsistent with label directions. It is also unlawful for a non-certified applicator to use a pesticide, which has been classified, with restricted use. Proper vegetation identification is also needed. There may also be a need to sub-soil on soils with evident clay or fragi-pans. The use of elevated rows (i.e., beds) on wet sites is discouraged because of the effects on sheet flow hydrology. Site preparation will meet the criteria of Forest Site Preparation (490).

On sites which were predominantly herbaceous vegetation prior to modification and planting and/or seeding is necessary, the minimum number of native species to be established shall be based

upon the number of ecological sites present. Sites restored to only one ecological site shall be established with at least two species adapted to the site. Sites with two or more ecological sites (i.e., wet meadow, shallow marsh, or slough eco-sites, etc.) shall be established with at least one native species on each ecological site.

Herbaceous vegetation may be established by a variety of methods including: mechanical (i.e., drilling, broadcasting) or aerial seeding, topsoiling, organic mat placement, wetland sod, vegetative sprigs, wetland hay, etc., over the entire site or a portion of the site and at densities and depths appropriate. Consult the plant materials specialist or biologist for appropriate seeding rates, depths, necessary equipment, and dates.

If the desired plant community is a fire maintained sub-climax type, then prescribed burning shall be a required maintenance item. When the desired vegetation reaches a size where it will not be destroyed by fire, prescribed burning shall be carried out at an interval appropriate to the community type throughout the life of the practice. Forested wetland plantings and/or seeding will include a minimum of three tree or shrub species on each ecological site (i.e., low flat, ridge eco-sites, etc.), where appropriate. Tree (and shrub) planting will follow the criteria of Tree and Shrub Establishment (612).

Seed planting rates and site preparation will meet the criteria of Woodland Direct Seeding (652) and Site Preparation (490). Seed viability will be determined prior to planting.

Forest stand improvement treatments needed to accomplish a planned restoration objective shall be planned in accordance with Forest Stand Improvement (666).

Permanent wildlife openings (such as shooting lanes and food plots) planned at the restoration site should only be located; along the forest perimeter, or beside permanent roads, or within permanent utility right of ways.

#### Criteria for Wetland Functions

A functional assessment (Hydrogeomorphic approach or similar method) shall be performed on the site prior to restoration. A "prior to restoration" map will be prepared to depict existing conditions on the site (i.e. PC, FW, FWP). A restoration map will be prepared to depict the effects planned measures will have on the site. Use the Cowardin Wetland Classification System to label habitat types.

Restoration goals and objectives shall include targeted natural wetland functions for the wetland type and the site location as determined by the functional assessment and reference site data. A post-project assessment will be performed after an adequate period to assess the success of the restoration.

#### **CONSIDERATIONS**

Consider effect of volumes and rates of runoff, infiltration, evaporation, and

transpiration because of changes in the volume of available soil water.

Consider effects on downstream flows or aquifers that would affect other water uses or users.

Consider effects of wetlands or water-related resources wildlife habitats that would be associated with the practice.

Consider as a high priority those sites adjacent to existing wetlands as they increase wetland system complexity and diversity, decrease habitat fragmentation, and ensure colonization of the site by wetland flora and fauna.

Consider linking wetlands by corridors wherever appropriate to enhance the wetland's use and colonization by the flora and fauna.

Consider the effects of varying water levels in response to potential climatic events such as wet or dry periods.

Consider changes in salt movement/concentrations in the soil resulting from hydrologic alterations.

The nutrient and pesticide tolerance of the plant species planned should be considered where known nutrient and pesticide contamination exists.

Consider effects of temperature on water resources to prevent undesired effects on aquatic and wildlife communities.

Consider if plan communities at the restoration site need to be protected from fire.

Consider if vegetated non-wetland buffers added to the site would improve habitat quality and/or protect water quality.

For discharge wetlands, consider upslope water/groundwater source availability.

## **PLANS AND SPECIFICATIONS**

Specifications for this practice shall be prepared for each site. Specifications shall be recorded using approved specifications sheets, job sheets, narrative statements in the conservation plan, or other documentation. Requirements for the operation and maintenance of the practice shall be incorporated into site specifications.

## **OPERATION AND MAINTENANCE**

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair upkeep of the practice (maintenance):

Any use of fertilizers, mechanical treatments, prescribed burning, pesticides and other chemicals to assure the wetland restoration function shall not compromise the intended purpose;

Biological control of undesirable plant species and pests (e.g., using predator or parasitic species) shall be implemented where available and feasible;

Timing and level setting of water control structures required for the establishment of

desired hydrologic conditions or for management of vegetation;

Inspection schedule for embankments and structures for damage assessment;

Depth of sediment accumulation to be allowed before removal is required;

Management needed to maintain vegetation, including control of unwanted vegetation;

Haying and livestock grazing plans will be developed so as to allow the establishment, development, and management of wetland and associated upland vegetation.

#### **REFERENCES:**

1. 1993, Mitsch, W.J. Gosselink, J.G., "Wetlands". Library of Congress Catalog Card Number 92-36129
2. 2000, NRCS North Carolina Wetland Restoration (657) Conservation Practice Standard