

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WETLAND RESTORATION

(Ac.)

CODE 657

DEFINITION

The return of a wetland and its functions to a close approximation of its original condition as it existed prior to disturbance on a former or degraded wetland site.

PURPOSE

To restore wetland function, value, habitat, diversity, and capacity to a close approximation of the pre-disturbance conditions by restoring:

- Conditions conducive to hydric soil maintenance.
- Wetland hydrology (dominant water source, hydroperiod, and hydrodynamics).
- Native hydrophytic vegetation (including the removal of undesired species, and/or seeding or planting of desired species).
- Original fish and wildlife habitats.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies only to natural wetland sites with hydric soils which have been subject to the degradation of hydrology, vegetation, or soils.

This practice is applicable only where the natural hydrologic conditions can be approximated by actions such as modifying drainage, restoring stream/floodplain connectivity, removing diversions, dikes, and levees, and/or by using a natural or artificial water source to provide conditions similar to the original, natural conditions.

This practice does not apply to:

- The treatment of point and non-point sources of water pollution (Conservation Practice Standard (CPS) Constructed Wetland (656));
- The rehabilitation of a degraded wetland, the reestablishment of a former wetland, or the modification of an existing wetland, where specific wetland functions are augmented beyond the original natural conditions; possibly at the expense of other functions.(CPS Wetland Enhancement (659);
- The creation of a wetland on a site location which was historically nonwetland (CPS Wetland Creation (658).
- The management of fish and wildlife habitat on wetlands restored under this standard (CPS Wetland Wildlife Habitat Management – (644)).

CRITERIA

General Criteria Applicable to All Purposes

The purpose, goals, and objectives of the restoration shall be clearly defined in the restoration plan, including soils, hydrology, vegetation, and fish and wildlife habitat criteria that are to be met and are appropriate for the site and the project objectives.

These planning steps shall be done with the use of a functional assessment-type procedure, or a state approved equivalent. The State Approved Wetland Assessment Equivalent is the SD-CPA-67. For a list of approved functional assessments refer to the hydrogeomorphic assessment models listed in Section I, Resource Evaluation Tools – (8) Wetlands, of the FOTG at:

<http://efotg.sc.egov.usda.gov/references/public>

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#), or visit the [electronic Field Office Technical Guide](#).

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[/SD/INTRODUCTION-INDEX-NoticeSD136.pdf](#)

The objectives will be determined by an analysis of current and historic site functions. They will be based on those functions which can reasonably be supported by current site constraints. Data from historic and recent aerial photography and/or other remotely sensed data, soil maps, topographic maps, stream gage data, intact reference wetlands, and historical records shall be gathered.

The soils, hydrology and vegetative conditions existing on the site, the adjacent landscape, and the contributing watershed shall be documented in the planning process. A portion of this documentation may exist as part of a wetland determination for the site, or it shall be developed using the current version of the state wetland mapping conventions found in Section I of the FOTG.

The nutrient and pesticide tolerance of the plant and animal species likely to occur shall be evaluated where known nutrient and pesticide contamination exists. The wetland restoration shall not utilize any fertilizers. Herbicides may be applied for the purpose of establishing the appropriate plant community. Sites suspected of containing hazardous material shall be tested to identify appropriate remedial measures. If hazardous wastes are identified on the site, planning for the practice will proceed only after the site has been cleaned, the clean up approved by the responsible regulatory agency, and the state conservationist has agreed to provide technical assistance for planning. If remedial measures are not possible or practicable, the practice shall not be planned.

The availability of sufficient water rights should be reviewed prior to restoration.

Upon completion, the site shall meet soil, hydrology, vegetation, and habitat conditions of the wetland that previously existed on the site to the extent practicable.

Where offsite hydrologic alterations or the presence of invasive species impact the site, the design shall compensate for these impacts to the extent practicable.

Invasive species, federal/state listed noxious plant species, and nuisance species (e.g., those whose presence or overpopulation jeopardize the practice) shall be controlled on the site as necessary to restore wetland functions. The establishment and/or use of non-native plant species shall be discouraged.

Criteria for Hydric Soil Restoration

Restoration sites will be located on soils that are hydric.

If the hydric soil is covered by fill, sediment, spoil, or other depositional material, the material covering the hydric soil shall be removed to the extent needed to restore the original soil functions.

Soil hydrodynamic and bio-geochemical properties such as permeability, porosity, pH, or soil organic carbon levels shall be restored to the extent needed to restore hydric soil functions.

Criteria for Hydrology Restoration

The hydroperiod, hydrodynamics, and dominant water source of the restored site shall approximate the conditions that existed before alteration. The restoration plan shall document the adequacy of available water sources based on groundwater investigation, stream gage data, water budgeting, or other appropriate means.

The work associated with the wetland shall not adversely affect adjacent properties or other water users unless agreed to by signed written letter, easement or permit. Detailed surveys shall be conducted at the wetland site to determine the extent of planned water levels near property lines. The full pool water level shall be a minimum of 12 inches below the adjacent property boundary elevation to prevent saturation of the soils on the adjacent property unless a detailed hydrologic evaluation shows there will be no negative impacts at higher water levels.

A signed written letter, easement, or permit by the adjacent landowner must be obtained if temporary water storage will occur on adjacent properties due to the wetland restoration.

Timing and level setting of water control structures, if needed, will be based on the actions needed to maintain a close approximation to the original, natural hydrologic conditions.

The original natural water supply should be used to reestablish the site's hydrology to approximate the hydrologic conditions of the wetland type. If this natural water supply does not restore the wetland hydrology, an artificial water supply can be used; however, well water pumped from an aquifer or flowing from an artesian well may not be used as a water supply. Additionally, tile drainage from cropland may not outlet into the wetland to be restored.

All wells within the wetland restoration area shall be decommissioned according to the CPS Well Decommissioning (351) for a restoration life greater than 15 years. For short-term restorations, where the restoration is not likely to be maintained for more than 15 years, the well shall not be used to add water to the area and shall be raised above the maximum designed water level. Water from flowing wells shall bypass the restoration area.

Alternate natural or artificial water supply sources shall not divert from other wetland resources (e.g., prairie pothole wetland complexes or springs). If the alternate water source requires energy inputs, these shall be estimated and documented in the restoration plan.

To the extent technically feasible reestablish macrotopography and/or microtopography. Use reference sites within the local area to determine desired topographic relief. The location, size, and geometry of earthen structures, if needed, shall match that of the original macrotopographic features to the extent practicable.

Macrotopographic features, including ditch plugs installed in lieu of re-filling surface drainage ditches, shall meet the requirements of other practice standards to which they may apply due to purpose, size, water storage capacity, hazard class, or other parameters. If no other practice standard applies, they shall meet the requirements for CPS Dike (356) unless there is no potential for damage to the

feature or other areas on or off site due to erosion, breaching, or overtopping.

Excavations from within the wetland shall remove sediment to approximate the original topography or establish a water level that will compensate for the sediment that remains.

Water control structures that may impede the movement of target aquatic species or species of concern shall meet the criteria in CPS Fish Passage (396).

Wetland restoration sites that exhibit soil oxidation and/or subsidence, resulting in a lower surface elevation compared to pre-disturbance, shall take into account the appropriate hydrologic regime needed to support the original wetland functions.

Surface Drainage Removal. Where open channels were constructed to drain the wetland, the channel will be filled with earth or controlled with a grade stabilization structure and/or a water control structure to restore the wetland hydrologic conditions.

The channel may be blocked with earth fill without a water control structure where the block will be permanently maintained and flow rate and duration will not cause erosion and head cutting. The surface drain block must be located near the edge of the wetland where it will fully restore water storage in the wetland. The area under the surface drain block must be stripped of vegetation, silt, and debris before installation of the earth fill.

The required surface block length (measured parallel to the channel) will depend on site conditions, including land use, soils, and size of the watershed. The surface drain block top length must be at least 20 feet for wetland areas in permanent vegetation and 50 feet for areas in cropland. A longer plug may be needed to adequately restore wetland functions. Surface drain block end slopes must be 3:1 or flatter upstream and 8:1 or flatter downstream. Drain block fills must be carefully compacted and overfilled 10 percent of the fill height to allow for settlement.

Grade Stabilization Structure. When the 10-year frequency, 24-hour duration storm flow or base flow from snow melt or groundwater inflow results in long duration flows or high peak discharge, the channel will be filled and

stabilized with a structure that meets the criteria for the CPS Grade Stabilization Structure (410).

Water Control Structure. A water control device meeting the criteria of the CPS Structure for Water Control (587) will be used when the water level required to be maintained for the restoration is different than that caused by blocking the channel.

The water control device may not increase the inflow into a downstream drain beyond what was originally apportioned or designed for the drain.

Subsurface Drainage Removal. In areas where subsurface drains were used to remove surface water or soil saturation, the existing system will be modified to restore the wetland hydrologic conditions. Review of drainage records, interviews, and site investigations will be needed to determine the extent of the existing system. The effect of any modification to the existing subsurface drainage system on upstream and downstream landowners will be evaluated and the landowner will be notified of potential offsite impacts. This evaluation will include both surface and subsurface impacts.

Where the subsurface drain serves as an outlet for upstream properties, it will be necessary to meet applicable state and local laws and regulations pertaining to subsurface drainage and flooding. Upstream surface and subsurface drainage will not be impacted unless appropriate easements are obtained or mitigation measures are implemented.

The effects of the subsurface drainage system may possibly be eliminated by the following:

- removing a portion of the drain at the upstream and downstream edges of the site; or
- modifying the drain with a water control device; or
- installing nonperforated pipe in and an appropriate lateral effect distance upstream and downstream from the wetland boundary.

The minimum length (measured from the outside edge of the wetland) of drain to be removed is 50 feet for soils with a hydraulic

conductivity of less than 0.6 inches per hour, 100 feet for 0.6 to 2.0 inches per hour, and 150 feet for greater than 2.0 inches per hour. All envelope filter material or other flow enhancing material will also be removed for this length. The trench will be filled and compacted to achieve a density equal to adjacent material.

Any water control structure will be attached to a nonperforated conduit that extends at least the minimum length previously specified for length of drain to be removed. The connections of the water control structure and the nonperforated pipe will be watertight at the head created at the maximum pool level.

Storage Volume Replacement. Where sediment, land shaping, or other activities have filled the wetland site, the storage shall be replaced by excavating the fill material from the site.

Embankments. Where surface drainage removal with drain blocks are not sufficient to restore hydrology, an earthen embankment may be constructed to create a pool storage volume equal to that which existed prior to conversion of the site. Embankments with an effective height of less than six feet will meet the criteria for the CPS Dike (356). Embankments with an effective height of greater than six feet will meet the criteria for the CPS Pond (378).

Embankments meeting criteria for dikes will safely pass a 10-year frequency, 24-hour storm at the dike design high water level.

Criteria for Vegetative Restoration

Hydrophytic vegetation restoration shall be of species typical for the wetland type(s) being established and the varying hydrologic regimes and soil types within the wetland. The appropriate plant community to be restored will be determined using one of the following:

- a. Biology Technical Note No. 16, Wetland Vegetation Establishment;
- b. The plant community found on an established reference wetland site for the hydric soil on the restored site;
- c. The plant community found in the Historic Climax Plant Community in the Ecological Site Description.

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

Where natural colonization of acceptable species can realistically be expected to occur within five years, sites may be left to revegetate naturally. If not, the appropriate species will be established by seeding or planting.

Adequate substrate material and site preparation necessary for proper establishment of the selected plant species shall be included in the plan.

Where planting and/or seeding is necessary, the minimum number of native species to be established shall be based on Biology Technical Note No. 16 or a reference wetland with the type of vegetative communities and species planned on the restoration site:

- Use the procedures in Biology Technical Note No. 16 (and Range Technical Note No. 4, when appropriate) or contact an area biologist. Select wetland species based on 1) the wetland mixes provided in Biology Technical Note No. 16, 2) a wetland reference site (approved by the area or state biologist), or 3) the ecological site description.
- Where the dominant vegetation will be herbaceous community types, a subset of the original vegetative community shall be established within five years, or a suitable precursor to the original community will be established within five years that creates conditions suitable for the establishment of the native community. Species richness shall be addressed in the planning of herbaceous communities. Seeding rates shall be based upon the percentage of pure live seed and labeled with a current seed tag from a registered seed laboratory identifying the germination rate, purity analysis, and other seed statistics.
- Where the dominant vegetation will be forest or woodland community types, vegetation establishment will include a mix of woody species (trees and/or shrubs) adequate to establish the reference wetland community, or a suitable precursor to the original plant community.

CONSIDERATIONS

Soil Considerations

Consider making changes to physical soil properties, including:

- Increasing or decreasing saturated hydraulic conductivity by mechanical compaction or tillage, as appropriate;
- Incorporating soil amendments;
- The effect of construction equipment on soil density, infiltration, and structure.

Consider changes in soil bio-geochemical properties, including:

- Increasing soil organic carbon by incorporating compost.

Increasing or decreasing soil pH with lime, gypsum, or other compounds

Hydrology Considerations

Consider the general hydrologic effects of the restoration, including:

- Impacts on downstream stream hydrographs, volumes of surface runoff, and groundwater resources due to changes of water use and movement created by the restoration;
- Complete ditch closure within the wetland and appropriate lateral effect distances from the wetland edge should be considered for use instead of ditch blocks for increased stability, landscape integrity, and hydrologic restoration;
- The use of water control structures and grade stabilization structures should be limited. The use of these structures is generally more appropriate for the CPS Wetland Enhancement (659) and the CPS Wetland Creation (658);
- A water control device placed on the inlet of an existing drain may be designed to intentionally limit inflow into downstream drains. This may prevent damage to the downstream drains;

- Long duration flows and high peak discharges will severely impact surface drain blocks. In these cases, a water control structure designed in accordance with the CPS Grade Stabilization Structure (410) or the CPS Pond (378) should be used.

Consider the impacts of water level management, including:

- Increased predation due to concentrating aquatic organisms, including herptivores, in small pool areas during draw downs
- Increased predation of amphibians due to high water levels that can sustain predators.
- Decreased ability of aquatic organisms to move within the wetland and from the wetland area to adjacent habitats, including fish and amphibians as water levels are decreased.
- Increases in water temperature on-site, and in off-site receiving waters.
- Changes in the quantity and direction of movement of subsurface flows due to increases or decreases in water depth.
- The effect changes in hydrologic regime have on soil bio-geochemical properties, including: oxidation/reduction; maintenance of organic soils; and salinity increase or decrease on site and on adjacent areas.

Vegetation Considerations

Consider:

- The relative effects of planting density on fish and wildlife habitat versus production rates in woody plantings;
- The potential for vegetative buffers to increase function by trapping sediment, cycling nutrients, and removing pesticides;
- The selection of vegetation for the protection of structural measures that is appropriate for wetland function;
- The potential for invasive or noxious plant species to establish on bare soils after

construction and before the planned plant community is established;

- The use of prescribed burning to restore wetland and adjacent upland plant communities.

Fish and Wildlife Habitat Considerations

Consider:

- The addition of coarse woody debris on sites to be restored to woody plant communities for an initial carbon source and fish and wildlife cover;
- The potential to restore habitat capable of supporting fish and wildlife with the ability to control disease vectors such as mosquitoes;
- The potential to establish fish and wildlife corridors to link the site to adjacent landscapes, streams, and water bodies and to increase the sites colonization by native flora;
- The need to provide barriers to passage for unwanted or predatory species.

PLANS AND SPECIFICATIONS

Plans and specifications for this practice shall be prepared for each site. Plans and specifications shall be recorded using approved specifications sheets, job sheets, or other documentation. The plans and specifications for structural features will include, at a minimum, a plan view, quantities, and sufficient profiles and cross-sections to define the location, line, and grade for stakeout and checkout. Plans and specifications shall be reviewed and approved by staff with appropriate job approval authority.

OPERATION AND MAINTENANCE

A separate Operation and Maintenance Plan will be prepared for sites that have structural features. The plan will include specific actions for the normal and repetitive operation of installed structural items, especially water control structures, if included in the project. The plan will also include the maintenance actions necessary to assure that constructed

items are maintained for the life of the project. It will include the inspection schedule, a list of items to inspect, a checklist of potential damages to look for, recommended repairs, and procedures for documentation.

Management and monitoring activities needed to ensure the continued success of the wetland functions may be included in the above plan, or in a separate Management and Monitoring Plan. In addition to the monitoring schedule, this plan may include the following:

- The timing and methods for the use of fertilizers, pesticides, prescribed burning, or mechanical treatments;
- Circumstances when the use of biological control of undesirable plant species and pests (e.g., using predator or parasitic species) is appropriate, and the approved methods;
- Actions which specifically address any expected problems from invasive or noxious species;
- The circumstances which require the removal of accumulated sediment;
- Conditions which indicate the need to use haying or grazing as a management tool, including timing and methods.

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