

**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.

modification of an existing wetland where specific wetland functions are augmented beyond the original natural conditions at the possible expense of other functions (Wetland Enhancement – 659).

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).

- The creation of a wetland on a site location which was historically non- wetland (Wetland Creation – 658).
- The management of fish and wildlife habitat on wetlands restored under this standard.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies only to natural wetland sites with hydric soils which have been subject to 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 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 (Constructed Wetland - 656)
- The rehabilitation of a degraded wetland, the re-establishment of a former wetland, or the

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 are 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 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, remotely sensed data, soils maps, topographic maps, stream gauge 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.

The nutrient and pesticide tolerance of the plant and animal species likely to occur shall be evaluated where known nutrient and pesticide contamination exists. Sites suspected of

containing hazardous material shall be tested to identify appropriate remedial measures. If remedial measures are not possible or practical, the practice will not be planned.

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

Upon completion of the restoration, 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 possible.

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 will 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 required to restore hydric soil functions.

Refer to the Oklahoma hydric soils list and the appropriate county soil survey for specific information on soil characteristics and properties.

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 gauge 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.

Timing and level setting of water control structures, if needed, will be based on the actions needed to maintain a close approximation of 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 is not possible, an alternate natural or artificial water supply can be used; however, these sources shall not be diverted from other wetland resources. If the alternate water source requires energy inputs, these shall be estimated and documented in the restoration plan.

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 the standard for Aquatic Organism 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.

Refer to Oklahoma NRCS standards for Pond (378), Structure for Water Control (587), Diversion (362), or Dike (356) where embankments, water control structures, or diversions are needed to achieve the desired wetland hydrology.

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. 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 5 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 a reference wetland with the type of vegetative communities and species planned on the restoration site:

- Where the dominant vegetation will be herbaceous community types, a subset of the original vegetative community shall be established within 5 years, or a suitable precursor to the original community will be established within 5 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.
- Restoration of vegetation on adjacent wetland buffers will be accomplished with native vegetation adapted to the site. Herbaceous plantings will consist of native grasses, forbs, and legumes planted in accordance with the Oklahoma Conservation Practice Standard Range Planting (550). Tree plantings on buffers will be established in accordance with the Oklahoma Conservation Practice Standard Tree/Shrub Establishment (612).
- All herbaceous and woody vegetative plantings will be and based on recommendations from the NRCS biologist, resource specialist, WRP specialist, or ODWC wetland biologist.

Criteria for Restoration of Landscape and Topographic Features

- Topographic features (both micro/macro-topography) should be restored on wetlands

where these features have been modified by activities such as land leveling, clearing, or farming practices.

- Micro-topography is characterized by features with less than 6 inches of relative elevation change.
- Macro-topography consists of features with greater than 6 inches of relative elevation changes.
- Macro-topographic feature designs should be installed in accordance with specifications identified in standard drawings contained in "Oklahoma Engineering Forms and Standard Drawings" which are available on the Oklahoma NRCS website or as described in Oklahoma NRCS Conservation Practice Job Sheet 657 02 "Using Micro and Macro Topography in Wetland Restoration", or as designed on a site by site basis by the WRP project engineer.

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.

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

NRCS, OK

September, 2011

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.

REFERENCES:

- USDA, NRCS. Wetland Restoration, Enhancement, or Creation, Engineering Field Handbook Chapter 13, Part 650, pp. 3, 24, 77, 78.
- USDA, NRCS, 2003. ECS 190-15 Wetland Restoration, Enhancement, Management & Monitoring. 425 pp.
- Executive order 13112, Invasive Species, February 3, 1999. Federal Register: Vol.64, No.25. Feb. 8, 1999.
- Hall, C.D. and F.J. Cuthbert. 2000. Impact of a controlled wetland drawdown on Blanding's Turtles in Minnesota. Chelonian Conservation Biology. Vol. 3, No. 4, pp. 643-649
- Hurt, G.W. and V.W. Carlisle, 2001. Delineating Hydric Soils, in Wetland Soils – Genesis, Hydrology, Landscapes and Classification. Edited by J.L. Richardson and M.J. Vepraskas. CRC Press, Boca Raton, FL pp. 183 – 206.
- Kingsbury, Bruce & Joanne Gibson, 2002. Habitat Management Guidelines for Amphibians and Reptiles of the Midwest. Partners in Amphibian & Reptile Conservation, Ft Wayne IN, 57 pp.
- M.J. Vepraskas and S. W. Sprecher editors, 1997. Aquic Conditions and Hydric Soils: The Problem Soils. Soil Science Society of America Special Publication Number 50. SSSA, Inc. Madison, WI.
- Maschhoff, Justin T & James H. Dooley, 2001. Functional Requirements and Design Parameters for Restocking Coarse Woody Features in Restored Wetlands, ASAE Meeting Presentation, Paper No: 012059.
- Management of Habitat for Breeding and Migrating Shorebirds in the Midwest, 13.2.14 Fish and Wildlife Leaflet 13, Waterfowl Management Handbook.* U.S. Fish and Wildlife Service. Washington D.C. 6 pp.
- Fredrickson, Leigh H. 1991. *Strategies for Water Level Manipulations in Moist-soil Systems, 13.4.6 Fish and Wildlife Leaflet 13, Waterfowl Management Handbook.* U.S. Fish and Wildlife Service. Washington D.C. 8 pp.
- Fredrickson, Leigh H. and Frederic A. Reid. 1988. *Waterfowl Use of Wetland Complexes, 13.2.1 Fish and Wildlife Leaflet 13, Waterfowl Management Handbook.* U.S. Fish and Wildlife Service. Washington, D. C. 6pp.
- Kelley, J.R. Jr., M.K. Laubhan, F.A. Reid, J.S. Wortham, and L.H. Fredrickson. 1990. *Options for Water-level Control in Developed Wetlands, 13.4.8 Fish and Wildlife Leaflet 13, Waterfowl Management Handbook.* U.S. Fish and Wildlife Service. Washington D.C. 8 pp.
- Ringelman, James K. 1990. *Managing Agricultural Foods for Waterfowl, 13.4.3 Fish and Wildlife Leaflet 13, Waterfowl Management Handbook.* U.S. Fish and Wildlife Service. Washington D.C. 4 pp.
- USDA, NRCS. 2002. Field Indicators of Hydric Soils in the U.S., Version 5.0. G.W. Hurt, P.M. Whited and R.F. Pringle (eds.). USDA, NRCS in cooperation with the National Technical Committee for Hydric Soils, Fort Worth, TX. Eldridge, Jan. 1990.