

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WETLAND ENHANCEMENT

(Ac.)

CODE 659

DEFINITION

The augmentation of wetland functions beyond the original natural conditions on a former, degraded, or naturally functioning wetland site; sometimes at the expense of other functions.

PURPOSE

To increase the capacity of specific wetland functions (such as habitat for targeted species, and recreational and educational opportunities) by enhancing:

- Hydric soil functions (changing soil hydrodynamic and/or bio-geochemical properties).
- Hydrology (dominant water source, hydroperiod, and hydrodynamics).
- Vegetation (including the removal of undesired species, and/or seeding or planting of desired species).
- Enhancing plant and animal habitats.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to any degraded or non-degraded wetland sites with hydric soils, where the objective is to enhance selected wetland functions to conditions different than those that originally existed on the site.

This practice does not apply to:

- The treatment of point and non-point sources of water pollution (Constructed Wetland – Code 656)
- The rehabilitation of a degraded wetland or the re-establishment of a former wetland so that soils, hydrology, vegetative community, and habitat are a close approximation of the

original natural condition and boundary that existed prior to the modification (Wetland Restoration – Code 657).

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

CRITERIA

General Criteria Applicable to All Purposes

The purpose, goals, and objectives of the enhancement shall be clearly defined in the enhancement 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.

The planning process will evaluate the impact of this practice on existing non-degraded wetland functions and/or values. The relative increase or decrease in functions will be assessed with the use of a functional assessment procedure or state approved equivalent. The functions to be increased or decreased on wetlands found to be currently functioning at or near a “reference” condition will be documented.

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 practicable, the practice shall not be planned.

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).

The Wetland Planning Checklist, Appendix A, Chapter 13, NRCS Engineering Field Handbook, will be completed prior to planning wetland enhancement projects.

Criteria for Hydric Soil Enhancement

Enhancement sites will be located on sites that are hydric.]

Changes to soil hydrodynamic and biogeochemical properties such as permeability, porosity, pH, or soil organic carbon levels shall be made as needed to meet the planned objectives.

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

Criteria for Hydrology Enhancement

The hydroperiod, hydrodynamics, and dominant water source of the enhanced site shall meet the project objectives. The enhancement 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.

Timing and level setting of water control structures required for the establishment and maintenance of vegetation, soil, and wildlife and fish habitat functions shall be determined

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 Enhancement

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 re-vegetate 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 unless the objectives require a different plant community.

- If the targeted hydrophytic vegetation is predominantly herbaceous, species diversity will be maximized as appropriate to meet the targeted functions. 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.
- 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 Landscape and Topographic Enhancement

Topographic features (both micro and macro topography) should be installed as an enhancement feature on wetlands where the existing landscape does not provide similar variations in water depth and duration.

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 enhancement, including:

- Impacts on downstream stream hydrographs, volumes of surface runoff, and groundwater resources due to changes of

water use and movement created by the enhancement.

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 predator fish.
- 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 anaerobic conditions have on soil bio-geochemical properties; including oxidation/reduction, and maintenance of organic soils.
- The potential for water control structures, dikes, and macro-topographic features to negatively impact the movement of non-target aquatic organisms.

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 maintain wetland and adjacent upland plant communities.

Fish and Wildlife Habitat Considerations

Consider:

- The addition of coarse woody debris to provide 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 linking 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 fish and wildlife 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 should be reviewed by individuals with appropriate training in design and implementation of wetland enhancement. NRCS staff is encouraged to work closely with the NRCS biologist, WRP specialist, resource conservationist, engineer, or ODWC wetland biologist.

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 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

enhancement objectives 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.

REFERENCES

USDA Natural Resources Conservation Service. 1992. *Engineering Field Handbook, Chapter 13, Wetland Restoration, Enhancement, or Creation*. Washington D.C. 74 pp

USDA Natural Resources Conservation Service. 1975. *Engineering Field Handbook, Chapter 6, Structures*. Washington D.C. 91 pp.

Eldridge, Jan. 1990. *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

Executive order 13112, Invasive Species, February 3, 1999. Federal Register: Vol.64, No.25. Feb. 8, 1999.

http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=1999_register&docid=99-3184-filed.pdf

Galatowitsch, Susan, et al, 1994. *Restoring Prairie Wetlands: an ecological approach*. Iowa State University Press, Ames, IA. 246 pp.

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.

USDA, NRCS, 2003. *ECS 190-15 Wetland Restoration, Enhancement, Management & Monitoring*. 425 pp.

<ftp://ftp-fc.sc.egov.usda.gov/WLI/wre&m.pdf>

USDA, NRCS. 2002. *Field Indicators of Hydric Soils in the U.S.*, Version 6.0. 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.

ftp://ftp-fc.sc.egov.usda.gov/NSSC/Hydric_Soils/FieldIndicators_v6_0.pdf