

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.

For embankment projects, this practice applies only to areas where the predominant slope is four percent or less.

This practice does not apply to:

- The treatment of point and non-point sources of water pollution (Constructed Wetland – PA656);
- The rehabilitation of a degraded wetland or the reestablishment 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 – PA657).

- The creation of a wetland on a site location that was historically non-wetland. (Wetland Creation – PA658).
- The management of fish and wildlife habitat on wetlands enhanced under Wetland Wildlife Habitat Management – PA644.

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.

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

Upon completion, the site shall meet the appropriate wetland criteria and provide wetland functions as defined in the project's objectives.

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 enhance wetland functions. The establishment and/or use of non-native plant species shall be discouraged.

Criteria for Hydric Soil Enhancement

Enhancement sites will be located on soils 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.

Criteria for Hydrology Enhancement

General - 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.

Other structural practices, macrotopography and/or microtopography may be used to meet the planned objectives.

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 Dike – PA356 unless there is no potential for damage to the feature or other areas on or off site due to erosion, breaching, or overtopping.

Water control structures that may impede the movement of target aquatic species or species of concern shall meet the criteria in Fish Passage – PA396.

Water depths for at least ninety percent of the total area below the design normal water elevation shall be six feet or less.

Embankments – Embankments may be used to impound water and provide wetland hydrology. Refer to the criteria for embankments in the Pennsylvania Conservation Practice Standard for Pond, PA378. For embankment projects, water depths for at least sixty percent of the total area below the designed normal water elevation will be eighteen inches or less. The overall bottom slope from the six foot water depth to zero will be convex or flat, but not concave.

Transitions in water depth from both six feet to eighteen inches and eighteen inches to zero will maximize shallower depths.

Existing drainage systems will be utilized, removed or modified as needed to achieve the intended purpose.

Surface Drain Plugs - In areas where open ditches were constructed to provide drainage, wetland hydrology may be restored or enhanced by constructing surface drain plugs, using a pipe riser or other structures within the ditch to control the water level, or by filling a surface drain to the original ground line. Refer to the criteria for embankments when fill will be placed on the ditch banks.

All fill shall be similar to adjacent soil materials and be compacted to achieve the density of the adjacent materials. Crown the fill a minimum of one foot above the top of the lower existing channel bank to account for settling.

The minimum length of surface drain plugs shall be $(6H + 4)$ feet. "Minimum length" refers to the length as measured along the top of the plug. "H" is measured from the settled top of the embankment to the low point along the centerline of the embankment (fill).

Subsurface Drain Plugs - In areas where subsurface drains were used to lower the water table, wetland hydrology may be restored or enhanced by removing or plugging the drain or replacing the perforated drain with a non-perforated drain.

The minimum length of drain to be removed or plugged shall be as follows:

| Length of Drain | Average Hydraulic Conductivity of Soil |
|-----------------|--|
| 50 feet | <0.6 inches/hour |
| 100 feet | 0.6 to 2.0 inches/hour |
| 150 feet | >2.0 inches/hour |

All envelope filter material or other flow enhancing material shall also be removed for this length. The trench used to alter the drain shall be filled and compacted to achieve a density equal to adjacent natural soil material.

When subsurface drains also function as outlets for other drained areas where drainage is still desired, appropriate measures must be incorporated to keep the upstream drainage systems functional. A non-perforated pipe shall replace the perforated pipe through the wetland area to be enhanced, and shall extend beyond the wetland in all directions at least the minimum length previously specified for length of drain to be removed or plugged. Drains may also be re-routed around the wetland at the same minimum distances from the wetland, or where topography permits, setting a water control structure at a level that does not affect upstream drainage.

A water control structure may be placed on the inlet of an existing drain. The water control structure shall be attached to a non-perforated 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 non-perforated pipe shall be watertight.

Removal of Fill Material – On sites where a wetland has been filled by sediment, land shaping, or other activities, the hydrology may

be restored by removing the fill material from the site. Fill material shall be removed only to the top of the buried hydric soil, placed on an upland site, and stabilized so that no erosion of the material occurs.

Shallow Excavation - A wetland may be enhanced by excavating below the existing ground surface to create a shallow basin that will hold surface water and/or intercept groundwater. The basin shall permit storage of water at a depth, frequency, and duration to support the desired plant community and provide other wetland functions.

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.

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.

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, and 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 macrotopographic features to negatively impact the movement of non-target aquatic organisms.

NOTE: State permits must be obtained to lower pools of impoundments for activities regulated by *other* state permits, or for any impoundment larger than one surface acre. Activities requiring draw down may include construction, maintenance or biological manipulation.

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 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 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:

Cole, C. A., T. L. Serfass, M. C. Brittingham, and R. P. Brooks. 1996. Managing your restored wetland. College of Agricultural Sciences, Coop. Ext., Pennsylvania State University, University Park. 44pp.

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. 643-649Hurt, 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.).

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

USDA, NRCS. Wetland Restoration,
Enhancement, or Creation, Engineering Field
Handbook Chapter 13, Part 650. 121 pp.

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

USDA-NRCS. 2000. Indiana Biology Technical
Note 1.

USDA-NRCS. Hydric Soil Technical Note 13,
Deliberations of the National Technical
Committee for Hydric Soils (NTCHS).

ftp://ftp-fc.sc.egov.usda.gov/NSSC/Hydric_Soils/note13.pdf