

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 such as a dike and/or diversion 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 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.(Wetland Enhancement - 659);
- 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.

CRITERIA

General Criteria Applicable to All Purposes

The purpose, goals, and objectives of the restoration will be clearly defined in the restoration plan, including soils, hydrology, vegetation, and fish and wildlife habitat criteria that are to be met and are

<p>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 Field Office Technical Guide.</p>

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appropriate for the site and the project objectives.

These planning steps will 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 and/or other remotely sensed data, soil maps, topographic maps, stream gage data, intact reference wetlands, and historical records will be gathered.

The soils, hydrology and vegetative conditions existing on the site, the adjacent landscape, and the contributing watershed will be documented in the planning process.

The nutrient and pesticide tolerance of the plant and animal species likely to occur will be evaluated where known nutrient and pesticide contamination exists. Sites suspected of containing hazardous material will be tested to identify appropriate remedial measures. If remedial measures are not possible or practicable, the practice will not be planned.

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

Upon completion, the site will meet soil, vegetation, hydrology 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 will 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) will be controlled on the site as necessary to restore wetland functions.

Criteria for Hydric Soil Maintenance and 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 will 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 will 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 will approximate the conditions that existed before alteration. The restoration plan will 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 will 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 will not be diverted from other wetland resources. If the alternate water source requires energy inputs, these will 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, will 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, will 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 will meet the requirements for 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 will 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 will meet the criteria in Fish Passage (396)..

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

Embankments, low embankments, potholes, level ditches, ditch plugs and tile breaks are methods of restoring the hydrology of a site.

Embankment structures greater than 6 feet high must be designed according to Pond Standard 378.

Low embankments less than or equal to 6 feet in height for wetland restoration will be designed according to Dike Standard 356.

Potholes and Level Ditches will be designed according to the following Criteria:

- If original conditions cannot be determined, pothole size, depth, shape and density should be based upon conditions existing in reference wetlands. Unless original conditions indicate otherwise, potholes will have varying depth with a maximum of 4 feet of excavation. A minimum of 2/3 of the surface area of the constructed pothole will have varying depths from 6 inches to no more than 24 inches.
- Pothole side slopes will be gentle with a minimum of 50% of side slope area being at a grade of 6:1 (6 horizontal to 1 vertical) or flatter. The remaining side slope area will have a grade of 3:1 or flatter.
- Potholes will be irregular in shape to maximize edge effect and provide additional cover for waterfowl, amphibians, reptiles and other wetland dependent species utilizing the site.
- Surface drainage into the pothole will be maintained.
- Level ditches to connect potholes will have a minimum excavated depth of 1 foot, and a maximum depth that is 1 foot less than the depth of the pothole. Side slopes will be no steeper than 3:1.
- If a supporting embankment or spoil piles are needed to contain water in the pothole follow the Dike Standard (356) for design criteria.

Criteria for Subsurface Drain Removal or Destruction will be designed according to this Standard, with the following Criteria:

In areas where subsurface drains were installed to remove surface and or subsurface water, the existing system will be modified to restore the wetland hydrologic conditions. Review of design records, interviews, and site investigations will be needed to determine the extent of the existing system.

The effect of a subsurface drainage system will be eliminated by the following:

- Remove and render inoperable a portion of the drain at the downstream edge of the site;

- modify the drain with a water control device; or replace the drain with non-perforated pipe through the wetland site.

The minimum length of drain to be removed or rendered inoperable will be as shown in Table 1.

Table 1

Saturated Hydraulic Conductivity (μ /sec)	Soil Texture Minimum	Distance(feet)
>14.11 μ /sec	Sand and Organics	75
4.23 – 14.11 μ /sec	Loam	50
<4.23 μ /sec	Clay	25

Bedding, filtering and/or flow enhancing material will be removed if necessary. The resulting trench will be filled with compacted earth to a density of the adjacent soil material.

Surface Drain Removal will be designed according to this Standard, with the following Criteria:

Where surface drains were constructed to drain wetlands, the drain will be plugged with earth to restore the wetland hydrology.

Provisions will be made to protect the site from erosion from the 10 year frequency, 24 hour storm

All fill will be earth compacted to the approximate density of the adjacent soil material.

If a plug is not 1 foot higher than the low bank of the ditch, it must be armored to control erosion from surface flow over the plug

The maximum plug height from ditch bottom will be 6 feet.

The width of the plug will be at least 2 times the channel top width, measured perpendicular to the flow.

The length of the plug will be at least 20 feet measured parallel to the ditch flow direction.

All slopes will be 5 to 1 or flatter.

Increase the fill height to compensate for settling. A minimum of 5 percent for mineral soils and 33 percent for organic soils will be used.

The ditch plug and all disturbed areas will be seeded according to the Critical Area Planting Standard (342).

Vegetative Restoration will be designed according to this Standard with the following Criteria:

Hydrophytic vegetation restoration will be of species typical for the wetland type(s) being established and the varying hydrologic regimes and soil types within the wetland. Preference will 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. Strip and stockpile on site topsoil prior to any excavations. Redistribute stockpiled top soil over disturbed areas to provide a seed source to encourage natural colonization of acceptable species. If the site is not realistic for natural colonization, 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 will be included in the plan.

Where planting and/or seeding is necessary, the minimum number of native species to be established will 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 will 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 will be addressed in the planning of herbaceous communities. Seeding rates will 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
- Increasing or decreasing soil pH with lime, gypsum, or other compounds

Consider impacts of the height of spoil piles on hydric soils (filling in a wetland)

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.
- Construct potholes on land that is less than, or equal to 1% in grade to maximize habitat potential

Vegetation Considerations

Consider:

The establishment and/or use of non-native plant species will be discouraged.

- 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.
- Use seeding mixtures for wildlife purposes found in Plant Materials Revised Technical Notes NY - 36, Wildlife Seed Mixtures for Habitat Restoration
- The installation of a water control structure to manipulate water levels for vegetative management

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.
- Consider a minimum pothole size of ¼ acre (12,000 square feet) to maximize habitat potential
- Consider using level ditches to connect potholes if topography and distance allows.

PLANS AND SPECIFICATIONS

Plans and specifications for this practice will be prepared for each site. Plans and specifications will 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 will 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

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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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