



Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

WETLAND RESTORATION

CODE 657

(ac)

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

This practice is used to accomplish the following purposes:

- To restore conditions conducive to hydric soil maintenance.
- To restore wetland hydrology (dominant water source, hydroperiod, and hydrodynamics).
- To restore native hydrophytic vegetation (including the removal of undesired species, and/or seeding or planting of desired species).
- To restore 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;

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; Virginia Conservation Practice Standard *Wetland Enhancement*(Code 659);

The creation of a wetland on a site location which was historically non-wetland; Virginia Conservation Practice Standard *Wetland Creation*(Code 658).

The management of fish and wildlife habitat on wetlands restored under this standard.

CRITERIA

General Criteria Applicable to All Purposes

Permits are not required where there is no impact to existing wetlands and streams. Nationwide Permit 27 (Section 404 of the Clean Water Act) authorizes certain activities impacting wetlands where there is limited incidental loss and restoration results in a net gain of wetlands. Contact the Corps of Engineers and/or the Virginia Department of Environmental Quality (DEQ) if there are any wetland questions or stream impacts.

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 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.

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 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.

Do not restore wetlands on sites with T&E species unless it is demonstrated that the impact will benefit the species at risk. Consultation with the appropriate regulatory agency or agencies is required.

If the wetland is adjacent to a cold-water stream, obtain input from Virginia Department of Game and Inland Fisheries Biologist to ensure that there is no effect on water temperature.

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 6-12 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 work.

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.

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 Virginia Conservation Practice Standard *Dike (Code 356)* unless there is no potential for damage to the feature or other areas on or off site due to erosion, breaching, or overtopping. Dikes used to impound water must use the Virginia Conservation Practice Standard *Dike (Code 356)*. If there is 18 inches or less of water impounded against the dike, the minimum freeboard requirement is 6 inches.

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 Virginia Conservation Practice Standard *Fish Passage (Code 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.

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 (200-mile radius).

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.

If natural colonization of pre-identified, selected species will realistically dominate within 5 years, then allow natural revegetation. Active forms of revegetation may be required if a site has not become dominated by the targeted species within 5 years.

Determine the appropriate number of vegetative species to establish using the following criteria:

On sites that are predominantly herbaceous vegetation, establish a minimum of 4 species on projects restored to one ecological site (i.e., wet meadow, shallow marsh, or slough eco-sites, etc.). For projects where there are two or more ecological sites, establish at least three native species on each site.

On sites that are predominantly forest or woodland community types, vegetation establishment will include a minimum of 6 species.

Use the Virginia Plant Establishment Guide to determine vegetative species, seeding rates and dates.

CONSIDERATIONS

Plan borrow areas for dikes or embankments as permanent pools or deepwater habitats. Use excess materials to create islands in water features or upland areas in flatlands.

Where possible, excavate fill for dikes and embankments away from the dike. This prevents permanent water against the structure and reduces likelihood of rodents burrowing in the dike.

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.
- Soil disturbance associated with the installation of this practice may increase the potential for invasion by unwanted species.

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.
- Microtopography and hydroperiod when determining which species to plant.

Fish and Wildlife Habitat Considerations

For wildlife purposes, planting density and stocking rates are generally lower than for production purposes, and the selection of species will generally be different than those used for production purposes.

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.
- Consider installing complexes of vernal pools (5 acres is ideal) to provide habitat for amphibian species, that includes hardwood buffer areas.
- 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. Record all required information in Wetland Restoration Job Sheet and in an engineer field book, on a plan sheet or design computation sheet, or other appropriate location. Plans and specifications shall be reviewed by staff with the appropriate planning, design, and implementation of wetland restoration.

DESIGN DATA

- Completed Environmental Evaluation and subsequent requirements.
- Wetland Restoration Job Sheet (The Operation and Maintenance Plan is part of the Job Sheet.)
- Survey and plot data: profile, cross-sections, topography, as needed.
- Design computations, including purpose of practice and references used.
- Plan view of site with existing and planned features, including dimensions, distances, etc.
- Standard Cover Sheet (VA-SO-100A).

- Materials and quantities needed. Identify borrow material and/or spoil area, as needed.
- Vegetation and/or ground cover requirements.
- Identification of needed Erosion & Sediment Control measures.
- Supplemental practices required.
- Virginia Conservation Practice Specifications (700 Series).
- Operation and Maintenance Plan

CHECK DATA

- As-built survey.
- As-built plans including dimensions, types and quantities of materials installed, and variations from design. Include justification for variations.
- Locations of appurtenant practices.
- Adequacy of vegetation and/or ground cover.
- Completed as-built section of Cover Sheet.

Use the practice job sheet to plan and certify this practice.

OPERATION AND MAINTENANCE

The Wetland Creation Job Sheet includes the Operation and Maintenance Plan for the wetland creation. The O&M Plan contains a list of the management and monitoring activities needed to ensure the continued success of the wetland functions. A Maintenance and Monitoring schedule will be prepared as part of the O&M Plan. All appurtenant practices associated with the wetland creation will meet the requirements of the appropriate Conservation Practice Standard. The Operation and Maintenance Plan for each of these practices will be appended to the Job Sheet.

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. Minimize disturbance to ground nesting species, especially during the primary nesting season.

Any use of fertilizers, mechanical treatments, prescribed burning, pesticides and other chemicals shall assure that the intended purpose of the wetland restoration shall not be compromised.

Management actions shall maintain vegetation, and control undesirable vegetation. Biological control of undesirable plant species and pests (e.g., using predator or parasitic species) shall be implemented where available and feasible. Management of water depth and duration may be utilized to control unwanted vegetation.

Inspect the embankments and structures on the site at least annually and after major storm events. Immediately repair any damage.

Timing and level setting of water control structures is required for the establishment of desired hydrologic conditions, for management of vegetation and for optimum wildlife and fish use.

REFERENCES

USDA, NRCS. Wetland Restoration, Enhancement, or Creation, Engineering Field Handbook Chapter 13, Part 650, pp. 3, 24, 77, 78, April 2008.

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