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 (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 (Wetland Wildlife Habitat Management (644)).

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 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 the current Iowa NRCS functional assessment models. 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 to document historic conditions.

Document the soils, hydrology, and vegetative conditions existing on the site, the adjacent landscape, and the contributing watershed in the planning process.

Evaluate the nutrient and pesticide tolerance of the plant and animal species likely to occur 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.

Ensure that water rights, if applicable, are obtained prior to restoration.

Upon completion, the site will 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 will compensate for these impacts to the extent practicable.

Control invasive species, federal/state listed noxious plant species, and nuisance species (e.g., those whose presence or overpopulation jeopardize the practice) on the site as necessary to restore wetland functions. Discourage the establishment and/or use of non-native plant species.

Establish vegetative buffers around the wetlands to reduce the movement of sediment and soluble and sediment-attached substances carried by runoff. Use Filter Strip (393) to determine the minimum width of the vegetative buffer.

Shape embankments, spoil, and excavated areas in a manner that is compatible with the existing landscape. For excavated areas, leave the ground surface as irregular as possible.

Place spoil material on non-hydric soils where practicable.

Criteria for Hydric Soil Restoration

If hydric soil is covered by fill, sediment, spoil, or other depositional material, remove the material covering the hydric soil to the extent practicable to restore the original soil functions. Document the depth of fill, sediment, spoil, or other depositional material with an on-site investigation.

Excavation beyond that necessary to remove sediment will meet the criteria found in Wetland Enhancement (659).

Restore soil hydrodynamic and bio-geochemical properties such as permeability, porosity, pH, or soil organic carbon levels 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, the capacity of drainage systems on other properties, and will not back surface water onto an adjoining property or restrict the capacity of adjacent subsurface drainage systems unless agreed to by signed written letter, easement or permit.

Locate any existing surface or subsurface drainage systems that would affect or be affected by the wetland and take measures to determine the extent of those systems. Utilize, remove, or modify existing drainage systems as needed to achieve the restoration and ensure drainage rights.

Where practicable, existing subsurface drains (tile) will be rendered inoperable (blocked or removed) or controlled as needed to meet the goals of the restoration and site conditions. The number and length (25 feet minimum per block) of blocks will depend on soils, topography, and project goals. Where an existing subsurface drain is to be removed under a proposed embankment, at a minimum remove the existing drain from 15 feet upstream from the upstream toe to the downstream toe. Excavated material will be replaced and compacted to a density equivalent to the surrounding soil beneath embankments and where necessary to prevent undesirable flow from the restoration site.

Refer to NEH, Part 650, Chapter 13 for information related to surface and subsurface drain plugging.

Water control structures will only be used to recreate natural hydrologic patterns or to allow management and maintenance of the desired community and will meet the requirements of Structure for Water Control (587). 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, or to meet management goals.

Use non-perforated conduits downstream of a water control structure for a minimum 50 feet and under any embankment from 15 feet upstream from the upstream toe to the downstream toe. The connections of the water control structure and non-perforated conduit will be watertight for the pressure developed at the maximum pool level.

Use the original natural water supply 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 practicable, reestablish macrotopography (excavations/fills causing an elevation change over 6 inches) and/or microtopography (excavations/fills causing an elevation change less than 6 inches). Use reference sites within the local area to determine desired topographic relief. The location, size, and geometry of earthen structures, if needed, and spoil mounds will match that of the original topographic features to the extent practicable.

Reestablish macrotopography in prairie potholes or swales on a floodplain by placing an embankment across the spill-over area on the rim of the pothole or swale. Use the following criteria if the height of the embankment does not exceed 1.5 feet:

1. The embankment will have a minimum top width of 10 feet.
2. The embankment will have 3:1 or flatter side slopes.
3. The maximum height of the embankment will be 1.5 feet.
4. No mechanical or auxiliary spillway will be utilized for this type of macrotopography reestablishment.

Ditch plugs are a special case of an embankment that is used to plug a drainage ditch or natural channel that is not the primary flow channel, for example, an oxbow or meander that has been cut off from the main channel. Use ditch plugs to raise the water table in the ditch or channel in lieu of filling the ditch or channel with earthfill. Specific design criteria for a ditch plug include:

1. Excavate a core trench across the ditch or channel to a depth of 2 feet.
2. The embankment will have a minimum top width of 10 feet.
3. The embankment will have 3:1 side slopes.
4. The embankment will extend 1 foot above the elevation of the flood plain and will extend 30 feet onto the floodplain on each side of the ditch or channel.

In some instances on very flat topography, it may not be practical to fill a drainage ditch to the level of the adjacent floodplain due to potential negative impacts on an upstream landowner. For this condition, partial plugging of the ditch will be allowed if the depth of the drainage ditch is less than 2.0 feet. Specific criteria for this type of a ditch plug include:

1. The embankment will have 10:1 side slopes.
2. The embankment will have a minimum top width of 30 feet.
3. Excavate a core trench across the drainage ditch to a depth of 1 foot.

Design embankment features (not including spoil mounds, ditch plugs, macrotopography reestablishment in prairie potholes or swales, and macrotopographic excavations) to meet the criteria of other practice standards which apply due to purpose, size, water storage capacity, hazard class, or other parameters. Practice standards to be used include:

- Pond (378),
- Dike (356),
- Grade Stabilization Structure (410), and
- Water and Sediment Control Basin (638)

If no other practice standard applies, embankments will meet the requirements for Dike (356).

Add an additional 1 foot of overfill to the constructed height of embankments constructed on a floodplain with a principal spillway or control structure to protect the spillway or control structure from damage by the overflow water. This additional height will be constructed for a distance of 50 feet on each side of the principal spillway or water control structure.

Embankments located on a floodplain where overtopping of the embankment by flow from the floodway into the wetland is likely may have a vegetated spillway area on level natural ground, in excavation, or on compacted fill. Vegetated spillways will be at least 100 feet wide and have a crest length of at least 25 feet. Compacted fill spillways will meet the following criteria:

- Height of spillway crest to downstream toe is 2 feet or less
- Design flow depth will be 0.5 feet or less
- Inlet and outlet slopes will be 5:1 or flatter
- Mulching of the spillway is required.

Locate the vegetated spillway in a position that minimizes the likelihood for flood flows from the stream system to damage the embankment, water control structure, and vegetated spillway.

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.

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.

Criteria for Vegetative Restoration

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 revegetate naturally. If not, the appropriate species will be established by seeding or planting. To decide if natural revegetation is appropriate, refer to ECS 190-15, Wetland Restoration, Enhancement, Management, and Monitoring for natural regeneration decision keys.

Adequate substrate material and site preparation necessary for proper establishment of the selected plant species will be included in the plan.

Where topsoil will be used as a seedbank, topsoil will not be stockpiled prior to redistribution during the summer. For other periods, topsoil will only be stockpiled in a manner that limits deterioration of viable plant parts and seeds. Refer to ECS 190-15, Wetland Restoration, Enhancement, Management and Monitoring, for guidance.

When natural revegetation is used, deep tillage or other methods will be used to expose the buried seedbank or bring the buried seedbank to the surface. If a site has not become dominated by the targeted species within 5 years, active forms of revegetation will be required.

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.
- Ensure that the approved seeding mixture does not include weed species and invasive species (e.g.: reed canary grass).

Refer to Conservation Cover (327), Tree/Shrub Establishment (612), Restoration and Management of Declining Habitats (643), Wetland Wildlife Habitat Management (644), NEH, Part 650, Chapter 13, and applicable Iowa Job Sheets and Technical Notes for vegetation establishment guidance.

If uplands are planned as part of a wetland creation, then native species will be used for these areas as well. Refer to Conservation Cover (327) for herbaceous restorations, or Tree/Shrub Establishment (612) and Upland Wildlife Habitat Management (645) if trees and/or shrubs are desired.

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

Natural drawdown through evapotranspiration is a natural and often desirable process rather than regulating water levels with water control structures. Drawdown of permanent storage is often necessary or desirable to manage wetlands.

Consider the general hydrologic effects of the restoration, including the 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.
- The manipulation of water levels or topography to control unwanted vegetation.

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.

The following list of Construction Specifications is intended as a guide to selecting the appropriate specifications for each specific project. The list includes most, but may not contain all, of the specifications that are needed for a specific project:

IA-1 Site Preparation

IA-5 Pollution Control

IA-6 Seeding and Mulching for Protective Cover

IA-9 Subsurface Drain Investigation, Removal, and Repair

IA-11 Removal of Water

IA-21 Excavation

IA-23 Earthfill

IA-26 Topsoiling

IA-27 Diversion

IA-45 Plastic (PVC, PE) Pipe

IA-46 Tile Drains for Land Drainage

IA-51 Corrugated Metal Pipe Conduits

IA-52 Steel Pipe Conduits

IA-61 Loose Rock Riprap

IA-95 Geotextile

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:

- 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.
- The timing and methods for the use of fertilizers, pesticides prescribed burning, or mechanical treatments.
- 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.
- The timing and level setting of water control structures for the establishment and maintenance of vegetation, soil, and wildlife functions.

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