United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

WETLAND RESTORATION

CODE 657

(ac)

DEFINITION

The re-establishment of abiotic conditions (e.g., hydrology, topographic features, and substrate) on filled or partially, effectively, or fully drained wetlands to a close approximation of pre-disturbance conditions.

PURPOSE

To the extent practicable, address identified resource concerns (e.g., water quality degradation, inadequate habitat for wildlife, or degraded plant condition) by restoring the original wetland abiotic conditions (e.g., hydrology, soils, and elevational gradients).

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to any land use(i) where there was once a naturally occurring wetland, (ii) the wetland has been altered by onsite (e.g., construction of irrigation tailwater reservoirs or livestock ponds, ditches or tile drainage, placement of fill, excavation, sedimentation, leveling, deep ripping, and soil mixing) or offsite actions or disturbances (e.g., levees, reservoirs, diversions, and changes in the watershed) that changed the hydrology and other abiotic features, and (iii) where the conservation objective is to restore the area to a close approximation of the pre-disturbance wetland conditions.

Many disturbed wetlands historically contained a mosaic of landscape features, including some small non- wetlands (e.g., pimple mounds, mima mounds, gilgai uplifts, irregular sediment deposition in floodplains) making it impracticable to separate (delineate) these areas from the historic wetland areas. In such situations, wetland restoration will include intermingled non-wetlands, with the objective of replicating the historic wetland and non-wetland conditions within the project area.

- Supporting practices often include but are not limited to: Conservation Practice Standard (CPS) Dike or Levee (Code 356) or Diversion (Code 362), used to construct a berm, dike, diversion, or ditch plug.
- CPS Structure for Water Control (Code 587), used to install a water control structure.

Common associated practices installed prior to or following installation of this practice include:

- CPS Wildlife Habitat Planting (Code 420) or Tree and Shrub Establishment (Code 612), used to restore the plant community.
- CPS Critical Area Planting (Code 342), used to plant vegetation on areas expected to have high erosion rates.
- CPS Wetland Wildlife Management (Code 644), used to manage the habitat.
- CPS Shallow Seasonal Water Management for Wildlife (Code 646), used to manage shallow water to mimic natural floodwater pulses.
- CPS Brush Management (Code 314) or Herbaceous Weed Treatment (Code 315), used to control undesirable brush or herbaceous species.
- CPS Forest Stand Improvement (Code 666), used to manage the species composition or density of existing trees.
- CPS Prescribed Burning (Code 338), used to restore or manage the plant community, or for site preparation.
- CPS Prescribed Grazing (Code 528), used to manage the vegetation with livestock.
- CPS Structures for Wildlife (Code 649), used to provide abiotic structures for wildlife (e.g., elevated mounds to provide nesting sites and escape from periods of high water; course woody debris to provide shelter, basking, and foraging habitat; and nest boxes or platforms).

This practice does not apply to:

- Creating a wetland to treat point and non-point sources of water pollution. Use CPS Constructed Wetland (Code 656).
- Rehabilitating 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, at the expense of other functions. Use CPS Wetland Enhancement (Code 659).
- Creating wetland functions on a site that was not historically a wetland. Use CPS Wetland Creation (Code 658).

CRITERIA

General Criteria Applicable to All Purposes

The restored wetland will be in the same hydrogeomorphic class and same vegetative modifier as the historic wetland (USDA NRCS 2008).

Locate restoration sites on soils that are hydric.

Evaluate sites that are suspected of containing hazardous material. If confirmed, do not install the practice.

Identify the project area's physical and legal constraints (e.g., property boundaries, flood prevention levees, public drainage systems, and changes in the watershed) to determine practice feasibility and scope. Document the soils, hydrology, existing vegetative conditions on the site, the adjacent landscape, and the contributing watershed in the design folder during project planning.

Plan the work associated with wetland restoration so that it does not adversely affect adjacent properties or other water users, the capacity of the drainage systems on other properties, 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.

Shape embankments, spoil, and excavated areas in a manner that is compatible with the existing landscape.

For excavated areas leave ground surface as irregular as possible. Where practicable, place spoil material on non-hydric soils. If the 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.

Within the physical and legal constraints, and to the extent practicable, restore hydrology (frequency, duration, depth, and timing of inundation or saturation), source (e.g., groundwater discharge, overbank flooding, or tidal inundation), and hydrologic losses (e.g., evaporation, vegetative transpiration, groundwater recharge, and surface outflow) to the historic conditions. Examples include:

- Removing sediment or fill.
- Breaking, crushing, or removing drainage tile.
- Replacing perforated drainage tile with solid tile.
- Breaching or removing berms, dikes, terraces, and levees.
- Filling pits or ponds.
- Grading to re-establish macro- or micro-topography.
- Installing berms or dikes with the application of CPS Code 356.
- Installing diversions with the application of CPS Code 362.
- Installing structures for water control with the application of CPS Code 587.
- Managing frequency, duration, depth and timing of inundation with the application of CPS Code 646 to mimic natural and historic flood pulses.

Additional Criteria for Hydrology Restoration

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, remove or block existing subsurface drains (tile), 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. Replace and recompact excavated material to a density equivalent to the surrounding soil beneath embankments and where necessary to prevent undesirable flow from the restoration site.

Only use water control structures, confirming with the requirements of Structure for Water Control (587), to recreate natural hydrologic patterns or to allow management and maintenance of the desired community. Base timing and level setting of water control structures 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 5 feet upstream from the upstream tow to the downstream toe. Design watertight water control structure and non-perforated conduit connections to withstand the pressure developed at the maximum pool level.

Use practice standards to design embankment features (not including spoil mounds and macrotopographic excavations), applicable to purpose, size, water storage capacity, hazard class, or other parameters. Applicable practice standards to be used include:

- Pond (378)

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

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

Place additional 1 foot of overfill to the constructed height of an embankment constructed on a floodplain with a principal spillway or control structure to protect the spillway or control structure from damage by the overflow water. Construct this additional height 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 to have a vegetated spillway area on level natural ground, in excavation, or on compacted fill. Construct vegetated spillways at least 100 feet wide with a crest length of at least 25 feet. Use the following criteria to construct compacted fill spillways:

- Height of spillway crest to downstream toe is 2 feet or less
- Design flow depth of 0.5 feet or less

CONSIDERATIONS

[General Considerations]

Restoring wetland hydrology to an area may increase or decrease the hydrology to adjacent and downgradient areas, including adjacent wetlands.

Some current streams and adjacent areas were historically low-gradient wetlands (Cluer and Thorne 2014). Soil investigations often provide strong evidence of the pre-disturbed conditions.

Excessive excavating and grading activities have the potential to significantly disrupt soil profiles (e.g., mixing of the A horizon, fracturing thin aquitards disruption of ground-water movement) and facilitate the establishment of noxious and invasive plant species.

Wetlands attract many species of wildlife. Some can create safety concerns with adjacent roads, airports and military installations, which may introduce liability concerns to the agency and landowner.

Restoring the occurrence of elevated areas with lighter textured soils (e.g., sand, sandy loams) removed during previous land-clearing, leveling, and plowing activities, will allow for the restoration of the historic plant species diversity. It will also provide surface and subsurface nesting, breeding, resting, and foraging sites for small mammals, reptiles, shorebirds, waterfowl, and invertebrates.

Assuring the soils stability in the upgradient non-wetland area will minimize sedimentation of the restored wetland. Sedimentation not only impacts the practice lifespan but creates a leveling effect that eliminates restored elevational mosaic patterns (e.g., microtopography).

PLANS AND SPECIFICATIONS

Develop plans and specifications for each site according to the requirements set forth in Title 210, National Engineering Manual, Part 541 – Drafting and Drawings.

Where applicable, assure water rights support the restoration objectives.

Describe the past actions that impacted the project area.

Describe and contrast the historic conditions and current conditions for soils (e.g., presence of aquitards, wetting and drying cycles), hydrology (e.g., source and hydroperiods) and vegetation (e.g., species composition, structure, and distribution) associated with the hydrology described. The historic conditions are extrapolated from a review of aerial photography or other remotely

sensed data, soil maps, topographic maps, stream gage data, similar intact reference wetlands, and historical ecological records. Additionally, sites specific evidence obtained from in-situ soil profiles (when possible) can be used to document the historical condition and inform the restoration target conditions.

Groundwater-influenced wetlands are often significantly impacted from regional ground and surface water irrigation. The impacts have created conditions wetter than the historic conditions (e.g., southwest Idaho) and drier than the historic conditions (e.g., Southern High Plains region of Texas). Long-term monitoring data can inform reasonable expectations and challenges regarding wetland hydrology restoration.

Describe the target hydrological conditions and provide an analysis of alternatives that compares different restoration actions and associated water management actions over the project life. Document alternatives considered with clear support for the chosen alternative.

Include a plan view, quantities, and sufficient profiles and cross-sections to define the location, layout, and grade for stakeout and checkout.

Identify suitable water sources based on groundwater investigations, stream gage data, water budgeting, or other appropriate means.

Identify other practices needed to restore the pre-disturbance hydrology (e.g., CPS Dike or Levee (Code 356) and CPS Seasonal Water Management for Wildlife (Code 646)). Plans and specifications must also conform with the requirements found in the supporting practice standards.

OPERATION AND MAINTENANCE

Operation and Maintenance (O&M) activities may be needed to ensure the continued hydrologic function of the restored wetland. If needed, a monitoring schedule will be included in the O&M plan.

The O&M plan may include the following:

- Inspection Schedule
- Maintenance requirements for water control structures, or other structural practices critical to maintaining the target conditions.
- Maintenance related to sedimentation.

REFERENCES

Cluer, B., and C. Thorne. 2014. A Stream Evolution Model Integrating Habitat and Ecosystem Benefits. River Research and Applications, 30(2) 135-154.

Maschhoff, Justin T. and James H. Dooley. 2003. Functional Requirements and Design Parameters for Restocking Coarse Woody Features in Restored and Enhanced Wetlands.

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USDA, NRCS, October 2011, Scenarios for Wetland Restoration. Title 210 - Engineering - Technical Note No. 4 (210 TN WTL-04)..

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