

**NATURAL RESOURCES CONSERVATION SERVICE
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 from those that originally existed on the site.

This practice does not apply to:

The treatment of point and non-point sources of water pollution (Constructed Wetland – Code 656);

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 – Code 657).

The creation of a wetland on a site location that was historically non-wetland. (Wetland Creation – Code 658).

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

CRITERIA

General Criteria Applicable to All Purposes

Design, construction, operation and maintenance activities shall comply with all federal, state, and local laws, rules, and regulations governing activities in or along streams, floodplains or wetlands as well as pollution abatement, health, safety or utility activities.

All necessary local, state, and federal permits will be obtained prior to implementation of this practice. Permits and/or notifications may include but are not limited to the following:

1. ***U. S. Army Corps of Engineers (Section 404 Clean Water Act)***
2. ***WVDEP (Sediment and erosion control & State CWA 401 certification)***
3. ***WV Office of Land and Streams from the WV Division of Natural Resources (In-stream work)***

The owner or operator is responsible for securing any permits or approvals and for performing in accordance with such laws and regulations. NRCS employees do not procure permits, rights, or approvals, or enforce laws and regulations. NRCS may provide the landowner or operator with

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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](#).

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technical information needed to obtain the required rights (or approvals) to construct, operate, and maintain the practice.

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. **NRCS shall utilize the WV Rapid Assessment Procedure (WVRAP) to evaluate enhanced wetlands when possible. In the absence of a functional assessment documentation on approved job sheets and/or assistance notes is acceptable.**

Without prior approval from the State Biologist, enhancement measures performed under this standard shall not be constructed as to provide habitat for any fish species. Habitat for fish shall be designed, installed and maintained under other appropriate standards including (399) Fishpond Management, (395) Stream Habitat Improvement and Management and/or (378) Pond.

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

The original functions of the wetland will be identified and documented in order to establish a baseline for wetland enhancement.

The soils, hydrology, and vegetative conditions existing on the site, the adjacent landscape, and the contributing watershed shall be documented in the planning process **prior to enhancement using approved job sheets soils reports or other suitable tools and methods. Wetland Planning and Monitoring**

Checklists are available in Appendix 13 C and D of Chapter 13 (Wetland Restoration, Enhancement or Creation) Part 650 Engineering Field Handbook. Additional assistance may be obtained from NRCS biologists, soil scientists and engineers trained in, and knowledgeable of wetland criteria, as well as WV Division of Natural Resources and the US Fish and Wildlife Service personnel as appropriate.

Soils at the site will be evaluated for their ability to hold or retain water, underlying materials, depth, and suitability.

Site topography will be evaluated for the feasibility of structures necessary for enhancement.

The nutrient and pesticide tolerance of the plant and animal species likely to occur shall be evaluated where known nutrient and pesticide contamination exists.

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

Sites suspected of containing hazardous material shall be tested to identify appropriate remedial measures and the suspected soil and/or water samples will be collected and analyzed for the presence of hazardous waste as defined by local, state, or federal authorities. If remedial measures are not possible or practicable, the practice shall not be planned.

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

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.

Wherever appropriate and feasible, wetland buffers should be utilized and linked to existing corridors and surrounding vegetation to enhance the wetland's use and colonization by flora and fauna.

Where movement of sediment, sediment-attached substances and soluble substances carried by runoff will adversely affect the wetland, vegetative buffers will be established. Buffers will be established in accordance with WV practice standards such as (391) Riparian Forest Buffer; (393) Filter Strips or other appropriate standards.

Where applicable, establishment of vegetation on disturbed areas outside the limits of the wetland shall conform to WV Practice Standards (391) Riparian Forest Buffer, (342) Critical Area Planting or other appropriate standard. This buffer vegetation will be compatible with the planned and existing functions of the wetland. However, manipulation or enlargement of the buffer alone does not constitute wetland enhancement.

Barriers designed and installed according to WV Standards (472) Access Control and/or (382) Fence will be provided to protect the wetland when livestock have access to the area.

If revegetation is required due to construction activities, preference shall be given to stockpiling existing topsoil for revegetation unless it potentially contains invasive species.

When wildlife habitat is identified as a primary function, designs will be prepared with consideration of management requirements developed according to (644) Wetland Wildlife Habitat Management and/or (646) Shallow Water Management and Development as appropriate. The U.S. Fish and Wildlife Service, Waterfowl Management Handbook and/or the WV Division of Natural Resources may also provide guidance in developing site specific management plans, and appropriate specifications, when waterfowl management is a planned function.

Criteria for Hydric Soil Enhancement

Enhancement sites will be located on soils that are hydric.

Changes to soil hydrodynamic and bio-geochemical 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

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 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 – 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. Water control structures that may impede **or prevent** the movement of target aquatic species or species of concern shall meet the criteria in Fish Passage – Code 396.

Low Dikes

Low Dikes may be used to impound water and enhance wetland hydrology. Reference Conservation Practice Dike (356) for design criteria such as the minimum top width, freeboard, settlement allowance, foundation cutoff depth and width and design storm frequency. Low dikes

designed for wetland enhancement shall be designed as a Class III Dike with a maximum design water depth of three (3.0) feet and a minimum 4:1 side slope (both sides).

Where a low dike crosses a concentrated flow area (such as a shallow ditch, borrow area, swale, etc) a berm shall be constructed on each side of the dike embankment side slopes shall be a minimum of 5:1; or the constructed berm (both sides of the dike) shall be a minimum of 1.0 foot high and have a minimum width equal to or greater than the top width of the constructed low dike. See (356) Dike.

Where a low dike is constructed near a stream, channel, basin, ditch or borrow area the toe of the constructed dike shall be setback the greater distance of the following

- *the sum of the design high water level behind the dike plus the depth of the swale or ditch times a factor of 10*
- *criteria located in (356) Dike, Embankment and Foundation where the seepage line is determined by extending a line drawn from the design high level elevation of the dike to the toe of the other side of the dike and observing that the line slope extension does not intersect any portion of the basin, stream, etc.*

Macrotopographic Depressional Basins (MDB) or Level Ditches (LD)

MDB's or LD's may be used to impound water and enhance wetland hydrology. The depth of basins shall not exceed three (3) feet without State Biologist and/or State Engineer approval. The side slopes shall be at least 5:1 (or flatter). The MDB's and level ditches are designed to appear natural and in various shapes (oval, oxbow, amoeba and meander), depths, side slopes and lengths depending on the design requirements. Refer to Shallow Water Development and Management (646), the Wetland Enhancement Job Sheet, Part 650 Engineering Field Handbook, Part 13,

Wetland Restoration, Enhancement or Creation and the WV standard Wetland Enhancement or other standard engineering drawings for criteria and design.

Criteria for Vegetative Enhancement

Establish native hydrophytic vegetation typical for the wetland type(s) being established.

Where natural colonization of selected species will dominate within 5 years, natural regeneration can be left to occur.

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

Domestic grain and seed crops may be planted to enhance wildlife and waterfowl objectives. However, this activity should not be considered as a vegetative wetland enhancement. Refer to conservation practice standard (644) Wetland Wildlife Habitat Management or (646) Shallow Water Development and Management and/or (342) Critical Area for this information.

Preference shall always be given to native wetland plants with localized genetic material. Plant materials collected or grown from material collected within a 200 mile radius from the site is considered local. If utilizing non-indigenous plants or seed, extreme caution must be exercised to reduce the risk of introducing detrimentally invasive and aggressive species. All stock, seed and plant substrate should be free from any contaminating seed source.

If enhancement of certain plant species (woody or herbaceous) is desired, planting may be required. Species selected will be compatible with the functions and hydrologic conditions of the enhanced wetland.

If mulching is required, it shall conform to the conservation practice standard (484) Mulching and shall be comprised of clean straw mulch only unless otherwise indicated by the State Biologist.

A. Herbaceous Vegetative Enhancement

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. ***Tall fescue or reed canarygrass shall not be used in conjunction with this standard.***

If seeding is required, rates shall be based upon percentage of pure live seed within six months of planting ***where applicable.***

Herbaceous vegetation may be established by a variety of methods including: mechanical or aerial seeding, top-soiling or donor soil, organic mats, wetland sod, vegetative sprigs, etc. This may be performed over the entire site or a portion of the site and at densities and depths appropriate to meet the intended objectives. Refer to WV Conservation Practice Standard (342) Critical Area Planting for additional information.

Planners may refer to the West Virginia Pollinator Handbook or other suitable wetland plant reference for West Virginia. Species recommended by the USFWS or WVDNR may also be utilized.

B. Woody Vegetative Enhancement

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.

Selected species should be compatible with the site characteristics and conditions, perform the desired wetland functions, and meet the site goals and objectives.

Stock for tree and shrub seedlings may be obtained as seed, bare-root, containerized, hardwood cuttings or balled and burlapped as appropriate for the site. Plantings and/or seeding will follow the criteria of WV Conservation Practice Standard (612) Tree/Shrub Establishment. Refer to the list of Trees and Shrubs Suitable for

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Establishment in West Virginia, Tree and Shrub Lists for WV found in Section IV – Tools of the WV FOTG.

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

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.

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- 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.

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.

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.

Consider the appropriateness of using this conservation practice standard on sites where construction activities may necessitate more degradation of wetland function or habitat than the structure creates.

Consider the appearance of the restored wetland in areas of high visibility and those areas associated with recreation. The shape and form of graded areas, excavations and fills as well as the planned plant community should relate visually to the surrounding area.

Consider the effects of adjacent land uses upstream and downstream on the enhanced wetland.

Consider effects on the rate or volume of downstream flow to minimize or prohibit environmental, social or economic effects.

Consider the long and short-term effects of enhancement activities on water quality and wildlife resources.

Consider the effects on structures by wetland dependent animals such as beaver and muskrat.

Consider the effects of deer browse or other species when establishing vegetation.

Consider the effects on reptiles and amphibians and provide habitat for non-target wildlife communities.

Consider the effects of soil disturbance and probability of invasion by unwanted species including reed canarygrass, purple loosestrife, phragmites and Johnsongrass on disturbed areas, especially in floodplains.

Consider enhancing habitat for pollinators that inhabit wetlands. Refer to the WV Pollinator Handbook for more information.

Consider existing wetland functions and/or values that may be adversely impacted.

Consider effect enhancement will have on disease vectors such as mosquitoes.

The inclusion of microtopography can achieve changes in depth and duration of flooding without changing extent of surface area.

Consider water depth and duration as a method to control unwanted vegetation.

Consider effect of volumes and rates of runoff, infiltration, evaporation, and transpiration on the water budget.

Consider effects on temperature of water resources to prevent undesired effects on aquatic and wildlife communities.

On sites where woody vegetation will dominate, consider adding 1 to 2 dead snags, tree trunks, or logs per acres to provide structure and cover for wildlife and a carbon source for food chain support.

For discharge wetlands, consider underground upslope water and/or groundwater source availability.

When determining which species to plant, consider microtopography and the different hydrology levels it produces.

Consider timing of water control to mimic the natural hydrological regime of the area, further enhancing the habitat for aquatic species.

Consider effects on downstream flows or aquifers that would affect other water uses or users.

Consider linking wetlands by corridors wherever appropriate to enhance the wetland's use and colonization by the flora and fauna.

Consider the effects that location, installation and management may have on subsurface cultural resources.

Consider the effect of water control structures on adjacent fish species.

Consider the effects that water level draw downs will have on the mortality of aquatic species..

Consider design modifications that will limit potential negative impacts of wetland plants and animals on the project. (i.e. muskrats, fish, etc.)

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.

Plans and specifications shall be reviewed and approved by staff with appropriate job approval authority.

At a minimum plans and specifications will include the following:

- **goals and objective for wetland enhancement;**
- **documentation of current functions and/or values of the wetland and target enhancement function;**
- **a plan view, quantities, and sufficient profiles and cross-sections to define the location, line, and grade for stakeout and checkout;**
- **documentation of existing vegetative communities on and immediately adjacent to the site;**
- **hydric soils information including approximate quantity, location type, extent, etc;**
- **for hydrologic enhancements, a site map showing a minimum of 2 ft elevation contours (1 ft contour is preferable);**
- **documentation of existing water table depths or evidence of primary hydrologic indicators such as seasonal high water tables;**

- **presence, location and elevation of neighboring property boundaries, utilities or easements;**
- **presence, types and extent of all existing or modified artificial drainage measures;**
- **planting plan (if applicable) including site preparation, species, quantities, type of seedlings, stock, spacing and location;**
- **known required permits including CPA-52 or similar environmental evaluation documentation;**
- **any conditions as outlined in permits shall be incorporated into specifications; and**
- **any component practices and specifications required for implementation of this practice.**

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.

The operation and management plan shall be provided to and discussed with the operator.

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 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 and **any ongoing management techniques to control unwanted, noxious or invasive species;**
- actions which specifically address any expected problems from invasive or noxious species;
- the circumstances which require the removal of accumulated sediment **and the depth of sediment accumulation before removal is required including methods of removal;**
- conditions which indicate the need to use haying or grazing as a management tool, including timing and methods;
- **the operation and maintenance plans for any individual practice components designed and installed under the provisions of other WV practice standards;**
- timing and level setting of water control structures required for the establishment of desired hydrologic conditions, for management of vegetation and for optimum wildlife use;
- inspection schedule for embankments and structures for damage assessment;
- **any acceptable uses including the timing and intensities of these activities (e.g. grazing, haying, timber harvest); and**
- **for wildlife habitat purposes, haying and grazing may be justified as a management tool and could be used for establishment, development, and management of vegetation. If grazing is utilized, a grazing management plan shall be developed prior to implementation of this method. Minimize disturbance to ground nesting species (March 15-July 15).**

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****Bold italics indicate changes made or information added to the National Standard by West Virginia.***