

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

WETLAND ENHANCEMENT

(Acre)

CODE 659



Wetland enhanced by increasing hydroperiod to benefit waterfowl and wading birds

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, by enhancing one or more of the following:

- Hydric soil functions (changing soil hydrodynamic and/or bio-geochemical properties).
- Wetland hydrology (dominant water source, hydroperiod, and hydrodynamics).
- Vegetation (including the removal of undesired species, and/or seeding or planting of desired species).

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to any degraded or non-degraded wetland sites with hydric soils and to former wetlands, where the objective is to enhance selected wetland functions to conditions different than 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 - 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 - 657);
- The creation of a wetland on a site location that was historically non-wetland (Wetland Creation - 658);
- The management of fish and wildlife habitat on wetlands enhanced under this standard.

CRITERIA

General Criteria Applicable to All Purposes

The purpose, goals, and objectives of the enhancement shall be clearly outlined, including the soils, hydrology, vegetation, and any fish and wildlife habitat criteria that are to be met for the site. Document this information in a conservation plan or wetland enhancement or mitigation plan, and on NRCS Job Sheets as appropriate. Enhancement requirements may vary based on the program

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact your Natural Resource Conservation Service [State Office](#), or visit the [electronic Field Office Technical Guide](#).

authority under which the restoration is conducted (e.g., Food Security Act Wetland Conservation, Wetlands Reserve Program, etc.).

Document the soils, hydrology and vegetative conditions existing on the site, the adjacent landscape, and the contributing watershed in the planning process. Onsite condition information may be attained via wetland delineation forms, existing condition UMAM assessments, and/or other technical references if needed. Utilize appropriate maps (e.g., soil survey, National Wetland Inventory, and USGS topographical maps), aerial and onsite photos, remotely sensed data, and other site-specific references.

Base the soils, vegetation, and hydrology criteria for enhancement on the desired community type, which will be defined according to the "26 Ecological Communities of Florida" (or successor document), the Guide to the Natural Communities of Florida, or other recorded classification system such as the hydrogeomorphic wetland classification system. The desired community type may or may not be the same as the existing wetland type but shall be identified with enough specificity to achieve the enhancement objectives, e.g., "cutthroat seep," "marsh lake," etc. It may be useful here to identify features of the soil, vegetation or predominant hydrology source(s) that will drive enhancement objectives. Data obtained for reference wetlands or aquatic sites (those sites containing the targeted soil, vegetation, and/or hydrologic conditions) in the watershed may also be used.

The planning process will evaluate potential adverse effects of this practice on existing wetland functions and/or values using the Florida Evaluation for Making Wetland Minimal Effect Determinations (see Florida NRCS Field Office Technical Guide, Section I (E)). Adverse effects determined to be greater than the minimal effect threshold as determined by the evaluation will be mitigated in accordance with NRCS policy as stated in the General Manual, Title 190 - Part 410.26.

Upon completion of the practice, the site shall meet the appropriate wetland criteria and

provide wetland functions as defined in the project's objectives.

Where known nutrient and pesticide contamination exists, the nutrient and pesticide tolerance of the plant and animal species likely to occur in the enhanced wetland shall be evaluated. Sites suspected of containing hazardous material shall be tested to identify appropriate remedial measures. Do not plan this practice if remedial measures are not possible or practicable.

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

Ensure that design, construction and maintenance activities associated with the practice do not result in potentially adverse effects to adjacent properties or other water users unless agreed to by signed written letter, easement, or permit. Detailed surveys may be needed to determine the extent of planned surface and subsurface water levels near property lines.

Avoid or minimize impacts to cultural resources, wetlands, and Federal and State protected species to the extent practicable during planning, design and implementation of this practice in accordance with established National and Florida NRCS policy in the General Manual Title 420-Part 401, Title 450-Part 401, Title 190-Parts 410.22 and 410.26, the National Planning Procedures Handbook (Florida Supplements to Parts 600.1 and 600.6), the National Cultural Resources Procedures Handbook, and the National Environmental Compliance Handbook.

All necessary local, state, and federal permits shall be obtained by the landowner or designee prior to the enhancement.

Criteria for Hydric Soil Enhancement

Locate enhancement sites on soils classified as hydric.

Changes to soil hydrodynamic and biogeochemical properties such as permeability, porosity, pH, or soil organic carbon levels shall be made as needed to meet the planned objectives.

If soil enhancement is needed, monitor relevant properties at intervals during the

enhancement process to determine trends in the desired properties. Refer to NRCS soil quality publications or soil quality assessment information (see References) for further information on assessing soil properties or consult a soil scientist for guidance.

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. Assumptions regarding the appropriate hydroperiod for the enhancement site may also be based on aerial photographic signatures on a reference wetland (or aquatic site) over a minimum of ten years, NRCS-approved hydrologic models, soil survey information, and/or other relevant data.

Document existing roads, ditches, canals, terraces, water control structures, etc., within the contributing watershed. Evaluate these structures for their potential effects on hydrologic enhancement. Also document and evaluate how adjacent properties drain into and through the wetland site. Where offsite hydrologic alterations impact the site, the design shall compensate for these impacts when necessary to achieve project goals.

Use a natural water supply which approximates the needs of the community type to establish the site's hydroperiod. If this is insufficient, artificial water supplies can be utilized to augment the natural supply; however, do not divert these sources from wetlands or sensitive aquatic resources, or pump from wells. Do not use artificial water sources designated by the Florida Department of Environmental Protection (FDEP) as Class IV or Class V waters unless first treated to meet criteria for Class III waters. If the alternate water source requires energy inputs, estimate and document these in the plan.

Other structural practices and installation of macrotopography and/or microtopography features may be used to meet the planned objectives. Soil investigations may be necessary to ensure that any earthwork excavation does not exceed impermeable soil

textures that may be necessary to maintain surface and subsurface hydrology.

Macrotopographic features, including ditch plugs installed in lieu of re-filling surface drainage ditches, shall meet the requirements found in Table FL13-5 and Figure FL13-41 of the Florida Supplement to National Engineering Field Handbook, Chapter 13. All slopes of the ditch plug shall be stable for the location and soil used. Preferred earthfill material for the ditch plugs is a mineral soil. Earthfill for ditch plugs shall be compacted to achieve the required density.

Wetland enhancement sites that exhibit soil oxidation and/or subsidence resulting in a lower surface elevation shall take this factor into account when planning the hydrologic regime needed to support the proposed functions.

Water control structures that may impede the movement of target aquatic species or species of concern shall conform to the criteria and measures in the FL NRCS – USFWS Consultation Matrix located in the Florida NRCS Field Office Technical Guide, Section II (D).

Criteria for Vegetative Enhancement

Hydrophytic vegetation enhancement shall be of species typical for the wetland type(s) being established and the varying hydrologic regimes and soil types within the site. Preference shall be given to native Florida species.

Where natural colonization of pre-identified, selected species will realistically dominate within three years for herbaceous wetlands or five years for forested or shrub wetlands, sites may be left to revegetate naturally. If a site has not become dominated by the targeted species within these time frames, active forms of revegetation may be required.

If the enhancement site has extensive cropping history, it is unlikely that an adequate seed bank exists and the site may be vulnerable to undesirable or invasive species infestations. Such sites may need to be actively planted.

Include details on adequate substrate material and site preparation necessary for proper establishment of the selected plant species in the plan specifications.

Species diversity in the enhanced wetland will be maximized as appropriate to meet the targeted functions. Vegetation establishment will include species diversity and amounts adequate to establish a wetland that approximates to the extent possible the reference community.

Where the dominant vegetation community is to be herbaceous, the conditions three years after planting will be within 75% (density and species diversity) of the planned target vegetative conditions. Any of a variety of methods, including mechanical or aerial seeding, organic mat placement, wetland sod, vegetative sprigs or transplants, etc., may be used to establish herbaceous vegetation over the entire site or a portion of the site and at densities and depths as appropriate. Herbaceous species planting will follow the Florida NRCS conservation practice standard Range Planting, Code 550.

Where the dominant vegetation community is to be forest or shrub, the conditions five years after planting will be within 75% (density and species diversity) of the planned target vegetative conditions. Tree/shrub planting and site preparation will follow Florida NRCS conservation practice standard Tree/Shrub Establishment, Code 612. *[Note: Survival requirements in Code 612 may be superseded by the wetland enhancement criteria.]*

Note that planting density and stocking rates may be lower and the selection of species different than for agricultural or silvicultural production purposes, since the objective of wetland enhancement is to increase the capacity of a specific wetland function(s).

Address all Category 1 invasive species designated by the Florida Exotic Pest Plant Council (see the FOTG Section I (E)) on the site where their presence or overpopulation jeopardizes the success of the restoration. This may require recurrent use of practices such as Florida NRCS conservation practice standards Prescribed Burning, Code 338; Herbaceous Weed Control, Code 315; Brush Management, Code 314, and/or manipulation of water levels. Avoid or minimize adverse the effects of pesticide application on desirable wetland vegetation or aquatic habitats.

Enhancement Success Criteria

Pursuant to program-specific requirements, monitor enhancement success at appropriate intervals. At a minimum, this includes prior to and at the conclusion of the targeted time frame for achievement of the desired soil, vegetation, and hydrologic conditions on the site. The UMAM assessment (or approved successor methodology) will be used to measure the change in wetland functions from the baseline (pre-enhancement) conditions to the final successful and self-sustaining wetland or aquatic community.

Determine targeted site functioning levels, represented by UMAM scores from a suitable reference wetland(s) or on the site before enhancement begins. It is strongly recommended to assess the site at intermediate points along the enhancement trajectory. Selection of additional reference wetlands may be necessary to provide target UMAM scores when intermediate developmental reference points are needed.

Monitoring of enhancement success shall occur at least annually during the first five years after establishment of the practice and shall include assessment of the vegetation and hydrologic characteristics, and where appropriate, the soil characteristics. More frequent monitoring is recommended during the first 2-3 years, or if events occur that may compromise the enhancement success trajectory. UMAM assessments are recommended as part of regular monitoring events.

Adaptive modification of management shall be made if necessary to achieve the stated goals of the enhancement. More stringent program-specific requirements may apply.

CONSIDERATIONS

Consider the effect of construction equipment on soil density, infiltration, and structure.

Consider increasing soil organic carbon by incorporating compost.

Consider establishing and maintaining vegetative buffers on adjacent uplands to protect and enhance wetland functions such as water quality enhancement, floodwater storage and wildlife habitat.

Consider enhancing sites adjacent or in close proximity to existing wetlands as they may offer increased wetland system complexity and diversity, lessen habitat fragmentation, and help ensure colonization of the site by desirable wetland flora and fauna.

Consider linking wetlands by corridors if appropriate to enhance use and colonization of the enhancement site by the native flora and fauna. This may not be appropriate if concerns exist regarding the potential for increased predation on desirable species.

On sites where woody vegetation will dominate, consider adding several snags, tree stumps, or logs if appropriate to provide structure and cover for wildlife and a carbon source for food chain support.

Consider the effect of water control structures on the ability of fish or other aquatic species to move in and out of the site.

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

Consider whether the use of biological control of undesirable plant species and pests (e.g. using predator or parasitic species) is feasible and appropriate, and the approved methods.

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

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

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

Consider the effects of soil disturbance and the probability of invasion by unwanted species.

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

Consider controlling water levels to prevent oxidation of organic soils and inundated organic matter and materials.

Consider long term groundwater source availability in areas where numerous or large

capacity consumptive use wells may lower regional groundwater tables.

Note: The [NRCS Wetlands](#) webpage contains useful information on wetland science and links to resources to assist the planner in enhancement plan development, operation, maintenance and monitoring. Florida-specific information on wetland restoration that may contain information useful to the planner may be found at

<http://www.dep.state.fl.us/water/wetlands/fwric/library.htm> and <http://www.dep.state.fl.us/water/wetlands/docs/mitigation/mitman.pdf>.

PLANS AND SPECIFICATIONS

Prepare specifications for this practice for each site and provide the required detail to implement the practice in accordance with this standard. Record specifications using applicable job sheets, narrative statements in the conservation plan, and any other relevant documentation. Items that shall be included in the plan and engineering design include but are not limited to:

- Location map of site
- Plan view of the site showing all planned practices
- Enhancement site acreage
- Historic and current aerial photos of site
- Description of targeted community type(s) and functions to be enhanced
- Method used to vegetate treatment area if applicable, and species to be planted
- hydrologic enhancement method and practices, if applicable
- Material type, size, location, and dimensions of all structural practices
- Borrow location and compaction requirements for earthfill, if applicable
- Location of all known utilities
- Information for any required permits.

Plans and specifications must be written or approved by NRCS staff with appropriate conservation planning authority in wetland

restoration planning, and in engineering design where applicable.

OPERATION AND MAINTENANCE

Prepare a separate Operation and Maintenance Plan 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 site 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 pesticides, prescribed burning, mechanical treatments, and other management practices.
- 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, methods, and measures to minimize disturbance to ground nesting species;
- Conditions where manipulation of water depth and duration may be used to control unwanted vegetation if it does not jeopardize project success.

REFERENCES:

Florida NRCS conservation practice standards:
Constructed Wetland, Code 656
Wetland Creation, Code 658
Wetland Restoration, Code 657

USDA NRCS, 2008. Uniform Mitigation Assessment Method (UMAM, FDEP 2007) as

modified for use by Florida NRCS, Field Office Technical Guide (FOTG), Section I (E)(1)(b)
<http://www.nrcs.usda.gov/technical/eFOTG/>

USDA SCS, 1989. 26 Ecological Communities of Florida. Field Office Technical Guide, Section II
<http://www.nrcs.usda.gov/technical/eFOTG/>

Florida Natural Areas Inventory, 2010. Guide to the Natural Communities of Florida,
<http://www.fnai.org/naturalcommguide.cfm>

USDA NRCS - Florida. "Florida Evaluation for Making Wetland Minimal Effect Determinations," Florida NRCS Field Office Technical Guide, Section I (E),
http://efotg.sc.egov.usda.gov//efotg_locator.aspx

NRCS General Manual:

Title 420-Part 401,
Title 450-Part 401,
Title 190-Parts 410.22 and 410.26,

National Planning Procedures Handbook
(Florida Supplements to Parts 600.1 and 600.6),

National Cultural Resources Procedures Handbook

National Environmental Compliance Handbook

National Engineering Field Handbook, Chapter 13, Florida Supplement

USDA NRCS Soil Quality Assessment website:
<http://soils.usda.gov/sqi/assessment/assessment.html>

USDA NRCS Soil Quality Publications:
<http://soils.usda.gov/sqi/publications/publications.html>