Wetland Restoration (Acre) 657

DEFINITION

A rehabilitation of a degraded wetland or the reestablishment of a wetland so that soils, hydrology, vegetative community, and habitat are close approximation of the original natural condition that existed prior to modification to the extent practicable.

PURPOSES

To restore wetland function, value, habitat, diversity, and capacity to a close approximation of the pre-disturbance condition by:

- Restoring hydric soil.
- Restoring hydrology (inundation and/or soil saturation).
- Restoring native vegetation (including the removal of undesired species, and/or seeding or planting of desired species).

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to sites with hydric soil which were natural wetlands that have been subject to hydrologic or vegetative degradation, or to sites where hydric soils are covered by fill, sediment, or other deposits.

This practice is applicable only where the natural hydrologic conditions, including hydroperiods, can be approximated by modifying drainage and/or inundation of a duration and frequency similar to the original, natural conditions.

This practice does not apply to: Constructed Wetland (656) intended to treat point and non-point sources of water pollution; Wetland Enhancement (659) intended to modify an existing wetland where specific functions and/or values are enhanced beyond original conditions; or Wetland Creation (658) intended to create a wetland on a site location which historically was not a wetland.

Where embankments are a component of the restoration, the criteria in this standard is applicable where:

a) Effective heights are 6 feet or less (effective height is the difference in elevation between the auxiliary spillway crest and the lowest point in the cross-section taken along the centerline of the dam).

b) Embankment ponds have 45 acre-feet of storage capacity or less.

c) Embankment structures that are class “a,” low hazard structures where failure will not cause significant damage downstream.

d) Drainage areas are 160 acres or less.

e) Embankments are not constructed in series with an upstream embankment.

Where the above criteria are not met, wetland restorations shall be designed in accordance with the criteria in Natural Resources Conservation Service (NRCS) Standard 378, Pond.

CRITERIA

General Criteria Applicable To All Purposes

The purpose, goals, and objectives of the restoration shall be clearly outlined, including soils, hydrology, and vegetation criteria that are to be met and are appropriate for the site and project purposes.

Upon completion of the restoration, the site will meet the current NRCS soil, hydrology, and vegetative criteria of a wetland.

If the presence of hazardous waste materials in the sediment or fill is suspected, soil samples will be collected and analyzed for the presence of hazardous waste as identified by local, state, or federal authorities. Sites containing hazardous waste will not be restored under this standard.

Consider the impact of this practice upon cultural resources. The wetland restoration shall follow Michigan Cultural Resources policy.

The effect of any modification to the existing surface and/or subsurface drainage system on upstream and downstream landowners shall be evaluated. Upstream surface and subsurface drainage shall not be impacted unless appropriate permissions are obtained or mitigation measures are implemented. All applicable state and local laws and regulations pertaining to flooding, and surface and subsurface drainage will be followed.

All federal, state, tribal, and local water laws and wetland regulations shall be followed. The landowner must obtain all required permits prior to starting the restoration.

Excessive nutrient, pesticide, or other pollutant inflows shall be controlled prior to site restoration. Examples of excessive inflows include direct runoff from a feedlot or other obvious pollution source, an actively eroding gully emptying into the site, or a poorly treated watershed that is contributing sediment and its associated pollutants.

Criteria For Hydric Soil Restoration

Where the wetland site has been covered by sediment, land shaping, or other activities, the wetland hydrology may be restored by excavating the fill material and/or the sediment to the surface of the original hydric soil.

Side slopes and wetland shape and size should approximate the original configuration. Excavated side slopes shall average 8:1 or flatter. The wetland edge shall have an irregular shoreline.

Criteria For Hydrology Restoration

Hydrologic conditions of the site are defined as the volume of water stored; rate and timing of inflow and outflow; duration; frequency; and depth of flooding, ponding, and/or saturation. Wetland hydrology shall be restored as close as possible to its original condition before it was manipulated. As a minimum, the hydrologic soil condition must be able to support hydrophytic vegetation.

To the extent technically feasible, reestablish topographic relief and/or microtopography. Use reference sites within the area to determine desired topographic relief.

Subsurface Drain Removal Or Destruction

In areas where subsurface drains were used to remove surface water or soil saturation, the existing system will be modified to restore the wetland hydrologic conditions. Review of drainage records, interviews, and site investigations will be needed to determine the extent of the existing system.

The effects of the subsurface drainage system may be eliminated by the following: (1) removing or rendering inoperable a portion of the drain at the downstream edge of the site; (2) modifying the drain with a water control device; or (3) installing non-perforated pipe through the wetland site.

The minimum length of drain to be removed or rendered inoperable is shown in Table 1.

All sand and gravel bedding and filtering material or other flow-enhancing material will also be removed. The trench shall be filled and compacted to achieve a density equal to adjacent material.

Surface water inlets are recommended to control the water level during flood events.

Where embankments will be constructed, all subsurface drains shall be removed starting at the minimum distance shown on Table 1 downstream of the embankment centerline and extending an additional 15 feet upstream from the upstream toe of the embankment.

Where surface water inlets are provided for wetland water level control, existing drains downstream of the site shall be protected by flow control devices. Inflow will be limited to the capacity originally apportioned to the drain.

The water control structure will be attached to a non-perforated conduit that extends at least the minimum length specified in Table 1. The connections of the water control structure and non-perforated pipe will be watertight at the head created at the maximum pool level.

TABLE 1

Minimum length of subsurface drain to be removed or rendered inoperable.
OR
Minimum length of surface drain to be filled.
(The length is measured parallel to the direction of the surface drain flow.)

Permeability * (inches/hour)	Soil Texture*	Minimum Distance
Greater than 2.0	Sand and Organics	150 feet
0.6 - 2.0	Loam	100 feet
Less than 0.6	Clay	50 feet

* Texture and permeability are for the general profile. Where the permeability and texture vary throughout the profile, consider the type of drainage system and which layer(s) are critical. Standard values for permeability and texture for each soil map unit are in the Field Office Technical Guide.

Disconnected subsurface drains downstream of the wetland shall have an end cap installed on the upstream end to prevent soil from entering the drain.

Surface Drain Removal

Where open channels were constructed to drain the wetland, the channel will be filled with earth or controlled with a grade stabilization structure to restore the wetland hydrologic conditions. A water control structure may be used to manage water levels for wetland operation and maintenance.

Provisions will be made to store, pass, or divert the flow from the 10-year frequency, 24-hour storm so that it does not cause erosion or flooding impacts.

The channel may be blocked with earthfill without a flow control device where flow duration and rate will not cause erosion and head cutting. The minimum length of channel to be filled will be as shown in Table 1.

The side slopes of channel blocks shall be 3:1 or flatter on the downstream side and 5:1 or flatter on the wetland side. All fill shall be compacted to achieve the density equal to that of adjacent materials.

The earthfill height shall be increased by at least 5% for mineral soil and 33% for organic soil to account for settlement and to prevent concentrated flow over the channel block.

Grade Stabilization Structure

Grade control measures will be used when the 10-year frequency, 24-hour duration storm flow or base flow results in flow exceeding 3 feet per second in velocity or 48 hours in duration. Grade stabilization structures shall meet the design requirements of NRCS Standard 410, Grade Stabilization Structure.

Water Control Structure

Water control structures will be used when it is desirable to control or manipulate the water level for operation and maintenance of the wetland at an elevation different than that caused by blocking the channel. Water control devices shall meet NRCS Standard 587, Structure for Water Control.

The water control structure shall be designed and installed in a manner to prevent internal soil erosion (piping) through or around the channel block or embankment.

Embankments

An earth embankment may be constructed to create a pool storage volume equal to that which existed prior to conversion of the site. Table 2 provides embankment criteria. The embankment top width shall be increased a minimum of 5 feet if muskrats could be a problem. Organic soils shall not be used for embankments exceeding 5 feet in structural height.

Immediately after construction, the entire embankment and spillway area shall have a protective vegetative cover established. A seeding plan shall be prepared following NRCS Standard 342, Critical Area Planting.

Pipes For Embankments

Where there is a prolonged low flow or a base flow over an embankment, a trickle tube or stone spillway will be used.

Pipes to handle base flows shall convey at least twice the base flow rate or the drawdown time requirements, whichever requires the greatest flow. The minimum pipe diameter shall be 4 inches.

Pipes going through the fill shall have a sand and gravel filter. If the pipe is connected to a subsurface drain, the drain must be non-perforated downstream from the embankment centerline for the distance shown in Table 1.

The invert of the pipe shall be 0.5 feet or one pipe diameter (whichever is greater) below the crest of any vegetated spillway.

Required principal spillway discharges are shown in Table 3. The principal spillway flow plus any detention storage must handle the design storm shown in Table 3 without flow through a vegetated spillway.

Structure And Drain Protection

Surface water inlet structures shall be equipped with trash racks to exclude debris.

Drain and pipe outlets shall be protected against entry of animals.

Criteria For Vegetative Restoration

Hydrophytic vegetative restoration shall be of species typical for the wetland type(s) being established. Undesirable and noxious or invasive species will be controlled.

In soils where seedbanks of desirable species exist or natural succession of selected species will begin to occur in less than five years, then natural regeneration will be allowed for re-vegetation. Specific guidelines that consider soil, seed source, and species will be developed. The topsoil from wetland excavated areas will be stockpiled and redistributed to maintain plant seedbanks.

If the site was predominantly herbaceous vegetation prior to modification and planting is necessary, then a minimum of two species adapted to the site will be planted. Herbaceous vegetation may also be established by placing soil containing seed or tubers at a minimum depth of 4 inches over at least 59% of the site.

Forested wetland sites needing plantings will include a minimum of three species, where appropriate, at least two of which will be hard mast producing species. Tree plantings will meet the criteria in NRCS tree establishment standards.

Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species from localized genetic material. Plans will include management which reduces the introduction of invasive plant species; provides management of existing invasive species; and minimizes the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native, non-invasive species may be used. Refer to the Field Office Technical Guide, Section I, Invasive Plant Species for plant materials identified as invasive species.

TABLE 2
GENERAL EMBANKMENT CRITERIA
Top Width - 8 feet minimum (12 feet for roadways) for mineral soils and 20 feet minimum for organic soils. **Side Slopes** - 5:1 or flatter upstream and 4:1 or flatter downstream. **Settlement** - The constructed height shall be increased by 5% for mineral soils and 33% for organic soils. **Site Preparation** - Include a cutoff trench as needed to reduce seepage losses. Topsoil and debris must be removed under the embankment. **Compaction** - All fill materials shall be placed and spread in layers not over 9 inches thick before compaction. The maximum layer for materials to be compacted with a bulldozer shall be 6 inches thick before compaction. Each layer shall be compacted by traversing the entire surface a minimum of 4 passes with either a tamping roller, rubber tire roller, loaded earth moving equipment, farm tractor, or bulldozer. Fill material shall have a water content sufficient to secure compaction. When kneaded in the hand, it will form a ball which does not readily separate when struck sharply with a pencil and not extrude out of the hand when squeezed tightly. **Vegetated Spillway** - The spillway shall pass the discharge from a 10-year, 24-hour storm for drainage areas up to 80 acres and a 25-year, 24-hour storm for drainage areas exceeding 80 acres. The spillway design may utilize any credit for principal spillway outflow or detention storage. The spillway shall have a 20 foot minimum level section. Spillways on natural ground are considered level if the elevation change is no more than 0.2 feet throughout the 20 foot length. Flow must go through critical depth in the control section. Flow from the spillway must reenter any downstream channel at a non-erosive velocity. A minimum of 0.5 feet shall be added to the design flow depth for freeboard.

TABLE 3	
PRINCIPAL SPILLWAY DISCHARGE REQUIRED	
Maximum Drainage Area (Acres)	Principal Spillway Discharge
Less than 60	**
60 - 160	2-year, 24-hour
** Mechanical spillway not required unless base flow exists.	

CONSIDERATIONS

The hydrology and vegetative characteristics of the site and its contributing watershed before alteration should be documented. This can be accomplished by review of drainage records, historical aerial photography, historic records, and site investigation. Vegetation can be determined from historic records or existing vegetation on similar soils on nearby sites.

Hydrologic conditions, including duration, depth, and timing are primary factors in vegetation establishment. The vegetation selected should be compatible with the planned hydrologic condition.

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

Consider the effect restoration will have on mosquitoes. Develop at least one area which is 5-6 feet deep of permanent water to provide habitat for predators of mosquitoes.

Nutrients and pesticides contained in surface and ground water, as well as accumulated sediments, may have an adverse effect on wetland vegetation. The nutrient and pesticide tolerance of the species planned should be considered where known nutrient and pesticide contamination exists.

This practice should be applied to sites that are adjacent to existing wetlands to increase wetland system complexity and diversity, decrease habitat fragmentation, and ensure colonization of the site by wetland plants and animals.

Wetlands should be linked by corridors whenever possible to enhance the wetland's use and colonization by the flora and fauna.

Sediment delivery to restored wetlands from surface water inflow should be reduced. This may be accomplished with watershed treatment, grassed or riparian filter areas, or sediment basins.

Embankments and excavated slopes should be located and shaped in a manner that is compatible with existing landscape.

Consider the impact upon both state and federally listed threatened or endangered species. Use the Natural Features Database as the first level of review. Any potential impacts to threatened and endangered species will need to be reviewed with the appropriate federal or state agency.

PLANS AND SPECIFICATIONS

Plans and specifications for this practice will be prepared for each site. Specifications shall be recorded using conservation sheets, narrative statements in the conservation plan, engineering designs, or other documentation. Specifications shall describe the requirements for applying this practice to achieve its intended purpose.

As a minimum, specifications will include the objective of the practice, location map, permit requirements, survey notes, design records, construction specifications, vegetative requirements, and construction inspection records.

OPERATION AND MAINTENANCE

An operation and maintenance plan will be prepared for each wetland restoration site. The following activities will be addressed in the plan: (1) timing and level setting of water control structures required for establishment of desired hydrologic conditions or for management of vegetation; (2) inspection schedule of embankments and structures for damage assessment; (3) depth of sediment accumulation allowed before removal required; (4) management needed to maintain vegetation, including control of unwanted vegetation; and (5) acceptable uses and timing (e.g., grazing and haying).

REFERENCES

Executive Order 13112, Invasive Species, February 3, 1999. Federal Register: Vol. 64, No. 25. Feb. 8, 1999.

USDA, NRCS, 2003. ECS 190-15 Wetland Restoration, Enhancement, Management and Monitoring, 425 pp.

USDA, NRCS Wetland Restoration, Enhancement, or Creation, Engineering Field Handbook, Chapter 13.