ILLINOIS URBAN MANUAL
PRACTICE STANDARD

WETLAND RESTORATION

(Ac.)

CODE 999

Source: Hey and Associates, Inc.

DEFINITION

The rehabilitation of a degraded wetland or the re-establishment of a wetland so that soils, hydrology, vegetative community and habitat are an approximation of the original natural condition that existed prior to historic modification.

PURPOSE

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

1. Restoring hydrology (depth, duration and season of inundation, and/or duration and season of soil saturation).
2. Restoring native vegetation (including the removal of undesired species and/or seeding or planting of desired species).
3. Restoring other physical habitat features and water storage and filtering capacity.

CONDITIONS WHERE PRACTICE APPLIES

The practice applies only to areas with existing hydric soils.

The practice is applicable only where the natural hydrologic conditions, including the hydroperiod, can be restored by modifying drainage and/or by artificial flooding of a duration and frequency similar to the original, natural conditions.

For a constructed wetland intended to treat point and non-point sources of water pollution use the **Bioretention Standard 800**.

To modify an existing wetland where specific attributes are heightened or enhanced by management activities use the Wetland Enhancement (998) standard.

To create a wetland on a site which historically was *not* a wetland use the Wetland Creation (997) standard.

CRITERIA

General Criteria

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

The soil, hydrology and vegetative characteristics existing on the site and the contributing watershed shall be documented before restoration of the site begins.

Where offsite drainage has had an impact on the site (*e.g.* drainage ditches, channelized streams, levees), the design shall compensate for these landscape features (*e.g.* increased water depth, berms or micro-topography).

Disturbance to ground nesting wildlife species shall be minimized.

Sites suspected of containing hazardous waste shall be tested to identify appropriate remedial measures. Sites containing hazardous material shall be cleaned up to appropriate environmental standards that protect ecological resources prior to the installation of this practice. The nutrient and pesticide tolerance of the species planned shall be considered where known nutrient or pesticide contamination exists.

Upon completion of the restoration, the site shall approximate soil, hydrology, vegetation and habitat conditions of the wetland that previously existed on the site before alteration to the extent it is known and practicable.

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. This will include mowing, cutting, pulling, herbicide application or the manipulation of water levels to control unwanted vegetation. Attention shall also be given to adjacent or nearby propagule sources that may compromise the success of the practice.

Any invasive control measures used must minimize “collateral damage” to desired or non-target species and wildlife.

Criteria for Hydric Soil Restoration

Restoration sites shall be located within hydric soils. If the hydric soil is covered by fill, sediment, spoil or other depositional material, the material covering the hydric soil shall be removed, to the extent feasible.

Depending on the duration of the drained state, drained hydric soils may lose some hydric characteristics (*e.g.* redoximorphic features). These characteristics return over time when hydrology is restored and a more natural anaerobic condition is present. If hydric soil has been stockpiled or will be imported to the project site, it shall be considered a wetland creation and follow the Wetland Creation (997) standard.

Tree (and shrub) planting shall follow the criteria of the Tree and Shrub Planting Practice Standard (985).

Criteria for Hydrology Restoration

The hydrology (including the timing of inflow, outflow, duration and frequency) of the restored site shall approximate

the conditions that existed before alteration, or be such that it mimics desired natural conditions. This includes hydrologic modification caused by roads, ditches, drains, terraces, etc. within the contributing watershed. To the extent feasible, re-establish topographic relief and/or micro-topography. Use reference sites within the area to determine desired topographic relief.

Existing drainage systems shall be removed or modified as needed to achieve the appropriate wetland hydrology. This will include installation of one or more of the following measures:

1. Small berms to raise water levels within drainage ditches or wetland basins;
2. Control structures within existing levees, berms, or wiers;
3. Control structures on drain tile systems;
4. Removal or crushing of drain tile systems;
5. Filling of drainage ditches; or
6. Any combination of these measures.

Designs shall always ensure that the work associated with the wetland restoration shall not adversely affect adjacent properties or other water users unless agreed to by signed written letter, easement or permit. Designs may need to include provisions for the by-pass flow of offsite drainage to avoid impacts to up-gradient landowners. All surface flows to be passed through the system shall first be conveyed through a vegetated buffer or other appropriate means of cleansing.

A natural water supply shall be used to reestablish the site's hydrology that will support the desired wetland type, however, this water source shall not be diverted from other wetland resources (*e.g.* prairie pothole wetland complexes or springs) and provisions must be made for its ongoing operation and maintenance.

If water control structures are required, the water level and timing of operation must be specified to obtain desired hydrologic conditions for vegetation establishment, management and optimum use by fish and wildlife.

A clear Management Plan with objectives and responsible parties for adjusting water control structures shall be completed if adjustable structures are used.

In all cases, earthwork, grading and excavation shall be kept to the minimum amount necessary to reestablish the appropriate hydrology. This is to reduce compaction of the hydric soils from the equipment used. Low ground pressure equipment shall be used whenever possible.

Criteria for Vegetation

Hydrophytic vegetation restoration shall be of native species typical for the wetland type(s) being established.

Preference shall be given to native wetland plants with localized genetic material. Plant materials collected or grown from material collected within a 100-mile radius from the site are considered local ecotypes unless otherwise specified by the project purpose or a land management or regulatory agency. If the desired species cannot be found within the 100

mile radius, then this can be expanded as needed to meet project goals. More conservative species may be more difficult to locate.

Where natural colonization of pre-identified, desired species will realistically dominate the site within 5 years, sites may be left to revegetate naturally. If a site has not become dominated by the targeted species within 5 years, active forms of revegetation shall be required.

In most cases, planting and/or seeding will be necessary. The minimum number of native species to be established shall be based upon the purpose of the restoration, the type of vegetative communities already present and the wetland plant community planned.

Where the dominant vegetation will be herbaceous community types, a subset of the original vegetative community shall 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 desired native community. Species richness and diversity shall be addressed in the planning of herbaceous communities. The species planted or seeded shall be appropriate for the hydrologic regime being restored.

Seeding rates shall be based upon percentage of pure live seed tested within 12 months of planting. Live plugs shall be used for species difficult to establish from seed, or if needed to meet desired vegetation growth goals. Rhizomes, root stock, and bulbs may also be used for some species. Most often a combination of methods is used for herbaceous/emergent wetland restorations. The spacing of plugs and seeding rates are determined in part by the aggressiveness of the species being established, the time frame desired for full vegetative performance and depredation pressure. Planting or seeding too sparsely often leads to undesirable weedy growth. Seeding rates should consider the seed size and be based on seed counts per unit area.

Where the dominant vegetation will be forest or woodland community types, vegetation establishment will include a minimum of six woody species appropriate to the hydrologic regime being re-established.

Seed viability will be determined prior to planting. Tree (and shrub) planting will follow the criteria of the Tree and Shrub Planting Practice Standard (985).

Trees will be planted on the contour to facilitate placing the appropriate species at the contour which will have the optimum depth and duration of inundation. Tree stocking rate or stem density shall be determined based on the type of community desired, size of stock and expected mortality rate. Follow Tree and Shrub Planting standard (985) for specification regarding the use of root pruned stock.

Adequate substrate material and site preparation necessary for proper establishment of the selected plant species shall be included in the design. Adequate substrate shall mean a soil suitable as a growth medium for the desire wetland vegetation in terms of organic content, permeability and soil texture.

Specifications for Subsurface Drain Removal or Destruction

A subsurface drain may be modified to restore hydrology by removal, plugging, crushing, adding a water control structure or replacement with solid drain tile of all drain tile closer to the wetland than the minimum distance shown in Table 1.

If present, all sand and gravel bedding and filtering material or other flow enhancing material shall also be removed. The trench shall be filled or compacted to achieve a density approximately equal to the adjacent native soil.

Installation of non-perforated subsurface drain tile around or through the wetland may be necessary to allow upstream drainage systems to continue to function properly.

Functional subsurface drains downstream of the wetland shall have an end cap installed on the upstream end or other satisfactory end seal installed to prevent soil from filling the drain.

Specifications for Surface Drain Filling

Where open channels and shallow surface drains provide surface and subsurface drainage that needs to be modified or eliminated to restore the wetland, the channel or surface drain will be:

1. Totally filled with earth; or
2. Filled with a single ditch plug or a series of ditch plugs to the full depth of the ditch according to Table 1; or
3. Filled with a ditch plug to a height less than the full depth of the ditch according to Table 1.

Ditch plugs will begin no closer to the wetland than the minimum distance in Table 1.

Plan the number and spacing of ditch plugs based on an evaluation of land grade, drain grade and depth of the drainage ditch. The end slopes on ditch plugs will be 3:1 or flatter on the down-stream side and 5:1 or flatter on the wetland side.

Where open channels and shallow surface drains provide only surface drainage, restoration may be achieved using a berm to keep water from entering the surface drain from the wetland.

All fill will be compacted as needed to achieve the desired densities. To account for settlement, the earth fill height will be increased by at least 5% for mineral soils compacted by construction equipment operating over the fill area, and by at least 10% where fill is dumped, bulldozed and shaped with limited compaction. The earth fill height will be increased by 20% where a mixture of mineral and organic soils is used. All fills using organic soils shall be increased by at least 33% to account for settlement.

Provisions will be made to store, pass or divert the flow so that it does not cause erosion and flooding impacts where the flow enters any downstream facilities. Earth fill materials shall be placed such that there will be no flow over the ditch plug except where a grade stabilization structure or structure for water control is used. A minimum of 0.5 feet shall be

included in the settled fill height of a ditch plug above the adjacent original ground surface for freeboard to insure that flows will be directed around the plug. A flow control device will be used where flow duration and rate would otherwise cause erosion and head cutting.

Table 1

Minimum length of subsurface drain to be removed or rendered inoperable or Minimum length of surface drain to be filled with ditch plug. (The length is measured parallel to the direction of the surface drain flow along the top of the settled ditch plug.)

*Soil Permeability (inches per hour)	*Soil Texture	**Minimum Distance from Wetland
> 2.0	Sandy & Organics	150 feet
0.6 - 2.0	Loamy	100 feet
< 0.6	Clayey	50 feet

* Soil Texture and permeability are for the general soil profile, not just the surface layer. Where the permeability and texture vary throughout the profile, consider the type of drainage system and which layer(s) are critical.
** Lateral effects of drainage features computed according to EFH Chapter 19 procedures can be substituted for the minimum distances shown in Table 1 (except for drains under embankments).

Specifications for Embankments
Earth embankments and appurtenances shall meet the requirements of the Diversion standard (815) and Diversion Dike standard (820).

Embankments located on a floodplain, where overtopping of the embankment by flow from the floodway into the wetland is likely, may have the vegetated spillway area on level natural ground, in an excavation, or on an area of the embankment where the height from the top of the embankment to the downstream toe is 2 feet or less. The embankment spillway area shall have a minimum embankment top width of 25 feet and a minimum level section width of 100 feet. The design flow depth shall be 0.5 feet or less. The embankment side slopes shall be 5:1 or flatter in this area. Mulching (see Mulching (875) standard) or other types of mechanical protection shall be required on embankment type spillways.

CONSIDERATIONS

It should be noted that Wetland Restoration as used herein includes rehabilitation and re-establishment as used under federal terminology from the Mitigation Rule as published by the US Army Corps of Engineers and US Environmental Protection Agency (33 CFR Parts 325 and 332; 40 CFR Part 230).

Both the present and future land use of the proposed restoration site and its surrounding area should be considered. Developments and other land use changes that may be initiated after the wetland restoration is completed could adversely affect the practice by altering the hydrology or the water quality.

A permanent conservation easement (including measures for maintenance and monitoring) should be considered.

Consider micro-topography and hydroperiod when determining which species to plant. On sites where woody vegetation will dominate, consider adding 1 to 2 dead snags, tree stumps or logs per acre where appropriate to

provide structure and cover for wildlife and a carbon source for food chain support.

Nearby or adjacent existing wetland functions and/or values may be impacted by the practice. Consider effects on these nearby existing wetlands and water-related resources, including fish and wildlife habitats, which will be associated with the practice.

Consider the effect wetland restoration may have on disease vectors (*e.g.* mosquitoes) and methods to limit disease vectors (*e.g.* making the wetland accessible to vector predators, summer drawdowns, etc.)

The wetland restoration practice may affect volumes and rates of runoff, infiltration, evaporation and transpiration thus changing the water budget for the site. This should be considered in the design and planning. Also consider effects on downstream flows or aquifers that would affect other water uses or users.

Devices such as staff gauges and monitoring wells should be installed to enable measurement of the hydrology in the restoration wetland to compare with project goals and objectives.

Adding artificial nesting structures that are appropriate for the region can increase utilization of these areas.

Link wetlands by native vegetative corridors wherever appropriate to enhance the wetland's use and colonization by the native flora and fauna. Consideration should be given to any regional green infrastructure plans or watershed plans.

Establish vegetative buffers on surrounding uplands where appropriate to reduce sediment, and soluble and sediment-attached pollutants carried by runoff and/or wind. Buffers also provide refuge and nesting habitat for wildlife.

Soil disturbance associated with this practice may increase the potential for invasion by unwanted species. Soil compaction may also inhibit growth by the desired plant species.

For groundwater discharge wetlands, consider groundwater source availability upgradient of the wetland.

Water Control Structures

The ability of fish and other aquatic species to move in and out of the wetland may be affected by water control structures, which may be desirable or undesirable. Consideration should be given to whether the natural wetland type desired is typically a fishless system, or if there are aquatic invasive species that should be precluded from entering the wetland restoration.

Consider also the impact that water surface drawdowns will have on concentrating aquatic species such as turtles and fish into diminished pool areas resulting in increased mortality.

Where visual quality would be impacted by structures (*e.g.* outlet structures, dikes, etc.), consider using low profile structures, natural screening and or colors that minimize the aesthetic impact.

PLANS AND SPECIFICATIONS

Plans and specifications for wetland restoration shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. All plans shall include installation, inspection and maintenance schedules with the responsible party identified.
At a minimum include the following items:

1. Species planting lists with appropriate seeding rates in ounces or pounds per acre of pure live seed based on specific seed sizes and the desired species density. Species shall be limited to those known to be available for a minimum of 3 years as local ecotype seed.
2. Appropriate engineering plans for measures to restore the hydrology including any necessary grading plans or water control structures (*e.g.* riser board control structures).
3. Utility plans disclosing locations of water control structures, inlets, outlets and any other subsurface utility lines.
4. Construction sequencing plan to keep steps of practice in the optimum order and minimize erosion including detailed sediment and erosion control plans.
5. Planting lists with installation details for any live herbaceous and woody plants installed.
6. Planting zone boundaries for various plant communities proposed for establishment.
7. Herbivory protection measures.
8. Performance standards that can be used to determine project success.

OPERATION AND MAINTENANCE

Any use of fertilizers, mechanical treatments, prescribed burning, pesticides and other chemicals shall assure that the intended purpose of the wetland creation will not be compromised. Any use of fertilizers, pesticides and other chemicals shall be applied only when necessary. Mechanical treatments and prescribed burning should be an integral component of any wetland restoration project.

The depth of any accumulated sediment shall be measured and the accumulations removed when the planned project objectives are jeopardized.

Management actions shall maintain native vegetation and control undesirable or invasive species. Biological control of undesirable plant species and pests (*e.g.* using predator or parasitic species) shall be implemented where available and feasible. Herbicide applications will be as specifically targeted to the control species as possible to minimize collateral damage. All herbicide applications shall be consistent with labeling.

For wildlife habitat purposes, haying and grazing, if justified as a necessary wildlife/wetland management tool, can be used for management of vegetation. If grazing is used as a management tool, a Grazing Plan shall be prepared. Disturbance to ground-nesting species shall be minimized by controlling the

timing of grazing activities. If grazing is contemplated, surveys may be necessary to determine what ground-nesting species are present.

The control of water depth and duration may be utilized to control unwanted vegetation. A clear process for determination of water level adjustments must be established as part of the plan and consistent with the project objectives. Responsibility for water level adjustments must be defined and understood by the parties involved.

An annual inspection schedule shall be established for embankments and structures for damage assessment. Management actions shall maintain desired vegetation and control unwanted vegetation.

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January 2014

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