3.5.A.1.(c) Wetland Detention Basins

Wetland detention basins have the majority of the bottom area planted in wetland vegetation. With typically a 0.04-cfs release rate for the 2-yr event, the low point in the detention basin will often be saturated for extended periods. Those areas of the detention basin that frequently remain inundated for longer than 12- to 24-hr will not be able to support turf grass and should be planted with vegetation adapted to extended wet conditions. Consequently, basins with a portion of the basin designed for the saturated conditions (i.e. wetland basins) are a logical alternative to dry detention basins.

The area that is planted and managed as a wetland may cover the entire bottom of the basin or only a portion of the bottom. If only a portion of the bottom is covered, the bottom may have two stages: 1) the lower area that is planted and managed as a wetland and 2) the upper area that is predominantly dry and not inundated by most events throughout the year. The wetland area can accommodate long periods of inundation and saturated conditions while the dry area can allow for active recreational needs. A rule of thumb for this type of multi-use design is to design the wetland area to provide all storage required for either the 2-yr or 10-yr, 24-hr storm events and the dry area for the additional storage required to detain the 100-yr, 24-hr event.

The outlet should be above the normal groundwater table to prevent continuous flow through the basin. Continuous flow reduces residence time and therefore pollutant removal performance. Alternatively, the detention pond can be designed as a combination detention and infiltration basin.

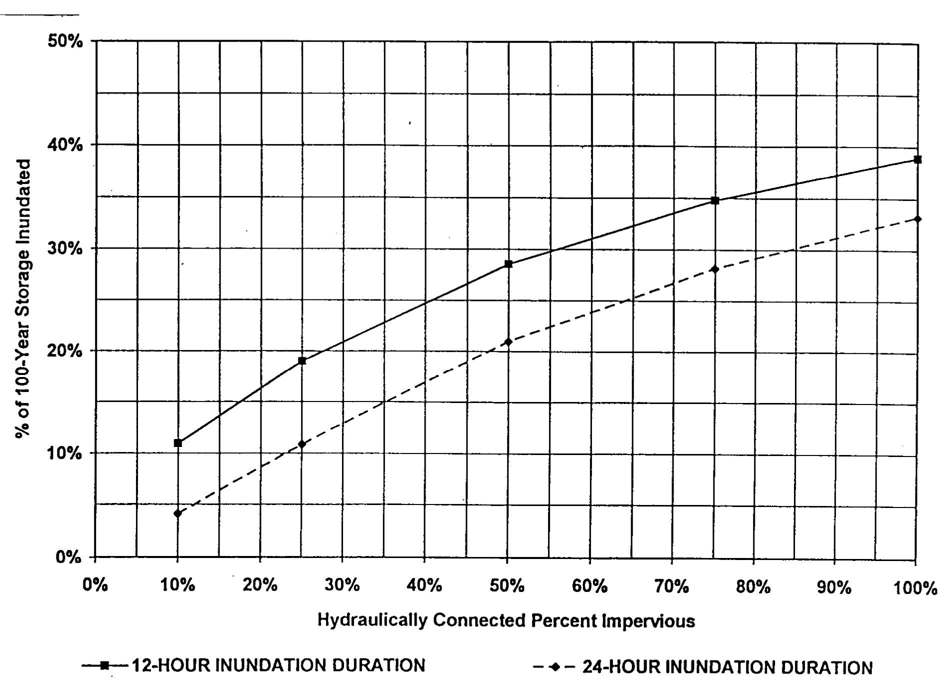
Inlet Control - In addition to the velocity dissipation measures relevant for all detention basins, inlet controls should be used to minimize re-suspension of previously settled pollutants. Wetland detention facilities can easily be designed to help accommodate this objective by installing stilling basins at each concentrated inlet point.

> *Stilling Basin* – stilling basins can used as pretreatment adjacent to existing wetlands or wetland detention facilities, in these locations a higher level of treatment is required than in locations designed primarily for velocity dissipation. Stilling basins for these locations need to be highly efficient in removing stormwater pollutants and provide some rate control. The stilling basin should be designed with a permanent pool volume equal 500 yd^3/ac of upstream impervious surface with a minimum permanent pool depth of 3-ft.

Side Slopes - If the upper area (typically above the 2- or 10-yr HWL) is to be used for more active uses, such as playing fields, there should be a distinct difference in elevation and approximately 5:1 slope between the upper and lower zones. If the upper area is to be used for more passive uses, such a natural area, a less distinct difference in elevation and a more gradual slope between the zones may be more desirable to simulate a more natural continuum.

Wetland Volume/Area Sizing - *Figure 3-o* shows the anticipated percentage of the 100-yr detention volume that will be inundated for at least 12- to 24-hr during a 2-yr event. The periods of inundation are based on the 0.15 cfs/ac 100-yr release rate and 0.04 cfs/ac 2-yr release rate. The indicated inundation volumes should also be reasonably representative of what would be expected for smaller release rates. The area of the basin with at least as much active storage volume as indicated by *Figure 3-o* (i.e., the volume that will be inundated for 12- to 24-hr) should be planted with native vegetation tolerant of prolonged inundation as further in this section.

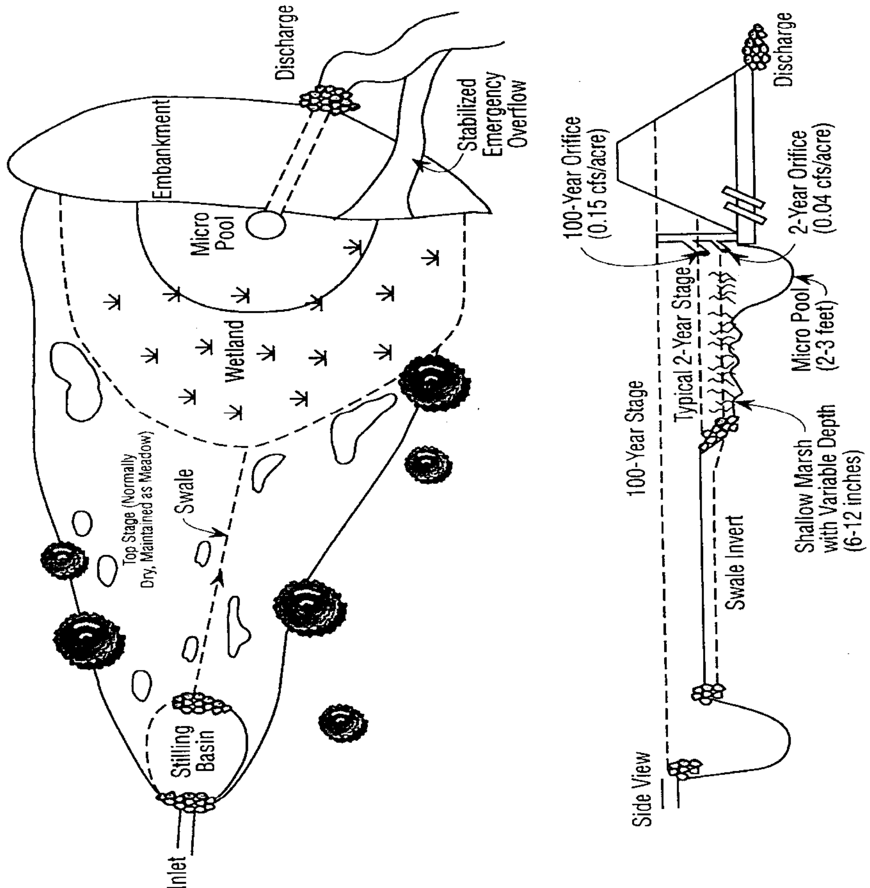
Wetland Schematics – Following are examples of different wetland detention facility layouts. As no design is exactly the same, these examples will help the designer to visualize the numerous possibilities. The basin needs to be tailored to best fit the proposed site layout. *Figure 3-p* is a schematic of a wetland detention basin with wetland covering a portion of the bottom of the basin. For lower impervious developments such as single family residential, this type of layout is possible. With higher impervious commercial and industrial developments however, the portion of the detention volume that will be inundated for extended periods will be sufficiently high that virtually the entire bottom of the basin will need to be planted with wetland vegetation. *Figure 3-q* shows the use of a berm to prevent short-circuiting. *Figure 3-r* shows several design configurations, the top figure includes an island and the bottom figure includes a meandering low flow path.



Source: NIPC

Detention Wetland Sizing

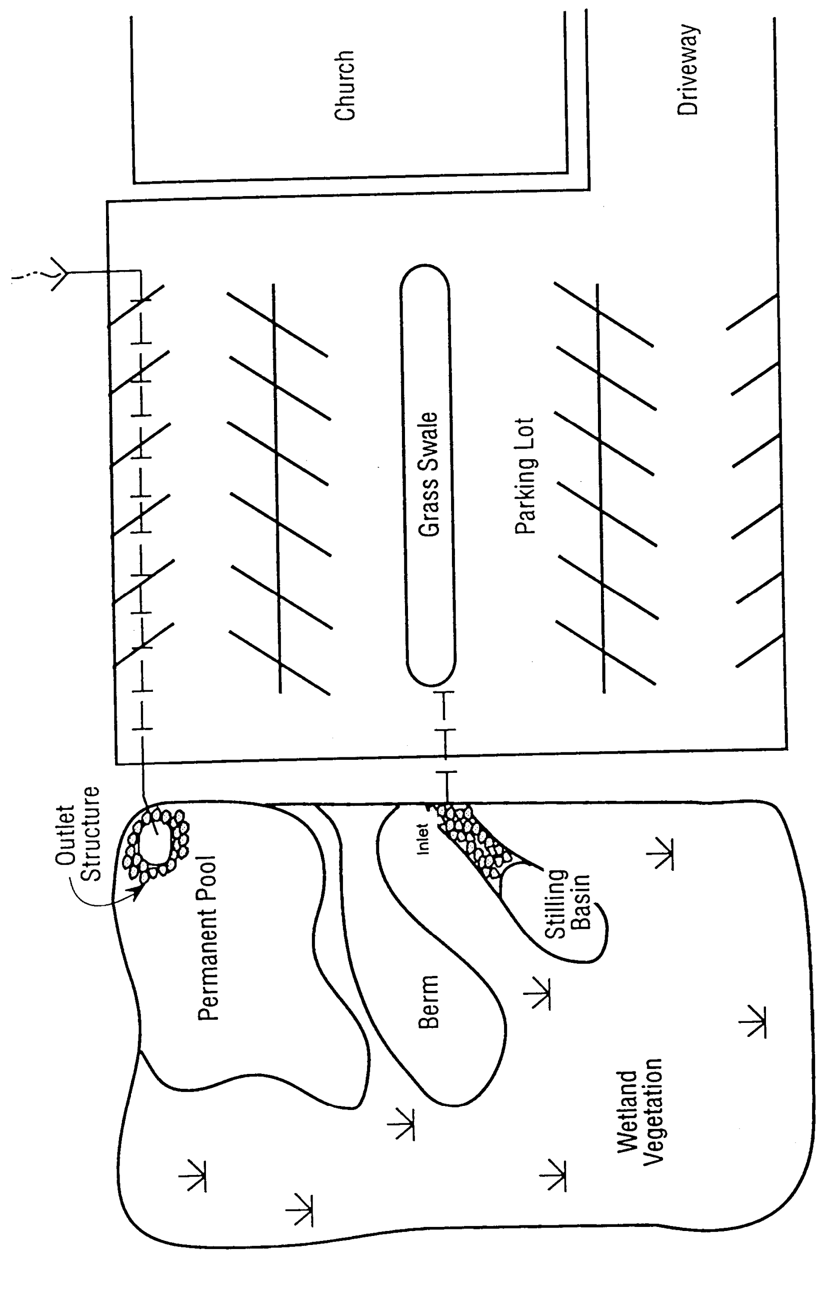
Figure 3-o



Source: NIPC

Typical Wetland Detention and Stilling Basin Layout

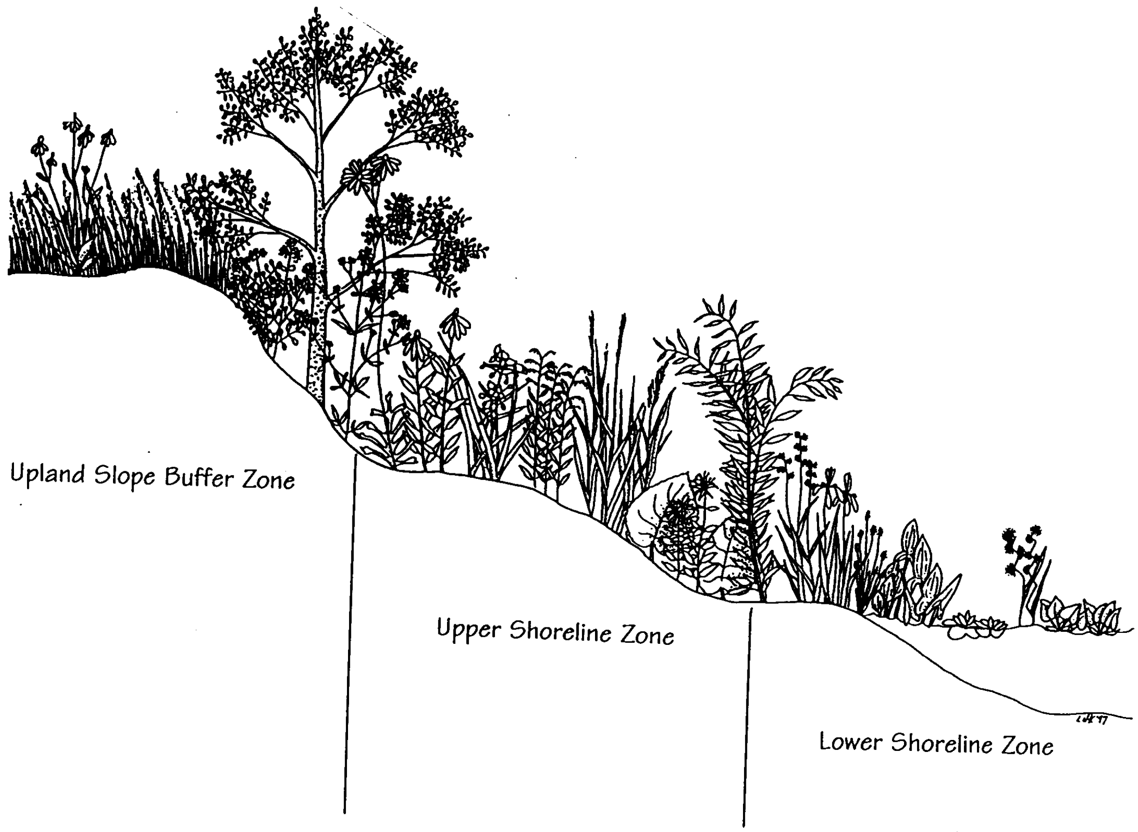
Figure 3-p



Source: NIPC

Detention Layout with Berm to Prevent Short Circuiting

Figure 3-q



Wetland Design Configurations

Figure 3-r

Construction of Wetland Detention Facilities - Soil preparation, plant selection, planting, and predation protection aspects of constructing wetlands within detention basins are discussed below. The discussions are applicable to both wet and wetland detention basins. While wet detention basins may contain mostly open water, a wetland fringe is recommended to prevent shoreline erosion, improve pollutant removal and aesthetics, and enhance aquatic and wildlife habitat.

Soil Preparation - Topsoil should be stripped and stockpiled prior to grading. Bottom grading that limits soil compaction to less than 275 psi is necessary to insure that wetland plants and seeds will survive in a new detention basin. Basins with a high degree of soil compaction or containing soils with a high clay content may have to be deep disced with a chisel plow. Heavy clay substrates can also be chemically amended to reduce this tendency for achieving a compacted condition that reduces plant growth success. Gypsum applied at 30 to 40 lb/1,000 ft^2 will loosen clay and assist work in maintaining a better plant medium. Topsoil is needed for the entire basin bottom and side slopes for wetland basins (except in deeper pools) and on and above the safety shelf for wet basins.

Hydric soils can be identified and classified by inspection of the soil colors, which are compared to a standardized soil color chart. In some cases, organic hydric soils may be recognized by their sulfurous smell, like rotten eggs, or by their greasy feel. Classification of wetland soils is generally by two types based on material composition: 1) mineral soil or 2) organic, or peat soil (also called histosol).

Wetland Area Grading - There are a number of options for grading the wetland portion of a wetland basin. Provided the basin includes a stilling basin to dissipate energy and an outlet pool to allow a submerged orifice, the bottom can be configured in virtually any manner that suits the aesthetic desires of the owner and designer. In general, bottom areas that are 0 to 1 foot deep will be vegetated with emergent wetland species. Areas greater than 1 to 2 feet deep will probably have open water. Two general design alternatives are:

- Grade the wetland bottom to provide a meandering flow path between the inlet and outlet. This can enhance pollutant removal.

- Grade the entire bottom in an irregular, non-uniform manner. Diversity and interspersion of depth zones will tend to result in greater diversity of plant species and potential for attracting birds and other wildlife.

Rough grading is sufficient for the bottom of shallow wetland areas, small depressions are preferred regardless of the flow path. The “microtopography” of small depressions increases the water holding capacity of the soil and increases the soil surface area for adsorption and microbial activity, which are the primary removal mechanisms for phosphorous, heavy metals, and some hydrocarbons.

Plant Selection - The number of plant species readily adaptable to the variable conditions found in detention basins is somewhat limited. Conditions such as high turbidity and sediment loading, large and frequent water level fluctuations, and high pollutant loads (especially winter deicing compounds) from impervious surfaces such as roof tops and roadways requires the use of plant species that tolerate a wide range of environmental conditions.

Wetland and prairie species native to northern Illinois and the upper Midwest are required. These species are conducive to the temperature and moisture conditions of the region and therefore are resistant to the wide range of conditions that can occur here. There have been instances in the past where non-native species have been introduced (e.g. reed canary grass) because of a perceived benefit. However, the benefits have been far outweighed by the invasive and aggressive nature of the species (such as purple loose strife) that has caused significant problems for high quality natural areas in the region. .

The Ordinance delegates the planting requirements in the detention areas to the Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois. This guide provides extensive information for each species appropriate for the different hydraulic conditions. The following information is described for each species:

- Growing Height
- Plant Type
- Indicator Status
- Preferred Soil pH Range
- Nutrient Load Tolerance
- Salt Tolerance
- Siltation Tolerance
- Flowering Characteristics
- Light Preference
- Seeding Rate
- Preferred Water Depth and Inundation Tolerance
- Wildlife Value
- Application/Zone Characteristics
- Availability, Establishment and Maintenance Characteristics

Table 3-j lists a number of native plant species that tolerate a wide variety of environmental conditions and also provide for pollutant removal and enhanced aesthetics. The table identifies appropriate species for different zones of the basin.

- <u>The lower shoreline zone species</u> in the emergent group of *Table 3-j* should be used from approximately 1 foot below to 1 foot above normal water level.

- <u>The upper shoreline zone species</u> in the saturated group should be used in those areas that will be inundated for at least 12- to 24 -hr during the two-year event as previously indicated by *Figure 3-r*.

- <u>The upland slope buffer zone species</u> should be used as an alternative to turf grass above those areas that will experience extended inundation beyond the 2-yr event.

Stormwater Detention Basins, Upper Shoreline Zone (Saturated)

SCIENTIFIC NAME	COMMON NAME
Alisma subcordatum	COMMON WATER PLANTAIN
Aster lanceolatus	PANICLED ASTER
Aster novae-angliae	NEW ENGLAND ASTER
Bidens cernua	NODDING BEGGARSTICKS
Bidens frondosa	COMMON BEGGARSTICKS
Calamagrostis canadensis	BLUE JOINT GRASS
Carex comosa	BRISTLY SEDGE
Carex cristatella	CRESTED OVAL SEDGE
Carex granularis	PALE SEDGE
Carex lanuginosa	WOOLY SEDGE
Carex stipata	AWL-FRUITED SEDGE
Carex vulpinoidea	FOX SEDGE
Celtis occidentalis	HACKBERRY
Cephalanthus occidentalis	COMMON BUTTONBUSH
Cornus racemosa	GRAY DOGWOOD
Cornus sericea	RED OSIER DOGWOOD
Cyperus esculentus	FIELD NUT SEDGE
Eleocharis obtusa	BLUNT SPIKE RUSH
Eleocharis smallii	CREEPING SPIKE RUSH
Elymus canadensis	NODDING WILD RYE
Elymus virginicus	VIRGINIA WILD RYE
Eupatorium maculatum	SPOTTED JOE PYE WEED
Eupatorium perfoliatum	COMMON BONESET
Glyceria striata	FOWL MANNA GRASS
Helenium autumnale	COMMON SNEEZEWEED
Helianthus grosseserratus	SAWTOOTH SUNFLOWER
Juncus effusus	COMMON RUSH
Juncus torreyi	TORREY'S RUSH
Leersia oryzoides	RICE CUT GRASS
Pycnanthemum virginianum	COMMON MOUNTAIN MINT
Quercus bicolor	SWAMP WHITE OAK
Salix amygdaloides	PEACHLEAF WILLOW
Salix nigra	BLACK WILLOW
Solidago gigantea	LATE GOLDENROD
Spartina pectinata	PRAIRIE CORDGRASS
Verbena hastata	BLUE VERVAIN
Vernonia fasciculata	COMMON IRON WEED
Viburnum lentago	NANNYBERRY

Stormwater Detention Basins, Lower Shoreline Zone (Emergent)

SCIENTIFIC NAME	COMMON NAME
Acorus calamus	SWEET FLAG
Alisma subcordatum	COMMON WATER PLANTAIN
Cephalanthus occidentalis	COMMON BUTTONBUSH
Cyperus esculentus	FIELD NUT SEDGE
Iris virginica	BLUE FLAG IRIS
Juncus effusus	COMMON RUSH
Polygonum amphibium	WATER SMARTWEED
Sagittaria latifolia	BROADLEAF ARROWHEAD
Scirpus acutus	HARDSTEM BULRUSH
Scirpus americanus	CHAIRMAKER'S RUSH
Scirpus fluviatilis	RIVER BULRUSH
Scirpus tabernaemontani	SOFT-STEM BULRUSH
Sparganium eurycarpum	COMMON BURREED

Upland Slope Buffers- Stormwater Ponds & Streambanks

SCIENTIFIC NAME	COMMON NAME
Andropogon gerardii	BIG BLUESTEM
Aster laevis	SMOOTH BLUE ASTER
Aster lanceolatus	PANICLED ASTER
Aster novae-angliae	NEW ENGLAND ASTER
Bidens frondosa	COMMON BEGGARSTICKS
Bouteloua curtipendula	SIDE-OATS GRAMA
Celtis occidentalis	HACKBERRY
Coreopsis tripteris	TALL COREOPSIS
Cornus racemosa	GRAY DOGWOOD
Cornus sericea	RED OSIER DOGWOOD
Elymus canadensis	NODDING WILD RYE
Elymus virginicus	VIRGINIA WILD RYE
Fraxinus pennsylvanica	GREEN ASH
Monarda fistulosa	WILD BERGAMOT
Panicum virgatum	SWITCH GRASS
Petalostemum purpureum	PURPLE PRAIRIE CLOVER
Pycnanthemum virginianum	COMMON MOUNTAIN MINT
Quercus bicolor	SWAMP WHITE OAK
Quercus macrocarpa	BUR OAK
Quercus palustris	PIN OAK
Ratibida pinnata	YELLOW CONE FLOWER
Rudbeckia hirta	BLACK-EYED SUSAN
Schizachyrium scoparium	LITTLE BLUESTEM
Silphium laciniatum	COMPASS PLANT
Silphium terebinthinaceum	PRAIRIE DOCK
Solidago rigida	STIFF GOLDENROD
Sorghastrum nutans	INDIAN GRASS
Spartina pectinata	PRAIRIE CORDGRASS
Tradescantia ohiensis	SPIDERWORT
Vernonia fasciculata	COMMON IRON WEED
Viburnum dentatum lucidum	ARROW WOOD VIBURNUM
Viburnum lentago	NANNYBERRY

Source: Native Plant Guide for Northeastern Illinois

Native Plant Guide List

Table 3-j