# KANE COUNTY

Rudd, Young, Feltman, Podraza, Wallers, Slowinski, Bardol, Wills, Olsem, Culp, Lobbes, Huddleston- Ag Chair

Non-Voting: Wilford, Finke, Custic, Polzin

## STORMWATER MANAGEMENT TECHNICAL ADVISORY COMMITTEE

## APRIL 4, 2018

**Auditorium** **Agenda** **12:00 PM**

**Kane County Government Center, 719 S. Batavia Ave., Bldg. A, Geneva, IL 60134**

1. **Call to Order**
2. **Approval of Minutes:** February 28, 2108
3. **Public Comments**
4. **Introduction: New Project Staff - ERA**
5. **Discussion:**
   A. Wetlands/Buffers
   B Best Management Practices
6. **New Business**
   A. TAC Updated Meeting Schedule
7. **Adjournment**

ENGINEERING
RESOURCE ASSOCIATES

ENGINEERS | SCIENTISTS | SURVEYORS

**April 4, 2018**

# Recommendations

## continued Wetlands/Buffers and Best Management Practices

**I. Overview:**

*The wetland topics not discussed at last month's meeting are being continued for discussion. Also, ERA has provided TAC with additional background and research on the topics that were tabled at last month's meeting. Also, ERA has provided topics for Best Management Practice discussion.*

**II. Objectives:**

*To obtain a consensus from TAC on the direction for the following:*

- *A. Wetland/Buffer Topics*
  - *a. Definitions*
  - *b. Mitigation to be local*
  - *c. Threatened and Endangered Species Consultation*
  - *d. Wetland Preservation During Development*
  - *e. Buffer Requirements*
  - *f. Qualified Review Specialist*
  - *g. Wetland Impacts and Mitigation*
- *B. Begin discussing the current NPDES and Ordinance requirements for Best Management Practices and how other Counties have incorporated these requirements.*

** The details and ordinance language will be discussed with TAC during future phases of this project.*

**III. Topics**

**A. Wetland/Buffer Topics –** See Table A for comparison of surrounding counties and USACE.

1. <u>Wetland Impact Definition/Indirect Impact</u>

   *Current Ordinance:*

   a. A Wetland Impact is defined as:
      i. The dredging or filling of any wetland having an FQI greater than twenty-five (25); or
      ii. The dredging or filling of any other wetland if:
         1. The effect would be that cumulatively, since the effective date hereof, 0.10 acre (4,356 square feet) or more of the wetlands on the site have been dredged or filled; and
         2. Such wetland is not then regulated by USACE; or
         3. Such dredging or filling is not an approved impact under a conservation plan administered by any federal agency under the food security act, as amended (16 USC section 3801 et seq.).

   b. Indirect Impacts are regulated by Section 9-93: Wetland Preservation During Development: Preserved wetlands shall be protected during development such that an FQI calculated two (2) years after the commencement of development will not be more than two (2) points less than

the FQI originally calculated. The developer shall mitigate for any wetland not so preserved at the ratio required for the FQI originally calculated.

*Background:* The Certified Communities that enforce Article 15 are struggling to get Developers to comply with this requirement. A development may have been turned over to a Homeowners Association, community or sold before an impact has been determined making it extremely difficult to require the developer to mitigate the impact in the event that the FQI were to decrease by 2 points. Additionally, the FQI can differ from year to year depending on the botanist that does the inventory, abnormally wet or dry conditions, and other contributing factors.

*Suggested Change:* Revise the Wetland Impact definition to include indirect impacts. The designed hydrology should be maintained as close to 100 percent of the existing hydrology as possible. An indirect wetland impact shall be assumed if the development activity causes the wetland hydrology to fall below 80 percent, or to exceed 150 percent (80/150 rule), of the existing condition storm event runoff volume to the wetland for the 2-year, 24-hour storm event. This is Lake County's requirement. Lake County has studied this requirement for several developments since 2003. That study can be found here: www.lakecountyil.gov/documentcenter/view/3178. (See Example Calculations from a Presentation by Lake County attached slides 4-11. Other examples to be presented.)

2. Mitigation to be Local –
*Current Ordinance:* All wetland mitigation required under a USACE section 404 permit for wetland disturbances in the county shall be provided in the County. All wetland mitigation required under this chapter for wetland impacts in the County shall be provided in the County. All wetland mitigation required under this chapter for wetland impacts in any other county may be provided in such county or in this County.

*Background:* The County recognizes that wetlands are a valuable resource to Kane County and each major watershed. Allowing mitigation outside Kane County represents a loss of the benefits that wetlands provide. However, currently there are no wetland mitigation banks within the County in the Kishwaukee River watershed. Allowing mitigation for impacts within the Kishwaukee River watershed outside of the County allows communities inside that watershed to continue to realize the benefits the wetland provided while allowing the Director the ability to approve banking outside the County without a variance. To avoid double mitigation requirements, mitigation for wetland disturbances required under a USACE section 404 permit may be allowed outside the County within a USACE approved bank with available credits in the event that a USACE approved bank with available credits isn't available within the County at the time of approval.

*Suggested Change:* All mitigation for wetland disturbances required under a USACE section 404 permit or wetland mitigation required under this chapter in the County shall be provided within the same major watershed as the impact (Fox River or Kishwaukee River) in the County. In the event that a wetland mitigation bank does not have credits available within the same watershed within the County the Director can approve banking outside of the County within the same watershed.

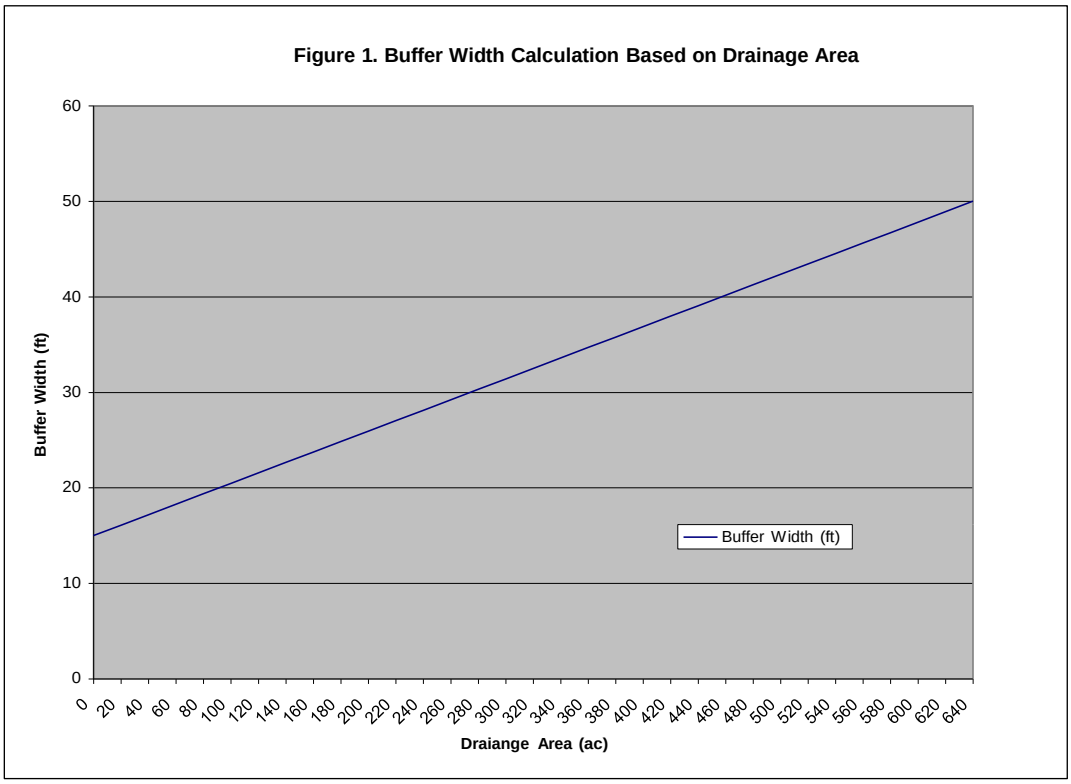
a. Example Mitigation Hierarchy – All mitigation for wetland disturbances required under a USACE section 404 permit or wetland mitigation required under this Ordinance shall be within this County unless:
    i. Wetland mitigation is required for wetland impacts in any other county, mitigation may be provided in such county or in this County;
    ii. Wetland mitigation bank credits are not available within the same watershed as the impact in this County, mitigation through the purchase of credits from a wetland mitigation bank outside the County within the same major watershed as the impact (Fox River or Kishwaukee River shall be allowable upon approval by the Director;
    iii. Mitigation required under a USACE section 404 permit that must occur within a USACE approved bank and credits within a USACE approved bank are not available within the County at the time of the approval, mitigation outside the County shall be allowable upon approval by the Director.
    iv. All other wetland mitigation shall be provided through one of the following options:
        1. On-site mitigation meeting the Wetland Mitigation Plan Requirements (see section 9-355 of the Ordinance);
        2. Off-site mitigation meeting the Wetland Mitigation Plan Requirements (see section 9-355 of the Ordinance) within the same major watershed as the impact (Fox River or Kishwaukee River) within this County;
        3. Mitigation through the purchase of credits from a wetland mitigation bank within the same major watershed as the impact (Fox River or Kishwaukee River) within this County; or
        4. Mitigation in the County by the payment of a fee in lieu of mitigation under Sections 303 and 304 of this Ordinance.

3. <u>Threatened and Endangered Species Consultation</u> – This section states, “Prior to the issuance of a stormwater management permit the applicant shall consult with IDNR and the United States Fish and Wildlife Service (USFWS) with respect to the presence of threatened or endangered species and shall obtain a "positive outcome" letter or other instrument of approval.”
    a. Update to reflect the current IDNR consultation process. IDNR provides consultation through their EcoCAT program. They charge a $500 fee for this unless the consultations by State or Federal Government (i.e. NOI, etc).
    b. Update to include current USFWS Section 7 requirements. An evaluation of the wetland completed in accordance with the current U.S. Fish and Wildlife Service review procedure.
4. <u>Wetland Preservation During Development</u> – See A.1.b above.
5. <u>Buffer Requirements</u>
    a. Linear Buffers
    *Current Ordinance:* The requirements of this section are not applicable to isolated wetlands or waters of the U.S. that are below the threshold size limitations for mitigation requirements under the USACE section 404 permit program (currently, less than 0.10 acre). Buffer widths required as a part of a USACE permit supersede the widths required in this section, unless the

width required herein is greater. Buffer widths are to be fifty feet (50') wide unless otherwise determined using the criteria specified below.

i. Linear buffers shall be designated along waters of the U.S. and wetlands associated with watercourses, i.e., swales, creeks, streams, rivers, etc. Refer to water body buffers in cases where wetlands are adjacent to and not part of the main channel, i.e., floodplain wetland, backwater slough, oxbow, bordering wetland complex.

1. When the lineal waters of the U.S. have a drainage area greater than six hundred forty (640) acres, measured at the downstream property line, or are designated as ADID because of high habitat value or an adjacent wetland has a calculated FQI greater than sixteen (16), the buffer shall be fifty feet (50'). Note: this does not apply to redevelopments on the main channel of the Fox River.
2. When the lineal waters of the U.S. have a drainage area less than six hundred forty (640) acres, measured at the downstream property line, the buffer width shall be determined utilizing the formula, X = (A * 0.0547) + 15, where "X" equals the buffer width in feet and "A" equals the drainage area in acres. The width calculated by this formula shall be rounded up to the nearest multiple of five (5). Figure 1 of this section may be used to determine buffer widths provided the resultant width is increased to the nearest multiple of five (5)." The current Table is below in Figure 1.




*Background:* The State of Illinois has adopted water quality standards to protect public health or welfare, enhance the quality of water, and serve the purposes of the Clean Water Act. The States water quality standards should:

- provide, wherever attainable, water quality for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water ("fishable/swimmable"), and

- consider the use and value of State waters for public water supplies, propagation of fish and wildlife, recreation, agriculture and industrial purposes, and navigation.

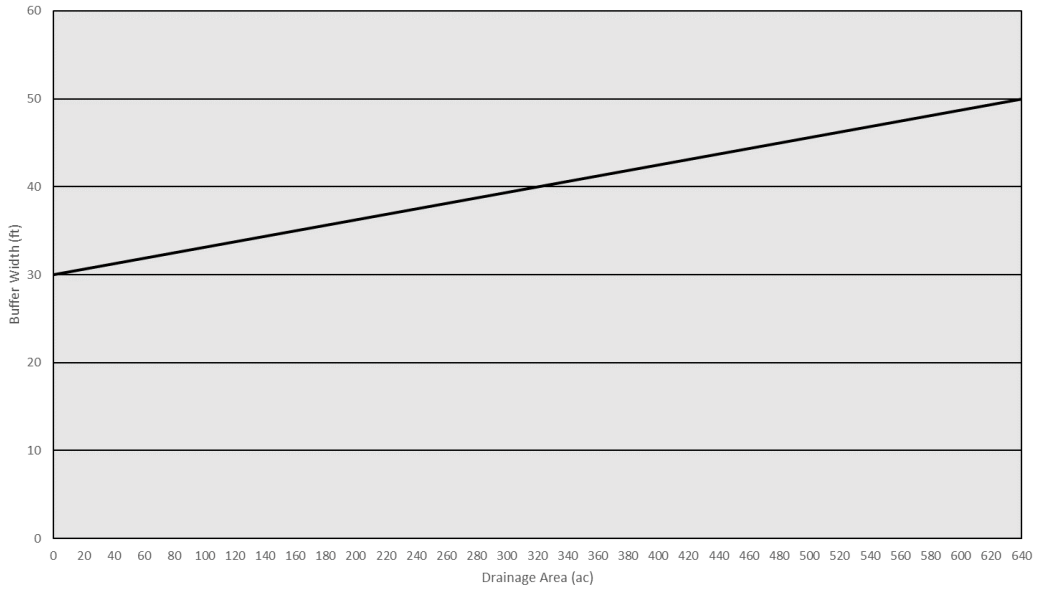
The State carries out regular appraisals of waterways with the purpose of determining compliance with the goals of the Clean Water Act. These appraisals are used to guide the NPDES permit updates for area Publicly Owned Treatment Works (POTWs) and will likely be used increasingly for NPDES Phase II permits. Many of assessed waterways in Kane County are not in compliance with the aquatic life designated use. Continued failure to meet the aquatic life use goal will likely lead to increased and more costly permit requirements for public agencies.

Research (see attached) indicates that the buffer width for nutrient retention should be between 5-30 meters (16.4-98 feet); while the effective buffer width for protection of aquatic wildlife and stream temperature is between 10-30 meters (33-98 feet).

Research indicates that buffering low order streams has greater positive influence on water quality than wider buffers on portions of larger order streams already carrying polluted water. Failure to protect to the smaller headwater streams ignores important sources of sedimentation and pollution. The USACE requires a 50-foot buffer for Waters of the U.S. and most other collar counties require between 30 and 50 feet.

*Suggested Change:* We recommend increasing the minimum buffer of 15 feet to at least 30 feet for linear water bodies with less than 640 acres of tributary area. If 30 feet is the desired width the new equation would be:
*X = (A * 0.03125) + 30.* See revised Table Below in Figure 2:

Figure 2. Buffer Width Calculation Based on Draingage Area




We also recommend considering a 100’ buffer for streams rated A or B for Diversity or Integrity, or mapped as Biologically Significant: as described in the Integrating Multiple Taxa in a

Biological Stream Rating System published by the Illinois Department of Natural Resources. These include: Tyler Creek, Ferson Creek, Little Rock Creek, Big Rock Creek, Welch Creek, Mill Creek, and Blackberry Creek. This is consistent with the USACE requirement of a 100 foot buffer for High Quality Aquatic Resources.

*Recommendation Summary:*

- 100 feet for Streams rated A or B for Diversity or Integrity or mapped as Biologically Significant
- 50 feet for streams with a tributary area greater than 640 acres, and
- 30-50 feet for streams with a tributary area less than 640 acres.
- Buffer averaging, and all other requirements of this section will still be applicable.

b. Water Body Buffers

*Current Ordinance:* The requirements of this section are not applicable to isolated wetlands or waters of the U.S. that are below the threshold size limitations for mitigation requirements under the USACE section 404 permit program (currently, less than 0.10 acre). Buffer widths required as a part of a USACE permit supersede the widths required in this section, unless the width required herein is greater. Buffer widths are to be fifty feet (50') wide unless otherwise determined using the criteria specified below.

i. Water body buffers shall encompass nonlineal bodies of water meeting the definition of waters of the U.S., including wetlands.
   1. If protective measures are installed along the perimeter of a buffer, the width may be reduced by up to ten percent (10%) immediately adjacent to the protective measure. The reduction in width that may be applied due to installation of protective measures may not be applied where buffer width averaging has been used and the buffer would be more than twenty percent (20%) less than originally specified. Protective measures may consist of fencing, sediment basins, biological filter strips or other methods approved by the administrator.
   2. For all nonlineal water bodies or wetlands with an FQI greater than sixteen (16), a minimum buffer width must be established in accordance with table 9-94A of this section.
   3. For wetlands with an FQI of seven (7) to sixteen (16) a minimum buffer width must be established in accordance with table 9-94B of this section.
   4. For wetlands with an FQI of less than seven (7) a minimum buffer width must be established in accordance with table 9-94C of this section.

These tables are provided below:

HIGH QUALITY WETLANDS - FQI>16

| Buffer Ratio | Wetland Area (Acres) | Buffer Area (Acres) | Buffer Width (Feet) |
|---|---|---|---|
| 0.5 | 0.10 | 0.050 | 15.0 |
| 0.5 | 0.25 | 0.125 | 15.0 |

| | | | |
|---|---|---|---|
| 0.5 | 0.50 | 0.250 | 20.0 |
| 0.5 | 0.75 | 0.375 | 25.0 |
| 0.5 | 1.00 | 0.500 | 30.0 |
| 0.5 | 1.25 | 0.625 | 30.0 |
| 0.5 | 1.50 | 0.750 | 35.0 |
| 0.5 | 1.75 | 0.875 | 35.0 |
| 0.5 | 2.00 | 1.000 | 40.0 |
| 0.5 | 2.25 | 1.125 | 40.0 |
| 0.5 | 2.50 | 1.250 | 45.0 |
| 0.5 | 2.75 | 1.375 | 45.0 |
| 0.5 | 3.00 | 1.500 | 50.0 |
| 0.5 | 3.25 | 1.625 | 50.0 |
| 0.5 | 3.50 | 1.750 | 50.0 |
| 0.5 | 3.75 | 1.875 | 50.0 |
| 0.5 | 4.00 | 2.000 | 50.0 |
| 0.5 | 4.25 | 2.125 | 50.0 |
| 0.5 | 4.50 | 2.250 | 50.0 |
| 0.5 | 4.75 | 2.375 | 50.0 |
| 0.5 | 5.00 or more | 2.500 | 50.0 |

MEDIUM QUALITY WETLANDS - 7.FQI.16

| Buffer Ratio | Wetland Area (Acres) | Buffer Area (Acres) | Buffer Width (Feet) |
|---|---|---|---|
| 0.4 | 0.10 | 0.04 | 15.0 |
| 0.4 | 0.25 | 0.10 | 15.0 |
| 0.4 | 0.50 | 0.20 | 15.0 |
| 0.4 | 0.75 | 0.30 | 20.0 |
| 0.4 | 1.00 | 0.40 | 25.0 |
| 0.4 | 1.25 | 0.50 | 25.0 |
| 0.4 | 1.50 | 0.60 | 30.0 |
| 0.4 | 1.75 | 0.70 | 30.0 |
| 0.4 | 2.00 | 0.80 | 30.0 |
| 0.4 | 2.25 | 0.90 | 35.0 |
| 0.4 | 2.50 | 1.00 | 35.0 |
| 0.4 | 2.75 | 1.10 | 35.0 |
| 0.4 | 3.00 | 1.20 | 40.0 |
| 0.4 | 3.25 | 1.30 | 40.0 |
| 0.4 | 3.50 | 1.40 | 40.0 |
| 0.4 | 3.75 | 1.50 | 45.0 |
| 0.4 | 4.00 | 1.60 | 45.0 |
| 0.4 | 4.25 | 1.70 | 45.0 |

| | | | |
|---|---|---|---|
| 0.4 | 4.50 | 1.80 | 45.0 |
| 0.4 | 4.75 | 1.90 | 50.0 |
| 0.4 | 5.00 or more | 2.00 | 50.0 |

LOW QUALITY WETLANDS - FQI<7

| Buffer Ratio | Wetland Area (Acres) | Buffer Area (Acres) | Buffer Width (Feet) |
|---|---|---|---|
| 0.3 | 0.10 | 0.030 | 15.0 |
| 0.3 | 0.25 | 0.075 | 15.0 |
| 0.3 | 0.50 | 0.150 | 15.0 |
| 0.3 | 0.75 | 0.225 | 15.0 |
| 0.3 | 1.00 | 0.300 | 20.0 |
| 0.3 | 1.25 | 0.375 | 20.0 |
| 0.3 | 1.50 | 0.450 | 20.0 |
| 0.3 | 1.75 | 0.525 | 25.0 |
| 0.3 | 2.00 | 0.600 | 25.0 |
| 0.3 | 2.25 | 0.675 | 25.0 |
| 0.3 | 2.50 | 0.750 | 25.0 |
| 0.3 | 2.75 | 0.825 | 30.0 |
| 0.3 | 3.00 | 0.900 | 30.0 |
| 0.3 | 3.25 | 0.975 | 30.0 |
| 0.3 | 3.50 | 1.050 | 30.0 |
| 0.3 | 3.75 | 1.125 | 35.0 |
| 0.3 | 4.00 | 1.200 | 35.0 |
| 0.3 | 4.25 | 1.275 | 35.0 |
| 0.3 | 4.50 | 1.350 | 35.0 |
| 0.3 | 4.75 | 1.425 | 35.0 |
| 0.3 | 5.00 or more | 1.500 | 35.0 |

| | | |
|---|---|---|
| Buffer ratio | = | Percent of total wetland area |
| Wetland area | = | Total on and off site area of the wetland = (% * Acres) |
| Buffer width | = | [(Area * 43560) / 4] / [Sqrt(Acres * 43560)] |

*Suggested Changes*:

5. The High Quality Wetland Table currently allows for a buffer between 15’ and 30’. Consider changing the table to FQI > 16 < 20 with a minimum width of 30’ and a max width of 50’.

6. The current standard for wetlands with an FQI greater than 25 the buffer width is 50 feet per 9-94.A.3. However, wetlands with an FQI greater than 20 are considered High Quality Aquatic Resources by the USACE and a 100 foot buffer is required. Most other collar counties require a 100 foot buffer for high quality wetlands. Consider changing the buffer width for wetlands that are considered a High Quality Aquatic Resource or those with a FQI greater than 20 to 100 feet.

*Recommendation Summary*:

- Low Quality Wetlands FQI < 7, buffer 15-35 feet
- Medium Quality Wetlands 7 > FQI < 16, buffer 15-50 feet
- High Quality Wetland 16 > FQI < 20, buffer 30-50 feet
- High Quality Aquatic Resource Wetlands, 100 feet
- Buffer averaging, and all other requirements of this section will still be applicable.

c. Exemptions: The following are exempt from buffer requirements provided they do not meet the definition of "waters of the U.S.":
   i. Roadside drainage ditches;
   ii. Channels;
   iii. Conveyance systems between site runoff storage facilities;
   iv. Excavated site runoff storage facilities, compensatory storage and sediment basins;
   v. Roadway crossings and their associated installations;
   vi. Downspout and sump pump discharge; and
   vii. Constructed stormwater management facilities.

   Consider removing this section. Clarification to the wetland delineation section as to what qualifies as a wetland discussed during the February TAC meeting will eliminate the need for this.

d. Free from Development - The current standard allows path up to 10' wide. Consider allowing paths up to 14' wide. This is the widest path requirement per the latest version of AASHTO Guide for Development of Bicycle Facilities.

6. Qualified Review Specialist – The Society of Wetland Scientists has a Professional Certification Program that many wetland professionals have gotten certification through. Consider including Professional Wetland Scientists as meeting the requirements to become a Qualified Wetland Review Specialist.
7. Wetland Impacts and Mitigation – This article is currently separated from the previously discussed wetland requirements. Consider moving this section to Article 9.
   a. General – Consider removing fees from this section. Relocate to an Appendix. This allows municipalities to adopt their own fees.
   b. Unmitigable Wetlands: Current standard states, "Wetlands identified as having an FQI greater than or equal to twenty five (25) shall not be filled or dredged as part of any development. The FQI shall be based solely on the wetland vegetation. Buffers and adjacent plant communities shall not be included in the calculation." Consider revising this to state impacted (not filled or dredged).

c. Mitigation Required – the current standard states, "All mitigable wetland impacts shall be mitigated as described herein with the following exceptions:
   A. A wetland impact created by the *dredging* of a wetland with an FQI of less than seven (7) need not be mitigated.
   B. A wetland impact upon manmade wetlands created by excavation or other unfinished development activities in previously nonwetlands areas need not be mitigated.
   C. Wetland impacts upon wetlands created by irrigation which would revert to nonwetlands areas if irrigation were to cease need not be mitigated.
   D. Wetland impacts upon wetlands created by the construction of manmade stormwater management facilities in previously nonwetlands areas need not be mitigated. Proof may be required to verify the purpose and use of the facility.
   E. Wetland impacts created by the construction of manmade ponds in previously nonwetlands areas need not be mitigated.
   F. Wetland impacts occurring on agricultural land that has been enrolled in any program under the food security act for the previous three (3) years need not be mitigated."

   Consider deleting B-E if those areas are added to the Requirements for Wetland Delineation Section as non-wetland. This was discussed at February TAC meeting. These items will be added to the wetland delineation section.

d. Mitigation Requirements –
   i. Letter A should be revised to be the Mitigation Hierarchy discussed above.
   ii. Letter E of this section currently states, "Wetland impacts upon wetlands with an FQI of more than twenty five (25) shall be mitigated at a minimum ratio of ten to one (10:1) plus one-half (1/2) for each point by which the FQI exceeds twenty five (25) rounded up to the nearest whole number. For example, a wetland having an FQI of thirty two (32) shall be mitigated at a ratio of fourteen to one (14:1) ((32-25)/2 = 31/2 rounded up to the nearest whole number = 4); 10 + 4 = 14." Consider removing the example from E as it is guidance.

e. Wetland Mitigation Performance Standards – The standards currently state, "A wetland mitigation facility shall not be dominated or contain cumulatively more than twenty five percent (25%) cover of the following species: buckthorn (Rhamnus cathartica or frangula), reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), or giant reed (*Phragmites australis australii*)." Consider including "non-native invasive species, including but not limited to" as the species listed are not an all inclusive list and other species should be included. As new invasive species are constantly changing the standard should reflect that.

**B. Best Management Practices –** See Table below for comparison of surrounding counties and NPDES.
*Current Ordinance:* Currently Kane County requires BMPs through the Site Runoff Storage Requirements (Detention) - Hydraulically Connected Impervious Area section. The ordinance states that, "The runoff from a 0.75 inch rainfall event over the hydraulically connected impervious area of the new development shall be stored below the elevation of the primary gravity outlet (retention) of the site runoff storage facility. The facility may be designed to allow for evapotranspiration or infiltration of this volume into a

subsurface drainage system and shall not be conveyed through a direct positive connection to downstream areas. Wherever the retention depth is less than three feet (3') the retention facility shall be constructed by over excavating the required retention volume by one foot (1') and replacing such volume with one foot (1') of topsoil suitable for growing wetland plants." The ordinance also allows for use of BMPs in lieu of detention. Permeable pavements as well as rain gardens and rain garden infiltration trench systems receive credit for their effectiveness in reducing site runoff.

*Background:*
Research has indicated that the 90th percentile, and often the 95th percentile, storm contains the vast majority of pollutants. This storm also represents the amount of water that would be retained onsite prior to development. The 90th or 95th percentile rainfall events represent a precipitation amount which 90 or 95 percent of all rainfall events for the period of record do not exceed. For further information regarding this please go to the following links:
90th percentile recommendation:
https://nepis.epa.gov/EPA/html/DLwait.htm?url=/Exe/ZyPDF.cgi/P1002OLQ.PDF?Dockey=P1002OLQ.PDF
95th percentile recommendation:
https://www.epa.gov/sites/production/files/2015-08/.../epa_swm_guidance.pdf

Post Construction BMPs are required for developments with disturbance greater than 1 acre by NPDES ILR40. The Illinois Post Development Stormwater Runoff Performance Standards Workgroup recommended that sites disturbing 1 acre of ground or more must either demonstrate no net increase in runoff due to the development or retain runoff from a 1 inch 24 hour storm event for development sites and 0.8 inch 24 hour for redevelopment sites in 2013. The Workgroup recommended implementation of post-development stormwater management requirements through NPDES permits - Stormwater Discharges from Construction Sites (ILR10) and Municipal Separate Storm Sewer Systems (MS4) by updating ordinances and in reviewing site construction plans & site inspections. To date their recommendations have not been implemented but may be in future changes to NPDES permit requirements. A link to a presentation summarizing their recommendations may be found here:
www.aiswcd.org/wp-content/.../1_IL-Workgroup-Stormwater-Performance-Stds.pdf

All of the collar counties require Volume and Water Quality BMPs (See Attached).

*Suggested Changes:*
- Better define BMPs - A measure used to control the adverse stormwater related effects of development (example practices include, but are not limited to: swales, filter strips, infiltration trenches, rain garden, permeable pavements and site runoff storage basins), designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitats.
- Define the runoff depth for which we want to retain or treat runoff (0.75", 1.0", 1.25", etc.). Lake County provides a Table that provides the Runoff Volume Reduction quantity (ft3/ac). This method may be a quick way to determine the volume that is required to be stored or treated. (see attached Appendix O: Runoff Volume Reduction)

- Require BMPs for developments over a certain number of square feet. Example thresholds should be discussed.
- Recognize that there are numerous areas in the County that do not infiltrate well. The NRCS is currently mapping areas where it would be feasible to construct infiltration based BMPs. Areas that do not infiltrate well should continue to be encouraged to provide water quality treatment through detention based or flow through practices (swales, filter strips, ect.)
- In areas where infiltration is not possible or recommended (gas stations, areas with seasonally high ground water, etc.) allow to the developer to pay a Fee-In-Lieu of constructing BMPs.
- Continue to allow quantifiable volume provided by BMPs in lieu of site runoff storage.

## A. REFERENCE

### Table A - Current County Ordinance Wetland & Buffer comparison:

| Ordinance Require-ments / County | Regulated Wetlands Jurisdictional (Jur.) Isolated (Iso.) | | Corps Wetland Determination (Det.) & Permit Review Delegation (Rev.) | | Wetland Classification High Quality Regulatory (Reg.) | | Mitigation Ratio High Quality Regulatory (Reg.) | | | Wetland Buffers Linear (Lin.) Water Body (WB) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | High Quality | | Regulatory | |
| | Jur. | Iso. | Det. | Rev. | High Quality | Reg. | Impact Threshold | High Quality | Reg. | Lin | WB | Lin | WB |
| DuPage | x | x | | $x_1$ | FQI>25 MDNR>5 HQAR | FQI<25 MDNR<5 | 0.1ac | 3:1 | 1.5:1 | 100ft | | Limits of Regulatory flood plain or Trib area < 100 ac = 15' Trib area > 100 ac = BFE study | 50ft |
| Kane | x | x | | | FQI > 16 ADID HQAR IBI | FQI<16 | 0.1ac[2] | FQI >16 3:1 FQI >25+ 10:1+ | 7<FQI<16 2:1 FQI <7 1:1[2] | 50ft | 50ft | Trib area >640ac, 15-50ft[3] Trib area >640ac, 50' | FQI<7, 15-35ft FQI>7<16, 15-50ft FQI>16, 15-50ft FQI>16, 50ft |
| Lake | x | x | $x_4$ | | HQAR ADID IBI>40 | All Others | 0.1ac | HQAR 3:1 ADID/ Forested 6:1 | 1.5:1[5] | 100ft | | Tributary >1mi$^2$ 30ft <1mi$^2$ 50ft | ⅓<X<1ac,30ft 1<X<2 ½ac, 40ft >2½ ac, 50ft |
| McHenry | x | x | | | HQAR HFVW HQHS | All Others | 0.1ac | HFVW 3:1[6] HQAR/HQHS 5:1[6] | 1.5:1[7] | 100ft | | Tributary >20acres 50ft | .25ac<X<.5ac, 30ft X>.5 ac, 50ft |
| Cook | x | x | | | FQI>20 C-val>3.5 HQAR | All Others | 0.1 | 3:1 | 1.5:1 | 100ft | 100ft | Isolated 30ft Jurisdictional 50ft | .1ac<X<.5ac, 30ft X>.5ac, 50ft |
| USACE | x | | | | HQAR HQHS | All Others | 0.1 | 1.5:1[8] | 1.5:1[8] | 100ft | 100ft | 50ft[9] | .25<X<.5 30ft X>.5 50ft |

1. DuPage County reviews impacts to jurisdictional wetlands under GP25.
2. Mitigation is not required for dredging a wetland with an FQI less than 7.
3. When the lineal waters of the U.S. have a drainage area less than six hundred forty (640) acres, measured at the downstream property line, the buffer width shall be determined utilizing the formula, X = (A * 0.0547) + 15, where "X" equals the buffer width in feet and "A" equals the drainage area in acres.
4. Lake County performs jurisdictional determinations.
5. 1:1 for approved and fully certified wetland mitigation bank credits, or open water not considered HQAR's.
6. 1:1 ratio may be allowed for IWMC impacts under Categories I, II and III, including HQAR, HQHS, an HFVW, provided that IWMC mitigation occurs onsite according to the requirements of this Ordinance.
7. May be reduced to 1:1 in wetland banking credits.
8. District has the discretion to require additional mitigation to ensure that the impacts are no more than minimal.
9. Water of the US with no associated wetland fringe may use buffer of 50 ft.

---

**C - 1 :**

# Riparian Buffer Zones: Functions and Recommended Widths

**Prepared by**
**Ellen Hawes and Markelle Smith**
**Yale School of Forestry and Environmental Studies**
**For the**
**Eightmile River Wild and Scenic Study Committee**
**April 2005**

*(as attachment)*

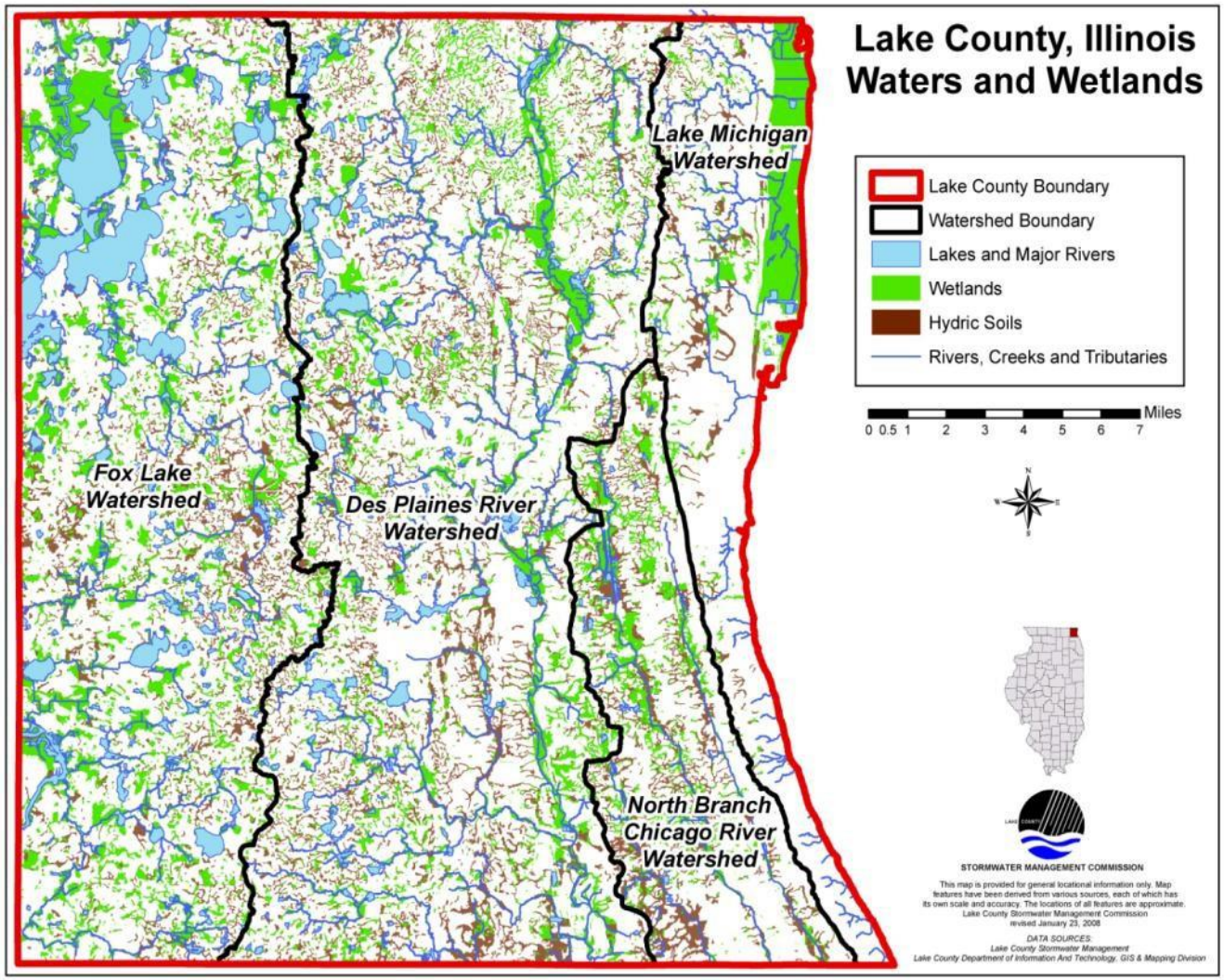
# Lake County Stormwater Management Commission's Study of Post-Development Isolated Waters of Lake County, Illinois

*Application of the 80% - 150% Wetland Hydrology Design Criteria*

LAKE COUNTY
STORMWATER MANAGEMENT COMMISSION

IAFSM
March 2013

# Background




**~21% of County = waters and wetlands (61,500 acres)**

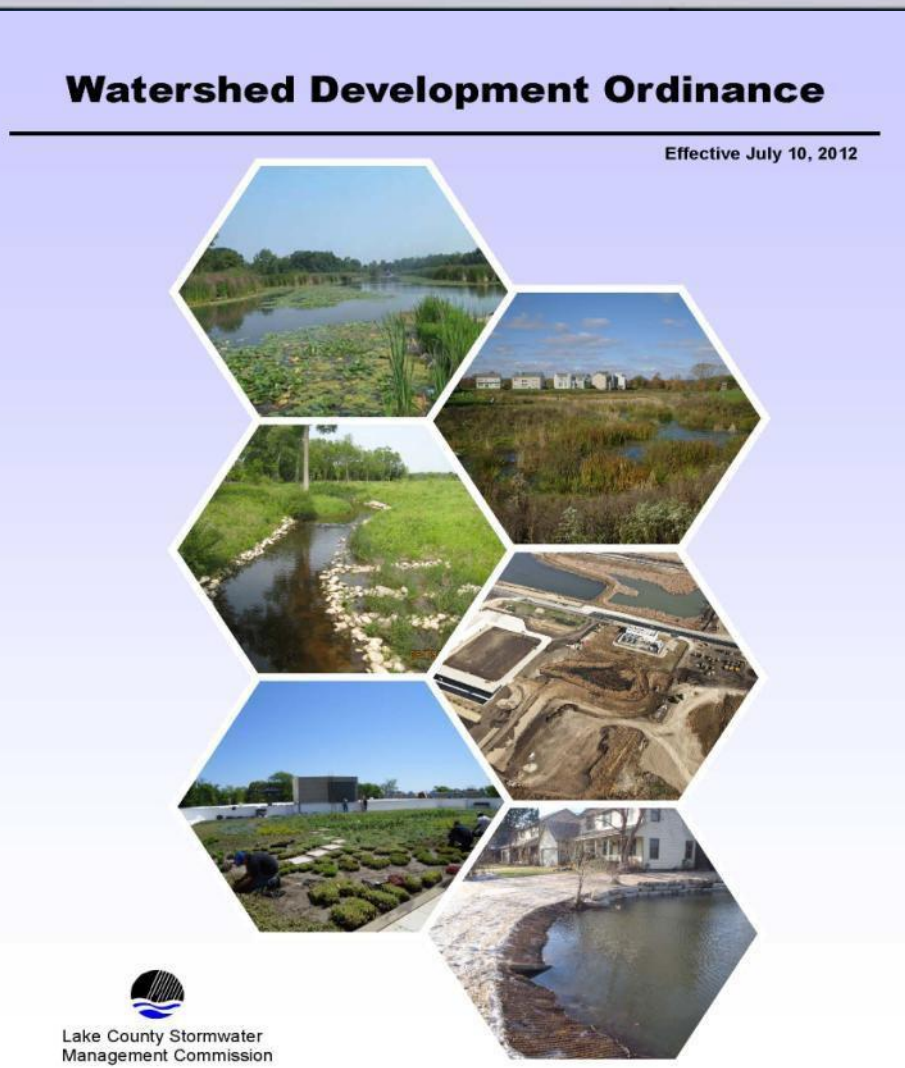
**~ 11% (7,000 acres) = *"Isolated Waters of Lake County" (IWLC)***

***Most of County has slowly permeable soils (Hydro Group C)***

STORMWATER MANAGEMENT COMMISSION

# Background

- **Developed by Independent Technical Advisory Committee (TAC)**
- **Amended August 2001 to include *isolated wetland* regulations after Supreme Court SWANCC Ruling**
- **Sets minimum county-wide standards for development:**
  - Floodplain
  - Floodway
  - Detention
  - ***Wetlands***
  - Buffers
  - Erosion Control



# WDO Wetland Hydrology Requirement ("80-150 Rule")

"The development design shall maintain between 80% and 150% of the existing condition, 2-year, 24-hour storm event runoff volume from the onsite tributary drainage area to the preserved Isolated Waters of Lake County."

(WDO Article IV.E.6)

# WDO Wetland Hydrology Requirement ("80-150 Rule")

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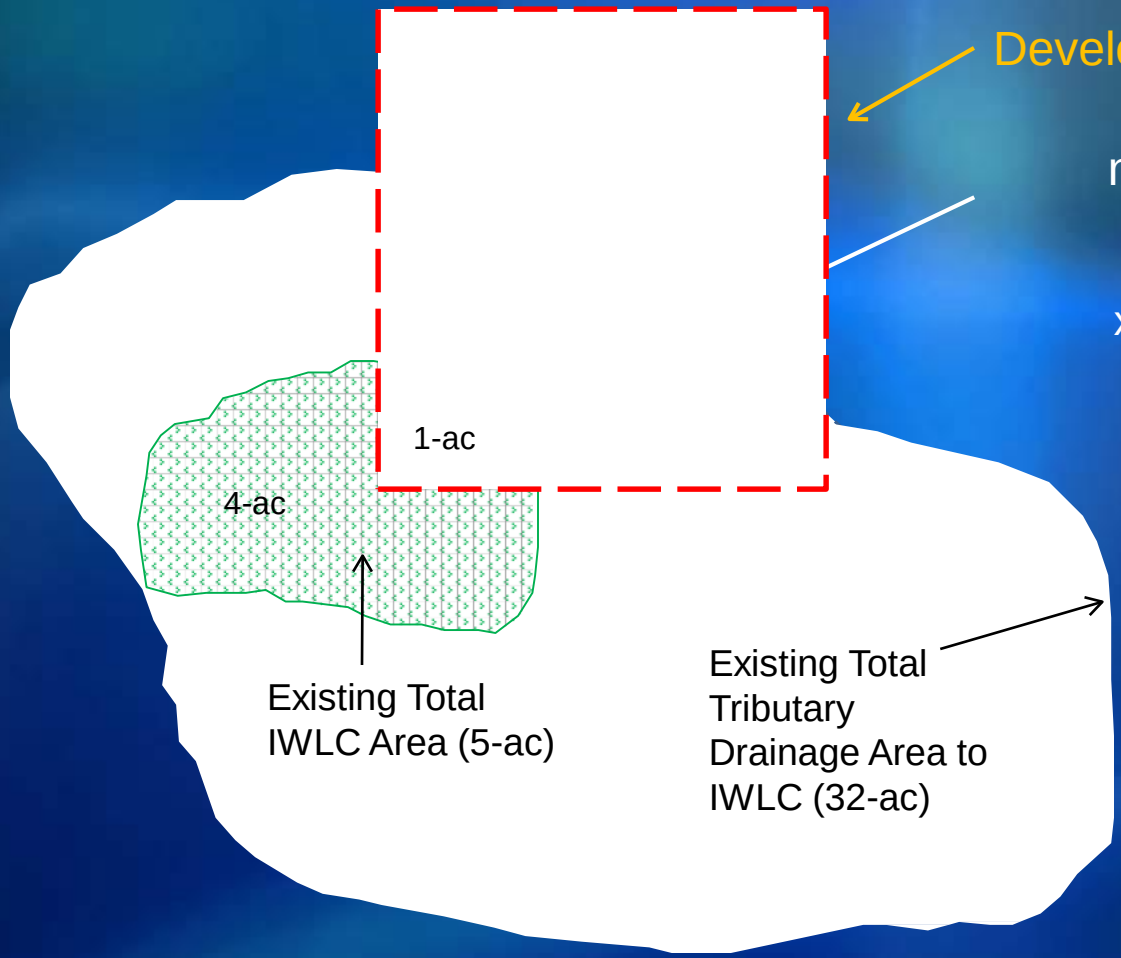
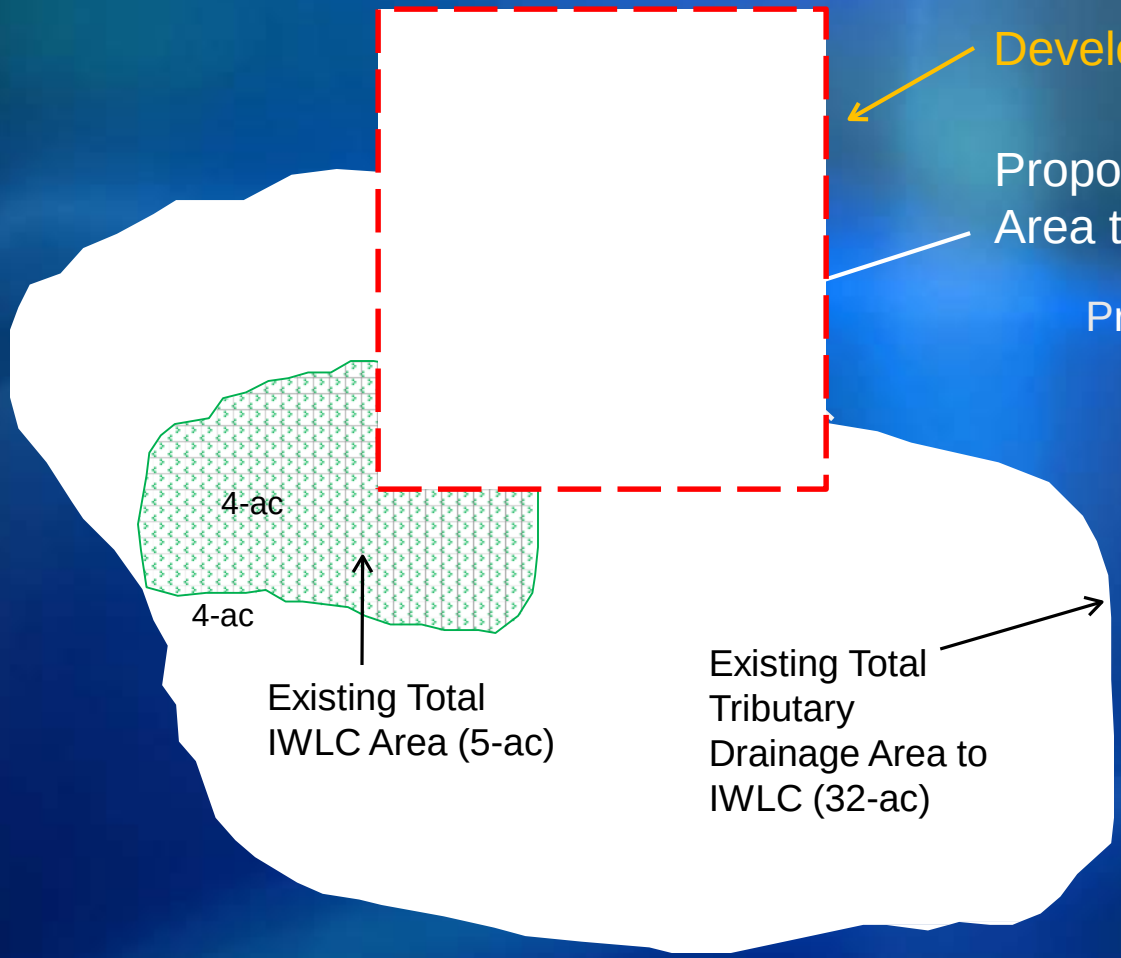
# Design Example



# Design Example



# Design Example

## Example Summary Table for 80-150 Wetland Hydrology Analysis

| Scenario # | Existing Conditions | | | | Proposed Conditions | | | | Volume Change [4] |
|---|---|---|---|---|---|---|---|---|---|
| | On-Site Trib Area (ac) | CCN | | | On-Site Trib Area (ac) | CCN [1] | Runoff [2] 2-yr, 24-hr | Volume 2-yr, 24-hr (ac-ft) | Proposed/Existing (%) |
| #1 | 8.00 | 74 | 0.79 | 0.53 | 4.00 | 86 | 1.50 | 0.50 | 94% |
| #2 | 8.00 | 74 | 0.79 | 0.53 | 4.00 | 98 | 2.57 | 0.86 | 162% |

[1] Include worksheets showing how runoff composite curve number (CCN) was derived (NRCS TR-55, Tables 2-2a through 2d).

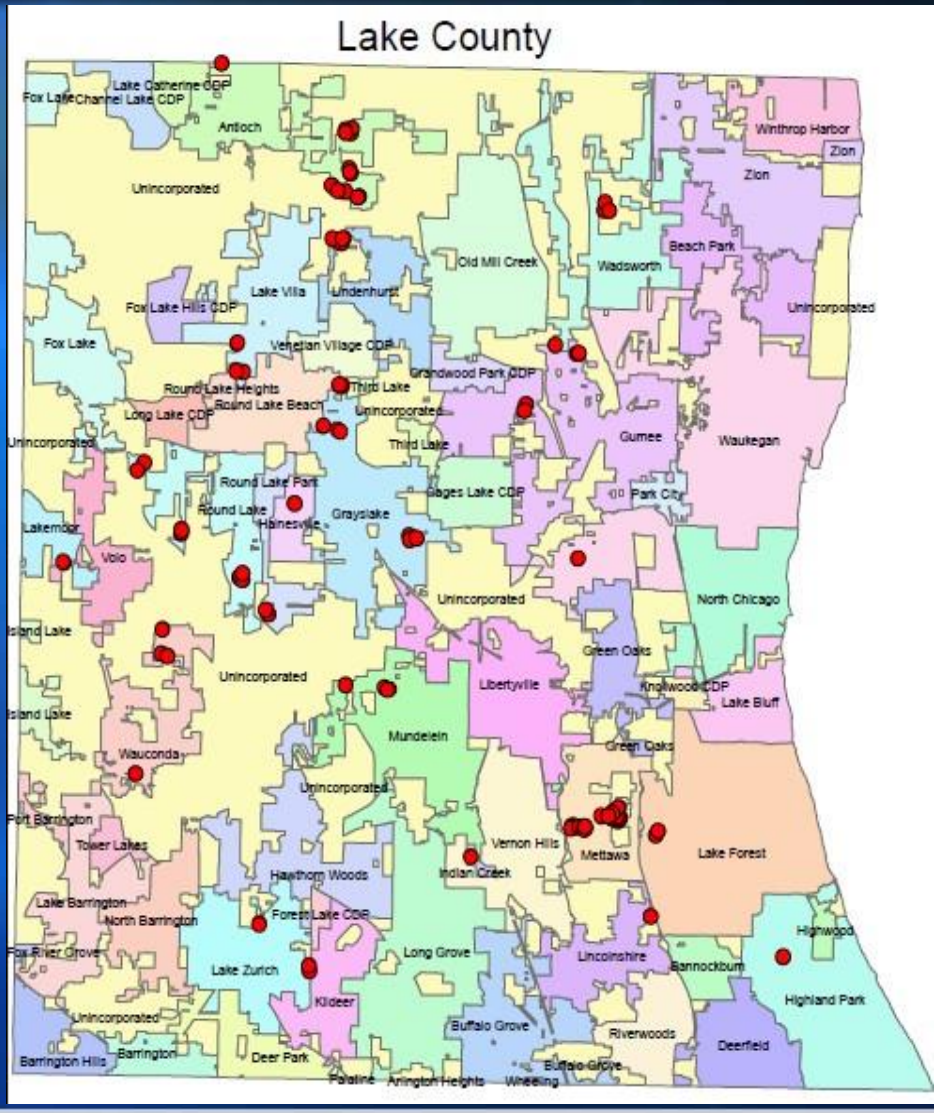
[2] Based on precipitation value of 2.80" for 2-yr, 24-hr storm event (from WOO, Appendix 1).

[3] Volume (ac-ft) = Runoff Depth (in)/12 x Onsite Trib Area (ac). Include supporting calculations.

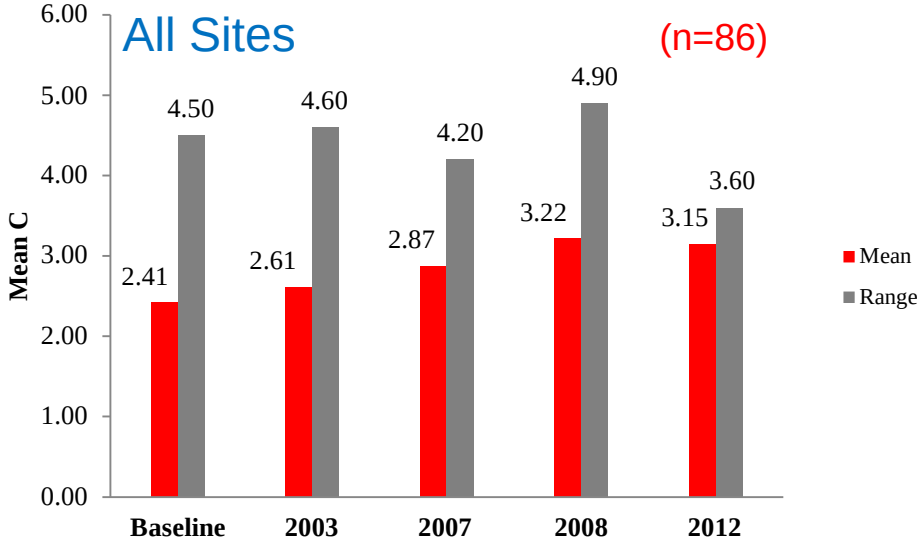
[4] Volume Change(%)= Proposed Volume (ac-ft) / Existing Volume (ac-ft).

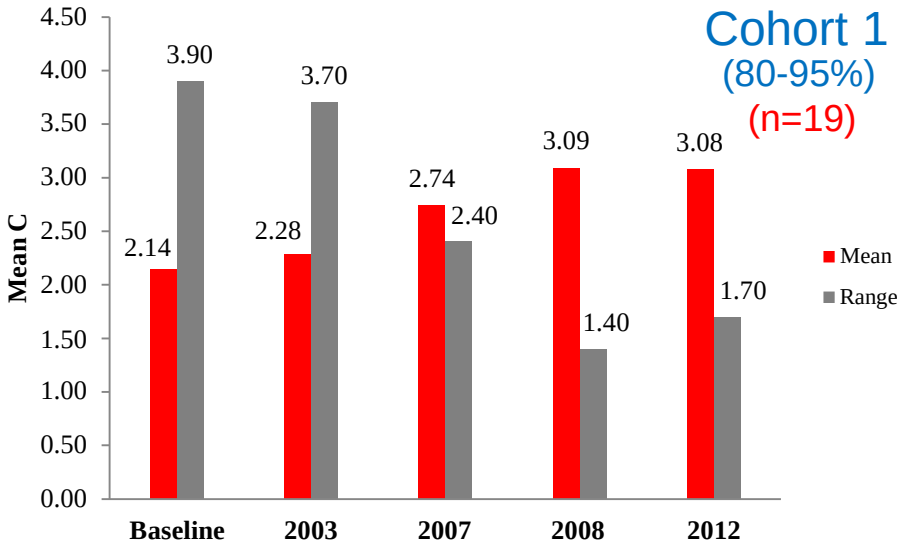
# SMC Study

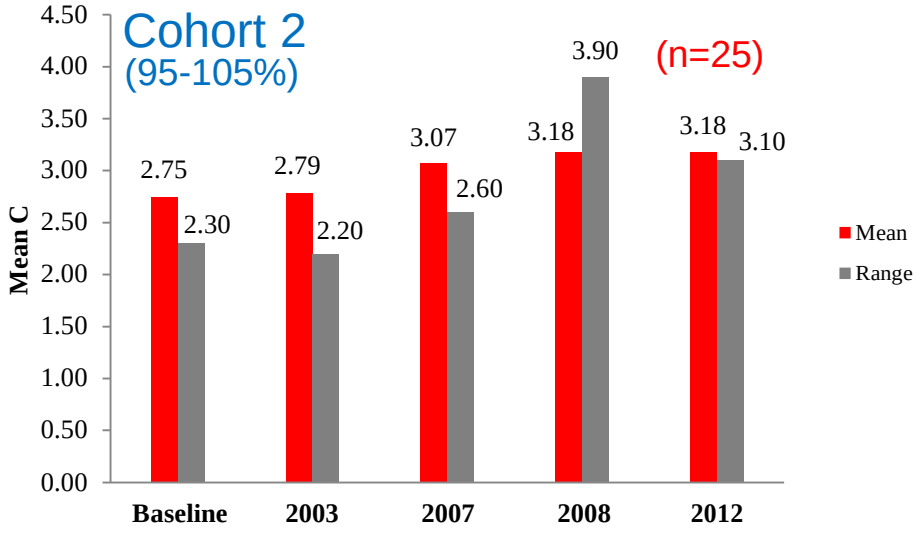
- **Purpose:**
  - Determine Effectiveness of WDO Wetland Hydrology Requirement
- **Method:**
  - Compared pre-and post-development data from 86 sites
  - Modeled hydrology:
    - Avg. 109.1, Range: 80-147.8%
- **Study Years:**
  - 2003, 2007, 2008, and 2012

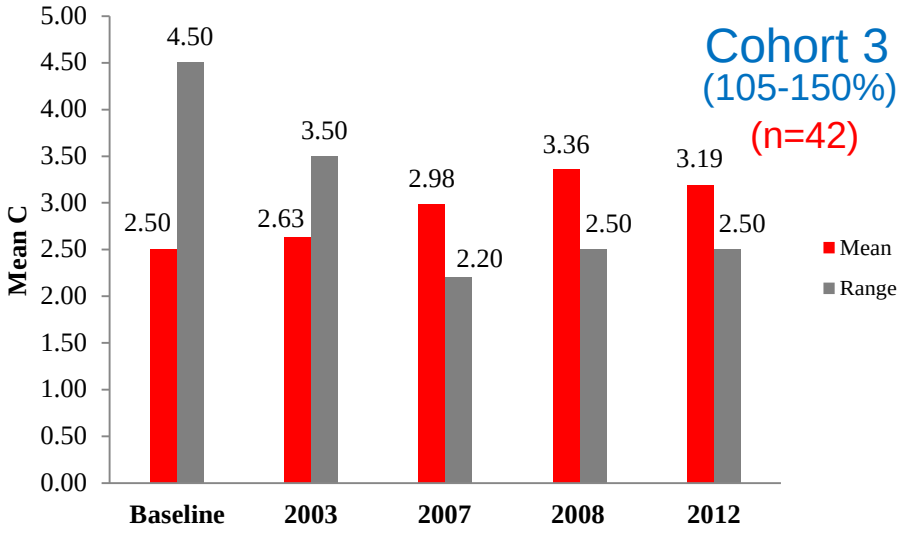


# Results – Floristic Quality

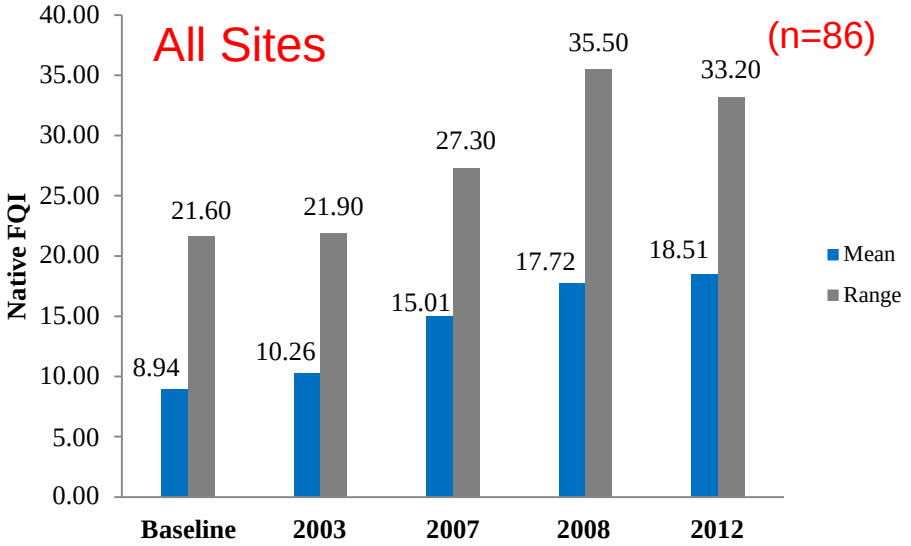


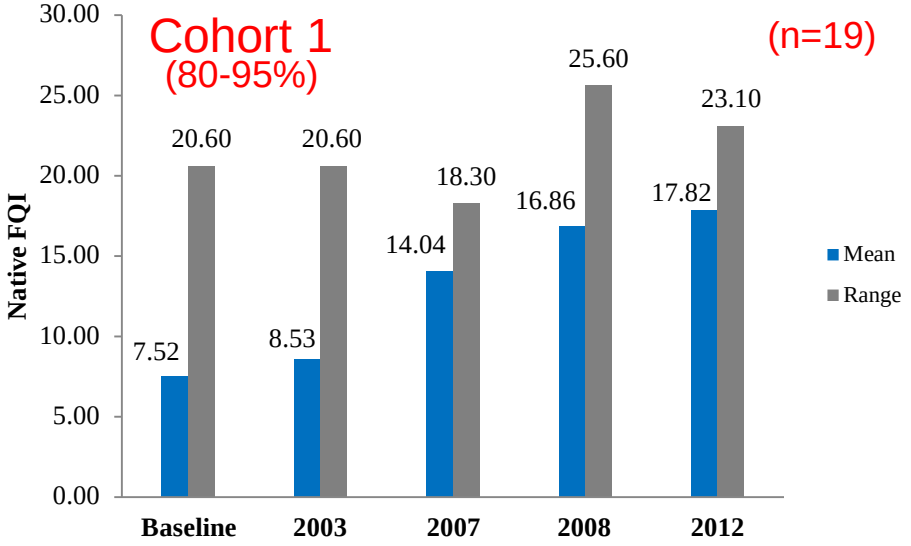



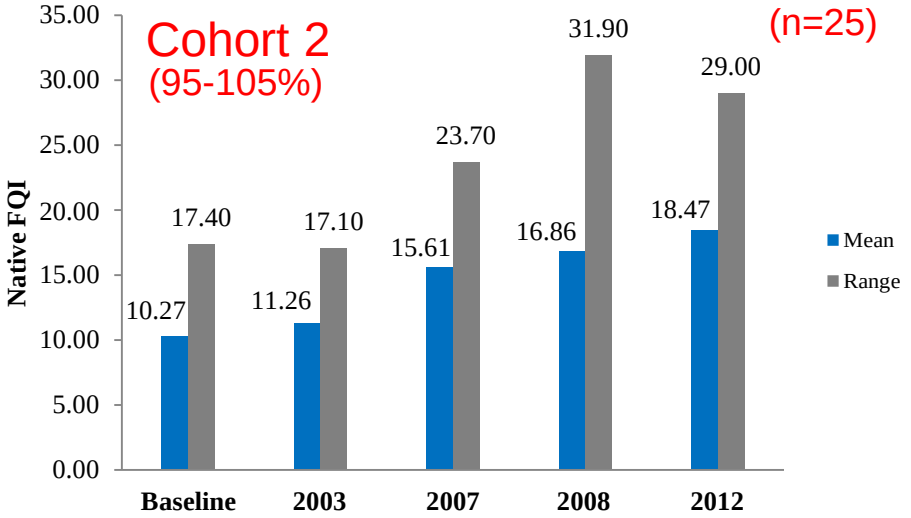



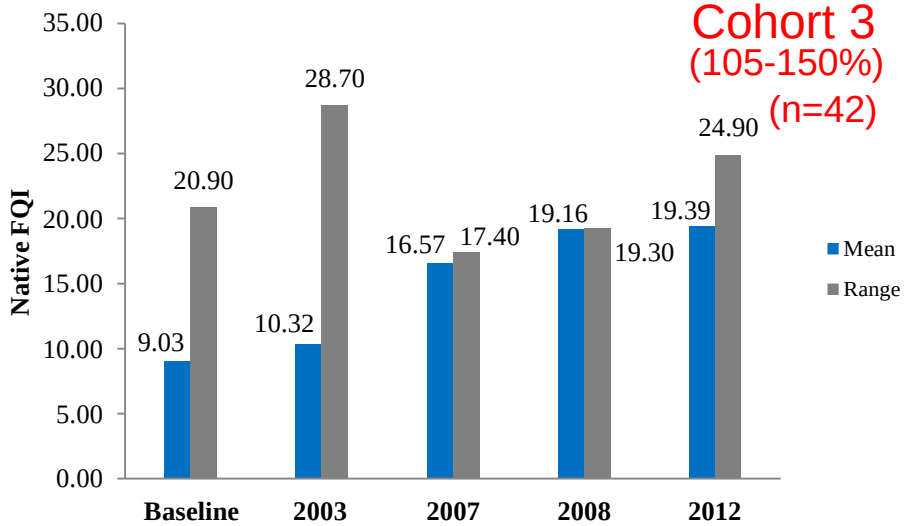



# Results – Floristic Diversity

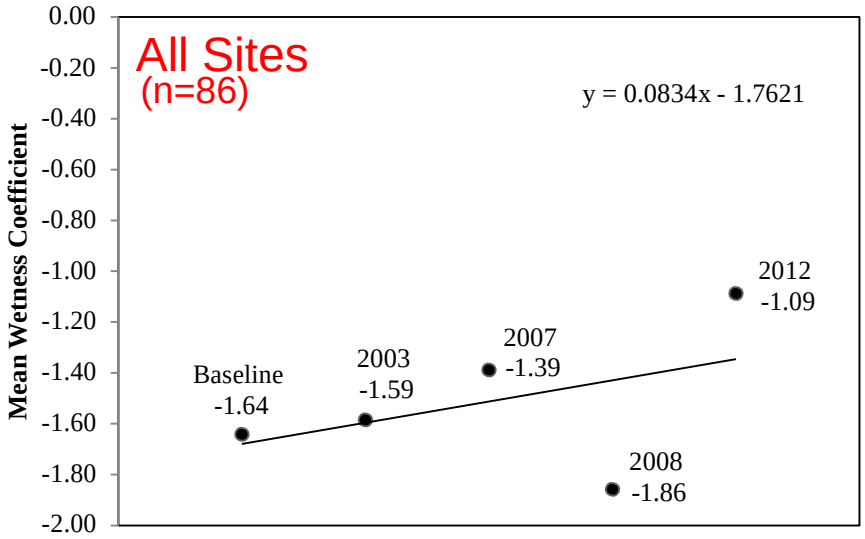


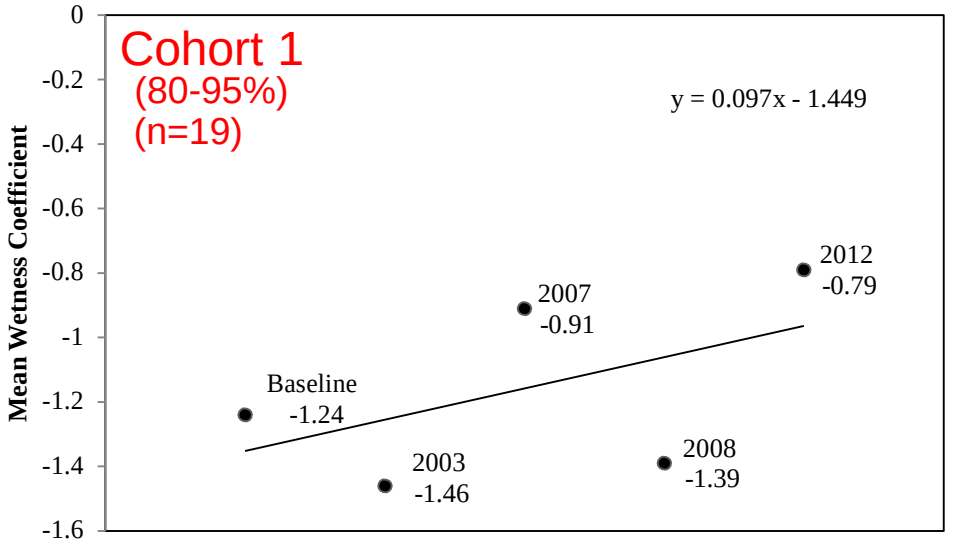



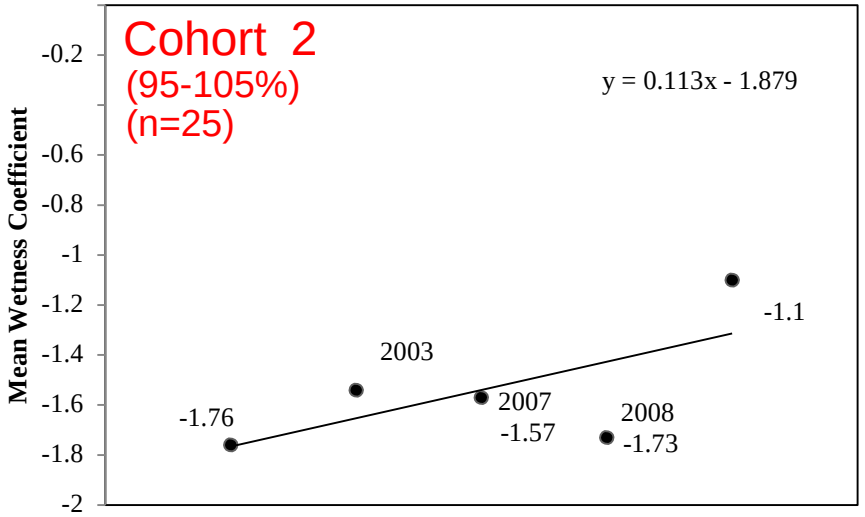



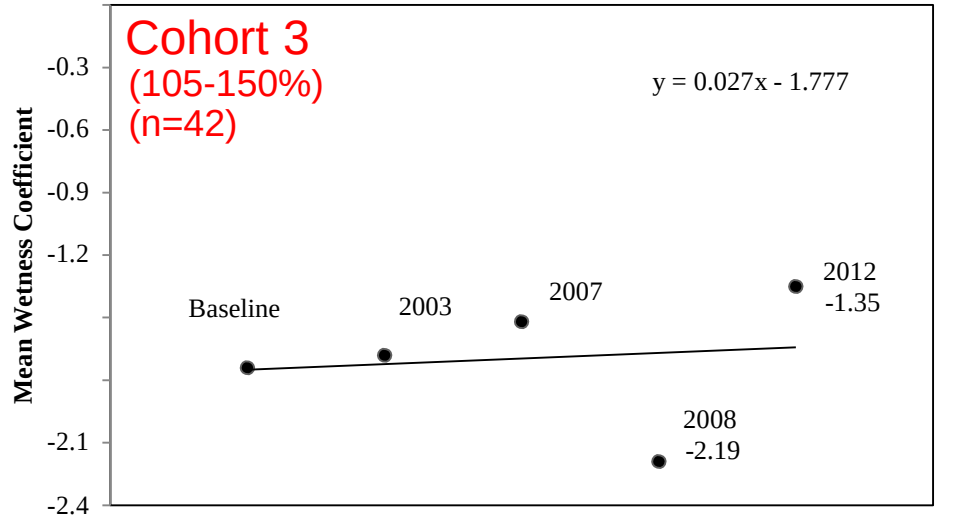



# Results – Wetness (Mean W)

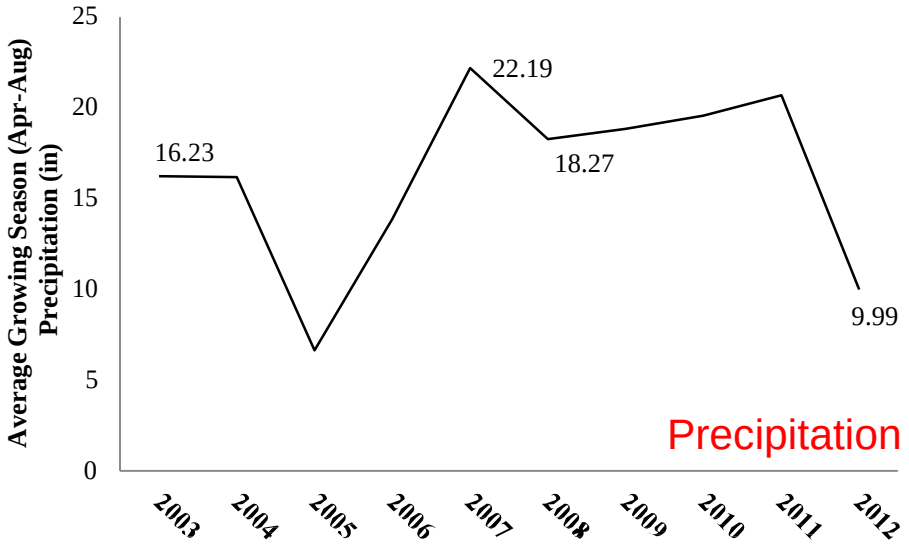


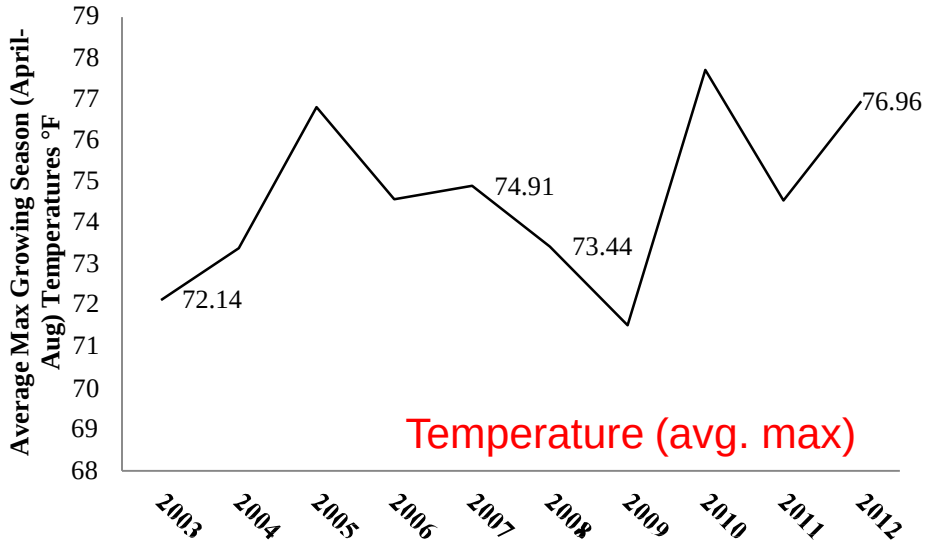



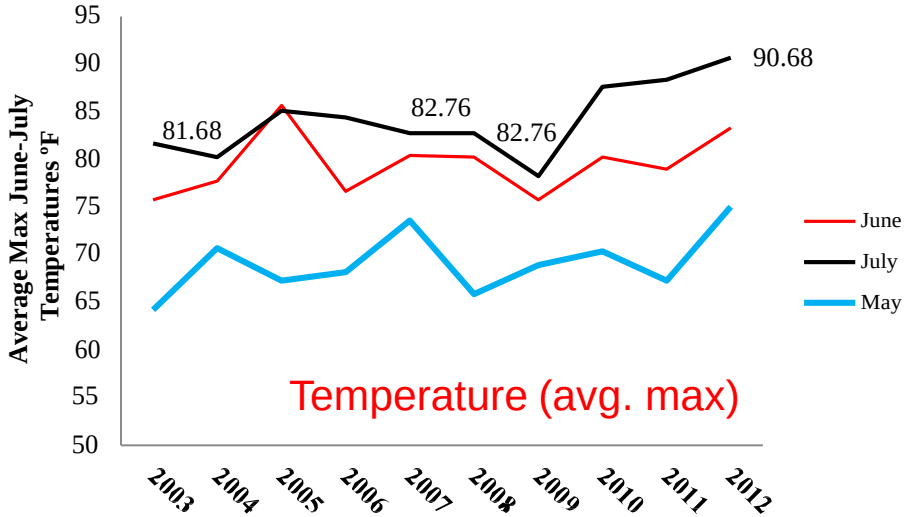



# Results – Climate



# Conclusions

- **Study confirms the efficacy of the WDO wetland hydrology requirement**
  - Floristic quality and diversity have significantly improved, indicating the strength of these ecosystems
  - Floristic quality and diversity are stabilizing after 6-10 years — adjusting to post-development hydrology
  - IWLC are maintaining wetland hydrology (W= -1.09)
  - The 105-150% range appears to be most effective in maintaining overall wetland integrity
  - Wetland wetness appears to be consistent with design hydrology per cohort analysis

# Questions?

- **Full Study Report Available:**

  **http://www.lakecountyil.gov/Stormwater/Publications/**

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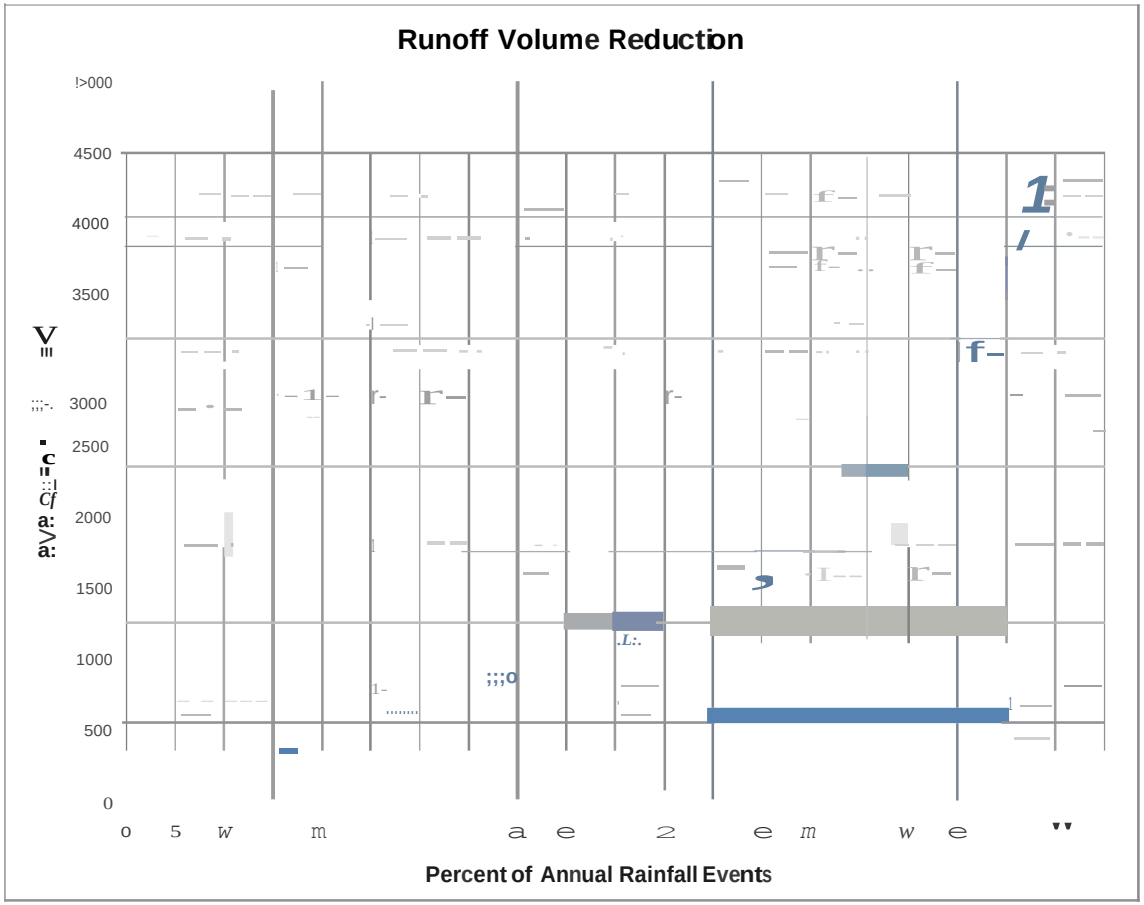
**Principal Wetland Specialist**

**Lake County SMC**
**500 W. Winchester Rd.**
**Libertyville, IL 60048**

**847-377-7700**
**jcrane@lakecountyil.gov**

| Percent of Annual Rainfall Events | 100% impervious; values Runoff Depth (in) | RVR Quantity It[1] /a new impervious |
|---|---|---|
| 0 | 0 | 0 |
| 5 | 0.02. | 70 |
| 10 | 0.05 | 180 |
| 15 | 0.09 | 320 |
| 20 | 0.12. | 450 |
| 25 | 0.16 | 590 |
| 30 | 0.19 | 690 |
| 35 | 0.22 | 800 |
| 40 | 0.24 | 870 |
| 45 | 0.28 | 1010 |
| 50 | 0.30 | 1110 |
| 55 | 0.35 | 1280 |
| 60 | 0.39 | 1420 |
| 65 | 0.45 | 1630 |
| 70 | 0.51 | 1870 |
| 75 | 0.60 | 2180 |
| 80 | 0.70 | 2560 |
| 85 | 0.81 | 2940 |
| 90 | 1.01 | 3660 |
| 95 | 1.35 | 4900 |
| 99 | 2.41 | 8760 |




Runoff Depth based on figure 3 of the Center for Watershed Protection Report.

Runoff Depth= P*R where:

P=Rainfall Depth (Inches)

R=Volumetric Runoff Coefficient= 0,95 for 100% impervious cover [0.05+.009(I), where I is 100% (Impervious cover))

RVR Quantity = Runoff Depth (in) / 12 (In/ft) * 43560 (ft'/ac)

# Riparian Buffer Zones: Functions and Recommended Widths

**Prepared by**

**Ellen Hawes and Markelle Smith**
**Yale School of Forestry and Environmental Studies**

**For the**

**Eightmile River Wild and Scenic Study Committee**

**April 2005**

## Table of Contents

## 1. Functions of Riparian Buffers

Riparian buffers are vital elements of watersheds, primarily due to their protection of surface and ground water quality from impacts related to human land use. These vegetated buffers are complex ecosystems that provide food and habitat for unique plant and animal species, and are essential to the mitigation and control of nonpoint source pollution. In fact, the removal of streamside vegetation, primarily for development purposes, has resulted in degraded water resources and diminished value for human consumption, recreation, and industrial use.[1]

In the Eightmile River watershed, maintenance of riparian buffers in their natural condition has been identified as one of the most effective means of protecting multiple outstanding resource values (ORVs), including water quality, hydrology, unique species and natural communities, and watershed ecosystem function.

Sedimentation increases turbidity and contributes to rapid siltation of waterbodies, negatively impacting water quality. Increased sediment loads also narrow channel widths and provide substrate for colonization of invasive aquatic plant species. Intact riparian buffers ameliorate these negative impacts by stabilizing streambanks. Roots of riparian vegetation deflect wave action and hold bank soil together. The buffer vegetation also decreases erosional impacts during flood events and prevents undercutting of streambanks.

Excess nitrogen and phosphorous from fertilizers and animal waste, as well as other pollutants originating from pesticides and herbicides, often bond to soil particles. The nutrient-loaded sediment contained in surface runoff then flows to the nearest waterbody and is deposited. This process is the primary cause of accelerated eutrophication of lakes and rivers[2]. Streamside forests function as filters, transformers, and sinks for harmful nutrients and pollutants[3]. Buffer plants slow sediment-laden runoff and depending upon their width and vegetational complexity, may deposit or absorb 50 to 100% of sediments as well as the nutrients and pollutants attached to them[4]. When surface water runoff is filtered by the riparian buffer approximately 80 to 85% of phosphorous is captured[5]. Nitrogen and other pollutants can be transformed by chemical and biological soil activity into less harmful substances. In addition, riparian plants act as sinks, absorbing and storing excess water, nutrients, and pollutants that would otherwise flow into the river, reducing water quality.

One of the most important functions of riparian buffers is enhanced infiltration of surface runoff[6]. Riparian vegetation in the buffer surrounding a waterbody increases surface roughness and slows overland flows. Water is more easily absorbed and allows for groundwater recharge. These slower flows also regulate the volume of water entering rivers and streams, thereby minimizing flood events and scouring of the streambed.

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[1] Welsch 1991
[2] Jontos 2004
[3] Welsch 1991
[4] Connecticut River Joint Commission 2005
[5] Connecticut River Joint Commission 2005
[6] Dillaha et al. 1989

Many plant and animal species depend on the distinctive habitat of riparian buffers, which include elements of both terrestrial and aquatic ecosystems. Forested buffers improve habitat quality by providing shade that cools water temperatures, thereby elevating the dissolved oxygen content that is necessary for many species of fish and aquatic insects. Woody debris from shrubs and trees within the vegetated buffer provides food and cover for a multitude of aquatic species. If large enough, buffers also provide corridors essential for terrestrial wildlife movement.

Vegetated buffers may serve as screens along waterways, protecting the privacy of riverfront landowners and blocking views of any unsightly development. Hiking and camping opportunities are also facilitated by forested buffers, which if large enough, allow outdoor enthusiasts to enjoy the proximity of the water. The diversity of plant species provides visual interest and increases aesthetic appeal.

## 2. Recommended buffer widths

The width of a buffer depends greatly on what resource you are trying to protect. Scientific studies have shown that efficient buffer widths range from 10 feet for bank stabilization and stream shading, to over 300 feet for wildlife habitat. Furthermore, the necessary width for an individual site may be less or more than the average recommendations, depending on soil type, slope, land use and other factors. The ranges cited below come from four literature reviews by The U.S. Army Corps of Engineers New England Division, the University of Georgia's Institute of Ecology, the U.S. Army Engineer Research and Development Center, and researchers from the UK Forestry Commission.[7] Results from studies done in New England fall within the ranges cited below, and no evidence was found in the literature to suggest that buffers should be, on average, either wider or narrower.

### a. Erosion control

Erodibility of soil type is a key factor when assessing adequate buffer widths. Widths for effective sediment removal vary from only a few feet in relatively well drained flat areas to as much as several hundred feet in steeper areas with more impermeable soils. In order to prevent most erosion, vegetated buffers of 30 feet to 98 feet have been shown to be effective.

### b. Water quality

*Nutrients* - Nitrogen and phosphorous can be retained in buffers that range from 16 to 164 feet. The wider buffers will be able to provide longer-term storage. Nitrogen is more effectively removed than phosphorous. In 1995, a study conducted in Maine found that the effectiveness of buffers at removing phosphorous is variable but in most cases, a 49-foot natural, undisturbed buffer was effective at removing a majority of the nutrient from surface runoff. However, the U.S. Army Corps of Engineers concluded in their 1991 study that there was insufficient evidence

[7] U.S. Army Corps of Engineers 1991, Wenger 1999, Fischer and Fischenich 2000, Broadmeadow and Nisbet 2004, respectively.

to determine a necessary buffer width for phosphorous retention. It is important, therefore, to combine buffer zones with strategies to reduce phosphorous at its source.

*Pesticides* – Buffer widths for pesticide removal range from 49 feet to 328 feet. Pesticides that are applied manually require less of a buffer area than aerially-sprayed pesticides.

*Biocontaminants* – Buffer widths for biocontaminants, such as fecal coliform, were not reviewed in this study. The University of Georgia found that, in general, buffers should be 30 ft. or greater. However, buffers may not be able to adequately filter biocontaminants and it is also important to reduce these pollutants at the source.

### c. Aquatic habitat

*Wildlife* – The minimum width of riparian buffers to protect aquatic wildlife, including trout and invertebrates, range from 33 feet to 164 feet.

*Litter and debris input* – Recommendations for buffer widths to provide an adequate amount of debris for stream habitat range from 10 feet to 328 feet, although most fall within 50 feet to 100 feet.

*Stream temperature*. Adequate shading can be provided by a 30-foot buffer, but buffers may need to be up to 230 feet to completely control stream temperature. The amount of shade required is related to the size of the channel. The type of vegetation in the buffer regulates the amount of sunlight reaching the stream channel. Generally, a buffer that maintains 50% of direct sunlight and the rest in dapple shade is considered preferable[8]

### d. Terrestrial habitat

The Eightmile River watershed contains a large number of roadless, undeveloped forest blocks and is more than 80% forested in total. Furthermore, the riparian corridor within 300 ft. of the river and its tributaries has remained mostly intact, supporting a high level of biodiversity as well as protecting water quality. The Eightmile River is host to a number of important species, including native brook trout, freshwater mussels, blue back herring, bobcats, great horned owls and cerulean warblers.

The habitat requirements for birds, mammals, reptiles, amphibians and fish vary widely, and the necessary buffer width to protect each species varies widely as well. While trout and salmon can benefit greatly from the shading, habitat, food, and water quality protection that a 150-foot buffer provides, mammals such as the red fox and the bobcat require riparian corridors of approximately 330 feet. Furthermore, birds such as the cerulean warbler, which requires large areas of forest, may need a buffer that is much greater than 330 ft.[9] For this reason, we do not believe that it is feasible to capture all of the habitat needs of all species with a uniform buffer. More careful targeting of potential riparian habitat, work with landowners to create conservation

[8] Broadmeadow and Nisbet 2004
[9] Chase et al. 1995

easements, as well as the creation of protected areas by the town will aid in more specific approaches to habitat preservation for these species.

For a more detailed look at the range of recommended buffer widths, see Appendix 1.

## 3. Factors influencing buffer width

There are many factors that influence the effectiveness buffers. These include slope, rainfall, the rate at which water can be absorbed into the soil, type of vegetation in the buffer, the amount of impervious surfaces, and other characteristics specific to the site.

### a. Slope

As slope increases, the speed at which water flows over and through the buffer increases. Therefore, the steeper the land within the buffer, the wider it needs to be to have time to slow the flow of water and absorb the pollutants and sediments within it. Many researchers suggest that especially steep slopes serve little value as a buffer, and recommend excluding areas of steep slope when calculating buffer width. The definition of "steep" varies from over 10% to over 40% slope[10].

### b. Soil type

The type of soil affects how quickly water can be absorbed. Soils that are high in clay are less permeable and may have greater runoff. On the other hand, soils that are largely made up of sand may drain water so rapidly into the groundwater that roots are not able to effectively trap pollutants. Furthermore, soils that are moister and more acidic have a better capacity to take up nitrogen from the soil and release it to the atmosphere (through denitrification).

### c. Vegetation mix

Structurally diverse riparian buffers, i.e. those that contain a mix of trees, shrubs and grasses, are much more effective at capturing a wide range of pollutants than a riparian buffer that is solely trees or grass. Removal efficiencies range from 61% of the nitrate, 72% of the total phosphorous and 44% of the orthophosphates from grass buffers to 92% of the nitrate 93% of the total phosphorous and 85% of the orthophosphates from combined grass and woody buffers. [11]

[10] Wenger 1999
[11] Jontos 2004

**Table 1:** Estimated reduction of nutrient loads from implementation of riparian buffers[12]

| Buffer Type | Nitrogen | Phosphorus | Sediment |
|---|---|---|---|
| Forested | 48-74% | 36-70% | 70-90% |
| Vegetated Filter Strips | 4-70% | 24-85% | 53-97% |
| Forested and Vegetated Filter Strips | 75-95% | 73-79% | 92-96% |

**Source:** Delaware Department of Natural Resources and Environmental Control

Generally, the grass filter strip works best for sediment removal, while the forested buffer is better for nitrate removal from subsurface flows[13]. Grasses have a shallower and denser root mat that is more effective in slowing runoff and trapping sediments from the surface flow. Trees have a deeper root system that can trap and uptake nutrients from the groundwater, stabilize banks, and regulate the flow of water to the stream.

Forests provide certain functions that grasses cannot. Trees shade the river and provide an input of leaf litter and branches that are necessary for many aquatic species. In addition, a forested buffer provides important habitat for terrestrial wildlife. Native plants species are preferred to ornamentals or exotics due to the habitat advantage they provide for wildlife. Old trees are especially valuable for providing inputs of coarse woody debris.

The most effective riparian buffers should include a mix of trees, shrubs and herbaceous plants native to the region and appropriate to the environment in which they are to be planted. When planting buffers, it is best to use adjacent reference riparian buffers as the basis for selecting floral composition[14].

**Table 2**: Plant type vs. removal efficiency

| Function | Grass | Shrubs | Trees |
|---|---|---|---|
| Sediment trapping | High | Medium | Low |
| Filtration of Sediment born Nutrients, Microbe and Pesticides | High | Low | Low |
| Soluble forms of Nutrients and Pesticides | Medium | Low | Medium |
| Flood Conveyance | High | Low | Low |
| Reduce Stream Bank Erosion | Medium | High | High |

Source: Jontos 2004 (modified after Fisher and Fischenich 2000)

[12] (Palace, 1998; Lowrance et al., 1995; Franti, T.G., (1997); Parsons et al. (1994); Gilliam et al. (1997); Osmond et al., (2000)
[13] Triangle J. Council of Governments 1999
[14] Jontos 2004

## 4. Buffer types

### a. Variable Width

Several models have been created to consider individual site factors in determining buffer width. These range from the complex to the relatively simple. The more complex models take into account multiple factors, such as slope, erodibility and infiltration rates[15]. Examples of such models include:

Brown et al. (1987):

$$\textit{Buffer width} = (\textit{average slope/erodibility factor})^{1/2}$$

Cook College Department of Environmental Resources:

$$\textit{Buffer width} = 2.5\ (\textit{time of travel of overland flow}) * (\textit{slope})^{0.5}$$

More simple models only take into account slope. A common formula is to set a fixed buffer width and apply 2 feet per percent slope. Many of these models recommend *not* including impervious surfaces or areas of steep slope in the buffer width (**Figure 1**). Cook College recommends excluding anything greater than 15% slope, while Wenger (1999) recommends excluding all slopes over 25%.

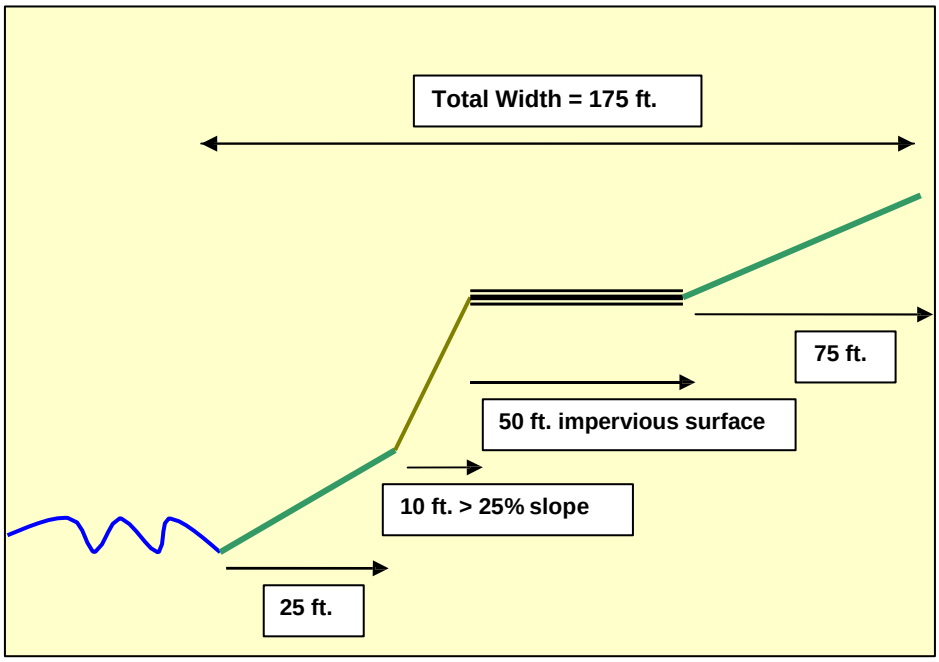
### b. Fixed Width

A fixed buffer width is the easiest to administer. However, care must be taken to select the appropriate width for the resources you are targeting. Studies unanimously support the conclusion that buffer efficiency at filtering out pollutants increases with width. However, this does not increase infinitely, and the goal is to find the most efficient width. For example, a study in the Mid-Atlantic[16] found that 90% of sediments were removed by a 62 ft. riparian buffer, but only 94% were removed by more than doubling the buffer width to 164 ft

If a fixed buffer width is chosen, it should be on the conservative side to provide leeway for slope and soil type. Data for the Eightmile River watershed show that significant areas of the land bordering the river have slopes that are above 15%. Therefore, we believe it is necessary to make a fixed buffer width wider than the average minimum recommendation of 100 ft.

[15] Described in the US Army Corps of Engineers (1991) literature review.
[16] Peterjohn and Corell 1994.

**Fig.1**: Variable buffer width adjusted from 100 feet to 175 feet to account for effects of slope and impervious surface.




### c. Three Zone

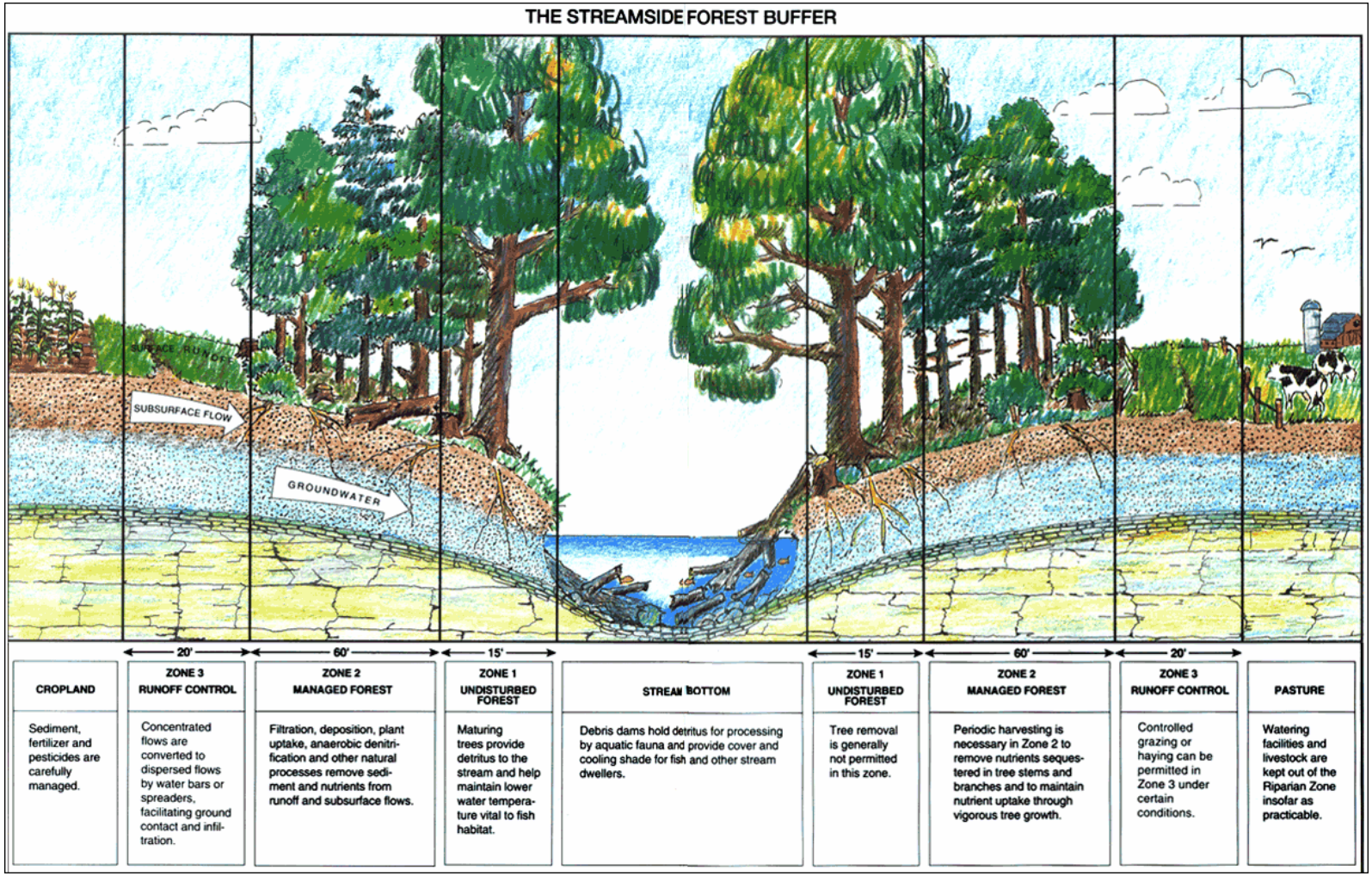
The Three Zone system was originally developed as part of an initiative to protect the Chesapeake Bay. The combination of vegetation types (trees, grass and shrubs) helps maximize the efficiency and diversity of benefits that the buffer provides (Figure 2).

Zone 1
*Minimum Width*: 15 ft.
*Composition*: Native trees and shrubs
*Function*: Bank stabilization, habitat, shade, flood prevention
*Management*: None allowed except bank stabilization and removal of problem vegetation.

Zone 2
*Minimum Width*: 60 ft.
*Composition*: Native trees and shrubs.
*Function*: Removal of nutrient, sediments and pollutants from surface and groundwater, habitat
*Management*: Some removal of trees to maintain vigorous growth.

Zone 3
*Minimum Width*: 30 ft.
*Composition*: Grasses and herbaceous plants
*Function*: Slow surface runoff, trap sediments and pesticides
*Management*: Mowing

Fig. 2: **Three-Zone System**




**Source**: Welsch 1991. Riparian Forest Buffers: Function and Design For Protection and Enhancement of Water Resources.

## 5. What order streams to protect

Buffers are most effective when they are contiguous. Guidelines for buffer widths recommend that long, continuous buffer strips should often be a higher priority than fragmented strips of greater width.[17] Small gaps in vegetation along the bank can channelize runoff into the river and effectively negate the effect of surrounding buffers. For this reason, landowners who currently have lawns that run to the edge of the river should be encouraged to replant trees and shrubs along the bank. In addition, footpaths cleared for river access should be winding, rather than straight, and as narrow as possible to minimize sedimentation.

Failure to extend protection to the smaller headwater streams in the river basin also ignores important sources of sedimentation and pollution. To preserve water quality in the Eightmile River, it is essential to protect all of its tributaries. In fact, smaller order streams often account for the greatest miles of watercourse in a basin. Buffering low order streams ($1^{st}$, $2^{nd}$ and $3^{rd}$) has greater positive influence on water quality than wider buffers on portions of larger order streams already carrying polluted water. While it may be politically infeasible to set wide buffer zones around intermittent and ephemeral streams, this omission is not justified by the science. A University of Georgia study of riparian buffers warns, "Governments that do not apply buffers to certain classes of streams should be aware that such exemptions reduce benefits substantially."[18] A review of buffers by the U.S. Army also notes that "even the best buffer strips along larger rivers and streams cannot significantly improve water that has been degraded by improper buffer practices higher in the watershed".[19]

Smaller headwater streams have the greatest area of land-water interaction, and have the greatest potential to accept and transport sediment. Ephemeral streams, which only exist during periods of high rain, can serve as important sources of sediment and pollutants to the river. It is important that they are maintained in a vegetated condition in order to help trap and slow the flow of pollutants. Furthermore, removing riparian vegetation from the banks of small, heavily shaded streams will have a much greater impact on stream temperature and aquatic habitat throughout the watershed than removing vegetation from larger rivers, where only a fraction of the water is shaded. Rather than ignoring these streams completely, a compromise would be to create a smaller setback. Clinnick et al (1985) advocate a minimum of a 20 m wide buffer for ephemeral streams, and where that is not possible, at least leaving the banks vegetated[20].

[17] Fisher and Fischenich 2000
[18] Wenger 1999
[19] Fisher and Fishenich 2000
[20] Wenger 1999

## Appendix 1–Summary of Effective Buffer Widths from Literature Review

| | Effective Width of Buffer (in feet) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Author** | **Aquatic Wildlife** | **Terrestrial Wildlife** | **Stream Temperature** | **Litter/Debris input** | **Nutrient Retention** | **Sediment Control** | **Bank Stabilization** | **Pesticide Retention** |
| Wenger 1999 | | 220-574 ft. | 33 – 98 ft. | 50 ft. | 50 – 100 ft. | 82 – 328 ft. | – | > 49 ft. |
| Army Corps 1991 | 98 ft. | 30 – 656 ft. | 33 – 66 ft. | 66-102 ft. | 52 – 164 ft. | 33 – 148 ft. | 49 – 98 ft. | 49 – 328 ft. |
| Fisher and Fischenich 2000 | > 98 ft. | 98-1,640 ft. | – | 10 – 33 ft. | 16.4-98 ft. | 30-200 ft. | 30 -66 ft. | – |
| Broadmeadow and Nisbet 2004 | 33 –164 ft. | – | 49 – 230 ft. | 82 – 328 ft. | 16.4-98 ft. | 49 – 213 ft. | – | – |

## Appendix 2 - General Recommended Widths of Buffer Zones

Source: Jontos 2004 (modified after Fisher and Fischenich 2000)

| *Function* | | **Recommended Width** |
|---|---|---|
| Water Quality Protection | Buffers, especially dense grassy or herbaceous buffers on gradual slopes, intercept overland runoff, trap sediments, remove pollutants, and promote ground water recharge. For low to moderate slopes, most filtering occurs within the first 10 m, but greater widths are necessary for steeper slopes, buffers comprised of mainly shrubs and trees, where soils have low permeability, or where NPS loads are particularly high. | 5 to 30 m |
| Stream Stabilization | Buffers, particularly diverse stands of shrubs and trees, provide food and shelter for a wide variety of riparian and aquatic wildlife | 10 to 20 m |
| Riparian Habitat | Riparian vegetation moderates soil moisture conditions in stream banks, and roots provide tensile strength to the soil matrix, enhancing bank stability. Good erosion control may only require that the width of the bank be protected, unless there is active bank erosion, which will require a wider buffer. Excessive bank erosion may require additional bioengineering techniques. | 30 to 500 m + |
| Flood Attenuation | Riparian buffers promote floodplain storage due to backwater effects, they intercept overland flow and increase travel time, resulting in reduced flood peaks. | 20 to 150 m |
| Detrital Input | Leaves, twigs and branches that fall from riparian forest canopies into the stream are an important source of nutrients and habitat. | 3 to 10 m |

## Appendix 3

References


Broadmeadow, S. and Nisbet, T.R. 2004. The effects of riparian forest management on the freshwater environment: a literature review of best management practice. Hydrology and Earth System Sciences, 8(3), 286-305.

Chase, V., Deming, L., and Latawiec, F. 1995. Buffers for wetlands and surface waters: a guidebook for New Hampshire municipalities. Audubon Society of New Hampshire.

Connecticut River Joint Commission. 2005. Introduction to riparian buffers. *From:* Riparian Buffers for the Connecticut River Valley, no.1. Available online at http://www.crjc.org/riparianbuffers.htm. Last accessed April 27, 2005.

Dillaha, T.A., J.H. Sherrard, and D. Lee. 1989. Long-term effectiveness of vegetative filter strips. Water Environ. Soc. 1:419-421.

Fischer, R.A. and Fischenich, J.C. 2000. Design recommendations for riparian corridors and vegetated buffer strips. U.S. Army Engineer Research and Development Center, Environmental Laboratory. Vicksburg, MS.

Jontos, R. 2004. Vegetative buffers for water quality protection: an introduction and guidance document. Connecticut Association of Wetland Scientists White Paper on Vegetative Buffers. Draft version 1.0. 22pp.

Krumine, M. 2004. Riparian buffers de-mystified! Tributary Times, 3(5). Delaware Department of Natural Resources and Environmental Control, Division of Water Resources. http://www.dnrec.state.de.us/water2000/Sections/Watershed/ws/trib_times_current.htm

Triangle J. Council of Governments. 1999. An introduction to riparian buffers. TJCOG Technical Memo: Riparian Buffer Series, No.1. January 1999.

U.S. Army Corps of Engineers. 1991. Buffer strips for riparian zone management. Waltham, MA.

Welsch, D.J. 1991. Riparian forest buffers: function and design for protection and enhancement of water resources. USDA Forest Service, Northeastern Area, Radnor, PA. NA-PR-07-91.

Wenger, S. 1999. A review of the scientific literature of riparian buffer width, extent and vegetation. Institute of Ecology, University of Georgia. Athens, GA

## Appendix 4 - Web Resources


Chesapeake Bay Committee. Cheasapeake Bay Riparian Handbook: A guide for establishing and maintaining riparian forest buffers.
http://www.chesapeakebay.net/pubs/subcommittee/nsc/forest/handbook.htm

Connecticut Association of Wetland Scientists. Jontos, R. 2004. Vegetative buffers for water quality protection: an introduction and guidance document.
http://www.ctwetlands.org/Draft%20Buffer%20Paper%20Version%201.0.doc

Connecticut River Joint Commission. 2005. Introduction to riparian buffers. *From:* Riparian Buffers for the Connecticut River Valley, no.1. http://www.crjc.org/riparianbuffers.htm.

Environmental Defense. 2003. Riparian buffers: common sense protection of North Carolina's waters. http://www.environmentaldefense.org/documents/2758_NCbuffers.pdf

Klapproth, J.C. and Johnson, J.E. 2000. Understanding the science behind riparian forest buffers: effects on water quality. Publication Number 420-151. http://www.ext.vt.edu/pubs/forestry/420-151/420-151.html

Krumine, M. 2004. Riparian buffers de-mystified! Tributary Times, 3(5). Delaware Department of Natural Resources and Environmental Control, Division of Water Resources.
http://www.dnrec.state.de.us/water2000/Sections/Watershed/ws/trib_times_current.htm

Maryland Department of Natural Resources Forest Service. Riparian forest buffers: function and design for protection and enhancement of water resources.
http://www.dnr.state.md.us/forests/publications/buffers.html

National Agroforestry Center. Riparian forest buffers.
http://www.unl.edu/nac/riparian.html

USDA Natural Resources Conservation Service. Buffers for conservation in New Hampshire:
http://www.nh.nrcs.usda.gov/features/Buffers/what_buffers.html

Welsch, D.J. 1991. Riparian forest buffers: function and design for protection and enhancement of water resources. USDA Forest Service, NA-PR-07-91.
http://www.na.fs.fed.us/spfo/pubs/n_resource/buffer/cover.htm

Wenger, S. 1999. A review of the scientific literature of riparian buffer width, extent and vegetation: http://outreach.ecology.uga.edu/tools/buffers/lit_review.pdf

# Northeastern Illinois BMP Design Standards

| BMP Standards: | Model Ordinance-Recommended | DuPage County (2013) | Cook County WMO (2014) | Lake County (2015) | McHenry County (2016) | Will County (2004) | | Kane County |
|---|---|---|---|---|---|---|---|---|
| | | | | | | *Incorporated* | *Unincorporated* | |
| Stormwater Volume Reduction | | List of BMPs (15-64) | Hierarchy (503.3) | Hierarchy & BMPs (503) | Hierarchy & BMPs (Article VI.B.6) | As required by CWA (55.022.J) | | List of BMPs (9-29.N) |
| Threshold for BMPs | | Net new impervious ≥2,5000 sf (15-40.F) | <u>Residential:</u> Parcel ≥ 1 acre (503.1.A)<br><br><u>Multi-Family Residential:</u> Parcel ≥ 0.5 acre (503.1.B)<br><br><u>Non-Residential:</u> Parcel ≥ 0.5 acre (503.1.C)<br><br><u>ROW</u>: New impervious area ≥ 1 acre where practicable (503.1.D) | <u>Minor/Major Development:</u> ≥ 1 acre disturbance and ≥0.5 acre new impervious (503.02)<br><br><u>Redevelopment:</u> ≥ 1 acre disturbance (503.02)<br><br><u>Public Road Development:</u> ≥1.5 acre new impervious and ≥1.5 acres new impervious per mile (300.07) | Minor/Major, Public Road and Mining Developments ≥1 acre disturbance (Article VI.B.6) | As required by CWA (55.022.J) | | When detention is required:<br>> 3 acre multi-residential,<br>>1 acre Commercial<br>>1 acre roads |
| Water Quality/Storm Volume | | 1.25" for all new impervious (15-64.A.1) | 1.00" for all new impervious (503.2) | 0.01" for every 1% impervious (0.2" minimum) (504.02)<br><br>0.5" for all tributary new impervious for hydrocarbon removal technology (504.04) | No minimum | As required by CWA (55.022.J) | | 0.75" for hydraulically connected impervious area of new development (9-29.G) |
| BMP Exemptions | | Net new impervious ≤2,500 sf since 04/23/13 (15-63.A.1)<br><br>Bridge/culvert replacement; Roadway resurfacing or reconstruction with < 2,500 sf net new impervious per ¼ mile (15-63.A.2)<br><br>Regional Stormwater Management or Flood Control Development (15-16.A.3)<br><br>Streambank stabilization, natural area restoration, wetland mitigation bank or off-site wetland mitigation (15-63.A.4)<br><br>Construction or reconstruction of pedestrian walkway/bike path ≤16' wide (includes shoulders) (16-63.A.5)<br><br>Modification of ex. stormwater facility to incorporate BMPs (15-63.A.6)<br><br>Water or sewer improvement (15-63.A.7)<br><br>Construction or maintenance of underground or overhead utility with supports and appurtenances (15-63.A.8) | Redevelopments w/ site constraints preventing use of retention based practices can reduce volume control storage by 25% for every 5% of reduced impervious area and shall:<br>• Demonstrate site limitations prevent providing full volume onsite<br>• Provide volume onsite to the maximum extent practicable with retention based practices (503.C)<br><br>Single Family Homes (501.Table 2)<br><br>Open Space Developments (501.Table 2) | N/A | N/A | N/A | | N/A |
| Credit for Detention | | Yes (15-64.C.2) | Yes (Page 5-61 TGM) | Yes (503.B.1 & 504.01) | N/A | N/A | | Yes |
| Fee-In-Lieu of BMPs | | Yes (15-98) | N/A | N/A | N/A | N/A | | No |

TAC Updated Meeting Schedule

April 4, 2018 –Continue Wetlands/Buffers and begin Best Management Practices (BMPs)

April 25, 2018 – continue Best Management Practices (BMPs) and begin Soil Erosion/Sediment Control & General Provisions, Administration, Enforcement

May 23, 2018 - continue General Provisions, Administration, Enforcement if needed.

Early Summer 2018 – No Meetings. Consultant to draft ordinance language. Meetings will resume in Summer 2018.