

Step 2a: ID Water Resources and Drainage Patterns

- ◆ Primary Conservation Areas
 - ◆ Regulated Waterbodies (Streams, Lakes, Wetlands)
 - ◆ Riparian areas (floodplains, floodways, stream meandering)
 - ◆ Soils suited for infiltration (groundwater recharge zones)
 - ◆ Mature trees
- ◆ Primary Development Areas
 - ◆ Proximity to existing development (roads, utilities)
 - ◆ Areas requiring minimal clearing, grading



Step 2b: Define Characteristics of Water Resource and its Watershed

- ◆ Flood Frequency
 - ◆ 100-year floodplain
 - ◆ 100-year floodway
- ◆ Stream Meandering
 - ◆ Streamway
- ◆ Water Quality / Hydrologic Control
 - ◆ Bank-full Channel
 - ◆ Floodprone Areas
- ◆ Watershed Characteristics
 - ◆ Soils
 - ◆ Vegetation
 - ◆ Terrain
 - ◆ Imperviousness

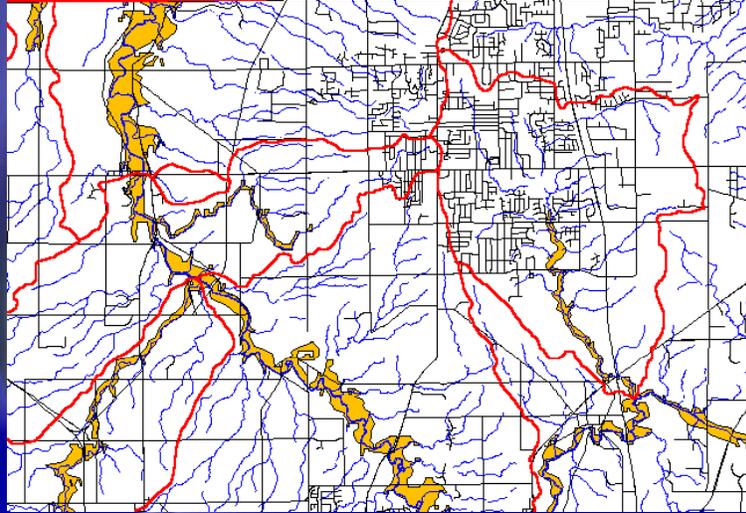


Structural BMPs Complement Non-Structural BMPs

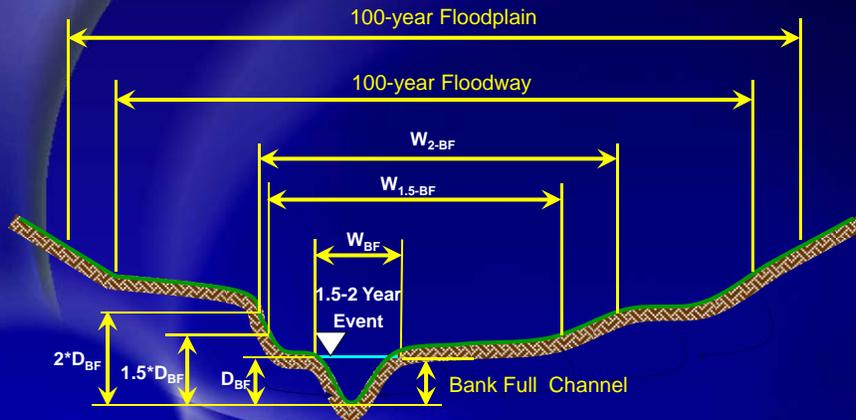
- ◆ Non-structural BMPs (Step 2)
 - ◆ Keep structures **away** from the stream
 - ◆ Maintain biological **health** of the stream
 - ◆ Provide **access** along the stream
 - ◆ Minimize **generation** of runoff and pollution
- ◆ Structural BMPs (Step 3)
 - ◆ **Control flow** into the stream
 - ◆ **Remove pollutants** before entering the stream

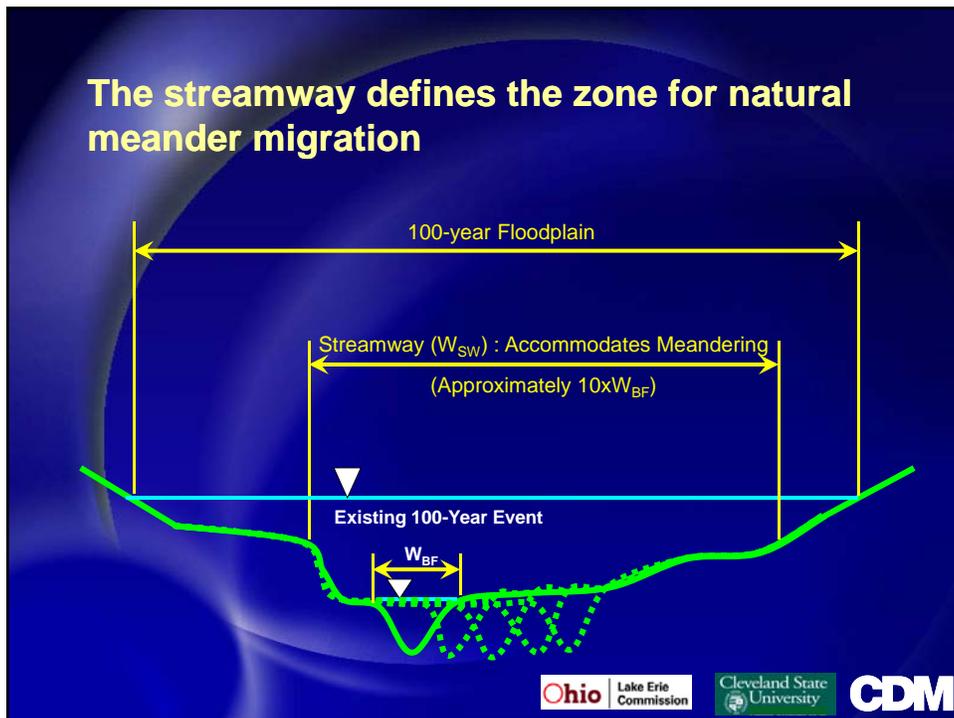
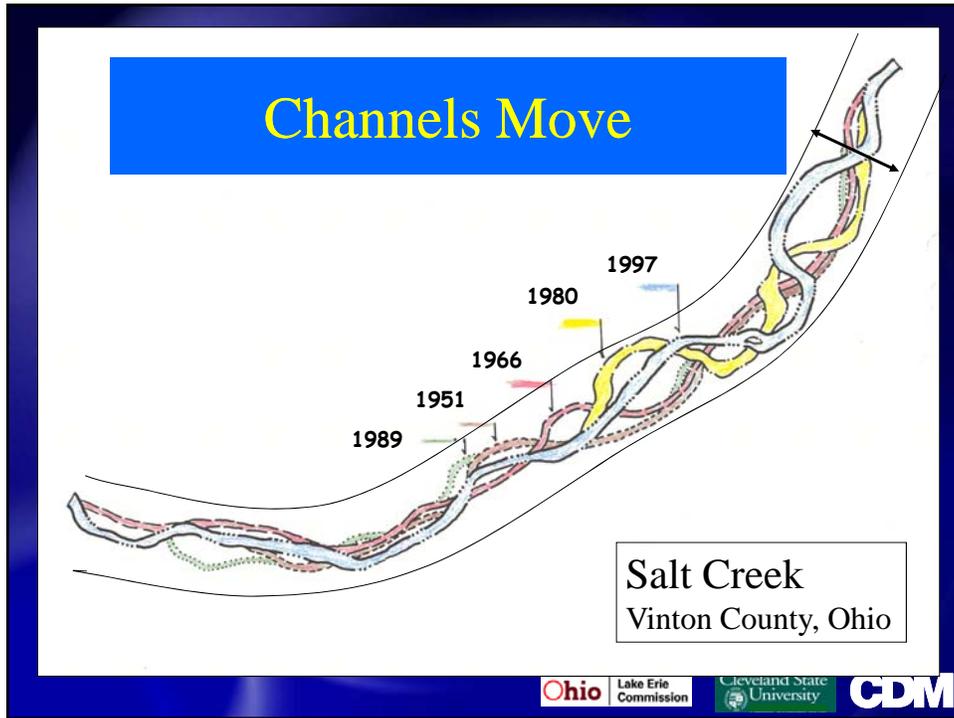


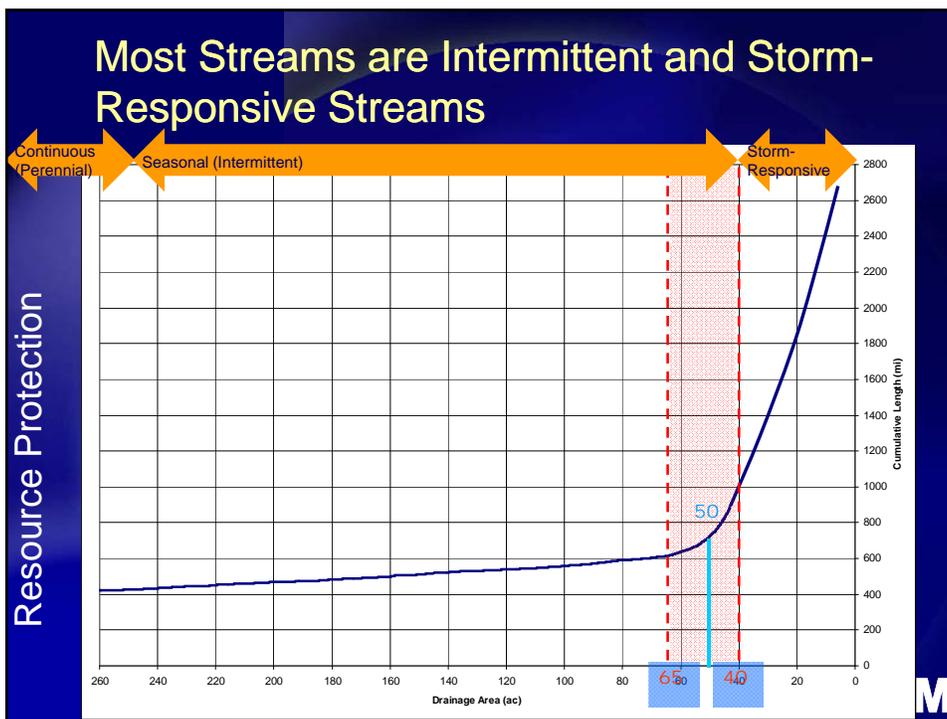
Floodplain preservation retains significant natural flood storage volume



Maintaining the hydrologic function of a stream requires an understanding of the frequency of floodplain inundation



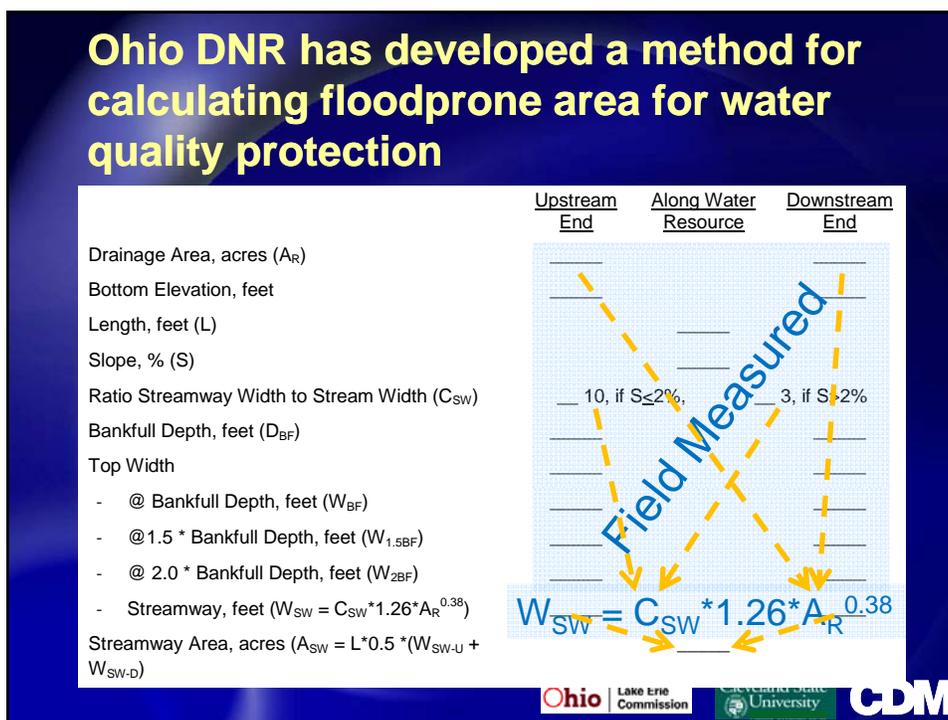
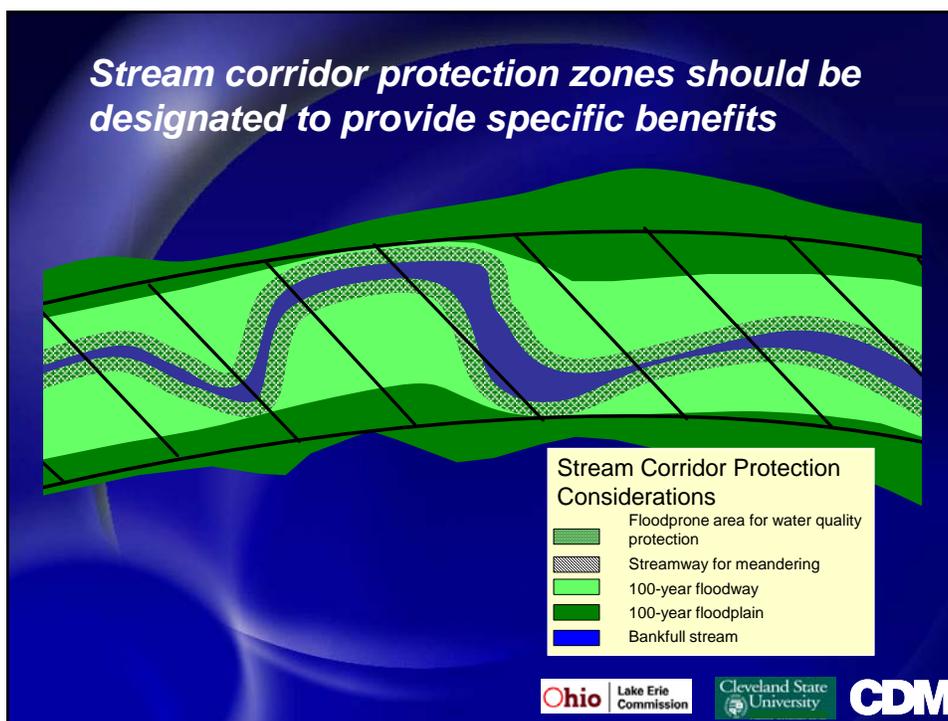


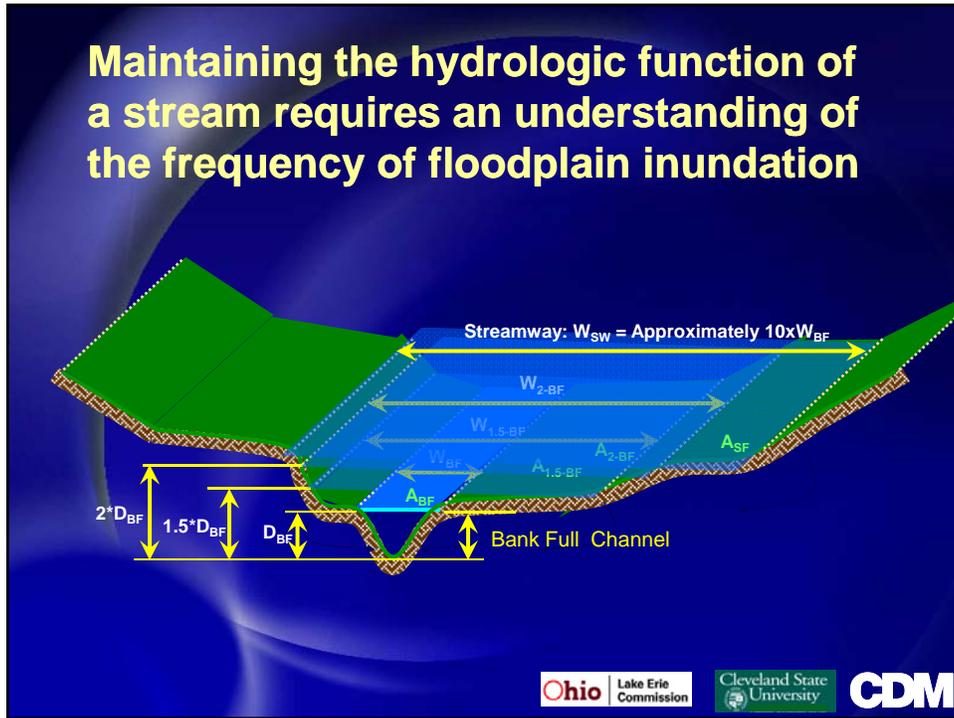


Stream Corridor Protection Recognizes Characteristics of Intermittent and Storm-Responsive Streams

				
Type of Stream	Continuous and major seasonal	Average seasonal	Most small seasonal	Storm-responsive
Drainage Area to Stream Segment	>250 ac - 250 ac	250 ac - 100 ac	100 ac - 40 ac	40 ac - 6 ac
Length of Stream Segment	>425 mi	132 mi	423 mi	1750 mi
Proposed Corridor Width (each side, from top of bank)	75 ft → 45 ft**	35 ft**	25 ft → 20 ft	20 ft → 10 ft
Function Provided				
Stream Functions				
Aquatic Habitat				
"Fishable" Segments				
In stream Pollutant Assimilation*				
In-stream flow control*				
Corridor Functions				
Reduced pollutant loading through:				
- Vegetation stabilizing streambanks				
- Vegetation filtering runoff through corridor *				
Flow control into streams				
Shade canopy (to maintain water temperature)				
Reduces other storm water controls				
Protection of structures from:				
- Stream erosion				
- Flooding				
Socio-Economic Factors				
Development layout consideration				
Compliment to CSO/SSO control objectives				
Green Space preservation				
Water related amenities				
* BMPs required under Article V also perform this function **Narrower widths apply where existing uses encroach into corridor Level of Influence from Function Provided Most Least				

M

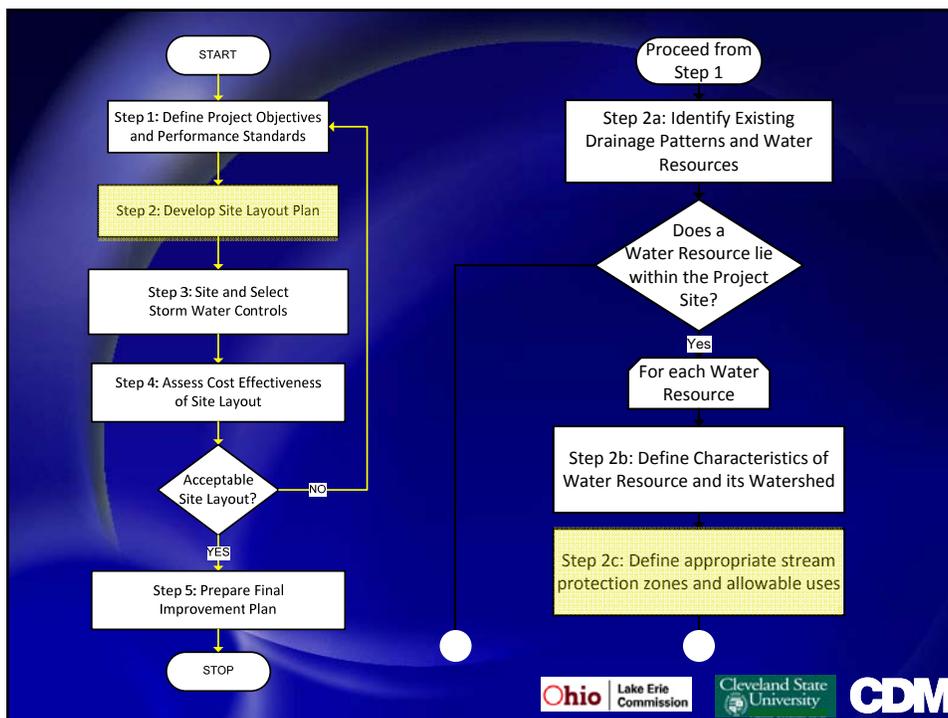
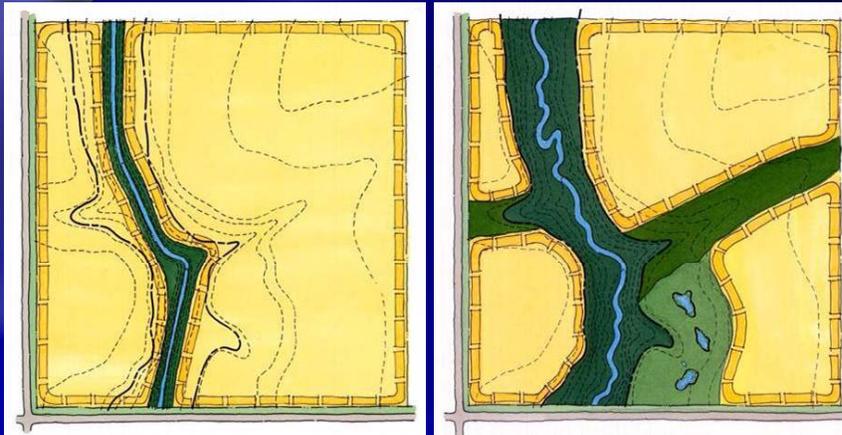




Ohio DNR has developed a method for calculating floodprone area for water quality protection

Stream Condition	Floodprone Area, ft ² ($A = L * 0.5 * (W_{-1.5} + W_{-2})$)	Incremental Area, ft ²
- @ Bankfull Depth	$A_{BF} = \underline{\hspace{2cm}}$	$I_{BF} = A_{BF} = \underline{\hspace{2cm}}$
- @ 1.5 * Bankfull Depth	$A_{1.5BF} = \underline{\hspace{2cm}}$	$I_{1.5BF} = A_{1.5BF} - A_{BF} = \underline{\hspace{2cm}}$
- @ 2.0 * Bankfull Depth	$A_{2BF} = \underline{\hspace{2cm}}$	$I_{2BF} = A_{2BF} - A_{1.5BF} = \underline{\hspace{2cm}}$
- Streamway	$A_{SW} = \underline{\hspace{2cm}}$	$I_{SW} = A_{SW} - A_{2BF} = \underline{\hspace{2cm}}$ (min.=0)
<u>Stream Condition</u>	<u>Entrenchment Ratios</u> ($E = L / A_{SW}$)	<u>Floodprone Area Weighting Factors</u> ($C = 0.6 / 2^E + 0.7$)
- @ Bankfull Depth	$E_{BF} = \underline{\hspace{2cm}}$	$C_{BF} = \underline{\hspace{2cm}}$
- @ 1.5 * Bankfull Depth	$E_{1.5BF} = \underline{\hspace{2cm}}$	$C_{1.5BF} = \underline{\hspace{2cm}}$
- @ 2.0 * Bankfull Depth	$E_{2BF} = \underline{\hspace{2cm}}$	$C_{2BF} = \underline{\hspace{2cm}}$
Adjusted Floodprone Area, ft ²		
- For $S \leq 2\%$, $A_{FP} = (I_{BF} * C_{BF}) + (0.8 * I_{1.5BF} * C_{1.5BF}) + (0.4 * I_{2BF} * C_{2BF}) =$	$\underline{\hspace{2cm}}$	
- For $S > 2\%$, $A_{FP} = (1.1 * I_{2BF}) + (0.5 * I_{SW}) =$	$\underline{\hspace{2cm}}$	

Ohio DNR's methodology suggests integrating stream setbacks, floodprone areas, and BMPs

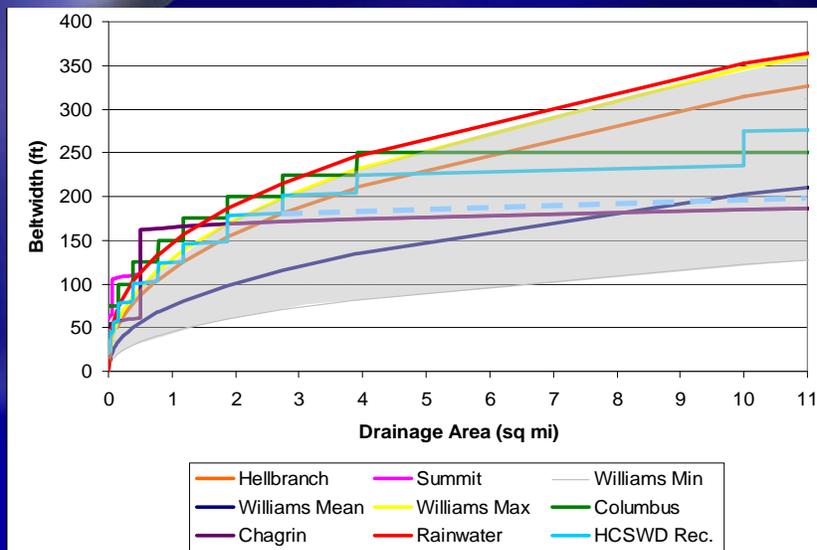


Step 2c: Define appropriate stream corridor zones and allowable uses

- ◆ Protection Goals by Stream Type
- ◆ Appropriate Dimensions (from Step 2b)
- ◆ Allowable Facilities / Activities



Comparison of Ohio DNR "Streamway" Criteria and Typical Stream Setback Criteria



What Facilities are allowable near streams?

Facilities	Allowed?		Conditions
	Yes	No	
▪ Facilities pre-existing before regulation	X		Regulation only applies to development/redevelopment
▪ Buildings, structures, and other facilities subject to building permits / zoning approval		X	Unless otherwise allowed by these Regulations
▪ Swimming Pools	X		
▪ Signs and Billboards	X		
▪ Parking lots and paved areas		X	
▪ Roads:			
o Crossing the stream	X		If impact minimized and stream crossing BMP provided
o Parallel to the stream		X	Unless necessary and approved by Enforcing Official
▪ Paved foot and bike paths	X		Must relocate paths damaged by natural erosion
▪ Levees and dikes	X		If impact to stream corridor minimized
▪ Pipe lines (water, sewer, storm):			
o Crossing the stream	X		If impact minimized and stream crossing BMP provided
o Parallel to the stream	X		If necessary and approved by Enforcing Official
▪ Septic systems	X		If necessary and approved by the Local Health Department
▪ Storm water quantity/quality control facilities	X		If compatible with habitat function and permitted under floodplain regulations
▪ Fences	X		If impact to corridor, flooding minimized
▪ Public utility transmission lines	X		If necessary and approved by Enforcing Official
▪ Electric, telecommunication, cable TV lines:			
o Crossing the stream	X		If impact minimized and stream crossing BMP provided
o Parallel to the stream	X		If necessary and approved by Enforcing Official
▪ If inconsistent with Earthwork Regulations (Article III of the Rules and Regulations of the HCSWD)		X	

Source: Hamilton County Storm Water District

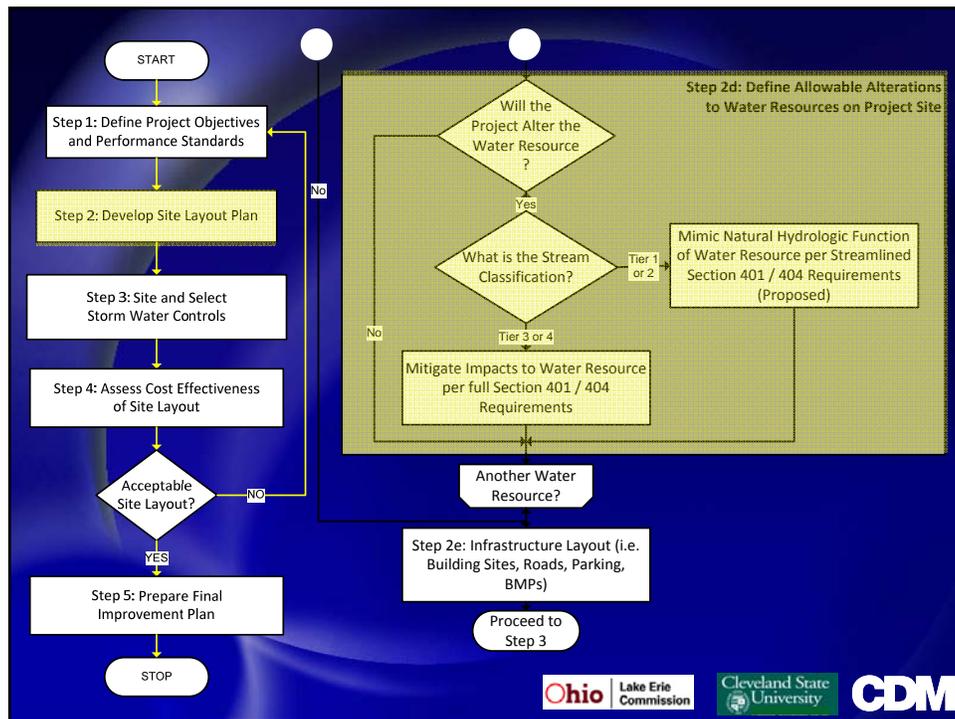


What Activities are allowable near streams?

Activities	Allowed?		Conditions
	Yes	No	
▪ Clearing of existing vegetation		X	Unless required to support an allowed facility or activity
▪ Vegetation management intended to:			
o maintain hydraulic function	X		
o protect levees / dikes	X		
o maintain habitat function	X		
o remove damaged / diseased trees	X		
o control invasive species	X		
o maintain pre-existing vegetation condition (e.g., mowing)	X		
o abate nuisance conditions	X		
o re-vegetate / re-forest to improve corridor function	X		
▪ Debris removal	X		Per approved maintenance agreement
▪ Passive uses including hiking, fishing, picnicking, and similar uses	X		
▪ Soil disturbance by grading, stripping, or other practices		X	Unless required to support an allowed facility or activity
▪ Filling or dumping		X	Unless required to support an allowed facility or activity
▪ Resource restoration activities:			
o compensatory floodplain storage	X		
o stream and/or wetland restoration / enhancement / mitigation	X		
▪ Any activity authorized by a Section 401 / 404 permit	X		
▪ Agricultural Activities	X		
▪ Construction activities related to landslide stabilization	X		
▪ Use, storage, or application of pesticides		X	Except for spot spraying of noxious weeds or non-native species consistent with ODNR recommendations
▪ Storage or operation of motorized vehicles		X	Except for approved maintenance and emergency use

Source: Hamilton County Storm Water District





Emerging Regulations for “Dysfunctional” Streams

- ◆ 2/3rds of Ohio Streams are hydrologically impaired
- ◆ Proposed modifications to Ohio EPA 401 Certification Requirements
- ◆ Proposes 4 tiered stream mitigation category approach.
- ◆ Mitigation design premise: maximize the stream’s natural state within site constraints
- ◆ Focus:
 - ◆ Restoring / protecting floodplain areas
 - ◆ Promotes restoration of degraded streams, ditches

Ohio | Lake Erie Commission | Cleveland State University | CDM

Proposed OEPA 401 Water Quality Certification – Stream Mitigation Rule

OEPA's proposed Tiered Mitigation Approach:

- ◆ Minimize the deviation of new or existing streams from their natural condition.
- ◆ Goal is to protect existing and downstream uses through tiered mitigation categories.
- ◆ 4 Proposed Tier Mitigation Categories



Proposed OEPA 401 Water Quality Certification – Stream Mitigation Rule

OEPA's proposed Tiered Mitigation Approach:

- ◆ 4 Proposed Tier Mitigation Categories
 - Tier 4 – Intended to maintain biota, habitat, form and function.
 - Tier 3 – Intended to maintain habitat, form and function.
 - Tier 2 – Intended to maintain form and function
 - Tier 1 – Intended to maintain function
- ◆ Opportunity exists in the Tier 1/Tier 2 areas to fix “dysfunctional” streams



Why Work in the Stream?

- ✓ Can restore functionality of a stream / ditch that is currently degraded with little to no permitting burden.
- ✓ Retaining / restoring natural stream form minimizes structural measures to maintain stream alignment.
- ✓ Can integrate into site design to maximize multiple uses (aesthetics, amenities, recreation, trails, flood control, water quality control).
- ✓ Material excavated for floodplain is on-site borrow source.
- ✓ Can potentially “bank” mitigation for use as credits for future development w/in same watershed area (OEPA debit-credit model as part of 401 rule revisions).



Proposed OEPA 401 Water Quality Certification – Stream Mitigation Rule

OEPA’s Proposed Tier 1 Mitigation Criteria:

- Anti-degradation exclusion applies.
- No linear foot replacement limits / requirements.
- Incorporate existing methodologies.
- Recommended for existing streams < 2% grade.
- Flood prone area must be replaced at the greater of:
 - Existing flood prone area or,
 - Area >30% of the streamway target width ($12.6 DA^{0.38}$).
- Ensure vertical stability – Address velocity issues.
- No ecological function requirements
- Monitoring related to stability and design requirements.
- Soil suitable for native vegetation and floodplain function



Proposed OEPA 401 Water Quality Certification – Stream Mitigation Rule

OEPA's proposed Tier 2 Mitigation Criteria:

- On-site replacement / restoration of stream channel and water quality services (BMPs).
- Design must be vertically stable.
- Stream channel must include length > or equal to existing condition (channel length) for self-forming or constructed channels.
- Flood prone area must be replaced at the greater of:
 - Existing flood prone area or,
 - Area >30% of the streamway target width ($12.6 DA^{0.38}$).
- Ecological function requirements associated w/ vertical stability.
- Monitoring related to stability, design requirements and stream recovery.
- Soil suitable for native vegetation and floodplain function.



Proposed OEPA 401 Water Quality Certification – Stream Mitigation Rule

OEPA 401 Water Quality Certification

- Where do I go for more information on these proposed rule changes:
www.epa.ohio.gov/dsw/rules/draft_401_sep08.aspx
- How can I get involved or submit comments?

For additional information or to submit comments

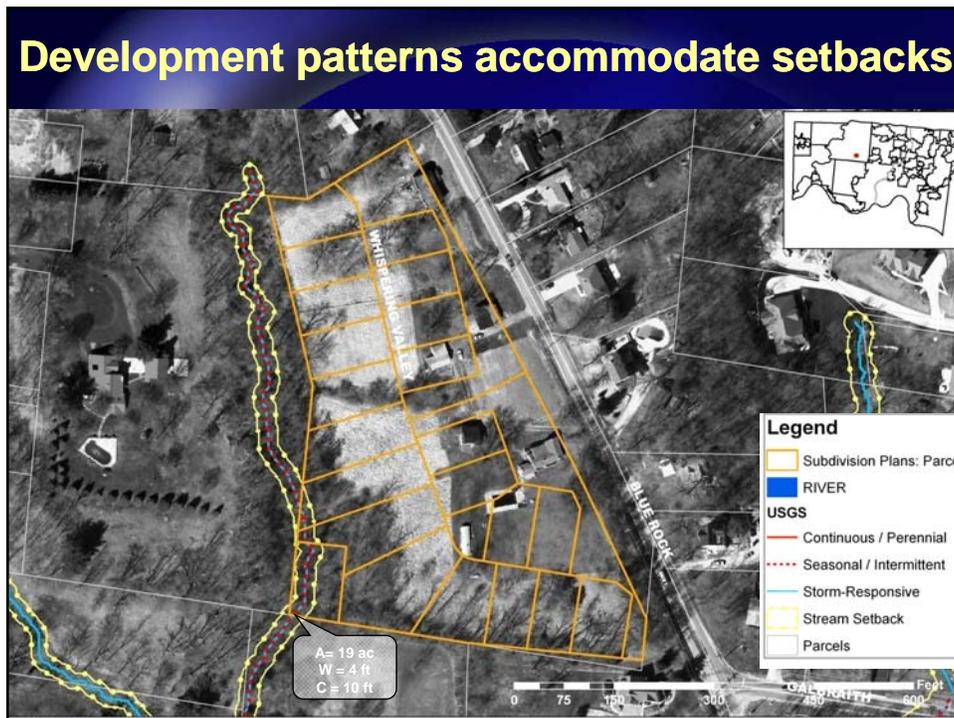
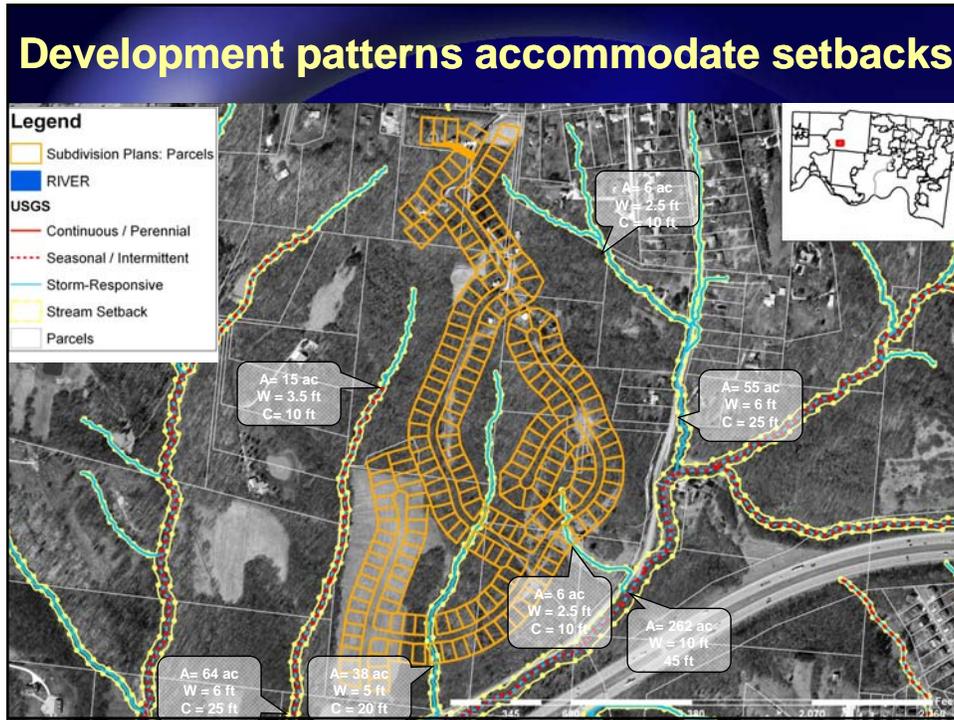
Please submit any comments you have on the draft rules in one of the following manners.

By e-mail: bob.heitzman@epa.state.oh.us

By mail: Bob Heitzman
Ohio EPA
Division of Surface Water
P.O. Box 1049
Columbus, Ohio 43216-1049

By fax: (614) 644-2745





Development patterns accommodate setbacks



Discussion Group Topic No. 3: Developing a Site Layout Plan

Instructions

Objective: To layout a proposed development which strikes a balance between development areas and conservations areas.

Lecture (15 minutes): Will cover information associated with assessing existing site conditions, terrain, drainage, land uses and water resources. The lecture will provide information on OEPAs proposed revisions to the 401 Water Quality Certification, infrastructure layout for conservation, development areas and information on imperviousness controls.

Group Discussion/Exercise (30 Minutes):

- Each group will have 30 minutes to develop a site conceptual layout that is a combination of the following:
 - Development areas – These need to include residential and/or apartment developments. Conceptual layout for the community parcel.
 - Conservation areas – These need to include open or natural areas and/or storm water management control areas.
- The conceptual layout should be developed on the tracing paper provided.
- Group discussion is encouraged during conceptual layout to develop a site that includes a balance between the following issues or concepts: drainage, water resources, development area needs, conservation areas and imperviousness controls.
- Delineate inter and intra conceptual project drainage for the development areas and conservation areas.
- Mark up a preliminary site development plan with agreed upon development and conservation areas.

Step 2b Worksheet

Define Characteristics of Water Resource and its Watershed

Name: _____

Site: _____

Date: _____

Water Resource Name / ID: _____

Type of Water Resource: ___ Stream ___ Lake ___ Wetland ___ Other: _____

Water Resource Characteristics

	<u>Upstream</u> <u>End</u>	<u>Along Water</u> <u>Resource</u>	<u>Downstream</u> <u>End</u>
Drainage Area, acres (A_R)	_____		_____
Bottom Elevation, feet	_____		_____
Length, feet (L)		_____	
Slope, % (S)		_____	
Ratio Streamway Width to Stream Width (C_{SW})	___ 10, if $S \leq 2\%$,		___ 3, if $S > 2\%$
Bankfull Depth, feet (D_{BF})	_____		_____
Top Width	_____		_____
- @ Bankfull Depth, feet (W_{BF})	_____		_____
- @ 1.5 * Bankfull Depth, feet ($W_{1.5BF}$)	_____		_____
- @ 2.0 * Bankfull Depth, feet (W_{2BF})	_____		_____
- Streamway, feet ($W_{SW} = C_{SW} * 1.26 * A_R^{0.38}$)	_____		_____
Streamway Area, acres ($A_{SW} = L * 0.5 * (W_{SW-U} + W_{SW-D})$)		_____	

Step 2c Worksheet

Define Allowable Facilities and Activities within Stream Protection Area

1. Indicate whether the following areas should or should not be included within a stream corridor protection zone and provide appropriate rationale.

<u>Area</u>	<u>Rationale</u>
___ Stream (bankfull conditions)	_____
___ Floodprone area (Worksheet 2b)	_____
___ Streamway (from Worksheet 2b)	_____
___ 100-year Floodway	_____
___ 100-year Floodplain	_____

2. Use the following table to indicate those types of facilities that should be allowed within a stream protection area. Use the “Conditions” column to provide further criteria to consider for that type of facility.

Facilities	Allowed?		Conditions
	Yes	No	
▪ Facilities pre-existing before regulation			
▪ Buildings, structures, and other facilities subject to building permits / zoning approval			
▪ Swimming Pools			
▪ Signs and Billboards			
▪ Parking lots and paved areas			
▪ Roads: <ul style="list-style-type: none"> ○ <u>Crossing</u> the stream ○ <u>Parallel to</u> the stream 			
▪ Paved foot and bike paths			
▪ Levees and dikes			
▪ Pipe lines (water, sewer, storm): <ul style="list-style-type: none"> ○ <u>Crossing</u> the stream ○ <u>Parallel to</u> the stream 			
▪ Septic systems			
▪ Storm water quantity/quality control facilities			
▪ Fences			
▪ Public utility transmission lines			
▪ Electric, telecommunication, cable TV lines: <ul style="list-style-type: none"> ○ <u>Crossing</u> the stream ○ <u>Parallel to</u> the stream 			
▪ If inconsistent with Earthwork Regulations (Article III of the Rules and Regulations of the HCSWD)			

Step 2c Worksheet (continued)

Define Allowable Facilities and Activities within Stream Protection Area

3. Use the following table to indicate those types of facilities that should be allowed within a stream protection area. Use the “Conditions” column to provide further criteria to consider for that type of facility.

Activities	Allowed?		Conditions
	Yes	No	
<ul style="list-style-type: none"> ▪ Clearing of existing vegetation 			
<ul style="list-style-type: none"> ▪ Vegetation management intended to: <ul style="list-style-type: none"> ○ maintain hydraulic function ○ protect levees / dikes ○ maintain habitat function ○ remove damaged / diseased trees ○ control invasive species ○ maintain pre-existing vegetation condition (e.g., mowing) ○ abate nuisance conditions ○ re-vegetate / re-forest to improve corridor function 			
<ul style="list-style-type: none"> ▪ Debris removal 			
<ul style="list-style-type: none"> ▪ Passive uses including hiking, fishing, picnicking, and similar uses 			
<ul style="list-style-type: none"> ▪ Soil disturbance by grading, stripping, or other practices 			
<ul style="list-style-type: none"> ▪ Filling or dumping 			
<ul style="list-style-type: none"> ▪ Resource restoration activities: <ul style="list-style-type: none"> ○ compensatory floodplain storage ○ stream and/or wetland restoration / enhancement / mitigation 			
<ul style="list-style-type: none"> ▪ Any activity authorized by a Section 401 / 404 permit 			
<ul style="list-style-type: none"> ▪ Agricultural Activities 			
<ul style="list-style-type: none"> ▪ Construction activities related to landslide stabilization 			
<ul style="list-style-type: none"> ▪ Use, storage, or application of pesticides 			
<ul style="list-style-type: none"> ▪ Storage or operation of motorized vehicles 			