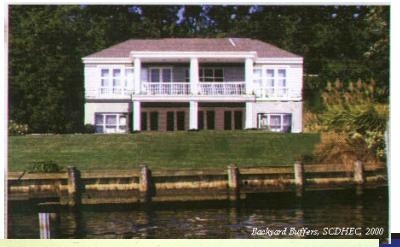
M6e: Stream Buffers and Land Development

Selected Slides from the Center for Watershed Protection

Comments by Bob Pitt
University of Alabama



Lack of streamside buffers provide little protection to water and to adjacent property.

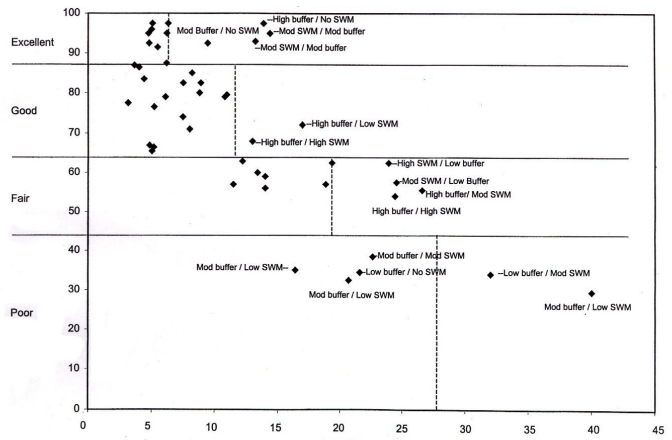
Center for Watershed Protection

Why Use Stream Buffers?

- **Partially mitigates adverse receiving water biological effects due to increased land development.**
- **Enhances stream habitat by protecting physical channels from direct modifications, preserves large woody debris sources, moderates temperature increases associated with increased pavement, etc.**
- **Adds value and beauty to streamside corridors and parks in urban areas.**
- **Protects public utilities from damage during channel enlargement associated with land development.**
- **Provides land for increased channel enlargement to minimize damage to adjacent property and buildings.**

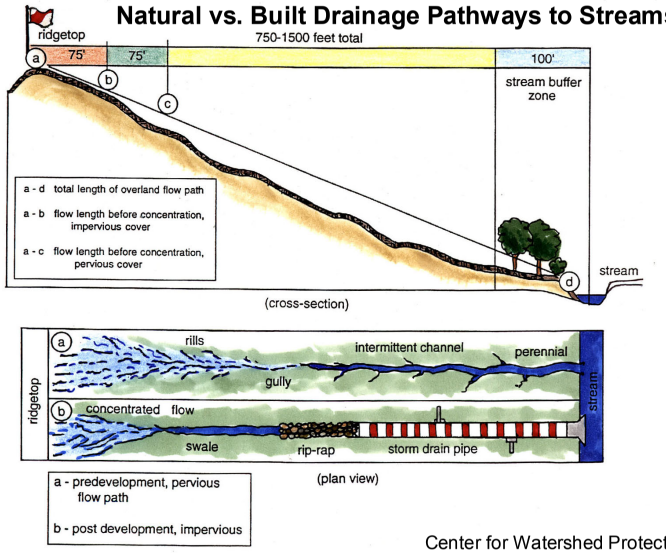
- **HOWEVER, buffers provide very little direct treatment of stormwater.**

Stream Buffers, in Conjunction with Extensive Stormwater Management, Help Compensate for Increased Development



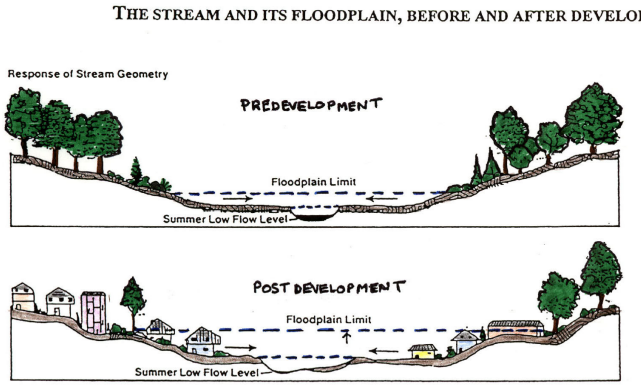
Center for Watershed Protection

Natural vs. Built Drainage Pathways to Streams



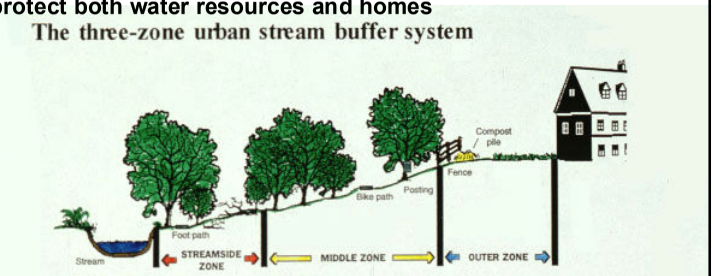
Center for Watershed Protection

Construction in the Floodplain Limit Adds Additional Hazards; Aquatic Buffers Must Extend at least to the Floodplain Limit



Center for Watershed Protection

Buffers can be specified to provide specific objectives and to protect both water resources and homes



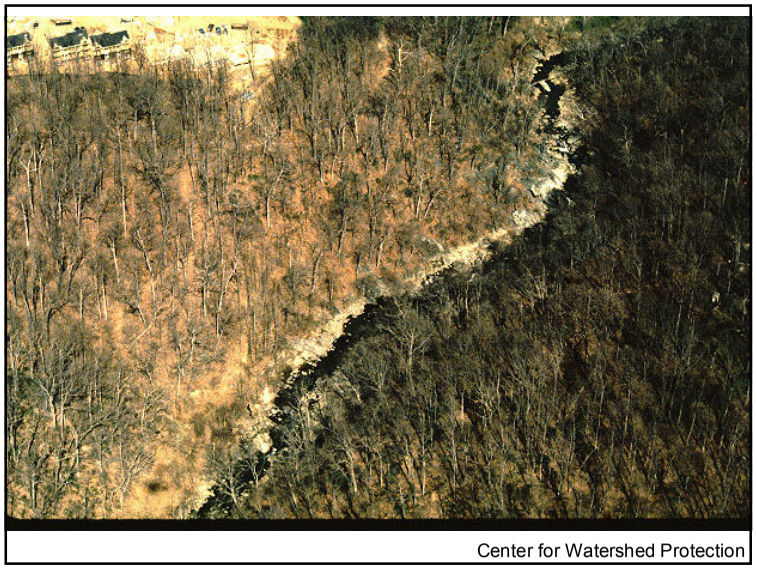
CHARACTERISTICS	STREAMSIDE ZONE	MIDDLE ZONE	OUTER ZONE
FUNCTION	Protect the physical integrity of the stream ecosystem	Provide distance between upland development and streamside zone	Prevent encroachment and filter backyard runoff
WIDTH	Min. 25 feet, plus wetlands and critical habitats	50 to 100 feet, depending on stream order, slope, and 100 year floodplain	25 foot minimum setback to structures
VEGETATIVE TARGET	Undisturbed mature forest. Reforest if grass	Managed forest, some clearing allowable	Forest encouraged, but usually turfgrass
ALLOWABLE USES	***Very Restricted*** e.g., flood control, utility right of ways, footpaths, etc.	***Restricted*** e.g., some recreational uses, some stormwater BMPs, bike paths, tree removal by permit	***Unrestricted*** e.g., residential uses including lawn, garden, compost, yard wastes, most stormwater BMPs

Center for Watershed Protection

Typical Streamside Buffers in Agricultural and Urban Areas

The steamside zone must be left in its natural state, and minimal modifications can be allowed in middle zone. For the best protection, utilities should also be placed in the middle zone and not in the streamside zone. Utility construction and maintenance can be very disruptive, and a further setback from a likely enlarging stream will also offer additional protection to the utility.

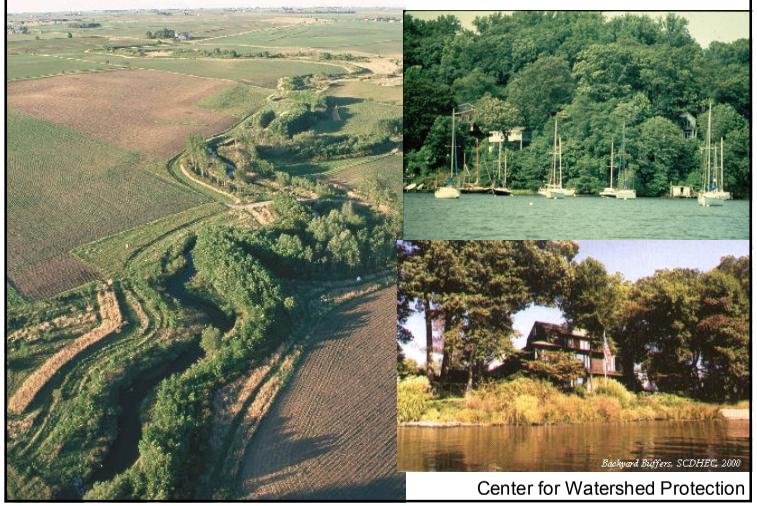
Center for Watershed Protection



Center for Watershed Protection

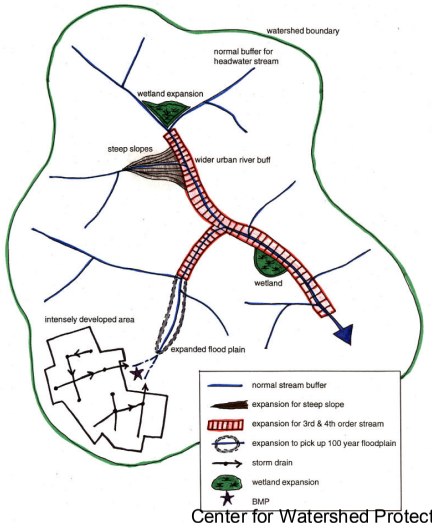
Center for Watershed Protectic

Typical aquatic zone buffers



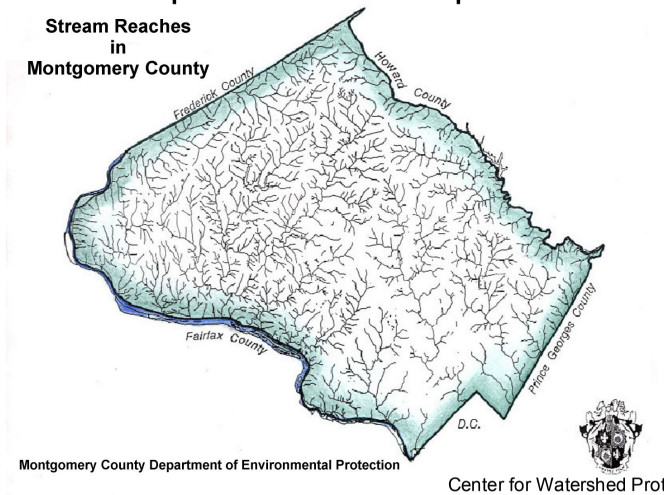
Center for Watershed Protection

Enlargements to the basic stream buffers may be needed in critical locations.



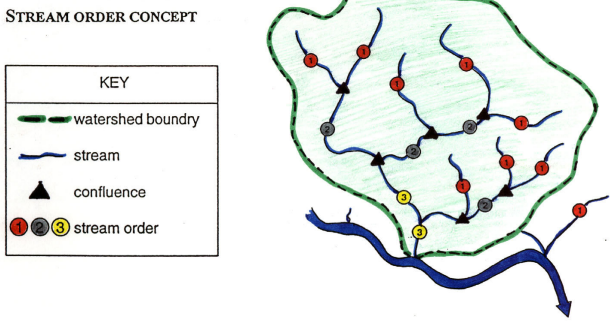
Center for Watershed Protection

There are a lot of streams in a county and long buffers that restrict development can affect developable areas.



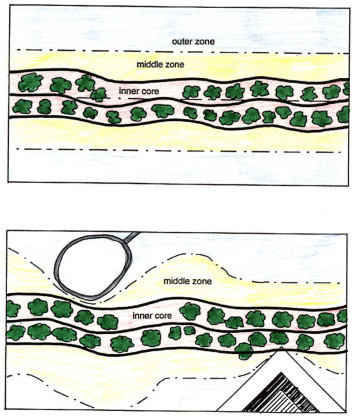
Center for Watershed Protection

Most watershed protection ordinances specify different buffer lengths for different stream orders and land slopes.



Stream buffer averaging in the middle zone

Some watershed protection ordinances allow averaging of the middle zone of the buffer to accommodate specific development constraints.

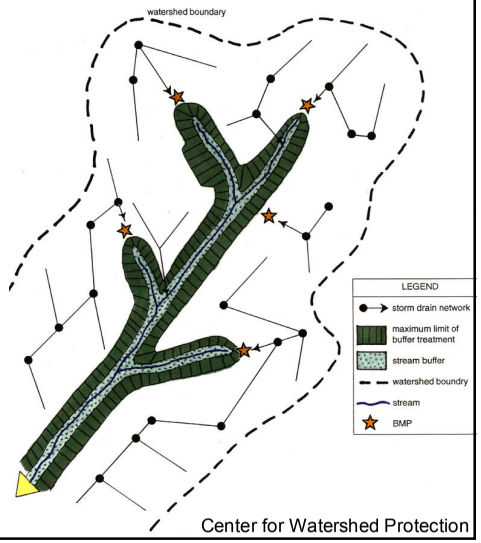


Some watershed protection ordinances provide an adjustment to the allowable building density according to the amount of land used in the stream buffer.

% of Site Lost to Buffers	Density Credit
1 to 10%	1.0
11 to 20%	1.1
21 to 30%	1.2
31 to 40%	1.3
41 to 50%	1.4

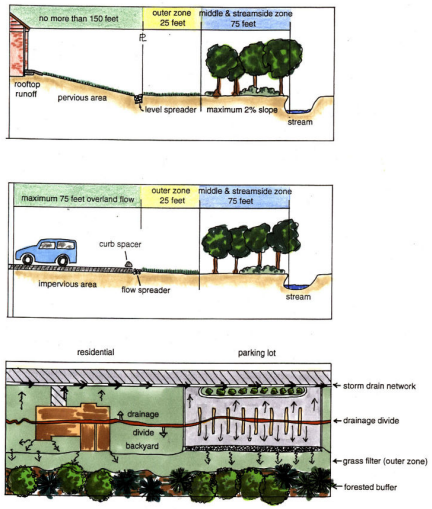
Center for Watershed Protection

The buffer directly treats only a relatively small amount of the stormwater from the watershed. Most of the stormwater is discharged to the creek through enclosed conduits that pass through the buffer. The solution is to provide treatment before the stormwater enters the buffer areas, as shown on this diagram.



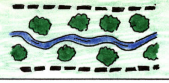
Center for Watershed Protection

Developed areas adjacent to aquatic buffers should not drain to conventional storm drainage systems, but should drain as sheetflows directly to the buffer zone. Concentrated flows must be kept out of the buffer areas, unless treated and properly designed to minimize channel erosion.



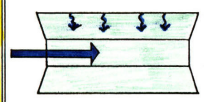
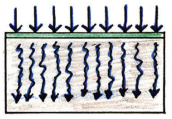
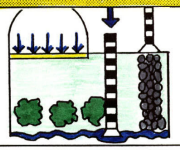
Center for Watershed Protection

DELINEATION CRITERIA FOR SHORELINE, WETLAND AND STREAM BUFFERS

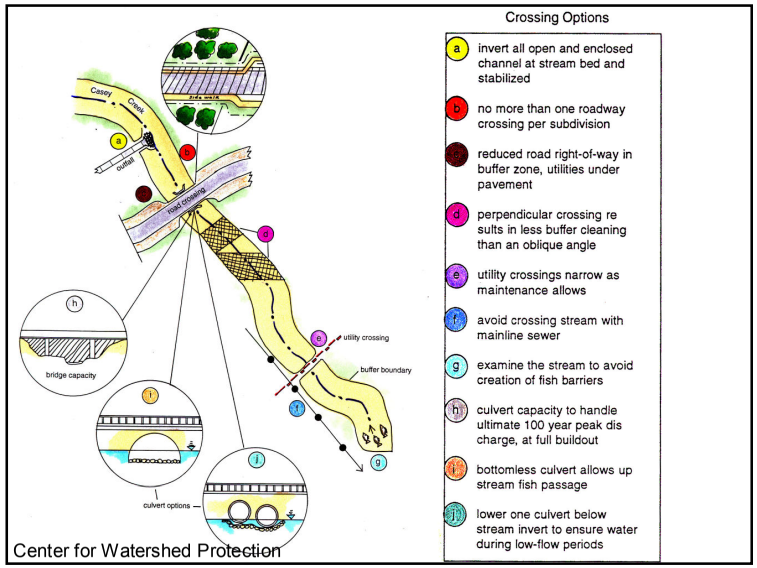
BUFFER TYPE	SHORELINE BUFFER	STREAM BUFFER	WETLAND BUFFER
Delineation			
Main Objectives:	Separation of land development from aquatic areas, pollutant removal	Preserve stream ecology, prevent flood damage and bank erosion, habitat	Prevent wetland disturbance
Width varies by:	Water use class or designation of lake or estuary	Stream order, and adjacent slopes	Size, type and quality of wetland
Measured from:	Mean high water or high tide line	Bank or stream centerline	Edge of field delineated wetland
Stormwater management	Bypass or treat	Bypass, but some limited treatment	Avoid direct entry
View corridors	Important	Seldom important	Seldom important
Access	Water-dependent	Restricted	Prohibited
Median Width (from Heraty, 93)	75 ft. (lake) 50 ft. (ocean)	88 ft.	100 ft.

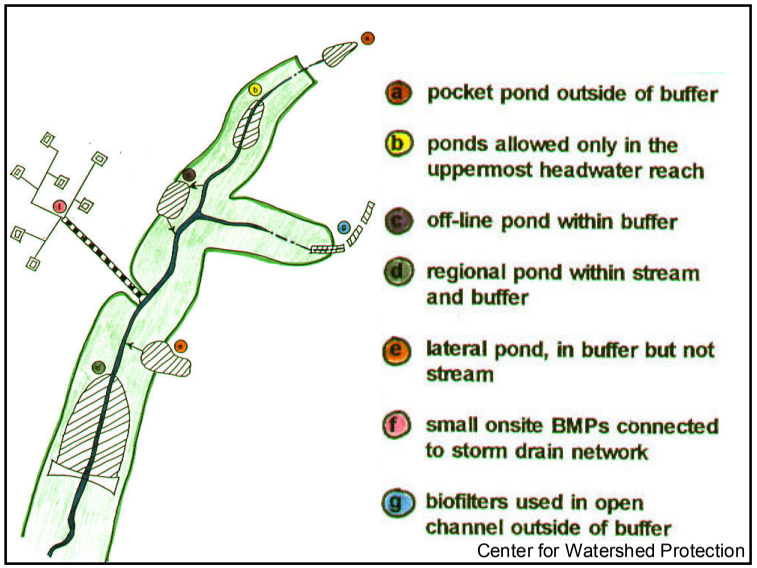
Center for Watershed Protection

SOME STANDARDIZATION OF URBAN VEGETATIVE FILTERING SYSTEMS

	Open Channel Systems	Filter Strip Systems	Buffer Systems
FILTER			
FLOW	shallow flow occurs through a designed open channel, concentrated outflow	grass filter that accepts sheetflow from adjacent areas, no concentrated outflow	primarily used to protect stream, but can act as a filter under restricted conditions
TERMS	swale (wet or dry) grass channel grass swale bioswale biofilter bioretention swale	filter strip vegetated filter strip grass filter strip grass buffer bioretention area	forest buffer stream buffer riparian filter buffer strip urban buffer treatment

Center for Watershed Protection


Crossing Options
a invert all open and enclosed channel at stream bed and stabilized
b no more than one roadway crossing per subdivision
c reduced road right-of-way in buffer zone, utilities under pavement
d perpendicular crossing re sults in less buffer cleaning than an oblique angle
e utility crossings narrow as maintenance allows
f avoid crossing stream with mainline sewer
g examine the stream to avoid creation of fish barriers
h culvert capacity to handle ultimate 100 year peak dis charge, at full buildout
i bottomless culvert allows up stream fish passage
j lower one culvert below stream invert to ensure water during low-flow periods
Casey Creek
outfall
road crossing
utility crossing
buffer boundary
bridge capacity
culvert options
Center for Watershed Protection


a pocket pond outside of buffer
b ponds allowed only in the uppermost headwater reach
c off-line pond within buffer
d regional pond within stream and buffer
e lateral pond, in buffer but not stream
f small onsite BMPs connected to storm drain network
g biofilters used in open channel outside of buffer
Center for Watershed Protection