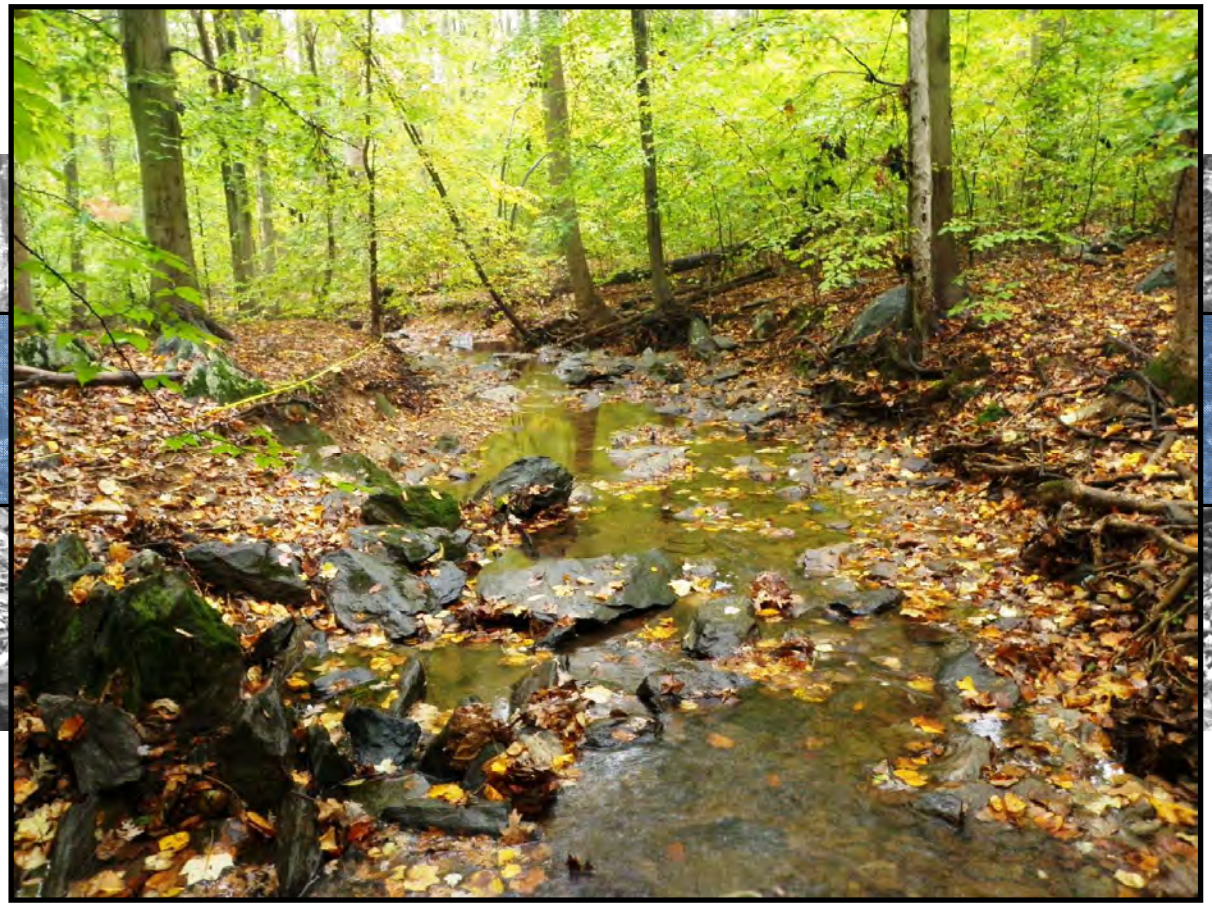
Upper Watts Branch

Community Presentation

03-13-12



Rockville Maryland

HAZEN AND SAWYER
Environmental Engineers & Scientists

CPJ Associates

Meeting Agenda

- Watersheds
- Stormwater
- Streams
- Stream Vegetation
- Stream Channel
- Sediment
- Stream Stabilty
- Forestry
- Project Status
- Next Steps
- Questions

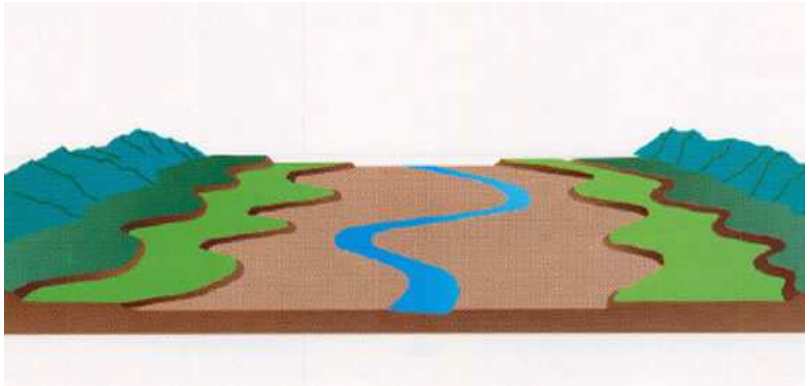
Watersheds

Watershed Definitions

- A watershed is the area of land where all of the water that is under it, or drains off of it, goes to the same place.
- The region or area drained by a river or stream (AKA, the drainage area).
- Areas that are divided from each other by higher land areas (ridges).
- Watershed shapes are sometimes described as valley types

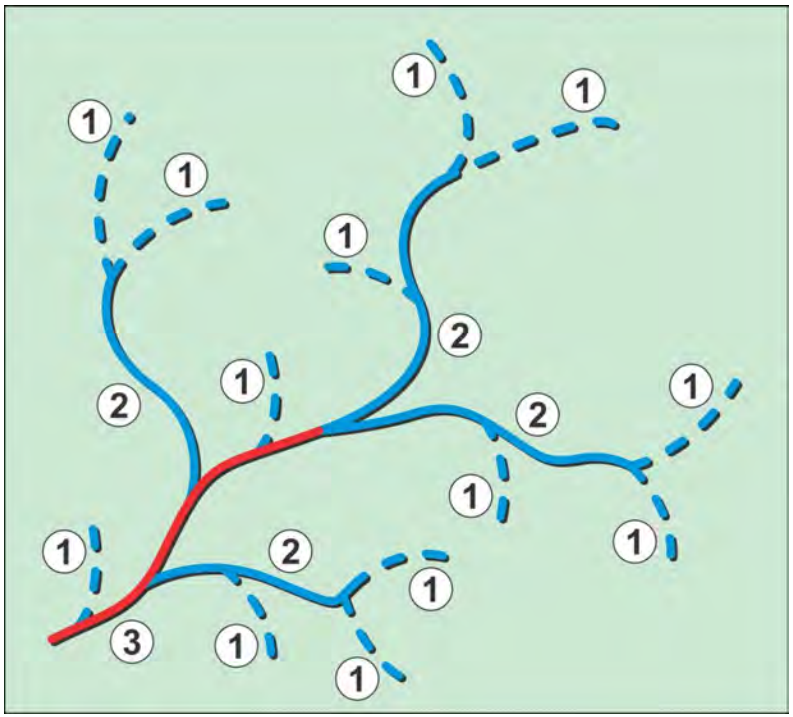
Project Stream Valley Type

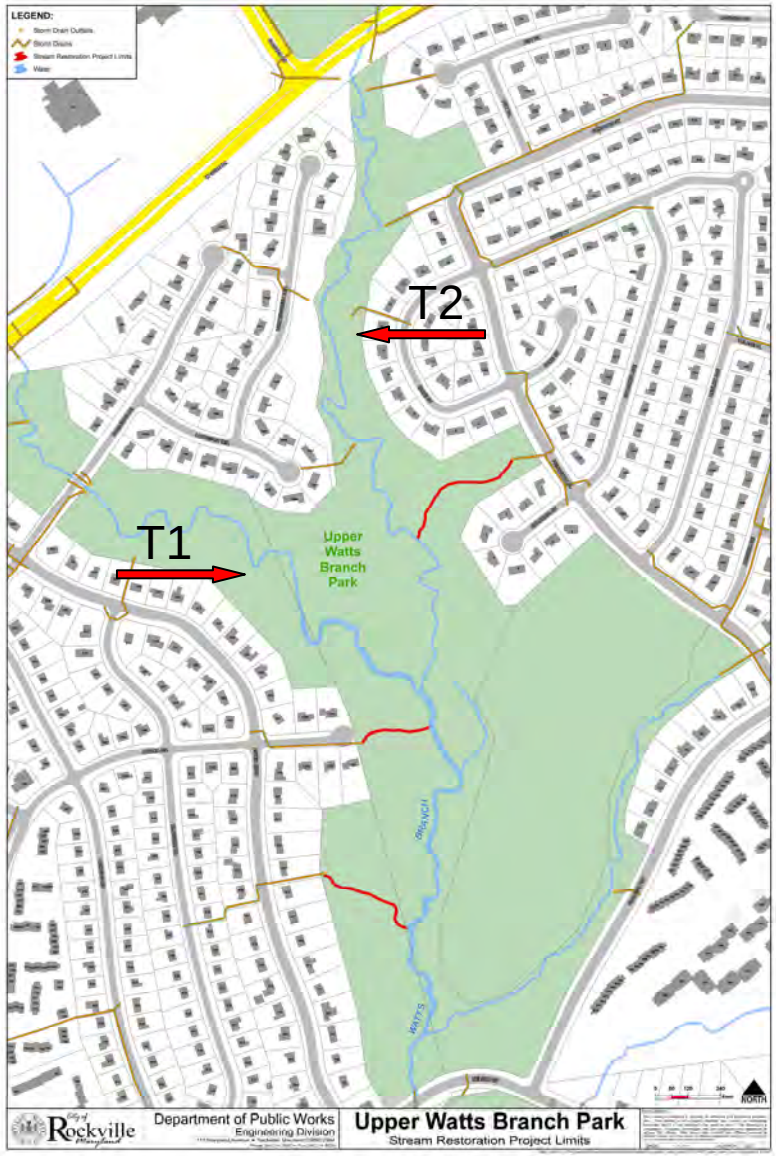
- Watts Branch and the UWB park are both located in a type VIII valley: wide, gentle valley slope with well developed flood plain and historical terraces.



Stream Networks and Watersheds

- The stream network within UWB park has several 1st order streams, some 2nd order streams and one third order stream

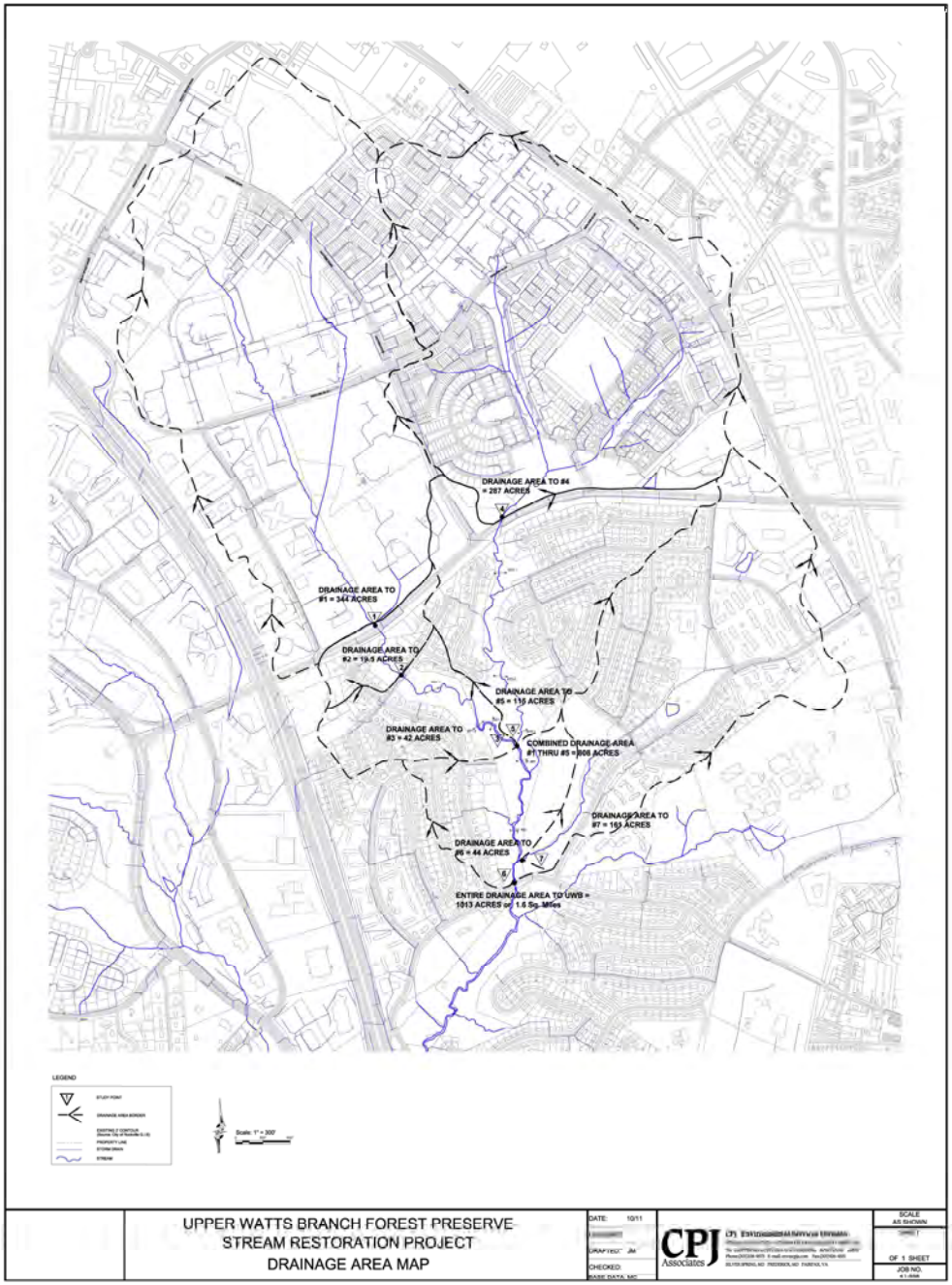




Comparison of Stream Orders

- Swale at Princeton Place (1st order)
- Tributaries 1 and 2 in UWB Park (2nd order)
- Main stem of UWB (where tributaries 1 and 2 meet) (3rd order)
- UWB mainstem at confluence with Watts Branch (4th order)
- Watts Branch at confluence with Potomac River (5th order)
- Potomac River at Chesapeake Bay (7th or 8th order)
- The Mississippi River (10th order)
- The Amazon (12th order, world's largest)

Drainage Area Map



Stormwater

The Water Cycle

Image Source: Federal Interagency Stream Restoration Working Group 1998.

What Is Stormwater Management?

Natural runoff

Forest and wetlands soak up rain water like a sponge. Water is absorbed by plants or flows down through the soil to recharge ground water, which helps keep streams flowing in dry periods. Excess runoff flows in shallow trickles across the ground into streams. The soil and plants help trap loose sediment and break down pollutants.

Urban runoff

When forests are converted to houses and roads, there is less vegetated area to absorb rainfall. The excess stormwater "runs off" of impervious areas such as rooftops and parking lots. This runoff picks up pollutants like fertilizers, pet waste, oil and dirt along the way and carries them through storm drain pipes to streams.

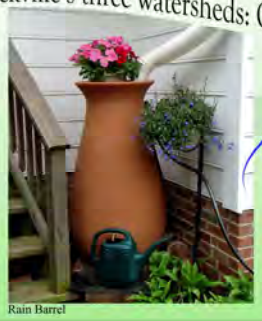
Urban runoff has enough force and speed to erode streambanks and move sediment downstream. It harms aquatic insects and fish, knocks down trees along stream banks, and degrades stream quality throughout Rockville and downstream to the Chesapeake Bay.

Water flows through Rockville's three watersheds: Cabin John Creek, Watts Branch and Rock Creek.

Stormwater Management (SWM)

Stream erosion and poor water quality from untreated stormwater affect Rockville's three watersheds - Watts Branch, Rock Creek and Cabin John Creek. Stormwater ponds and filters help in two ways. They trap trash and pollutants to make stormwater cleaner, and they slow down the runoff to reduce streambank erosion.

Parts of Rockville have outdated stormwater controls or none at all. Today, the City updates its older stormwater management systems to improve their effectiveness. The City also restores streams with rocks and native plants to stabilize eroding channels. Plantings and natural designs make these projects both attractive and good for the environment.



Rain Barrel

Help Save Our Streams

Simple changes around your home and in your daily habits can help improve water quality:

- Pick up pet waste
- Redirect down spouts so the water empties onto lawn or landscaped areas
- Use a rain barrel at the bottom of a down spout to water your garden
- Test your soil so you apply the right amount of fertilizers
- Replace paved areas or lawn with landscaping or trees
- Stay informed by visiting www.rockvillemd.gov/environment

Rockville Maryland

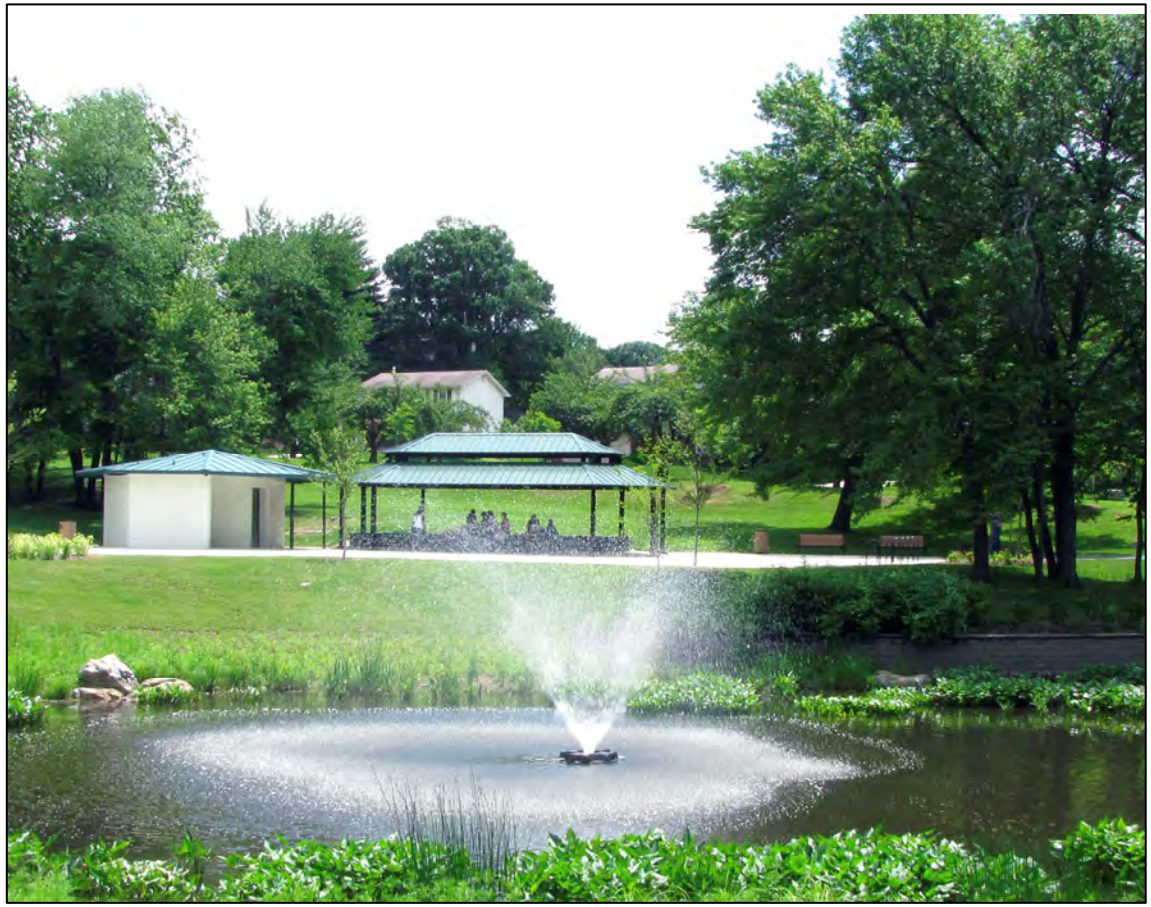
Interpretive Sign Design by Charles P. Johnson and Associates, Inc.

Influences of Development

Image Source: dagnygromer.wordpress.com

Stormwater Management

- Quantity
- Quality



Increased Runoff

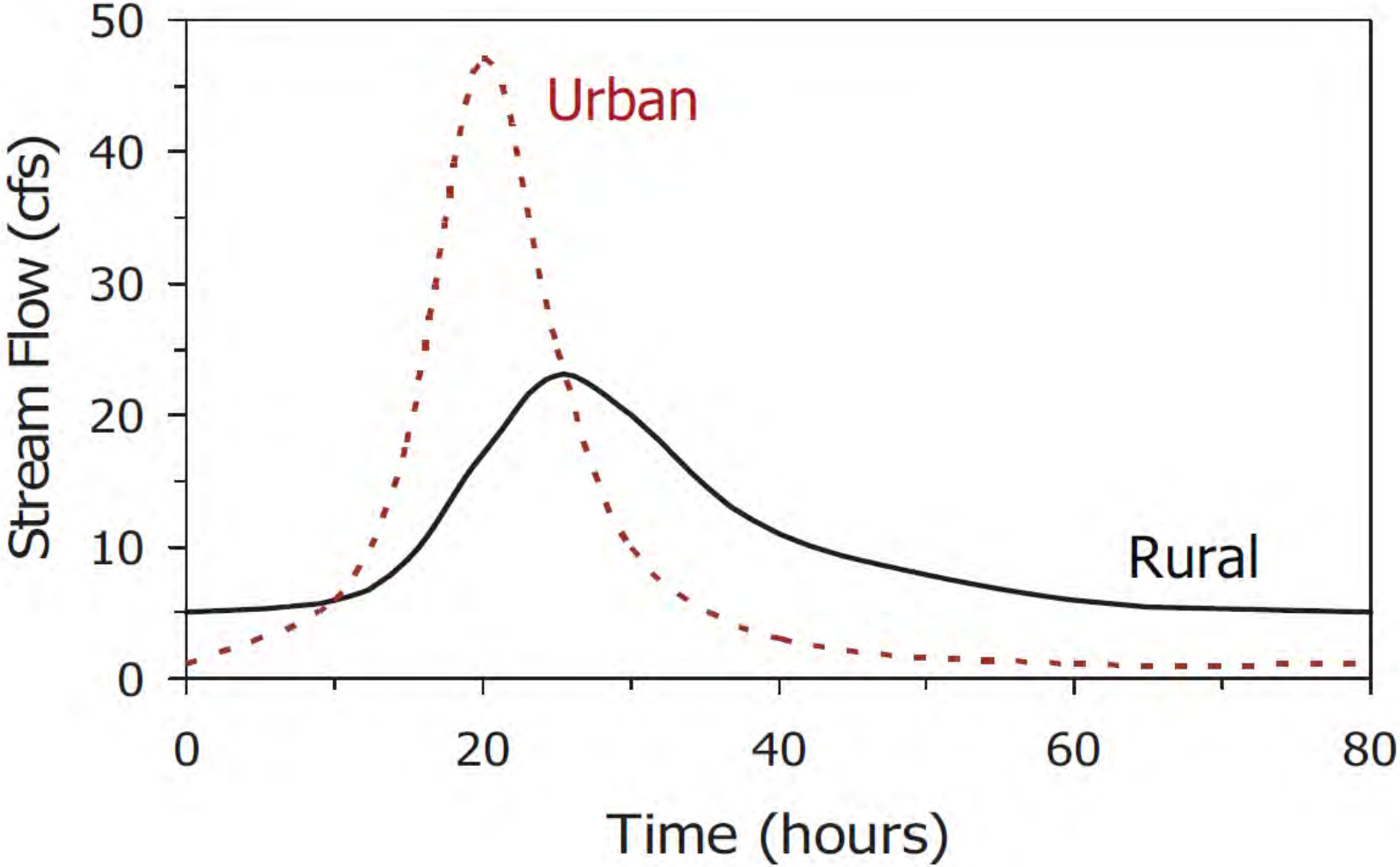


Image Source: NC State BAE Dept

Stormwater Regulations

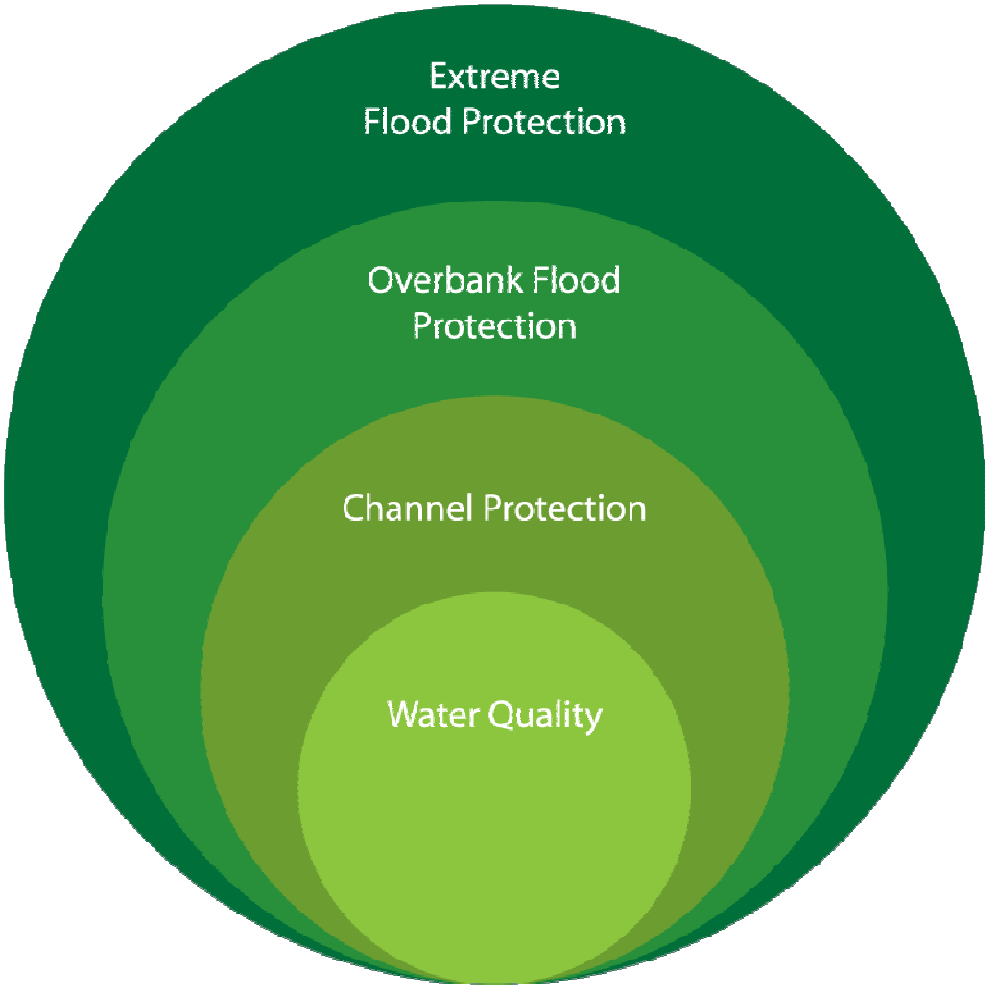
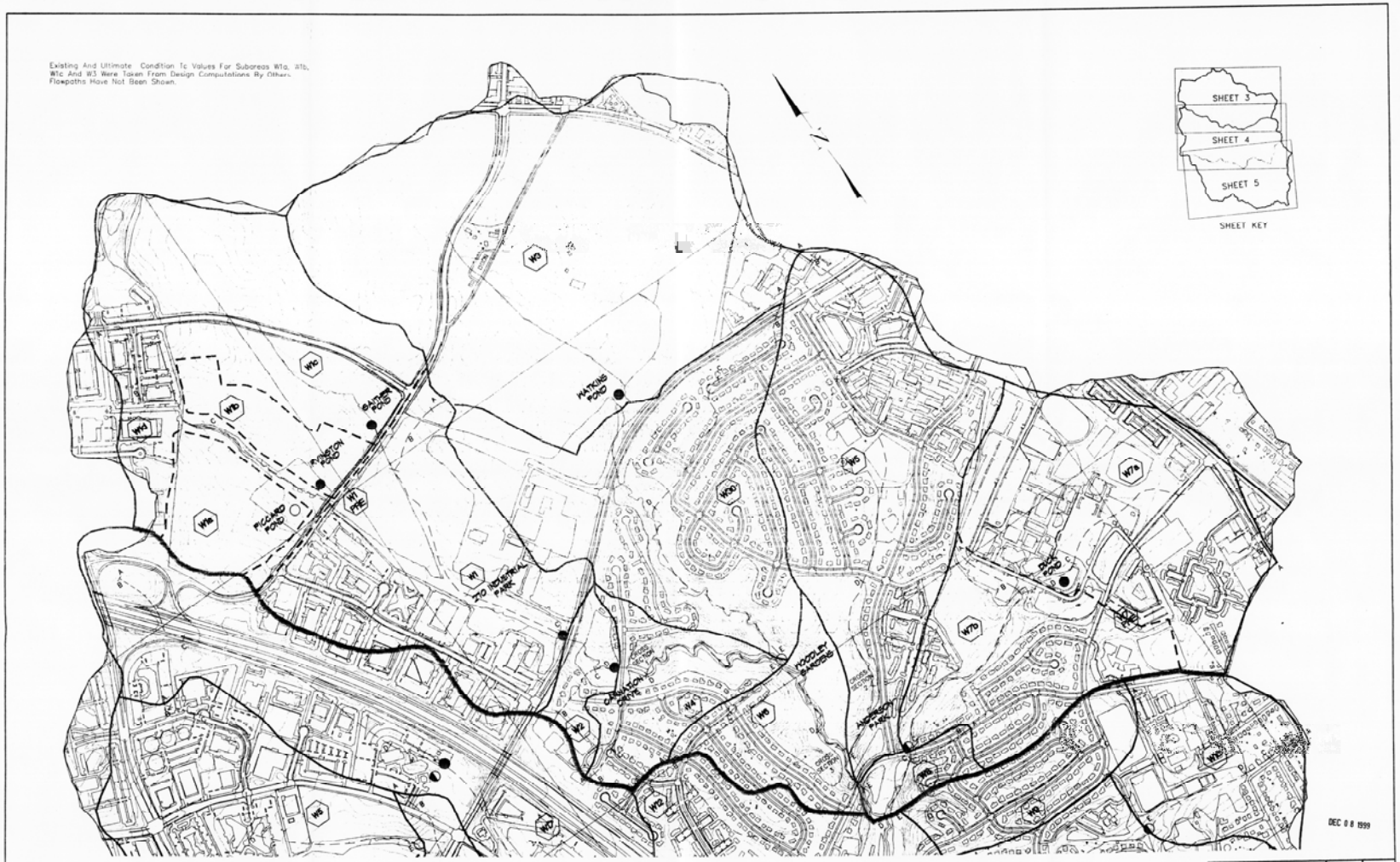


Image Source: Center for Watershed Protection

TR-20



ROCKVILLE

DESIGNED
TRACED
CHECKED

APPROVED
DIRECTOR OF PUBLIC WORKS

GRAD.
PAV.
SD
W & S
SWM
OTHER

DEPARTMENT OF PUBLIC WORKS
CITY OF
ROCKVILLE
MARYLAND AT VINSON ROCKVILLE, MARYLAND

DATE PROJECT STARTED
DATE PROJECT COMPLETED
DATE ACCEPTED BY CITY
DATE TRANS. TO FINANCE DEPT. W/R'S FORM

AS BUILT COMPLETED
DATE
CHIEF INSPECTOR

Morris, Hendricks & Glancock, P.A.
Engineers • Planners • Surveyors

Watts Branch Watershed Study
TR 20 Hydrologic Analysis
Partial Watershed Map 1

NO.	DATE	REVISIONS	APP'D	DATE

DATE 12-99
JOB NO. 99-329
SCALE 1" = 400'
DRAWING NO. 3 OF 5
FILE

Existing Facilities within UWB Park

Existing Facilities within Watts Branch Watershed

Storm Water Management UWB

- Retrofit SM18 & SM20

Streams

Stream Types

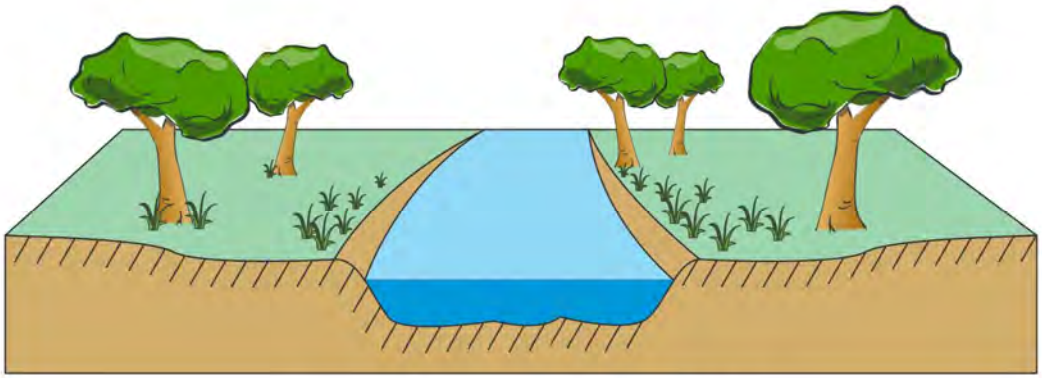
- Perennial
- Intermittent
- Ephemeral
- Spring-fed
- Subterranean
- Tidal

Stream Characteristics

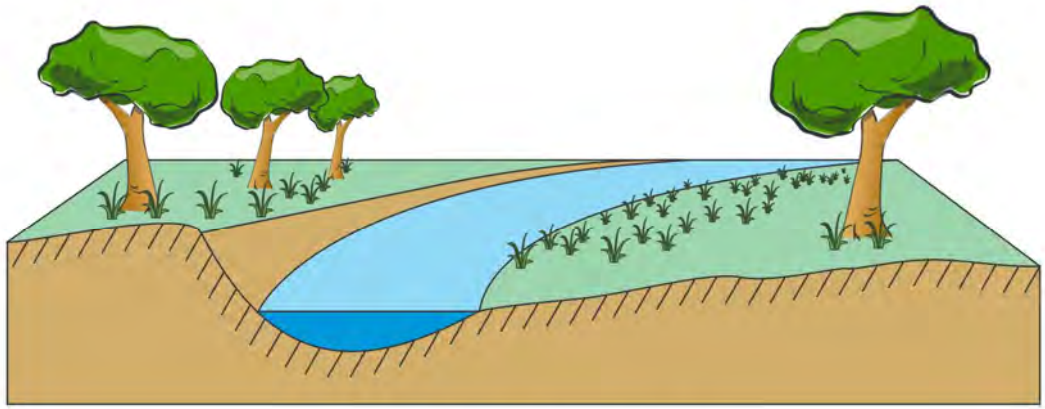
- Dimension, Plan and Profile
- Bed Material
- Vegetation
- Channel Evolution
- Sediment Transport
- Stability

Dimension

- Dimension: The cross sectional shape of a stream

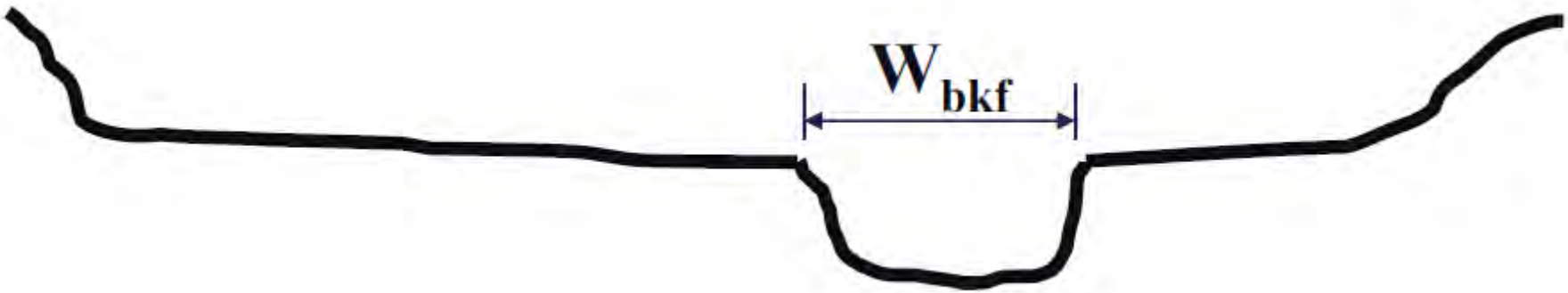


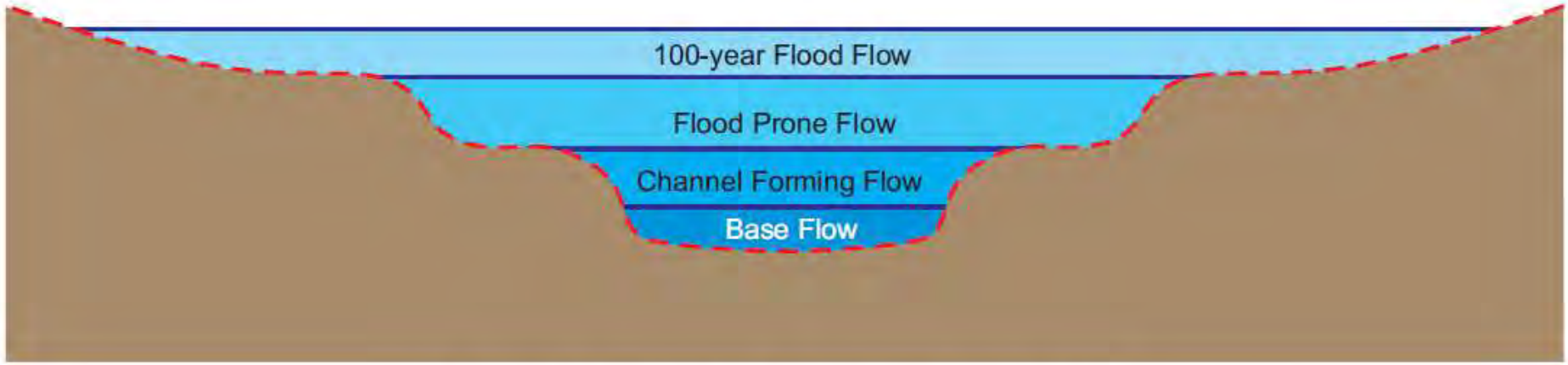
Typical Cross Section in Straight Reach



Typical Cross Section in Bend

Dimension Cont.





Typical Stream Flow Elevations

Plan

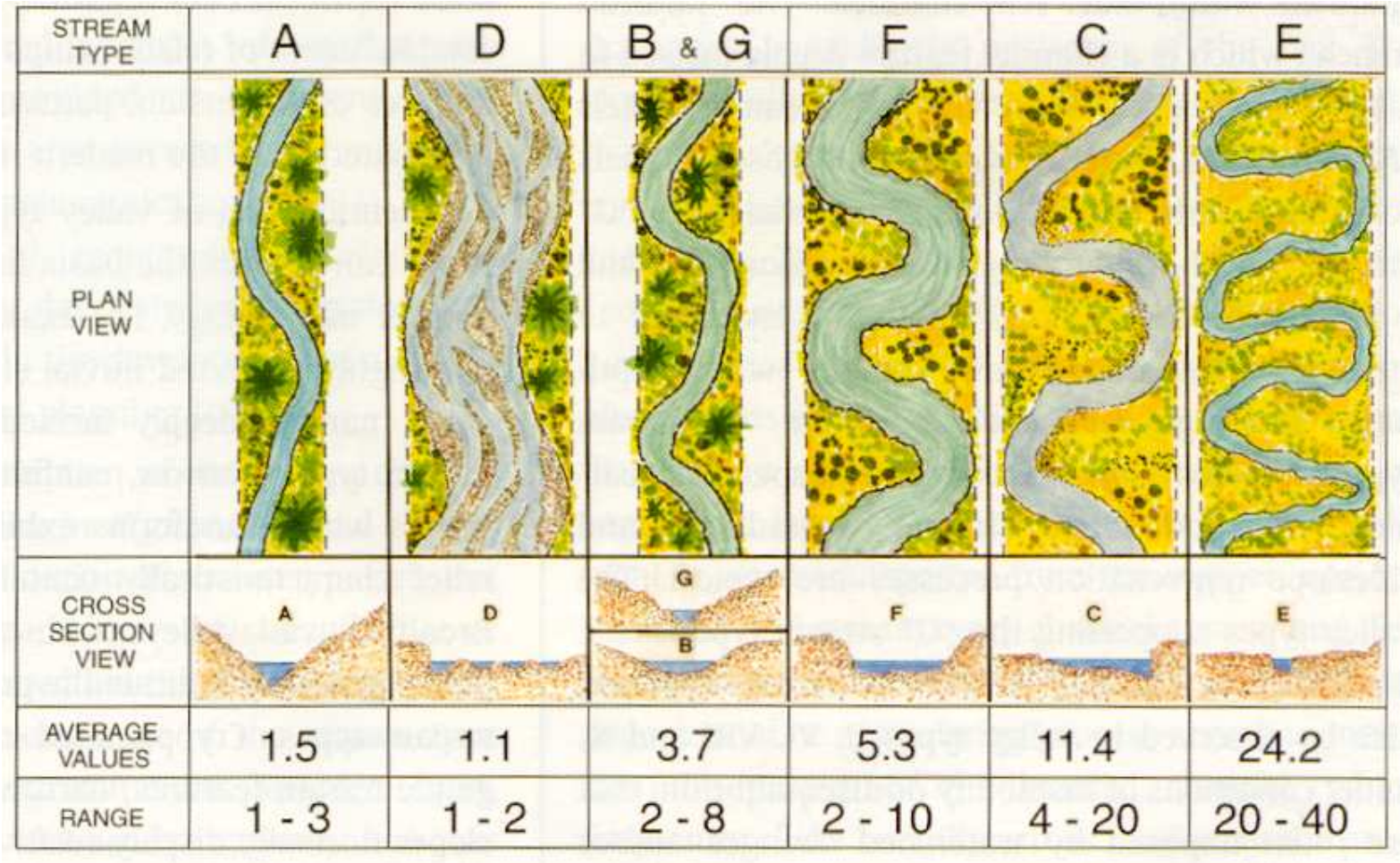
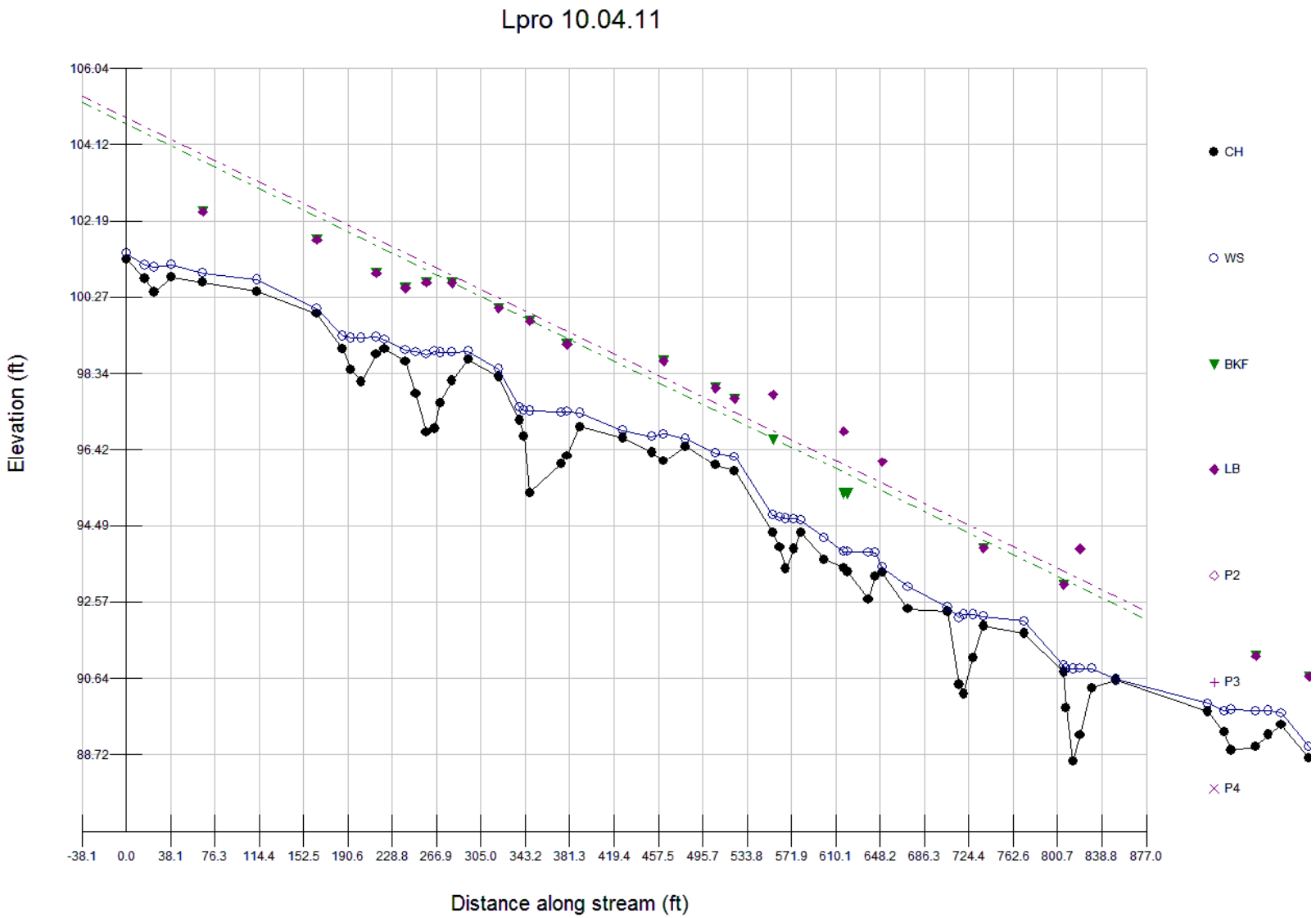


Image Source: Rosgen, 2006

Profile


Lpro 10.04.11
Elevation (ft)
106.04
104.12
102.19
100.27
98.34
96.42
94.49
92.57
90.64
88.72
-38.1
0.0
38.1
76.3
114.4
152.5
190.6
228.8
266.9
305.0
343.2
381.3
419.4
457.5
495.7
533.8
571.9
610.1
648.2
686.3
724.4
762.6
800.7
838.8
877.0
Distance along stream (ft)
CH
WS
BKF
LB
P2
P3
P4

Stream Bed Material

- Can vary from fine clay to bedrock
- Usually classified as clay, sand, gravel, cobble, boulders or bedrock
- A stream may have more than one type of material

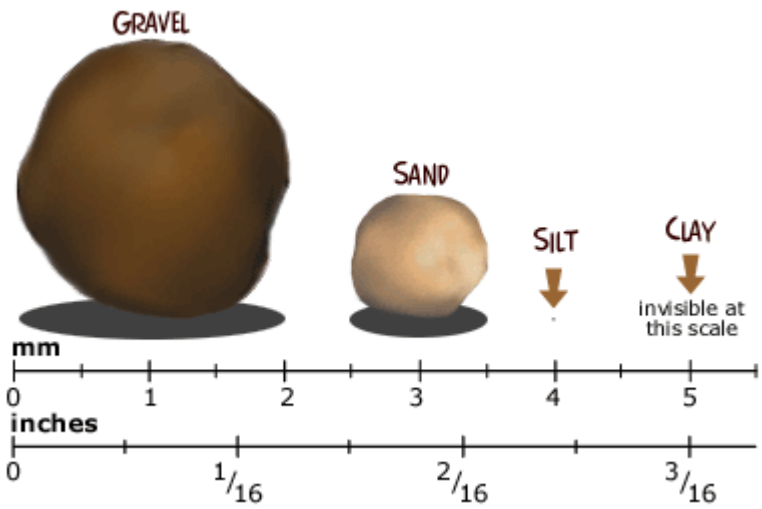


Image Source: http://water.me.vccs.edu

Bed Material

Silt/Clay (6)	<0.063 mm
Sand (5)	<2 mm
Gravel (4)	<64 mm (2.5 inches)
Cobble (3)	< 256 mm (10 inches)
Boulder (2)	> 256 mm
Bedrock (1)	

Numbers 1-6 Refer to Rosgen Classification

Silt-Clay Bed Streams (< 0.062 mm)

Gaithersburg, MD

Colesville, MD

Sand Bed Streams (< 2 mm)

Ashton, MD

Huntersville, NC (restored)

Gravel Bed Streams (< 64 mm)

Winston-Salem, NC

Brookville, MD (restored)

Cobble Bed Streams (< 256 mm)

Red Feather Lake, CO

Ashton, MD (restored)

Boulder Streams

Boundary Waters, MN

Glen Echo, MD (restored)

Bedrock Streams

Garrett County, MD

Winston-Salem, NC

Stream Vegetation

Vegetation (in water)

Lower Potomac River, MD

Vegetation on Banks

Lack of bank vegetation in Charlotte, NC

Lush bank vegetation Calverton, MD (restored)

Vegetation (flood plain)

Mature flood plain forest,
Shepherdstown, WV

Newly established flood plain ,
Huntersville, NC

Stream Channels

Channel Evolution (simple)

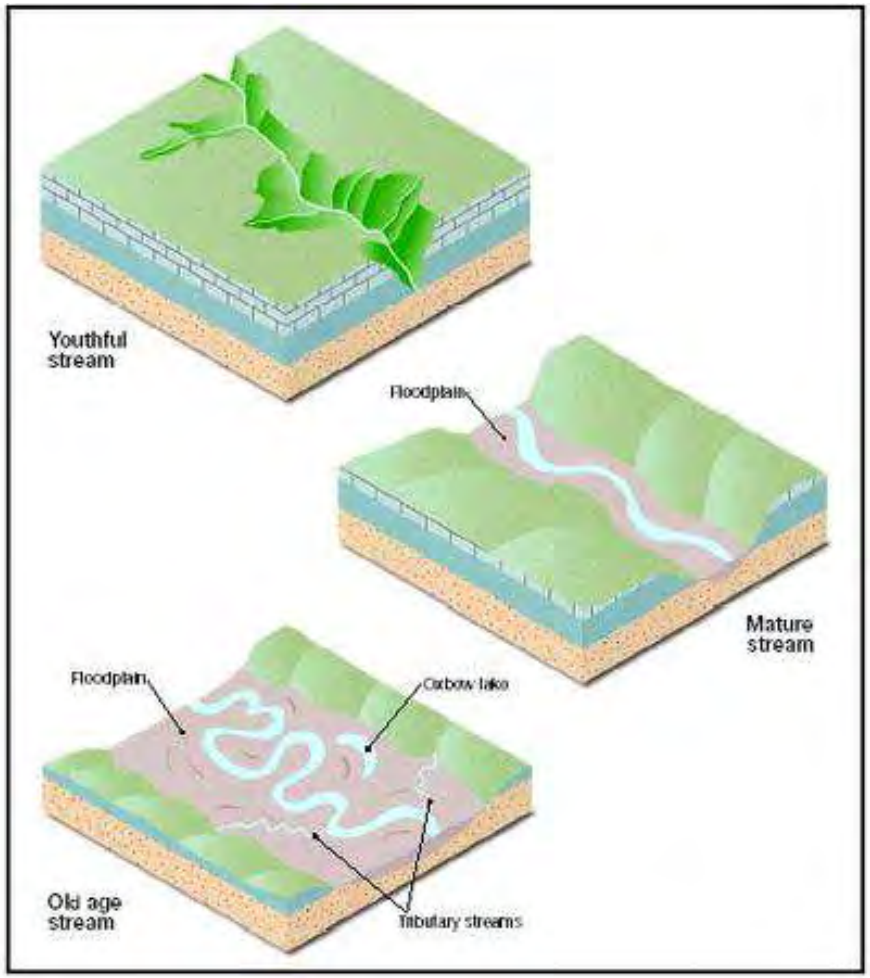


Image Source: http://www.scienceclarified.com

Channel Evolution Continued

- A more descriptive model was developed by Simon in 1986 and has 6 stages or classes

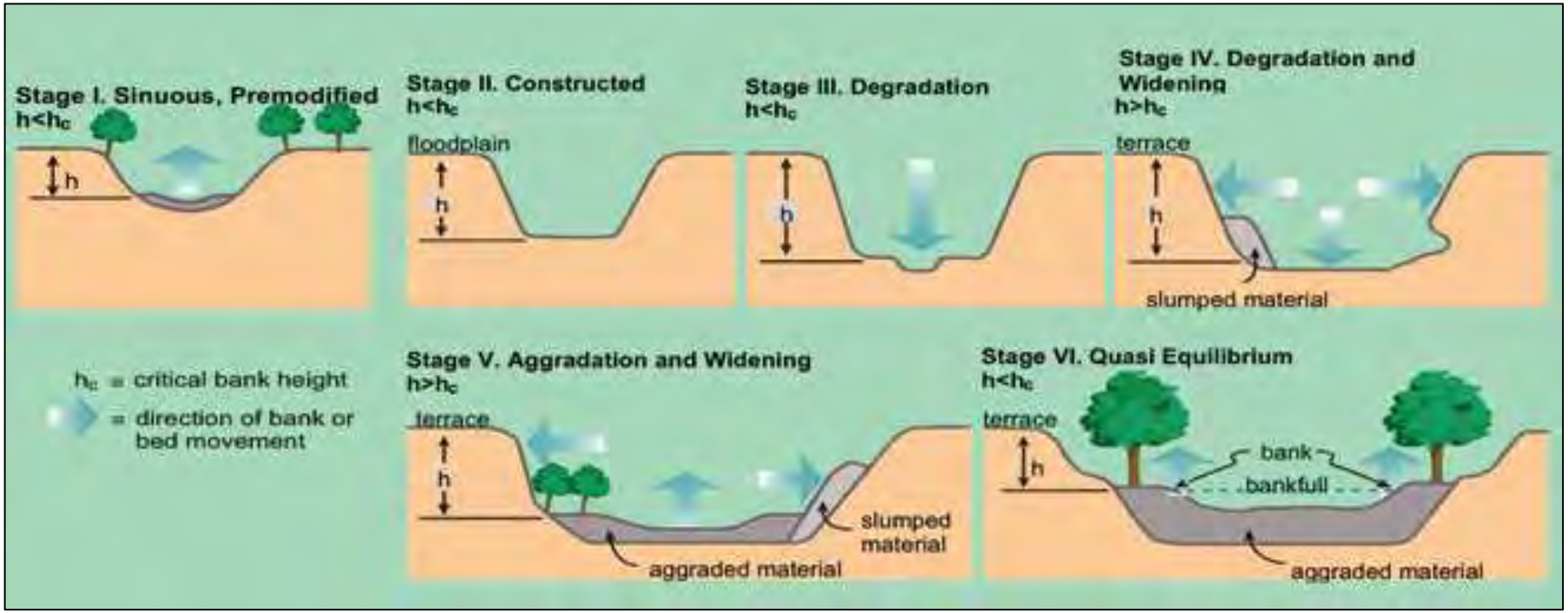
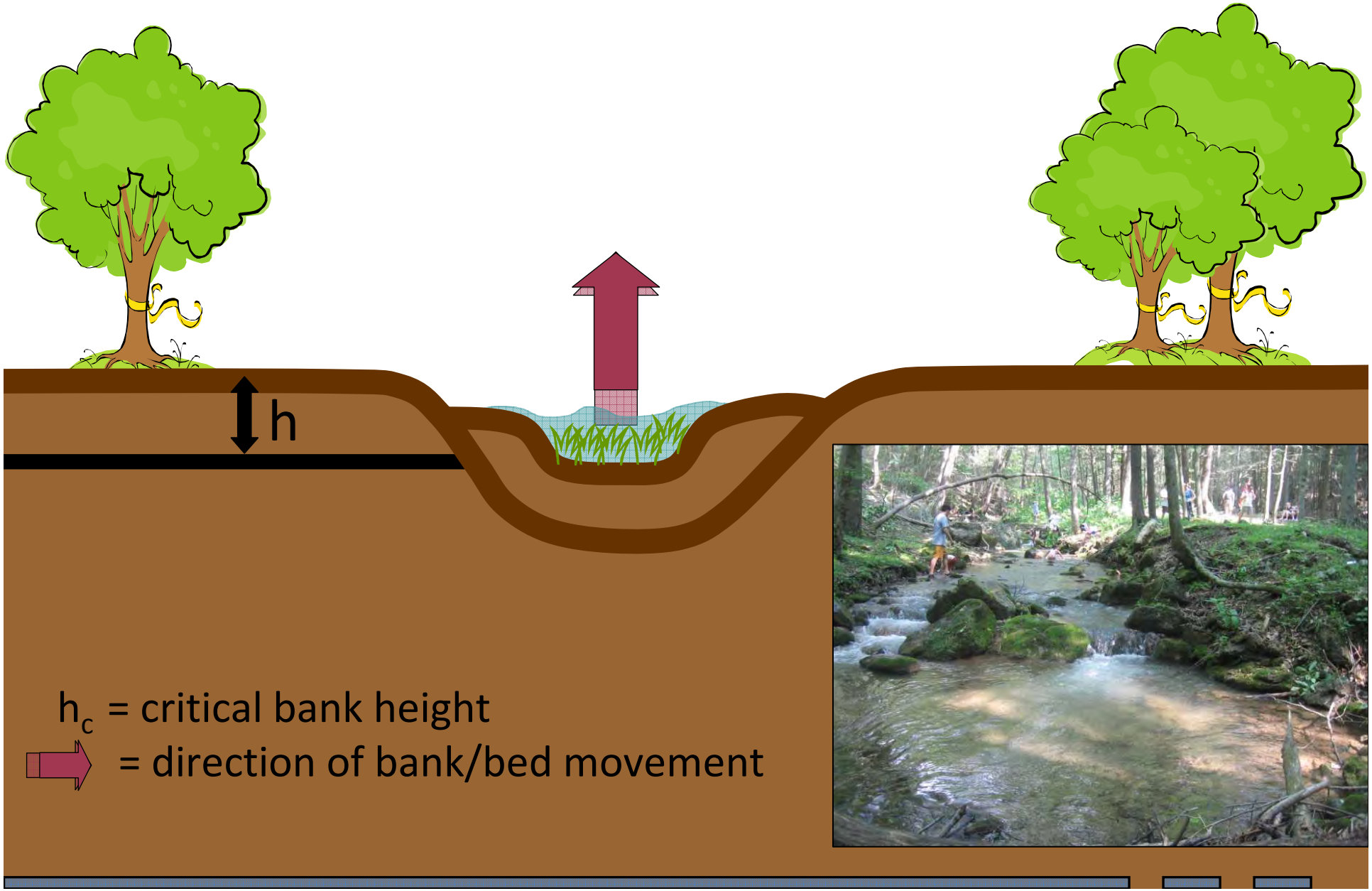
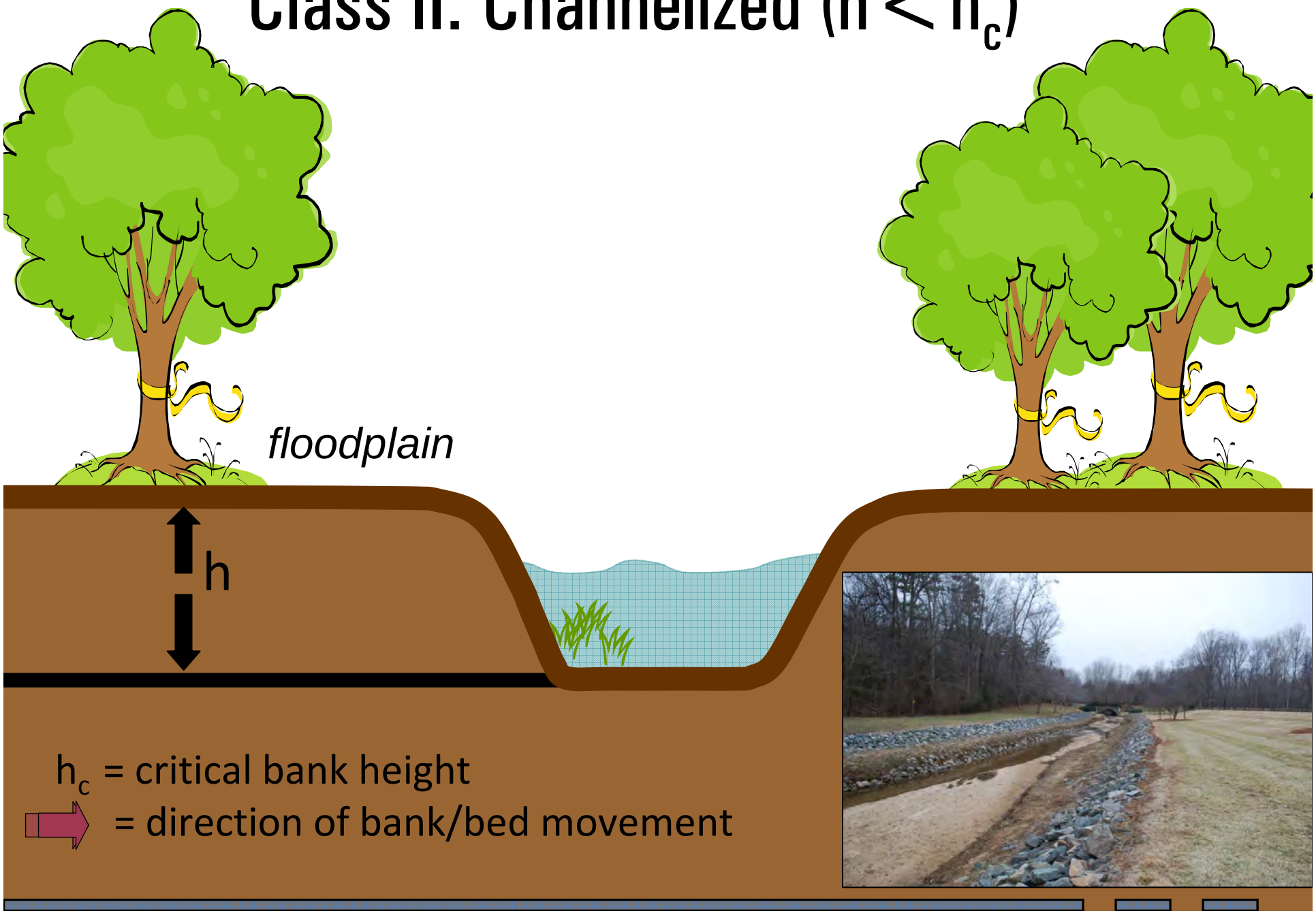


Image Source: http://gfscd.org

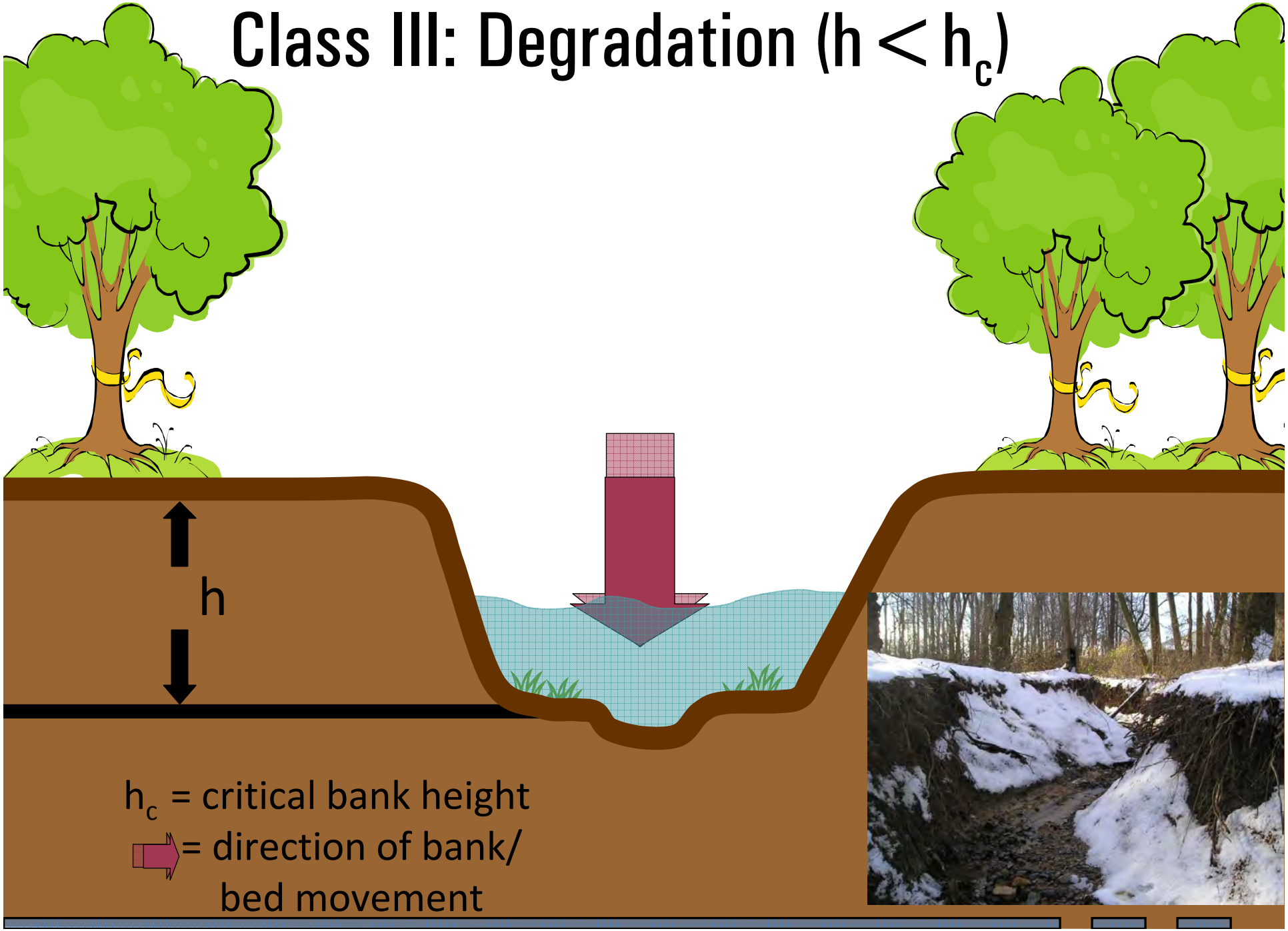
Class I: Sinuous, Premodified ($h < h_c$)



Class II: Channelized ($h < h_c$)



Class III: Degradation ($h < h_c$)

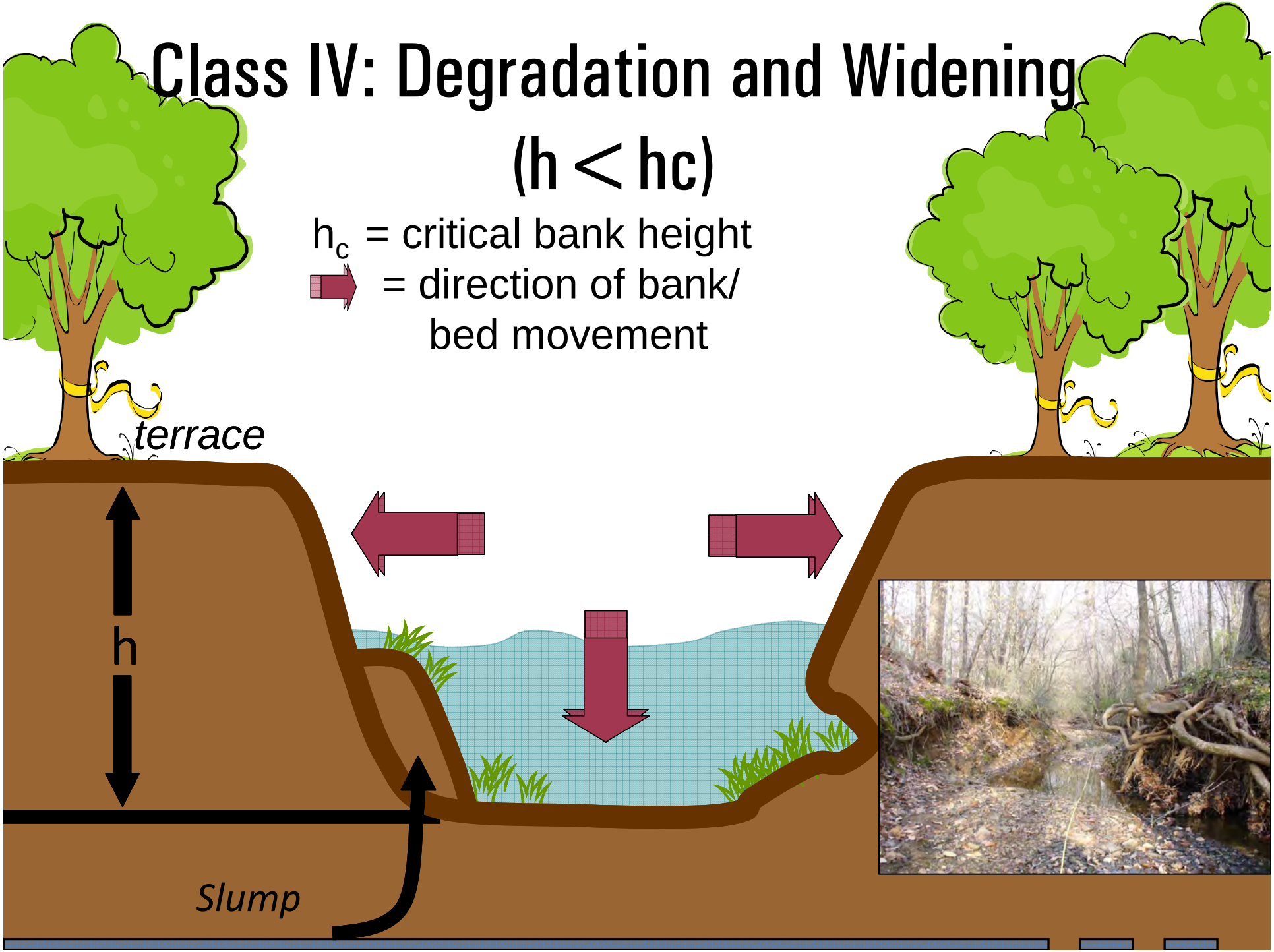


Class IV: Degradation and Widening

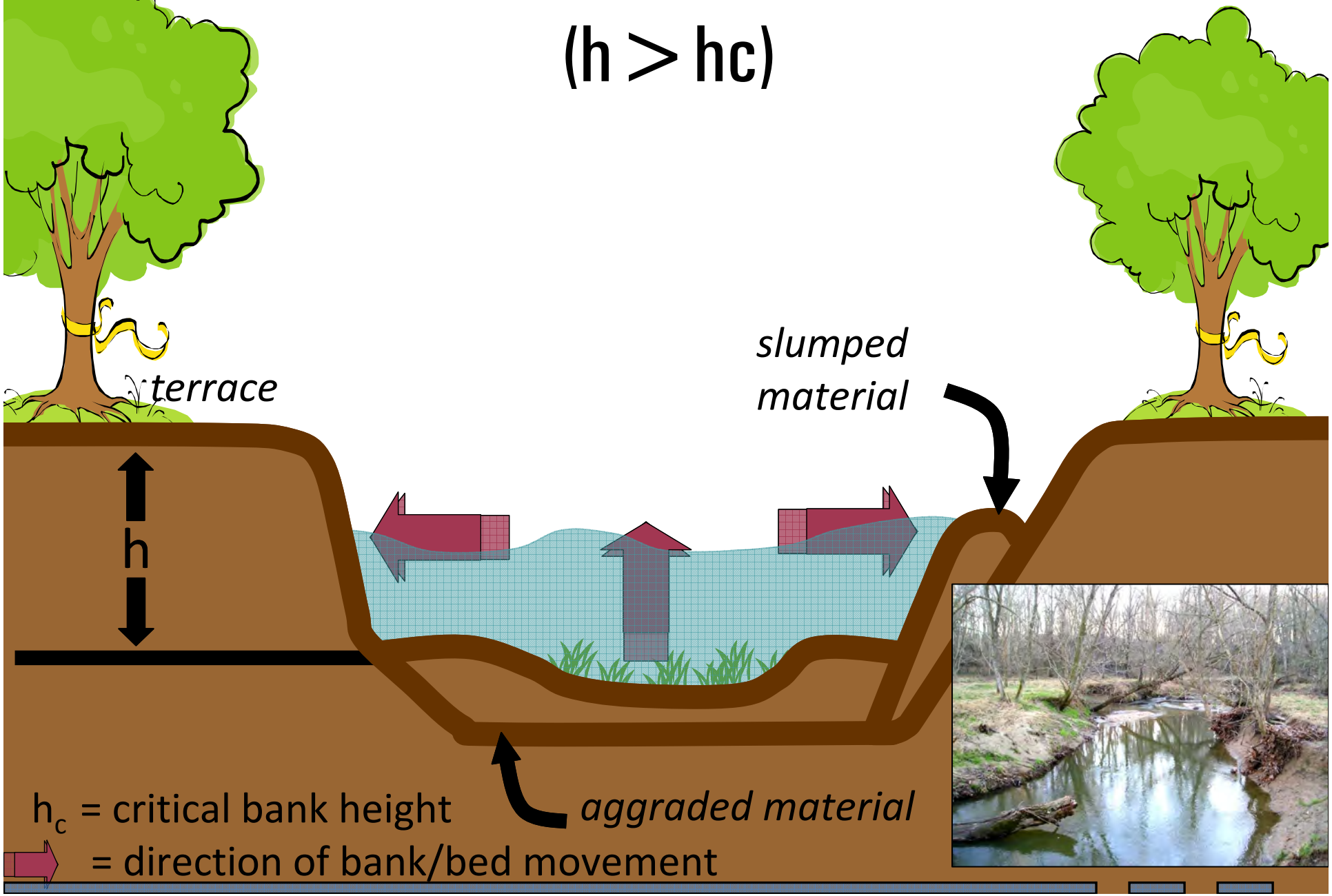
(h < hc)

h_c = critical bank height

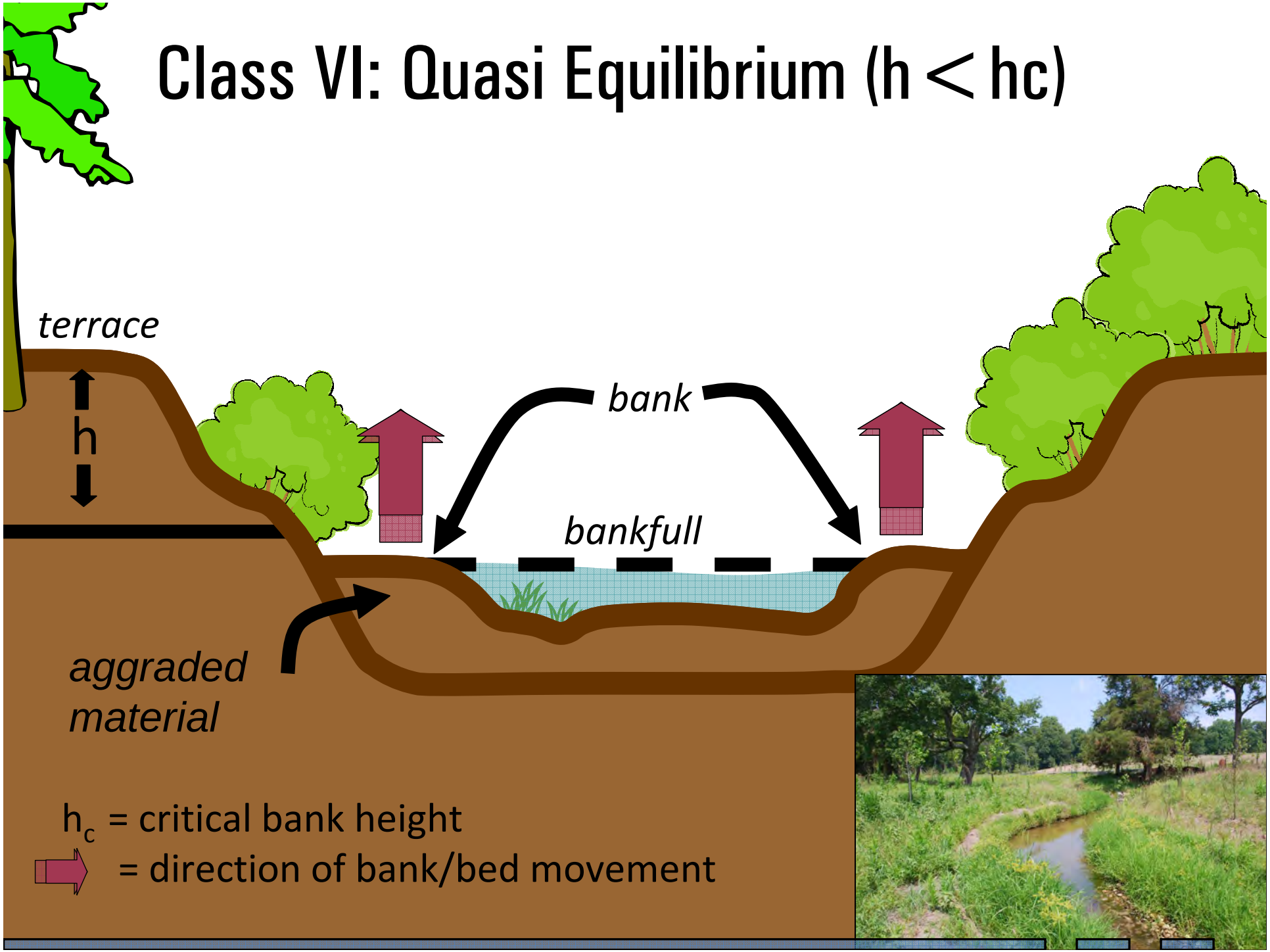
= direction of bank/ bed movement



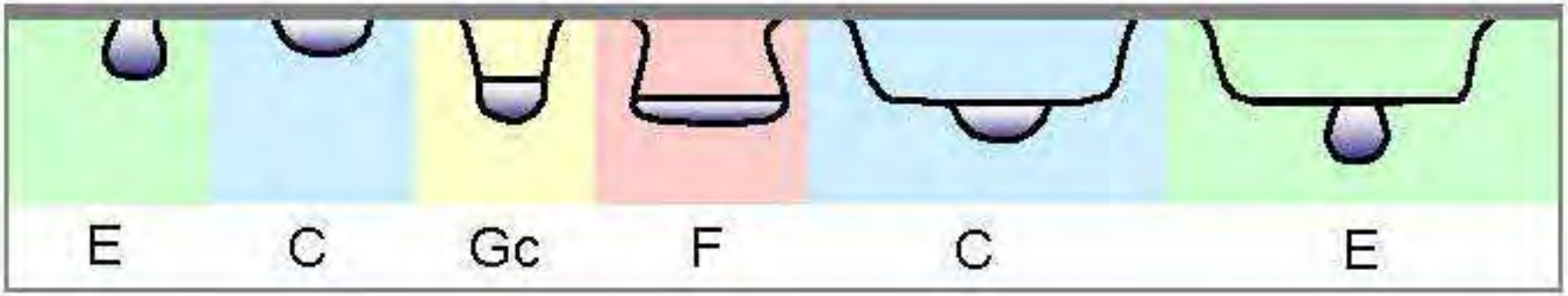
Class V: Aggradation and Widening
(h > hc)



Class VI: Quasi Equilibrium (h < hc)



Channel Evolution (Rosgen, 1999)



Natural Streams vs. Urban Streams

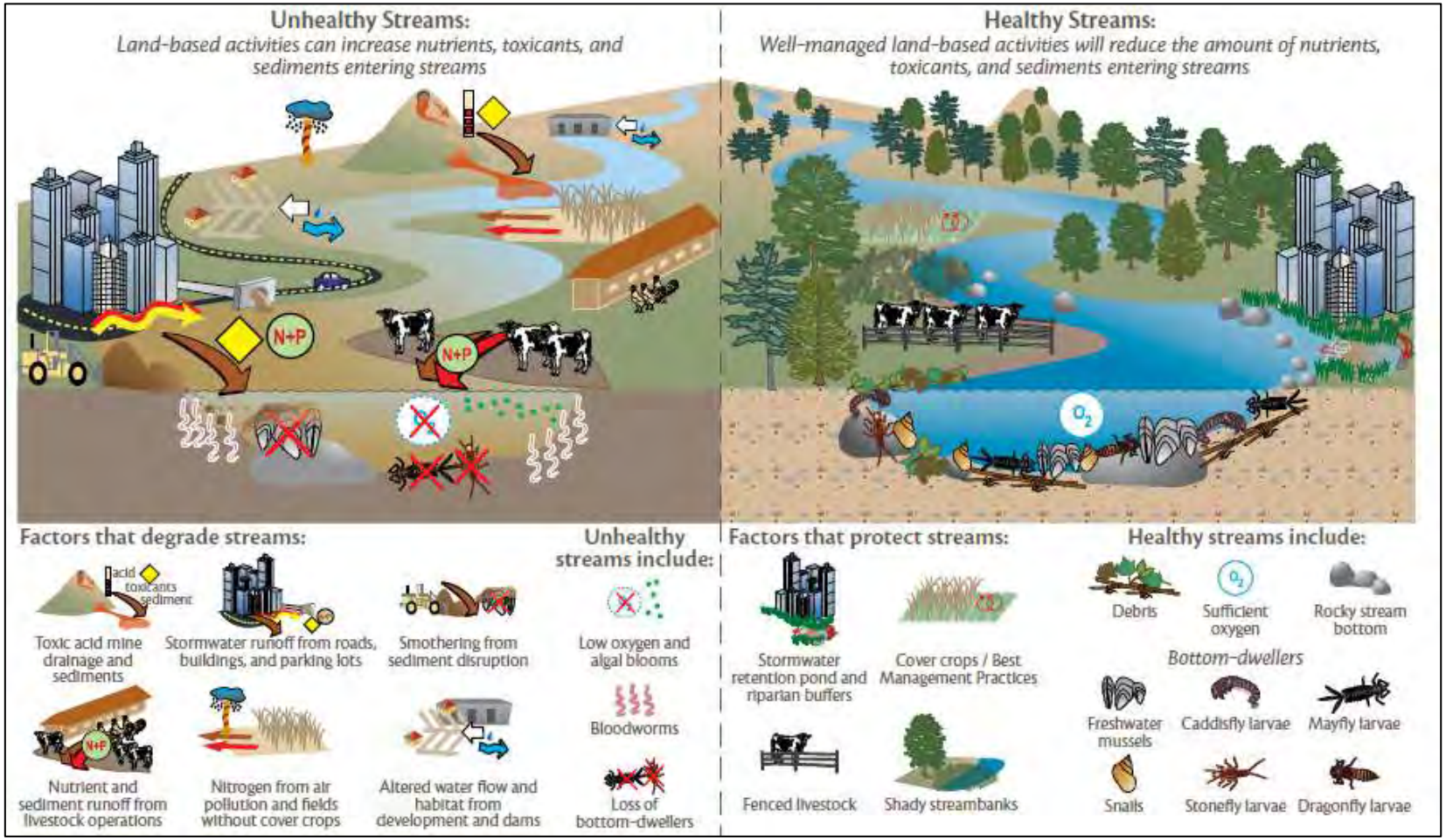
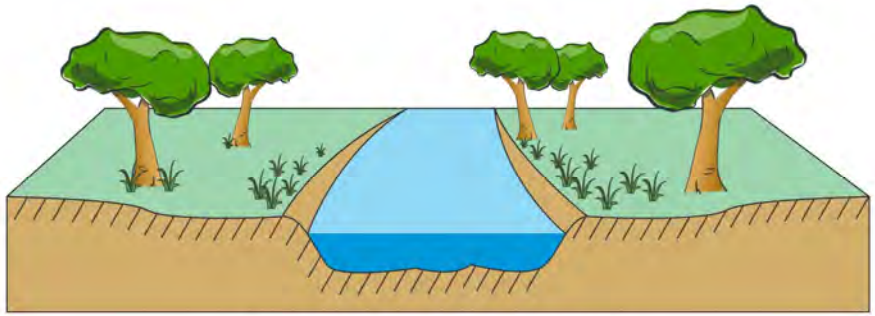


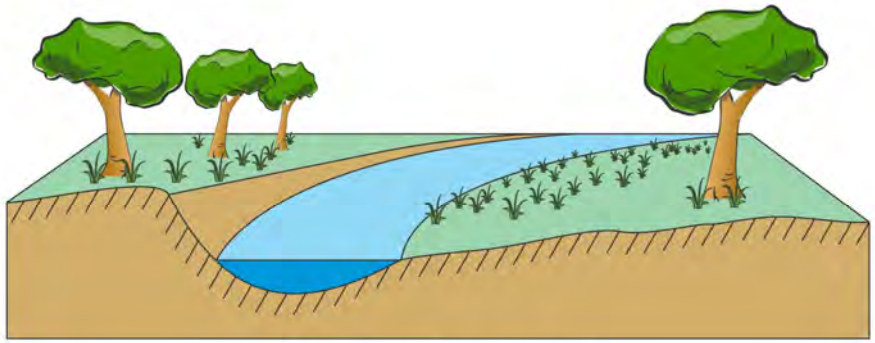
Image Source: Eco-check.org (2008)

Sediment

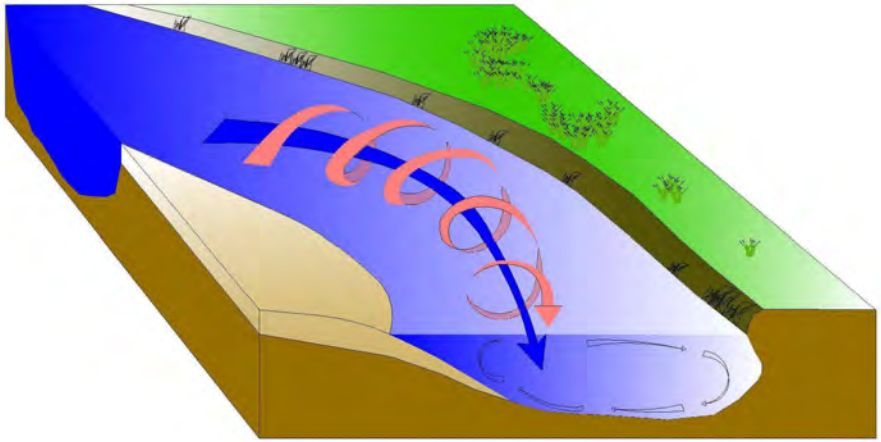
Sediment Transport



Typical Cross Section in Straight Reach



Typical Cross Section in Bend



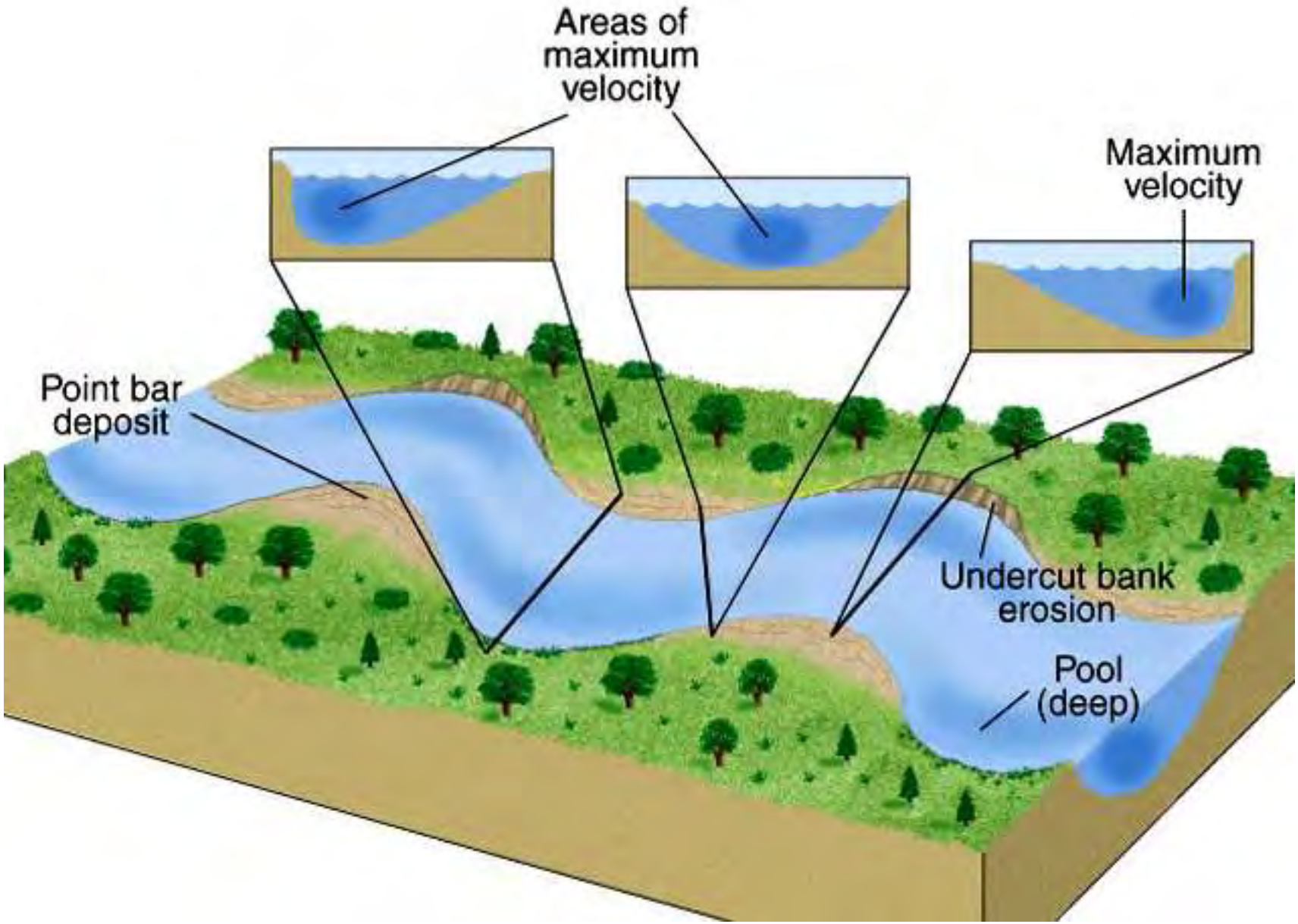


Image Source: University of Idaho

Sediment Transport Cont.

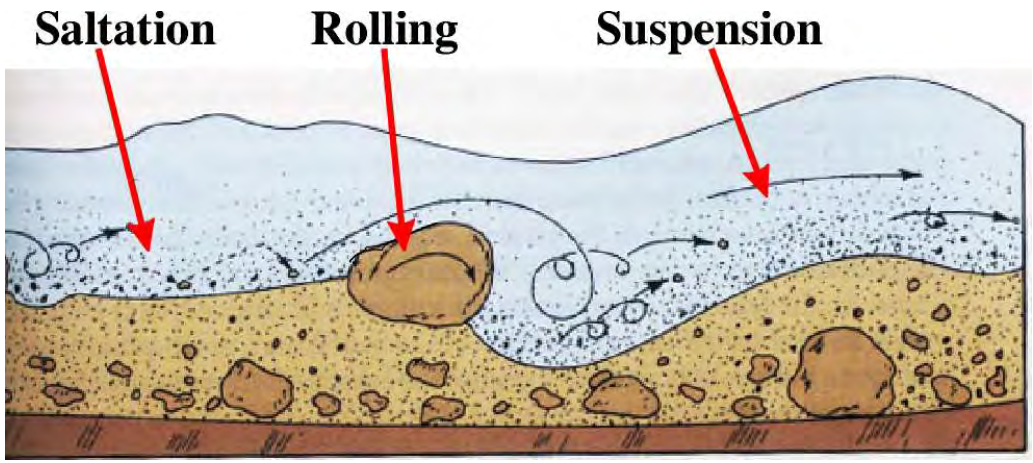


Image Source: http://www.geol.umd.edu/~piccoli/100/CH12.htm

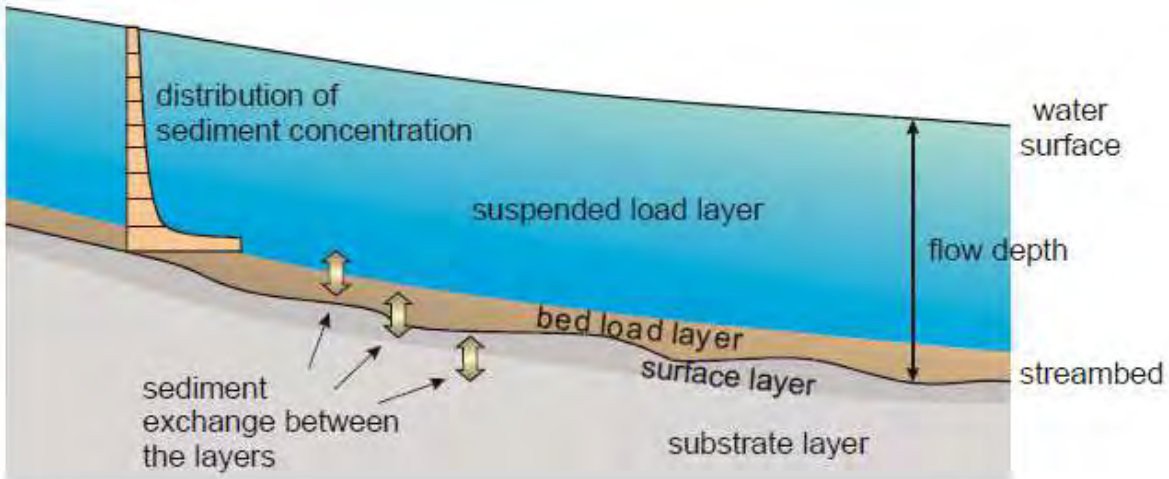
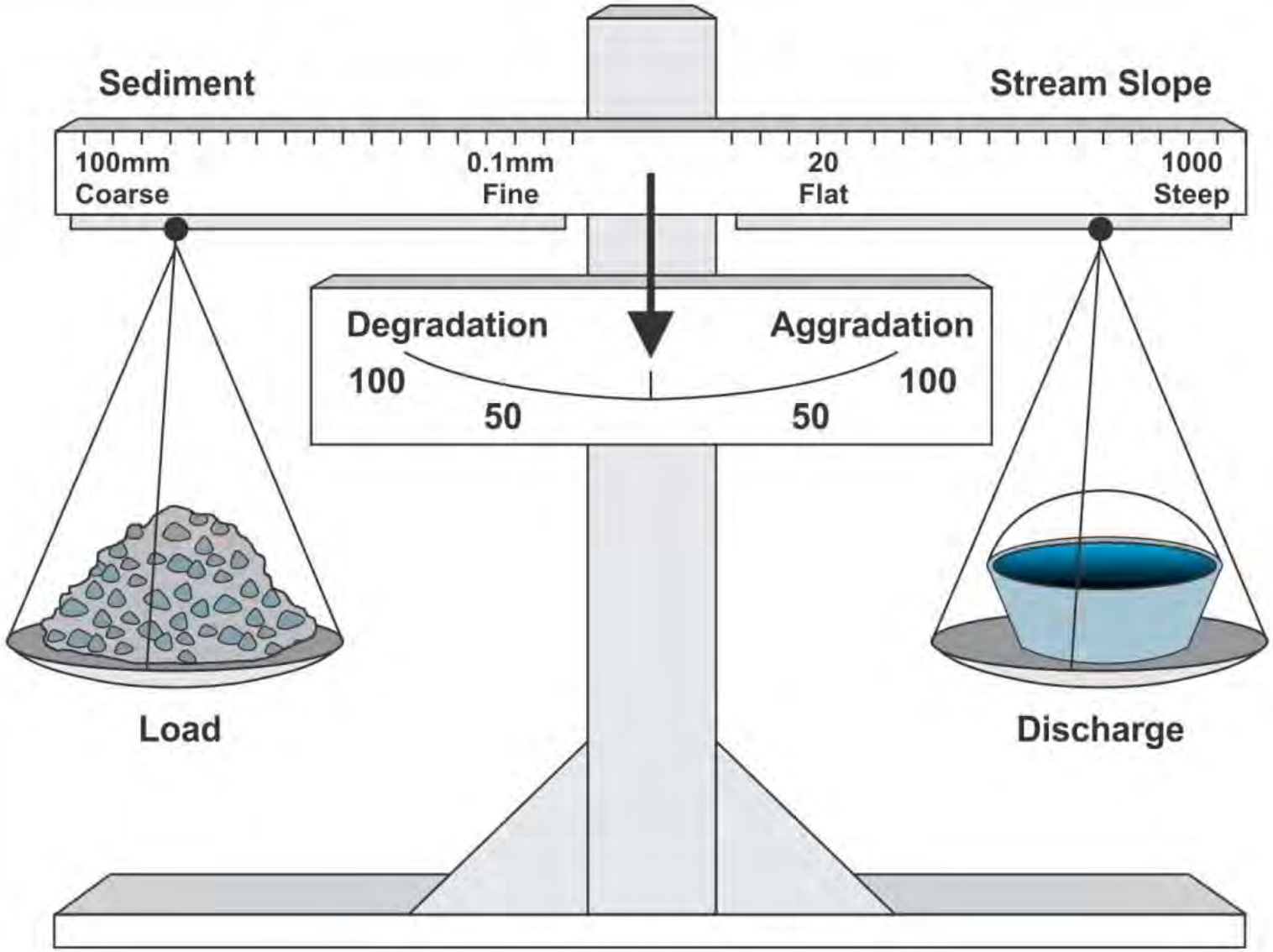
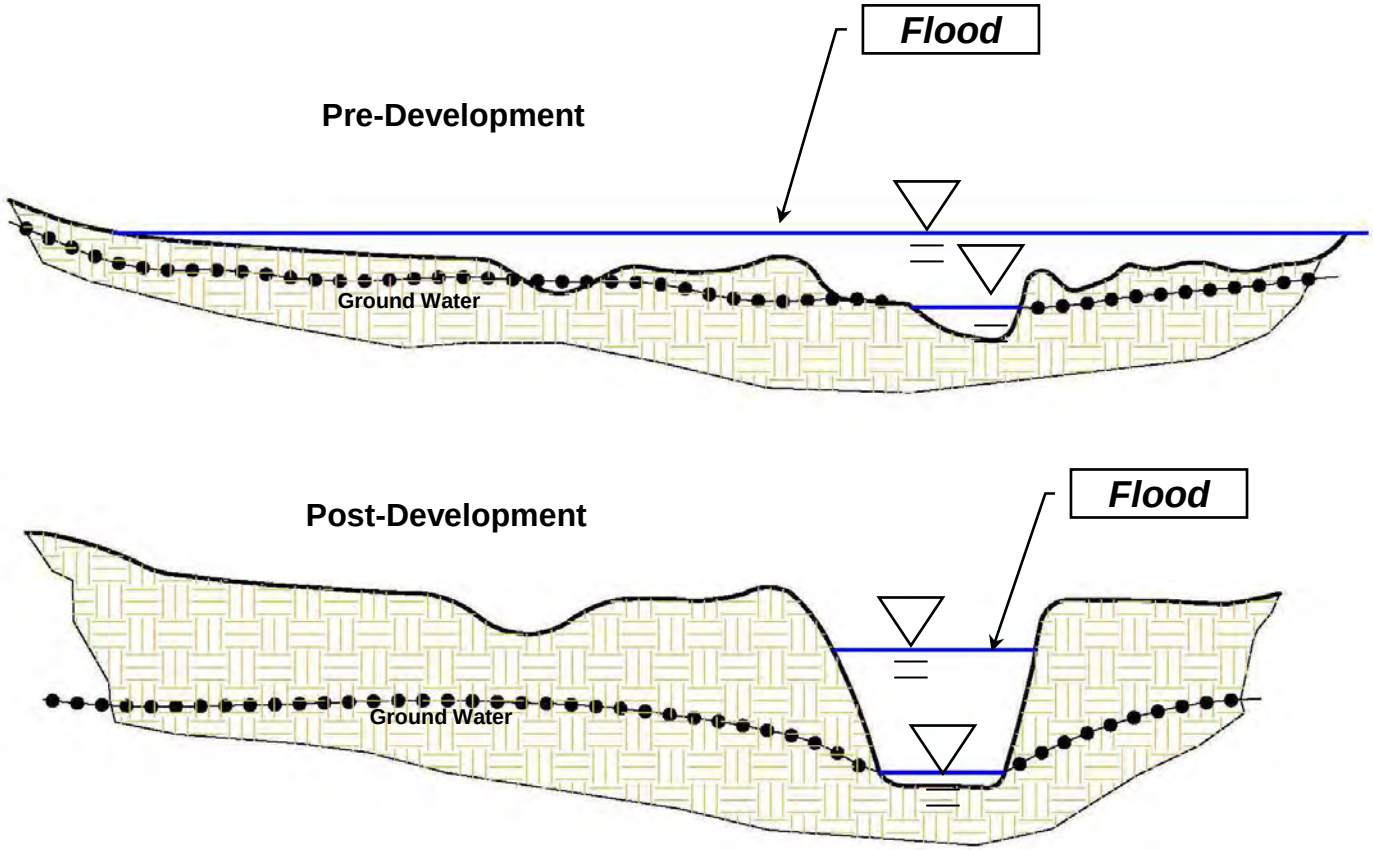


Image Source: USDA 1995

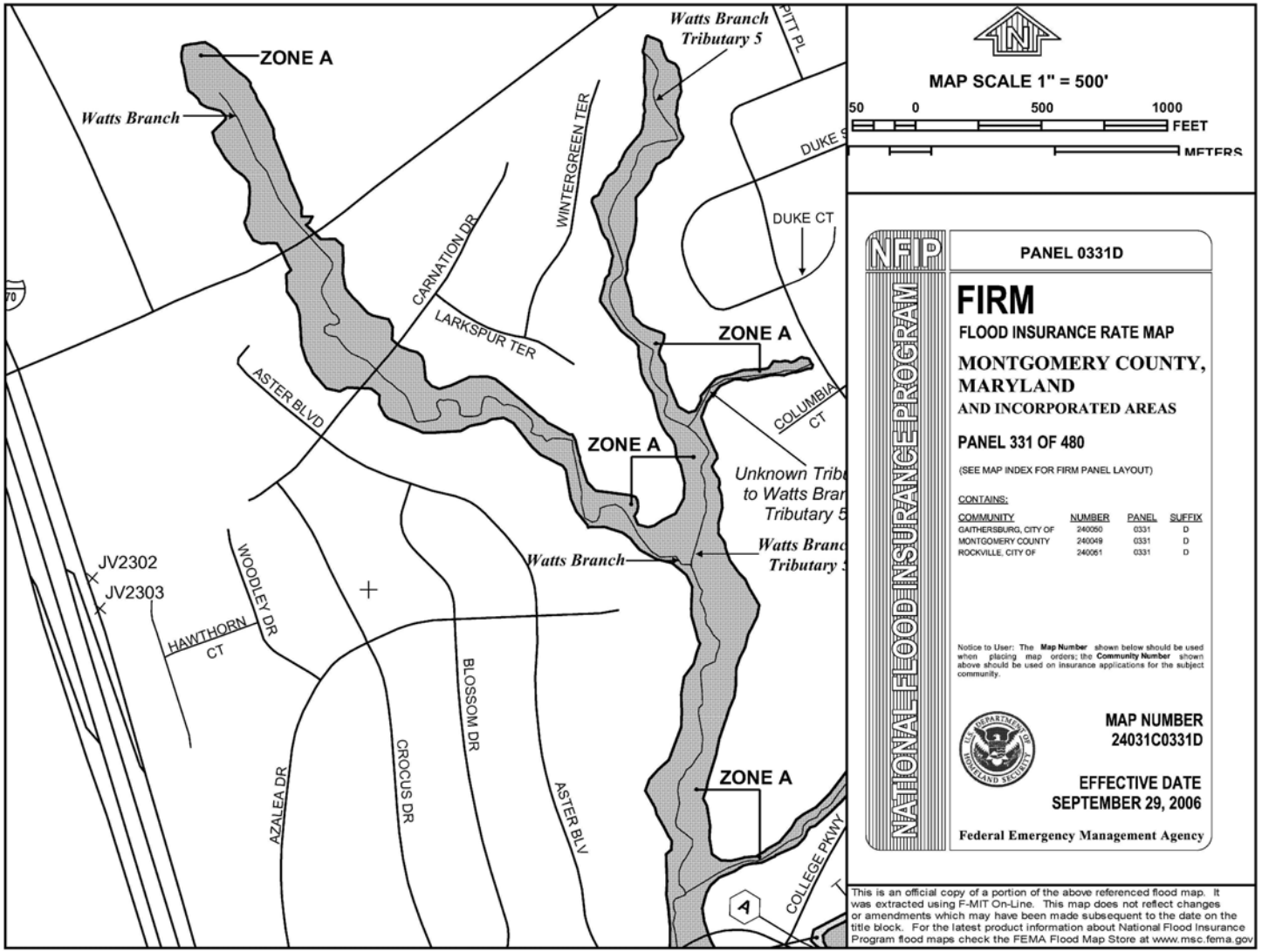
Sediment Transport (Lane, 1955)



Floodplain Connectivity



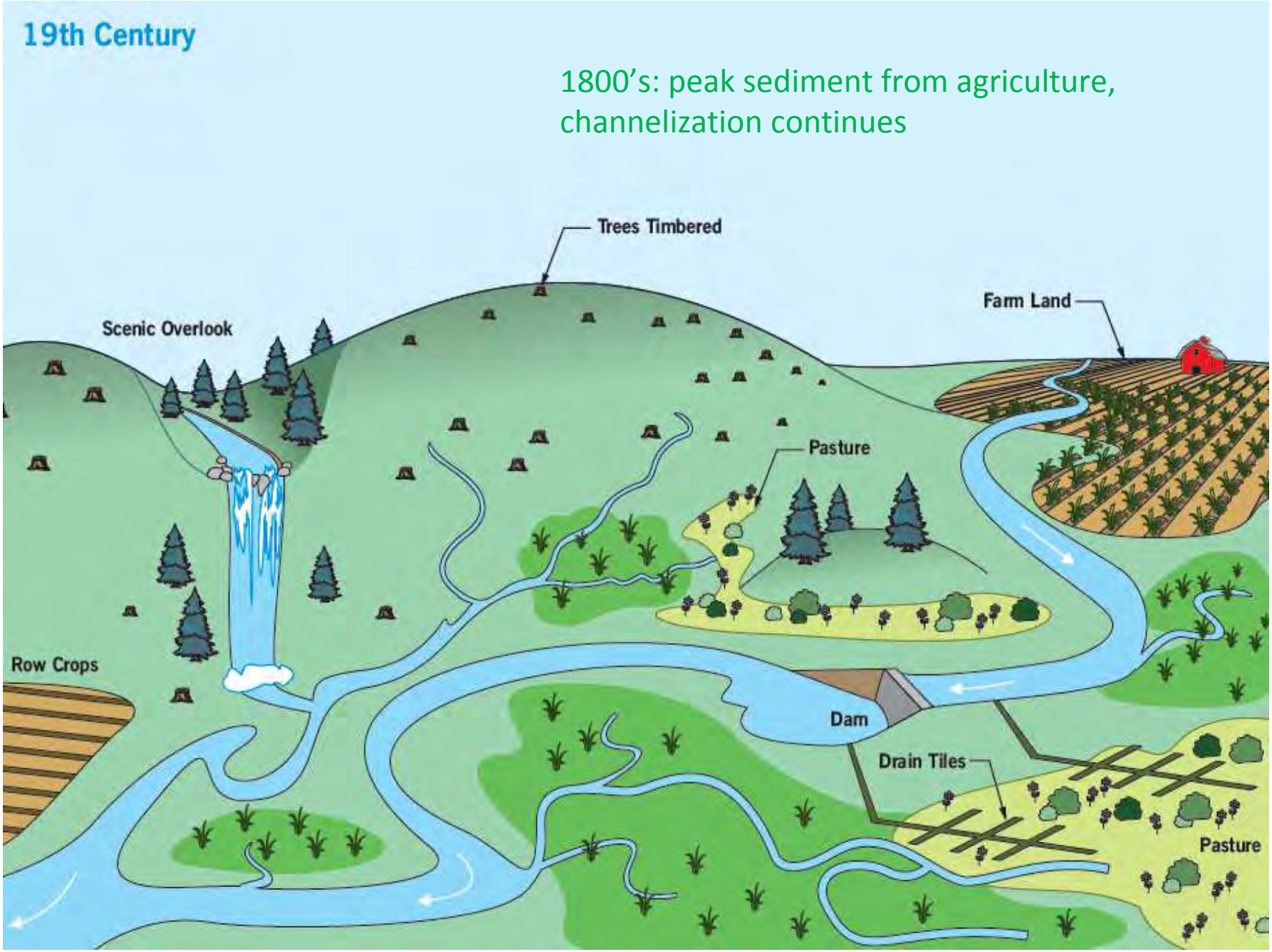
FEMA Floodplain Map



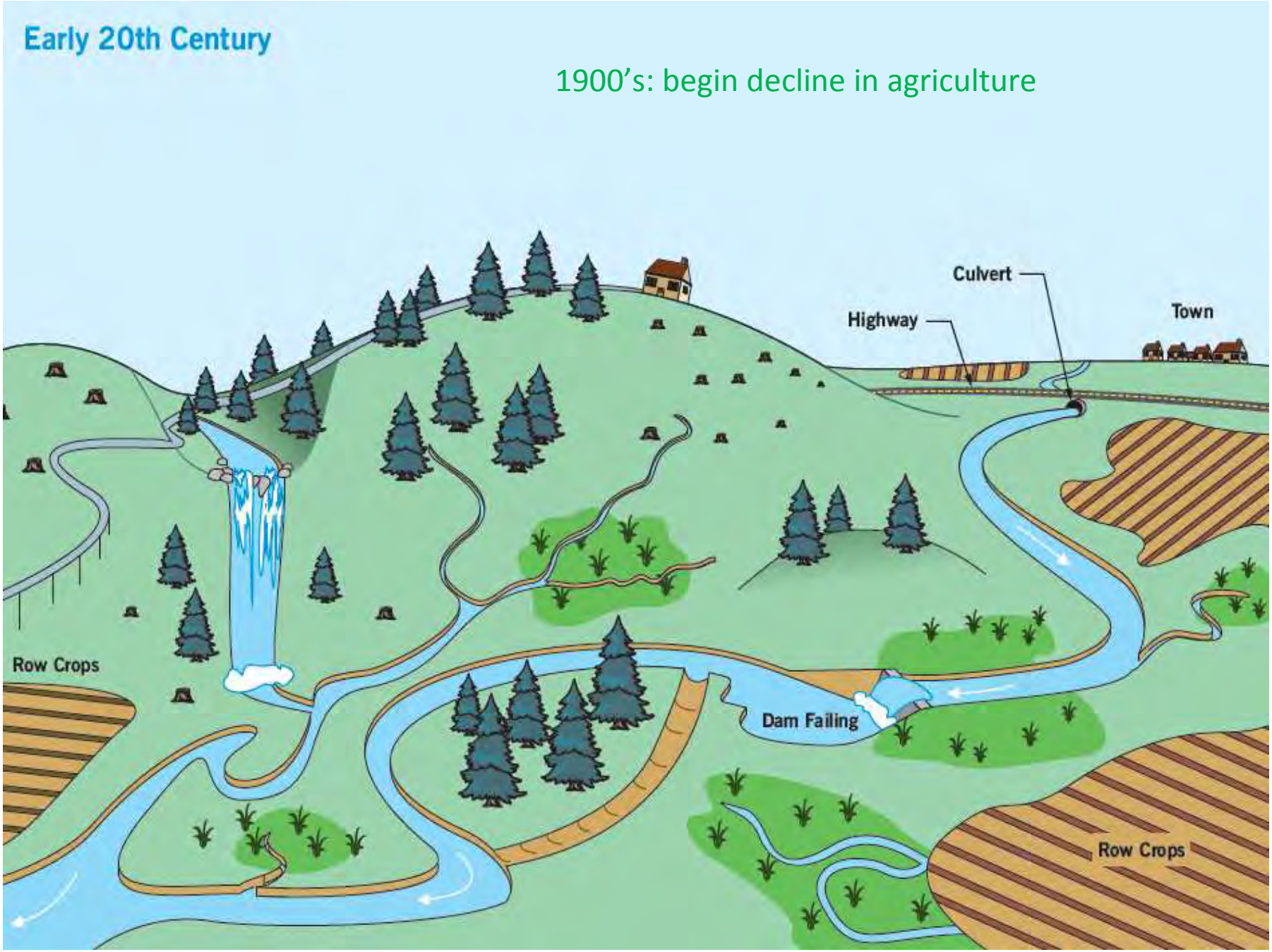
Stream Stability

Mid-Atlantic Land Use Summary

- 1700s - European settlement and agriculture; begin channelization
- 1800s - peak sediment production from agriculture; more channelization (legacy sediments)
- Stream responses: increase water and sediment yields, degrading steep streams, aggrading low-slope streams
- 1900's - decline in agriculture; conversion of cropland to pasture & forest; implementation of soil conservation; urbanization
- 2000's – continued urbanization
- Stream response: decreasing water and sediment yield, channel incision



1800's: peak sediment from agriculture, channelization continues


Early 20th Century
1900's: begin decline in agriculture
Culvert
Highway
Town
Row Crops
Dam Failing
Row Crops

Stream Stability

Ability of a stream, over time, in the present climate, to transport the sediment and flows produced by its watershed in such a manner that the stream maintains its dimension, pattern, and profile without either aggrading or degrading (Rosgen, 1996)

Causes of Instability

- Increased slope
- Increased runoff
- Change sediment load
- Loss of riparian buffer
- Instream modification

Change in Slope

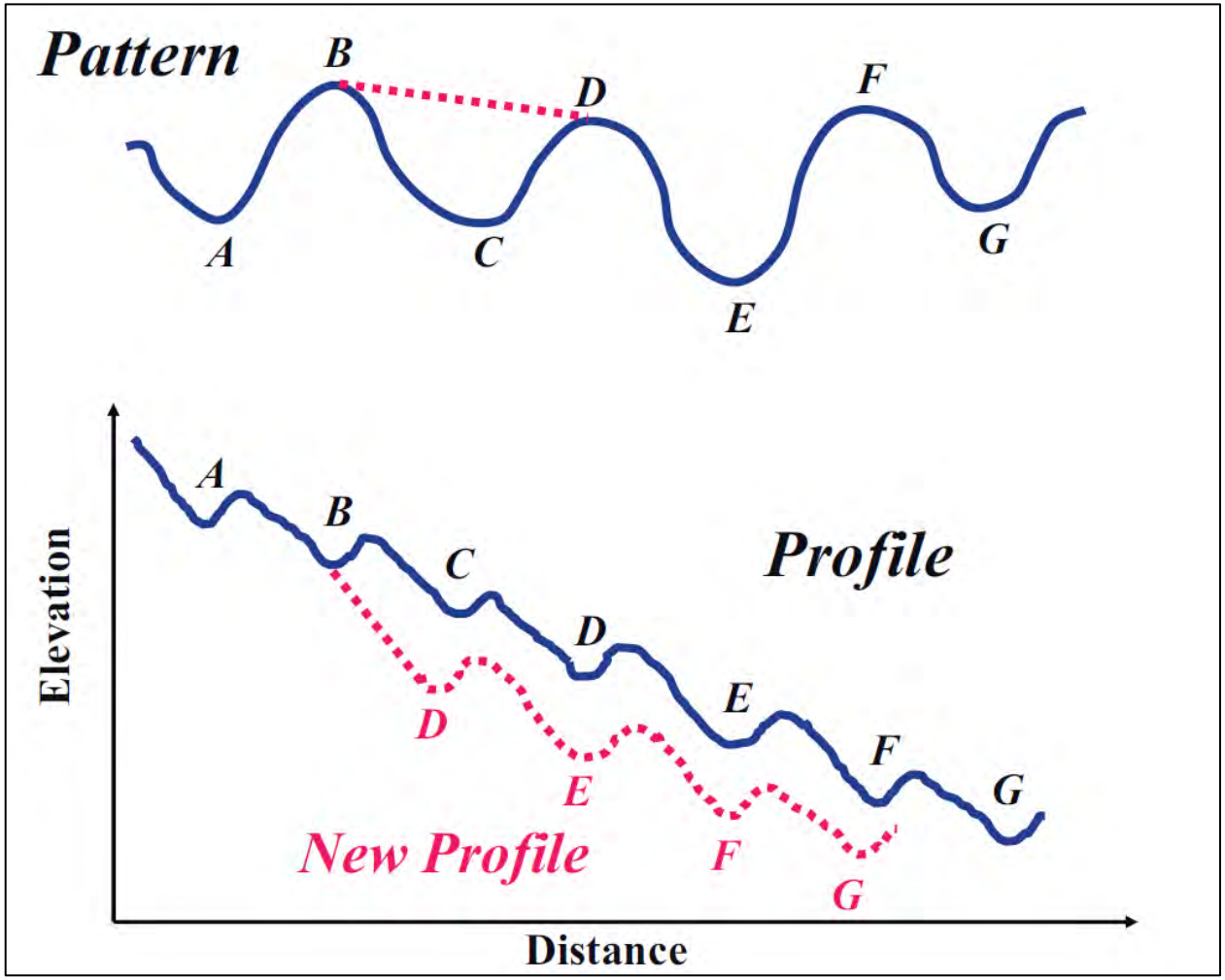
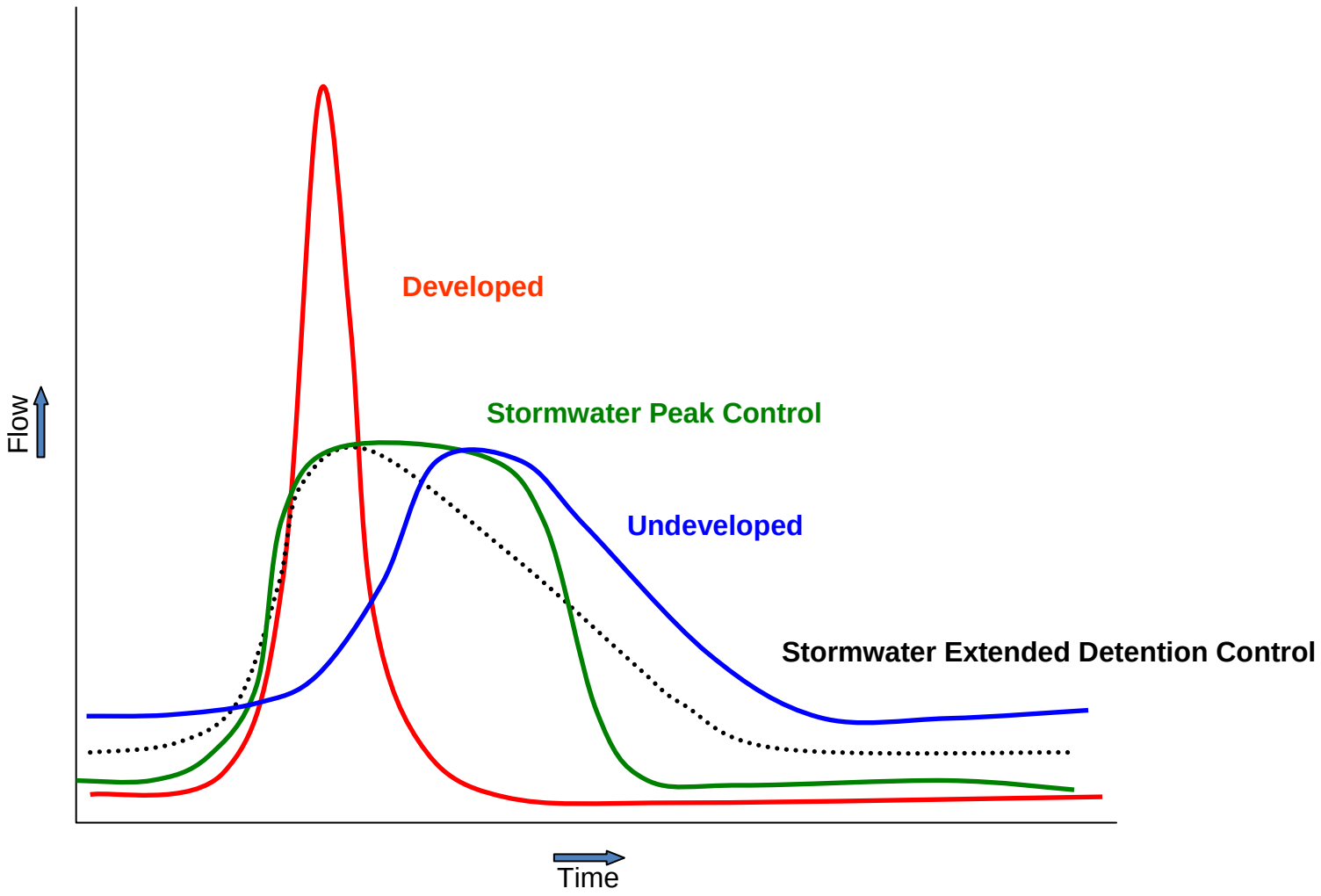


Image Source: NC State BAE Dept

Hydrograph


Developed
Stormwater Peak Control
Undeveloped
Stormwater Extended Detention Control
Flow
Time

Change in Sediment Load

Loss of Riparian Vegetation

Good Bank Vegetation

Poor Bank Vegetation

No Bank Vegetation

In-Stream Modification

- Dams/impoundments
- Channelization
- Straightening
- Levees
- Hardening
- Mining

Stable vs. Unstable Streams

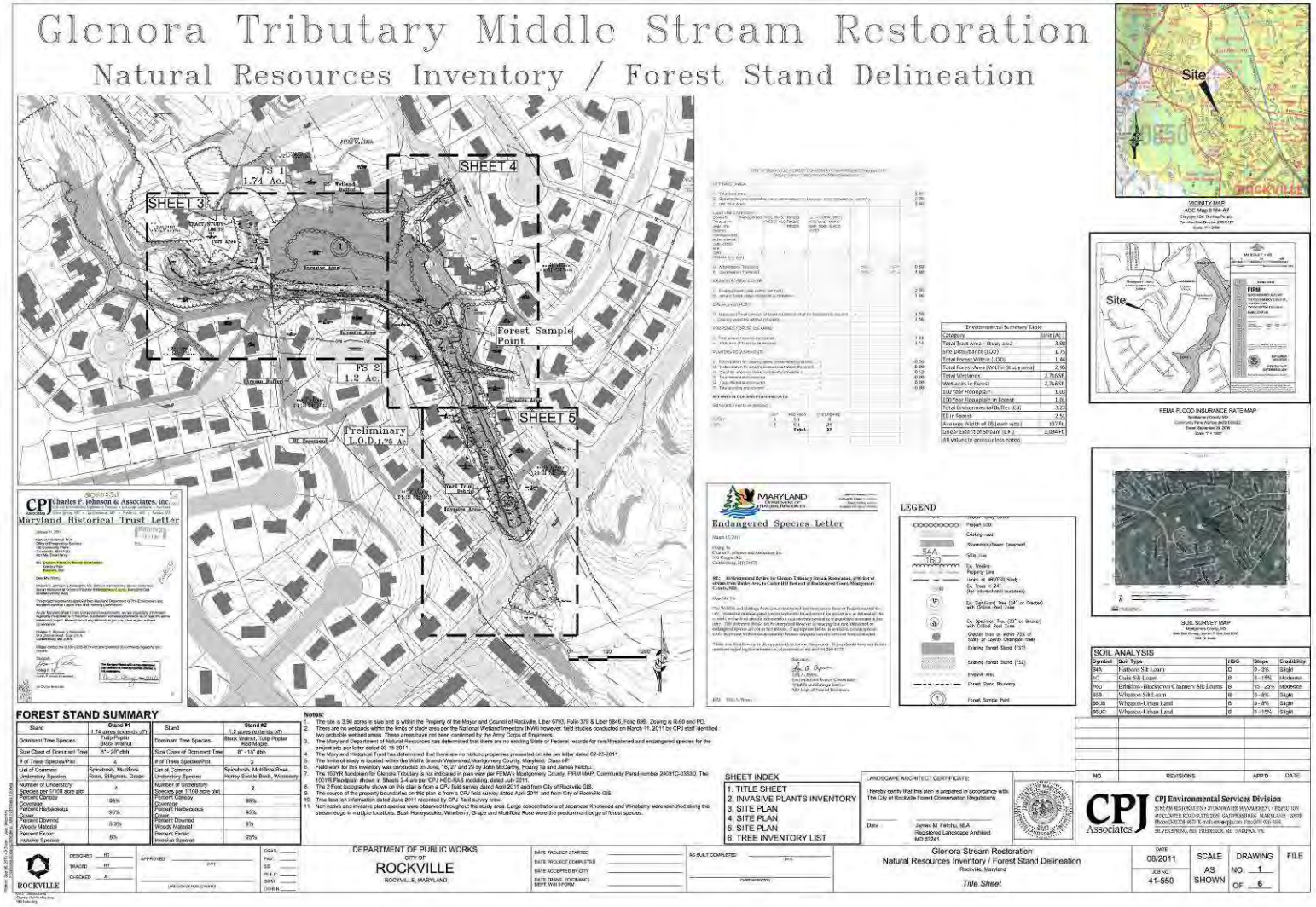
Attribute	Stable	Unstable
Dimension	Uniform & Consistent	Irregular & inconsistent
Riffle/Pool Sequence	Appropriate	Inappropriate
Bank Erosion	Low	High
Vegetation	Dense	Sparse
Floodplain	Wide & Accessible	Narrow & Inaccessible

Forestry

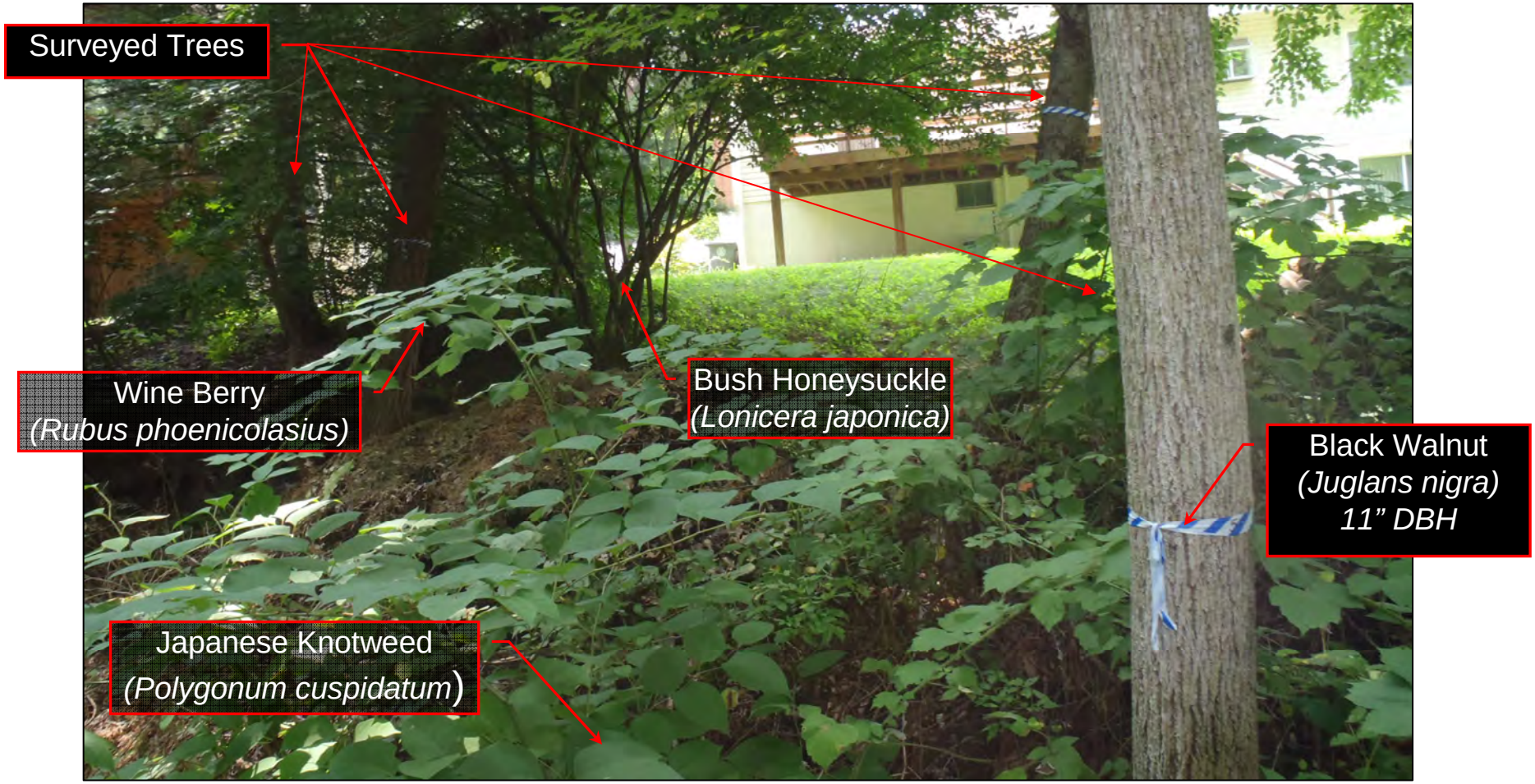
Forestry

- Existing forest preserve
- Natural Resource Inventory-Forest Stand Delineation
- Forest Conservation Plan
  - Tree Removal
  - Planting Plan
  - Invasive Species

Natural Resource Inventory/Forest Stand Delineation (NRI/FSD)

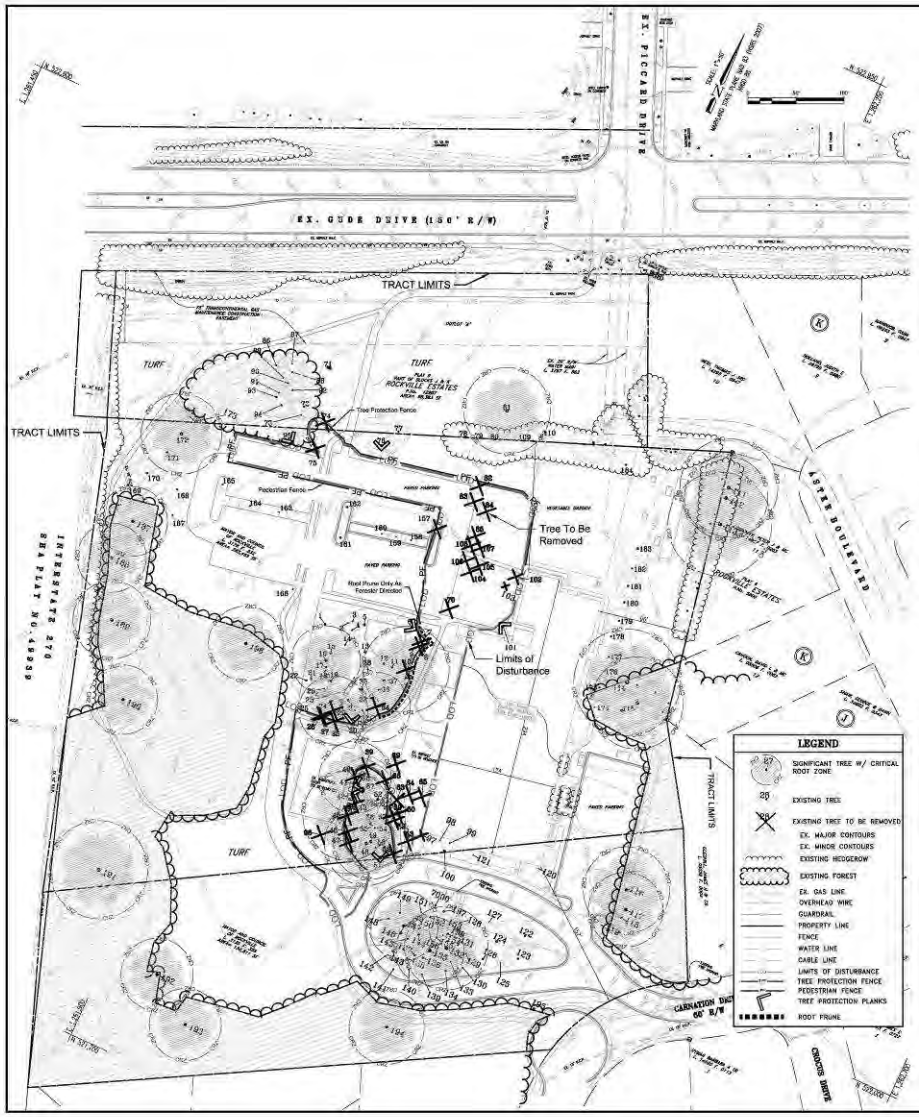


(NRI/FSD)



							Roots		Trunk		Branch		Twigs	Leaves	Total	Condition %
Tree#	**Notes**	**Size (in)**	**CRZ (ft)**	**Street Tree?**	**Common Name**	***Scientific Name***	**S**	**H**	**S**	**H**	**S**	**H**	**H**	**H**	0	0%
1108	Vines	2	3.0	No	Black Walnut	*Juglans nigra*	2	2	2	2	2	2	3	3	18	56%

Forest Conservation Plan (FCP)



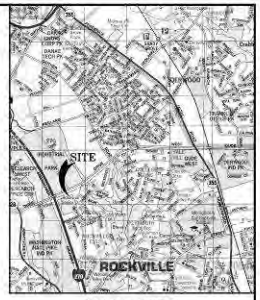
General Notes:

1. Existing Topography and existing features shown hereon are provided by the professional field survey from CPJ on June and July of 2009. Survey datum is Maryland State Plan NAD 83/91; NAVD 88.
2. The contractor shall notify City of Rockville Utilities at 240-314-8567 and "MISS Utility" at 1-800-257-7777 at least 48 hours prior to any excavation work being done.
3. The contractor to contact City Forester at (240-314-8713) to attend pre-construction and pre-planting meetings.
4. Additional tree protection measures may be required by the City of Rockville Inspector. These measures may include additional root pruning, limb pruning, and alternative root protection measures (aeration matting, mulch, etc.).
5. Contractor to place matting and seeding on all newly graded areas per plan.

PLANTING SCHEDULE FOR PARTIAL SHADED CONDITION

SHADE TREES	ID	Common Name	Scientific Name	Size	Quantity	Spacing	Sun Exposure	Notes
		Fringe Tree	*Chionanthus virginicus*	2.5" Caliper	7	*	Partial - Full	Single Stem
		Kwanzan Cherry	*Prunus serrulata "Kwanzan"*	2.5" Caliper	7	*	Partial - Full	Single Stem
		Japanese Zelkova	*Zelkova serrata*	2.5" Caliper	7	*	Partial - Full	Single Stem
		Eastern Redbud	*Cercis canadensis*	2.5" Caliper	7	*	Partial - Full	Single Stem
		Red Norway Maple	*Acer platanoides*	2.5" Caliper	7	*	Partial - Full	Single Stem

Note: * Trees planting locations to be staked by contractor and approved by the Forestry Inspector at the Pre-Planting Meeting.



VICINITY MAP
SCALE = 1"=2,000'
COPYRIGHT ADC THE MAP PEOPLE
PERMITTED USE NUMBER 20003121
ADC MONTGOMERY CO. MAP PAGE # 5164-B5

CITY OF ROCKVILLE FOREST CONSERVATION WORKSHEET March 2009
Project Name: Rockville Senior Center

NET TRACT AREA

A. Total tract area				11.90
B. Deductions (see definition #6 in instruction on this page, enter deductions - specify)				0.00
C. Net Tract Area			=	11.90

LAND USE CATEGORY

ZONING	R-200, R-200	R-90, R-75, RMD16, RMD25	LLRP, BPR, RPC, MXT, MXC, MXNC, MXB, MXE, MXCD, MXTD	
Planning Area				
Land Use Category (select one or combine two zones if the site spans two land use categories)				

D. Afforestation Threshold	15%	x C =		1.79
E. Conservation Threshold	15%	x C =		1.79

EXISTING FOREST COVER

F. Existing forest cover (within net tract)	=	3.00
G. Area of forest above conservation threshold	=	1.22

BREAK EVEN POINT

H. Breakeven Point (amount of forest retained so that no mitigation is required)	=	2.03
I. Clearing permitted without mitigation	=	0.97

PROPOSED FOREST CLEARING

J. Total area of forest to be cleared	=	0.00
K. Total area of forest to be retained	=	3.00

PLANTING REQUIREMENTS

L. Reforestation for clearing above conservation threshold	=	0.00
M. Reforestation for clearing below conservation threshold	=	0.00
N. Credit for retention above conservation threshold	=	1.22
P. Total reforestation required	=	0.00
Q. Total afforestation required	=	0.00
R. Total planting requirement	=	0.00

REFORESTATION AND PLANTING DATA:

Tree Removal And Replacement Data

	QTY	Rep Ratio	Planting Req
<12"	20	0:1	0
12"-18"	8	1:1	8
18"-24"	6	2:1	12
24"-30"	1	3:1	3
30"+	2	6:1	12
Total remove =	37	Total:	35

Tree To Be Removed and Replaced Schedule

Tree#	Size (in)	CRZ (ft)	Common Name	Scientific Name	Rqd. Replace	Notes
7	18	22.5	Mockernut Hickory	*Carya alba*	1	
8	5	7.5	Flowering dogwood	*Cornus florida*	0	
10	30	45.0	Black oak	*Quercus velutina*	6	
26	22	33.0	Tulip	*Liriodendron tulipifera*	2	
27	8	12.0	Mockernut Hickory	*Carya alba*	0	
28	21	31.5	Tulip	*Liriodendron tulipifera*	2	
29	24	36.0	Tulip	*Liriodendron tulipifera*	2	
34	24	36.0	Black Gum	*Nyssa sylvatica*	2	
39	20	30.0	Tulip	*Liriodendron tulipifera*	2	
40	25	37.5	Tulip	*Liriodendron tulipifera*	3	
44	16	24.0	Tulip	*Liriodendron tulipifera*	1	
45	31	46.5	Tulip	*Liriodendron tulipifera*	6	
46	22	33.0	Tulip	*Liriodendron tulipifera*	2	
47	14	21.0	Mockernut Hickory	*Carya alba*	1	
52	15	22.5	Mockernut Hickory	*Carya alba*	1	
53	15	22.5	Norway Spruce	*Picea abies*	1	
58	8	12.0	Mockernut Hickory	*Carya alba*	0	
59	11	16.5	Mockernut Hickory	*Carya alba*	0	
60	12	18.0	Mockernut Hickory	*Carya alba*	1	
63	15	22.5	Mockernut Hickory	*Carya alba*	1	
64	5	7.5	Crab Apple	*Malus sp.*	0	
65	10	15.0	Crab Apple	*Malus sp*	0	
69	8	12.0	Pin oak	*Quercus palustris*	0	
74	13	19.5	Japanese Zelkova	*Zelkova serrata*	1	
75	11	16.5	Japanese Zelkova	*Zelkova serrata*	0	
82	10	15.0	Red Norway Maple	*Acer platanoides*	0	
83	9	13.5	Red Norway Maple	*Acer platanoides*	0	
84	11	16.5	Red Norway Maple	*Acer platanoides*	0	
85	9	13.5	Red Norway Maple	*Acer platanoides*	0	
96	6	9.0	Burford Chinese Holly	*Ilex cornuta 'Burfordii'*	0	
97	5	7.5	Burford Chinese Holly	*Ilex cornuta 'Burfordii'*	0	
102	8	12.0	A. Holly	*Ilex opaca*	0	
103	3	4.5	Star Magnolia	*Magnolia stellata*	0	
104	11	16.5	Red Norway Maple	*Acer platanoides*	0	
105	10	15.0	Red Norway Maple	*Acer platanoides*	0	
106	10	15.0	Red Norway Maple	*Acer platanoides*	0	
107	8	12.0	Red Norway Maple	*Acer platanoides*	0	
108	7	10.5	Red Norway Maple	*Acer platanoides*	0	
157	12	18.0	Flowering Cherry	*Prunus sp.*	1	

Replacement trees required 36.0

Tree Remove And Replace Data

	QTY	Rep Ratio	Planting Req.
<12"	21	0:1	0
12"-18"	8	1:1	8
18"-24"	6	2:1	12
24"-30"	1	3:1	3
30"+	2	6:1	12
Total remove =	39	Total:	36

SHEET INDEX

1. GENERAL PLAN VIEW
2. PLAN VIEW WITHIN LOD
3. NOTES AND DETAILS
4. TREE LIST

PROFESSIONAL CERTIFICATION:
I hereby certify that this plan is prepared in accordance with the City of Rockville Forest Conservation Regulations.

DATE: JAMES FITCHU
REGISTERED LANDSCAPE ARCHITECT # 3241

FOREST CONSERVATION PLAN
ON APPROVED NRI/FSD (FTP No. 2010-00005)
PRELIMINARY - (FCP)

ROCKVILLE SENIOR CENTER
ROCKVILLE (4th) ELECTION DISTRICT
ROCKVILLE, MARYLAND

CPJ Associates — Charles P. Johnson & Associates, Inc.
Civil and Environmental Engineers • Planners • Landscape Architects • Surveyors
www.cpjassoc.com — Gaithersburg, MD • Frederick, MD • Stevensville, MD • Fairfax, VA

CLIENT: CITY OF ROCKVILLE
DESIGNED: RTP
DRAWN: RTP
DATE: December, 2009
SCALE: 1"=50'
FTP PLAN NO.: 2-00005
SHEET 1 OF 4
FILE NO.: 38-2009-3010

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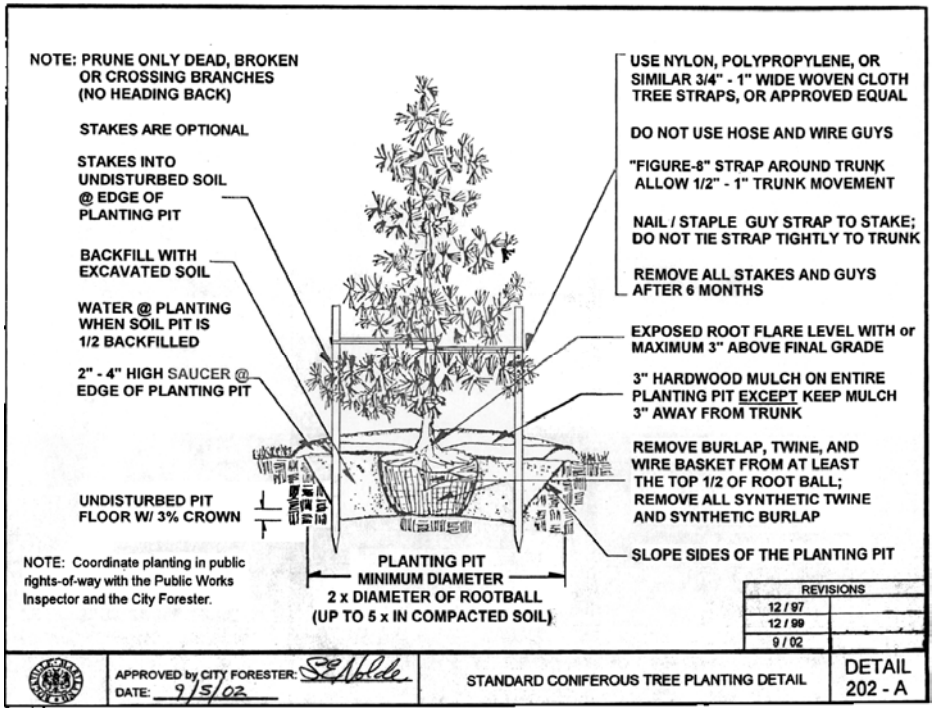
Last Saved: 12/2/2009 - Last Plotted: 12/2/2009 10:51 AM - Sheet: P:\ROCKVILLE SENIOR CENTER\FCP

Forest Conservation Plan (FCP)



- Typical FCP Details

Trees To Be Protected

ID	Common Name	*Scientific Name*	DBH (in.)	CRZ (Ft.)	Condition	RP	DRF	CA	SP	DRW
A	Tulip Poplar	*Liriodendron tulipifera*	20	30	81%		X	X		X
10	Black oak	*Quercus velutina*	30	45	72%	X	X	X	X	X
34	Black Gum	*Nyssa sylvatica*	24	36	75%	X	X	X	X	X

Forest Conservation Plan (FCP)

Planting Plan

PLANTING GENERAL NOTES

1. ALL PLANT MATERIALS AND PLANTING PROCEDURES, EXCEPT AS OTHERWISE NOTED, SHALL CONFORM TO THE LATEST EDITION OF "LANDSCAPE SPECIFICATION GUIDELINES FOR THE BALTIMORE-WASHINGTON METROPOLITAN AREA" BY LCA-MD*DC*VA "OR ANY T-HING THAT IS NOT COVERED BY SPECIFICATIONS FOR THIS PROJECT.

2. USING THE SERVICES OF MISS UTILITY AND A PRIVATE UTILITY LOCATING COMPANY LOCATE AND MARK ALL UNDERGROUND UTILITIES BEFORE DIGGING. THE CALL TO MISS UTILITY (1-800-257-7777) SHALL BE MADE AT LEAST 48 HOURS BEFORE DIGGING. ALL UNDERGROUND UTILITIES NOT MARKED BY MISS UTILITY SHALL BE MARKED BY THE PRIVATE UTILITY LOCATING COMPANY BEFORE DIGGING.

3. ALL PLANTING BEDS AND PLANT LOCATIONS SHALL BE STAKED OUT BY CONTRACTOR AND APPROVED BY CITY FORESTRY INSPECTOR BEFORE DIGGING. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND COORDINATE PLANTINGS WITH ALL EXISTING UTILITIES. IF DISCREPANCIES OCCUR BECAUSE OF UTILITY LOCATIONS OR OTHER EXISTING CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE CITY FORESTRY INSPECTOR IMMEDIATELY TO COORDINATE ANY NECESSARY ADJUSTMENTS. THE OWNER RESERVES THE RIGHT TO RELOCATE STAKEOUT LOCATIONS.

4. ALL PLANT MATERIAL SHALL BE LABELED BY THE NURSERY AND DELIVERED WITH LABELS IN PLACE FOR INSPECTION. SUBSTITUTIONS IN PLANT SPECIES OR SIZE SHALL NOT BE PERMITTED. DO NOT PRUNE PLANT MATERIAL EXCEPT DEAD BRANCHES, UNLESS OTHERWISE DIRECTED BY THE CITY'S ARBORIST.

5. IN CASE OF DISCREPANCIES BETWEEN QUANTITIES OS THE PLANT LIST AND ON THE PLAN, THE PLAN SHALL GOVERN.

6. REPRESENTATIVE SOIL SAMPLES FROM BOTH IN-SITE SOILS AND SOILS BROUGHT IN SHOULD BE SENT TO A SOIL LABORATORY FOR TESTING. SOIL AMENDMENTS SHALL BE MADE BASED UPON RESULTS OF THE SOIL TESTS AND RECOMMENDATIONS BY TEST LAB.

7. ALL PLANTING BEDS SHALL HAVE AT LEAST 18" DEPTH OF PLANTING SOIL MIX. ALL OTHER NON-PAVED DISTURBED AREAS SHALL HAVE AT LEAST 2" OF TOPSOIL AND SHALL BE SEEDED UNLESS OTHERWISE NOTED ON DRAWING.

8. ALL SHRUB, GROUNDCOVER AND PERENNIAL AREAS SHALL BE PLANTED IN CONTINUOUS PREPARED BEDS, MULCHED WITH COMPOSTED HARDWOOD MULCH AS DETNLED ANC SPECIFIED. PLANTING BEDS SHALL BE 6" HIGHER THAN ADJACENT LAWN OR PAVEMENT ELEVATION, UNLESS OTHERWISE NOTED OR DOING SO WOULD PREVENT DRAINAGE. PLANTING BEDS SHALL SLOPE @ 2% MINIMUM, AWAY FROM THE BUILDING.

9. SEE SPECIFICATIONS AND GENRAL NOTES ON CIVIL DRAWINGS FOR OTHER REQUIREMENTS, INCLUDING BUT NOT LIMITED TO PREPARATION OF PLANTING BEDS, PLANTING SOIL MIX, GRADING, AND REPAIR AND/OR REPLACEMENT OF ANY EXISTING CONDITION OR NEWLY IMPROVEMENT DAMAGED BY CONTRACTOR.

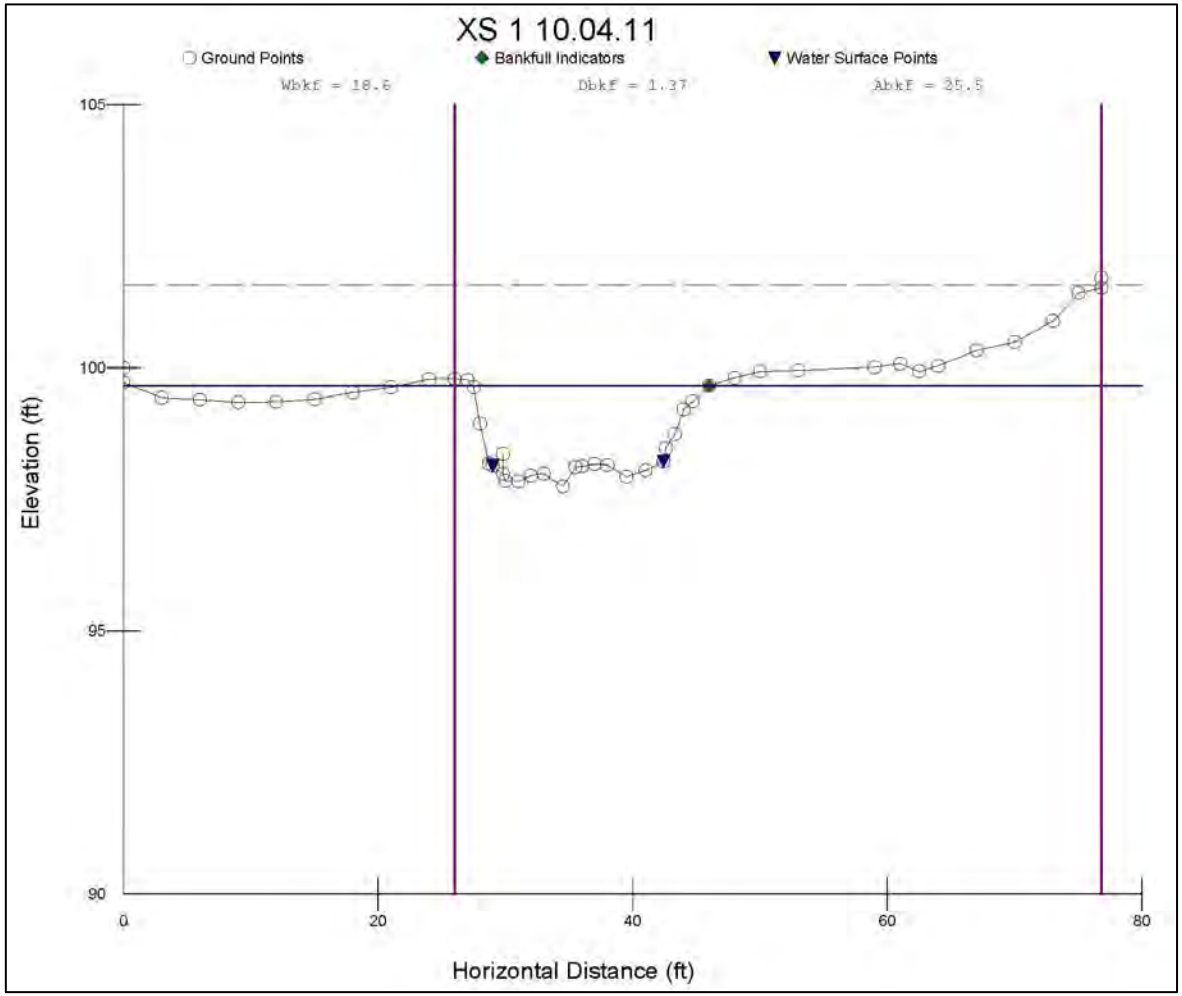
10. THIS PLAN IS FOR LANDSCAPE PURPOSES ONLY, AND OTHER INFORMATION SHOWN IS FOR REFERENCE ONLY. SEE OTHER DRAWINGS FOR INFORMATION ABOUT ALL LAYOUT, GRADING, DRAINAGE, PAVING, WALLS AND OTHER SITE IMPROVEMENTS.

	Significant Tree Replacement		Square Foot Cover Afforestation Credit					

Project Status

Project Status

- Project overview
- Stream data collection to date



Completed Geomorphic Work

- 12 Cross sections surveyed
- 19 Pebble counts conducted
- 8 Toe pins installed (to measure erosion)
- 6,244LF of stream profile surveyed

Next Steps

Next Steps

- Existing data evaluation
- Geomorphic map
- Rank areas for possible restoration
- Community input

Data Evaluation Methods

- Comparison of 2011 & 1999 stream cross sections
- Stream erosion rate mapping
- Estimated tree loss
- Estimate of pollution abetment provide by current and/or possible stormwater management
- Geomorphic stability data
- Utility protection

Technical Data Sources

- Watts Branch Study
- CWP reports
- Existing SWM Facility Plans and Comps
- Utility Plans
- 1999 Topo and Tree survey
- College Garden Monitoring

Questions?

Rockville Maryland

HAZEN AND SAWYER
Environmental Engineers & Scientists

CPJ Associates