Water Needs Room to Move

Why “Stream Reaming” Isn’t a Good Solution to Flooding.

Special thanks to:

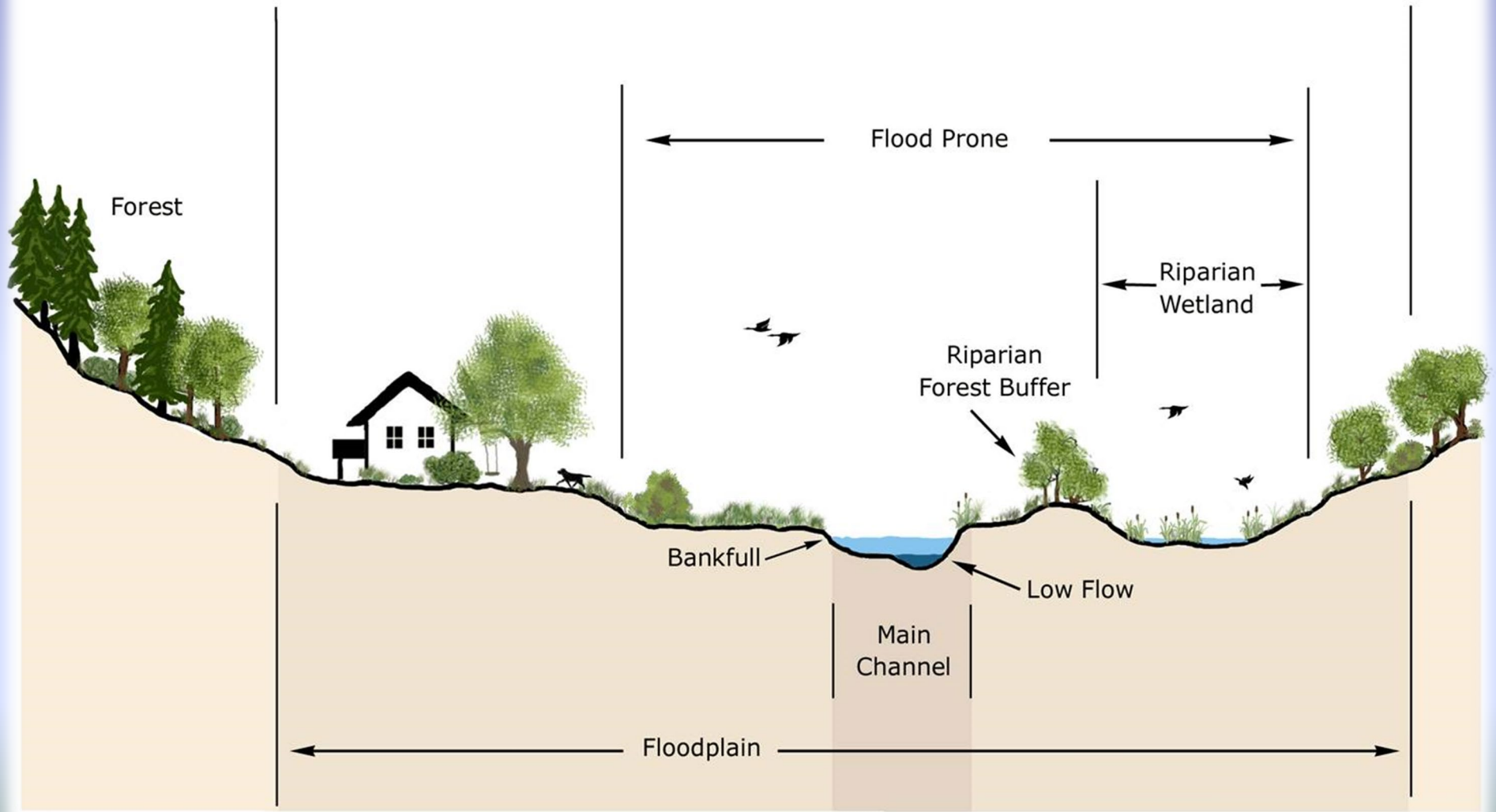
Janet Thigpen

for info and use of images
from the “Stream Guide” series.

Southern Tier Central Regional Planning & Development Board

CHEMUNG COUNTY SOIL & WATER CONSERVATION DISTRICT

Streams are complex, living systems

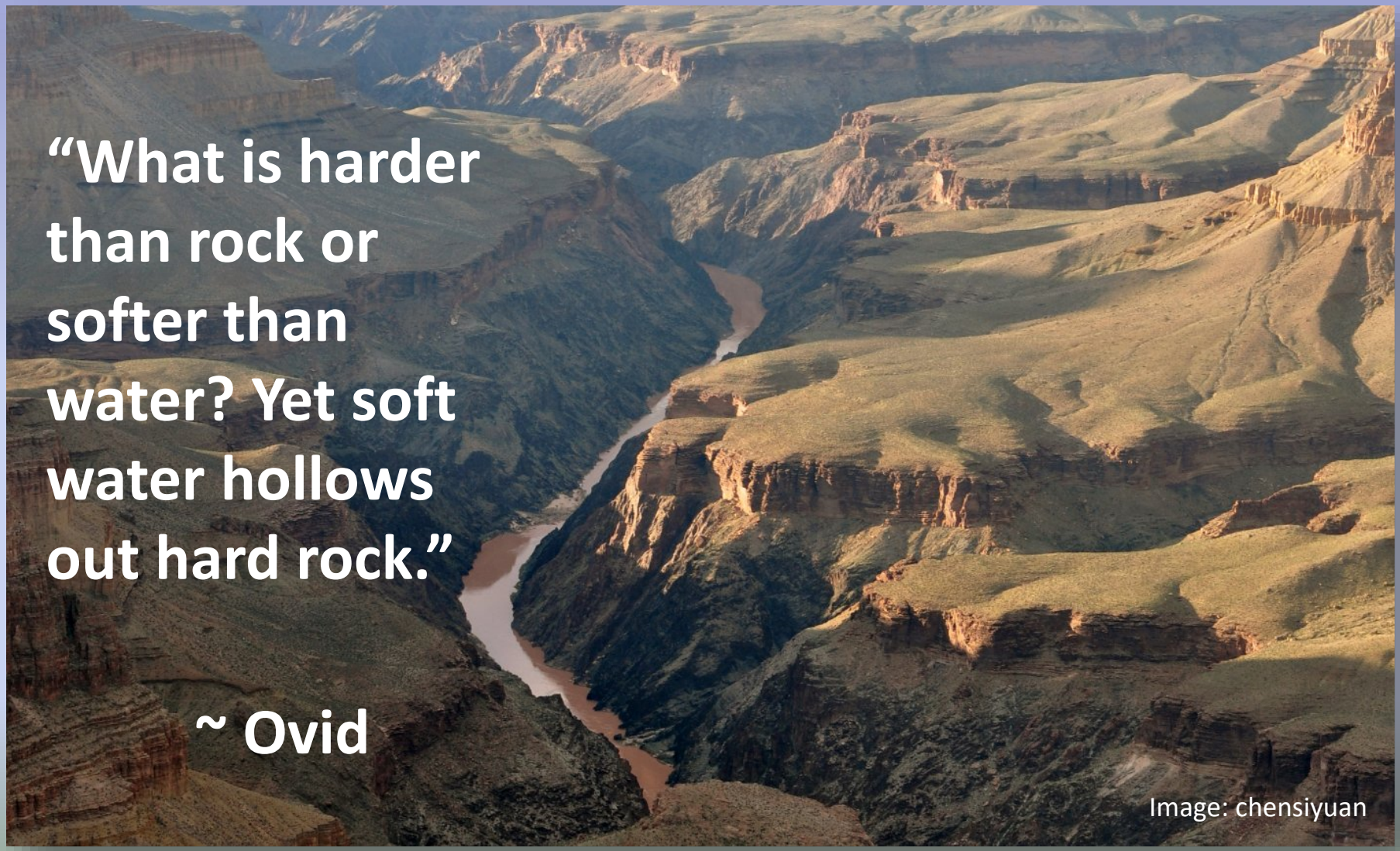


Streams move:

- Water
- Sediment and debris
- Aquatic organisms

Image: Chemung County Soil & Water Conservation District

Water is the dominant agent of landscape alteration.



Water shapes land as it runs downhill.

Stream forms and channel cross sections vary due to differences in:

- **water** discharge produced by rainfall over watershed.
- volume & characteristics of **sediment** picked up by the water.

Images: Mwanner, N.D. Smith, Greg O'Beirne, Nicholas

Natural stream corridors are in "dynamic equilibrium."

Image: Chemung County Soil & Water Conservation District

Streams re-adjust to disturbance

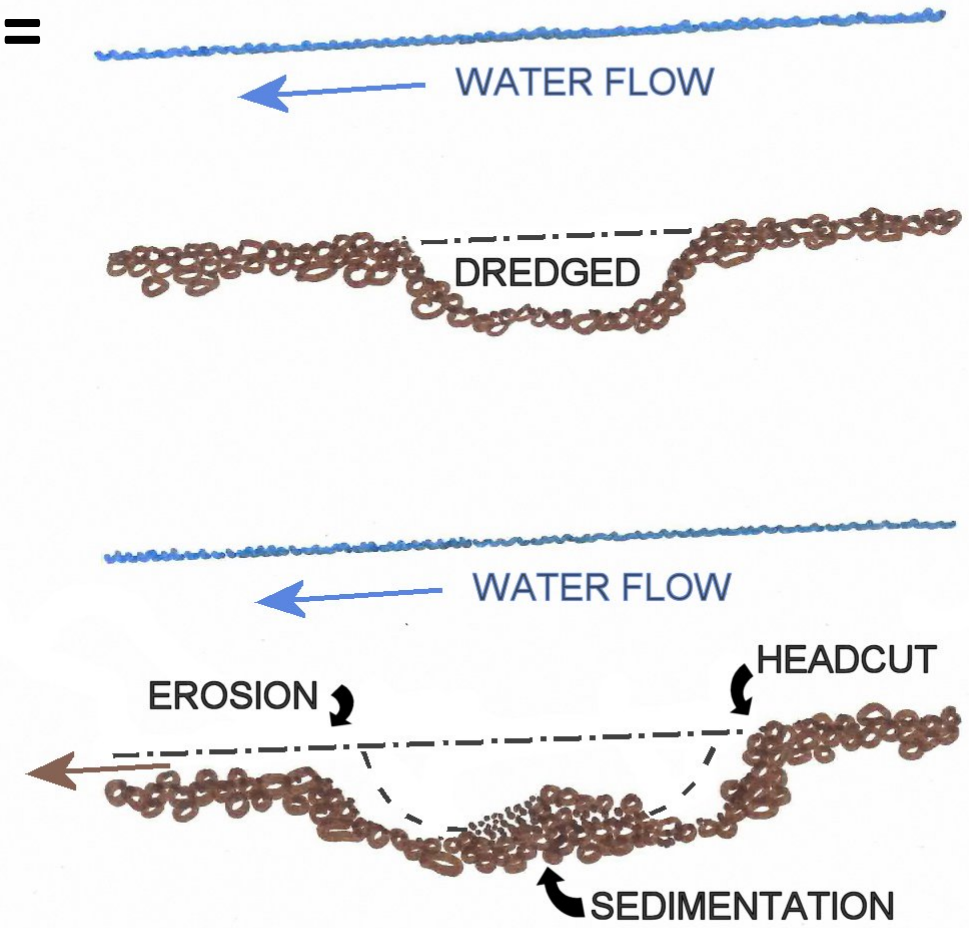
whether natural or man-made.

Stream “Reaming” vs. “Repair”

- “Reaming” refers to over-dredging.
  In the past, streams were “hogged,” straightened, and /or sometimes bermed. The thinking was that a deep, straight channel would move water out of an area fast and prevent flooding. However, this method proved to be short-sighted.
- “Repair” refers to restoring the land in and around a stream that attempts to mimic pre-flood conditions. This can include careful removal of flood-deposited sediments.

What “Reaming” Does:

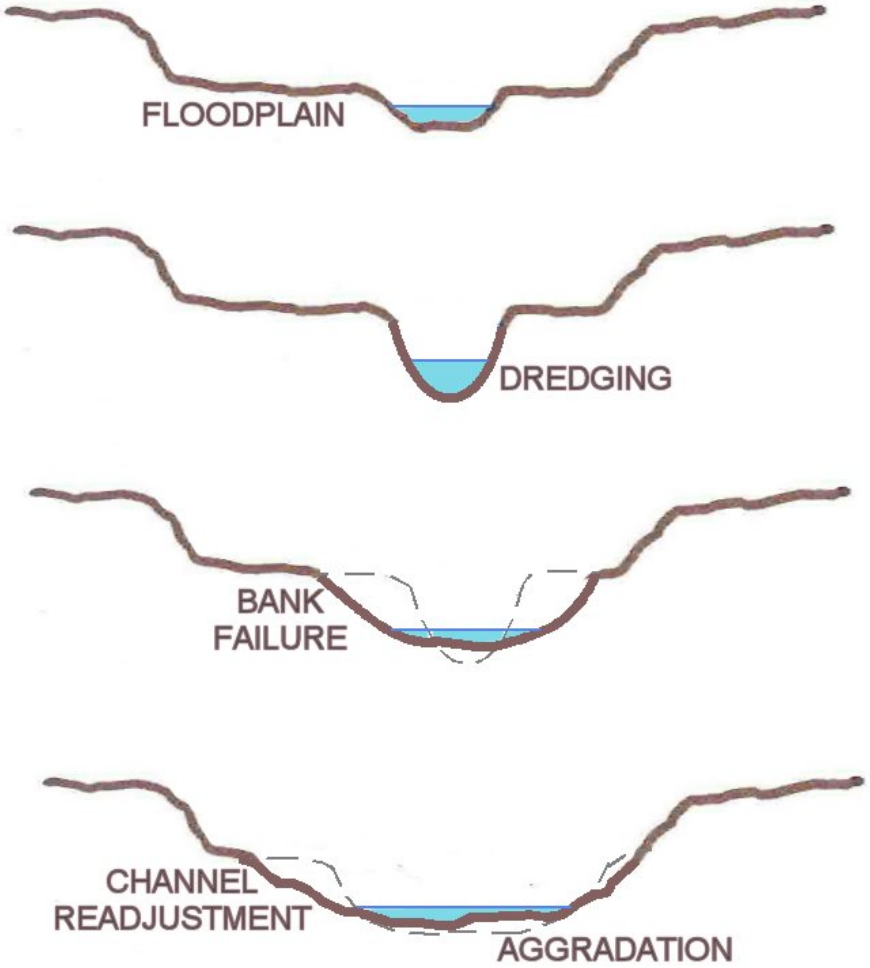
- **Over-dredging = deeper.**
- Increases sediment movement.
- Destroys streambed habitat.



Cross-section parallel to stream

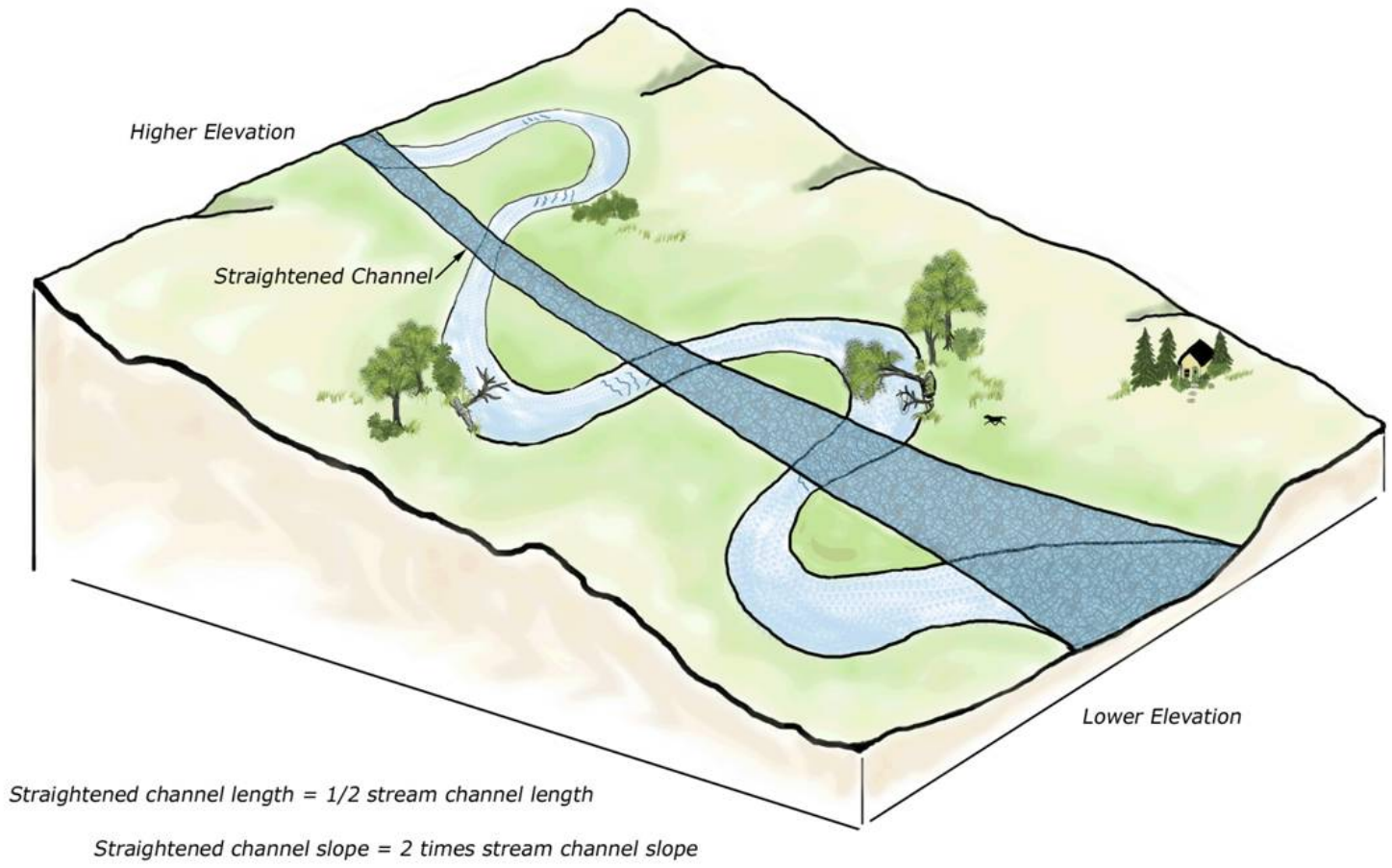
What “Reaming” Does:

- Over-deepening de-stabilizes channel edges.
- Streambanks erode and are forced to readjust.
- Sediments from erosion lower water clarity.
- Water table drops, causing drought for riverbank plants.



Cross-section perpendicular to stream

What “Reaming” Does:



Steeper + Shorter = **Faster** Water

Image: Chemung County Soil & Water Conservation District

What “Reaming” Does:

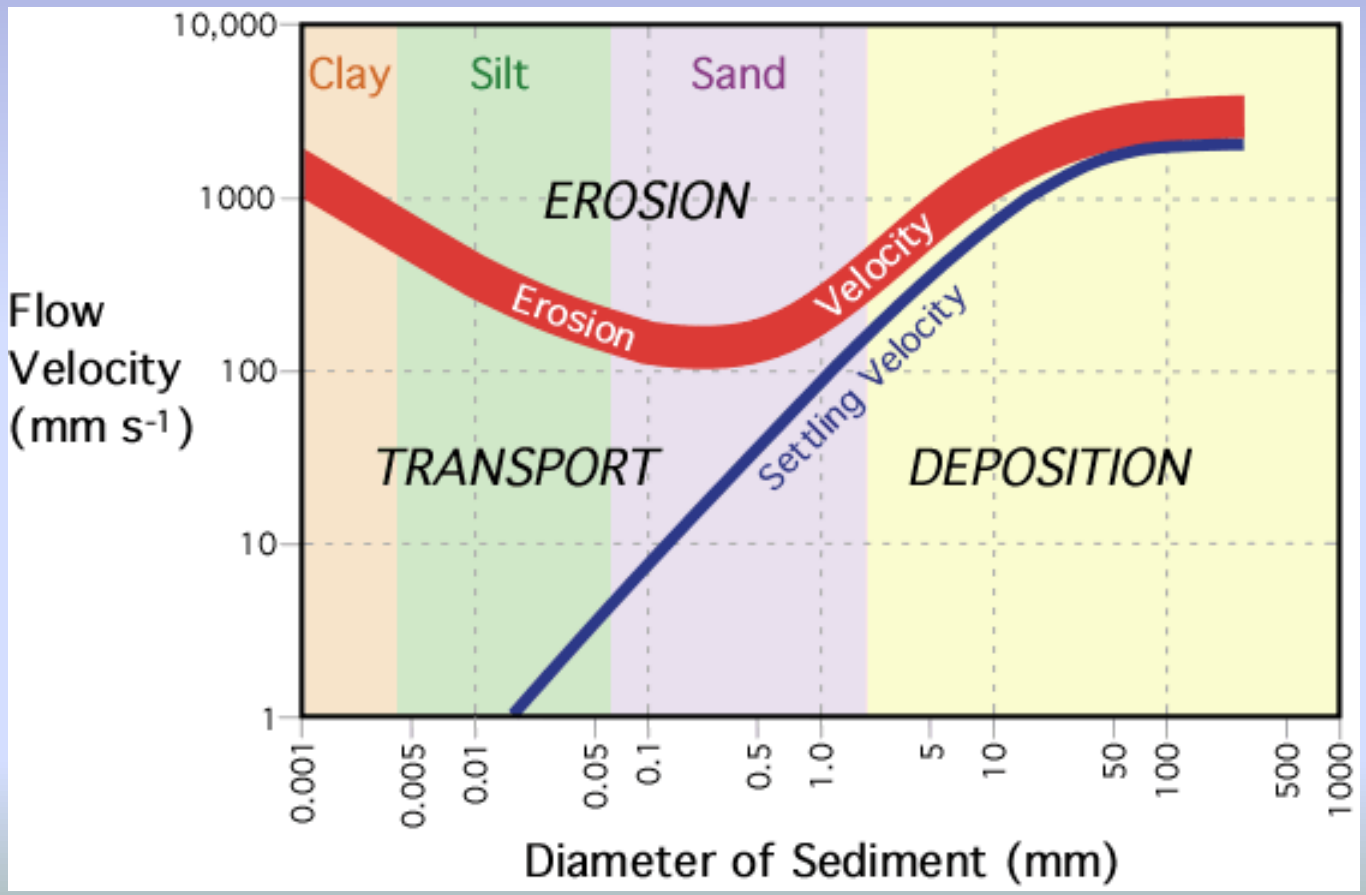
Deeper + Steeper + Shorter = Faster = **Harder**

Fast water creates a lot of force!

Image: Hike for Cam Project

Faster water moves greater volumes of sediment, and larger particle sizes…

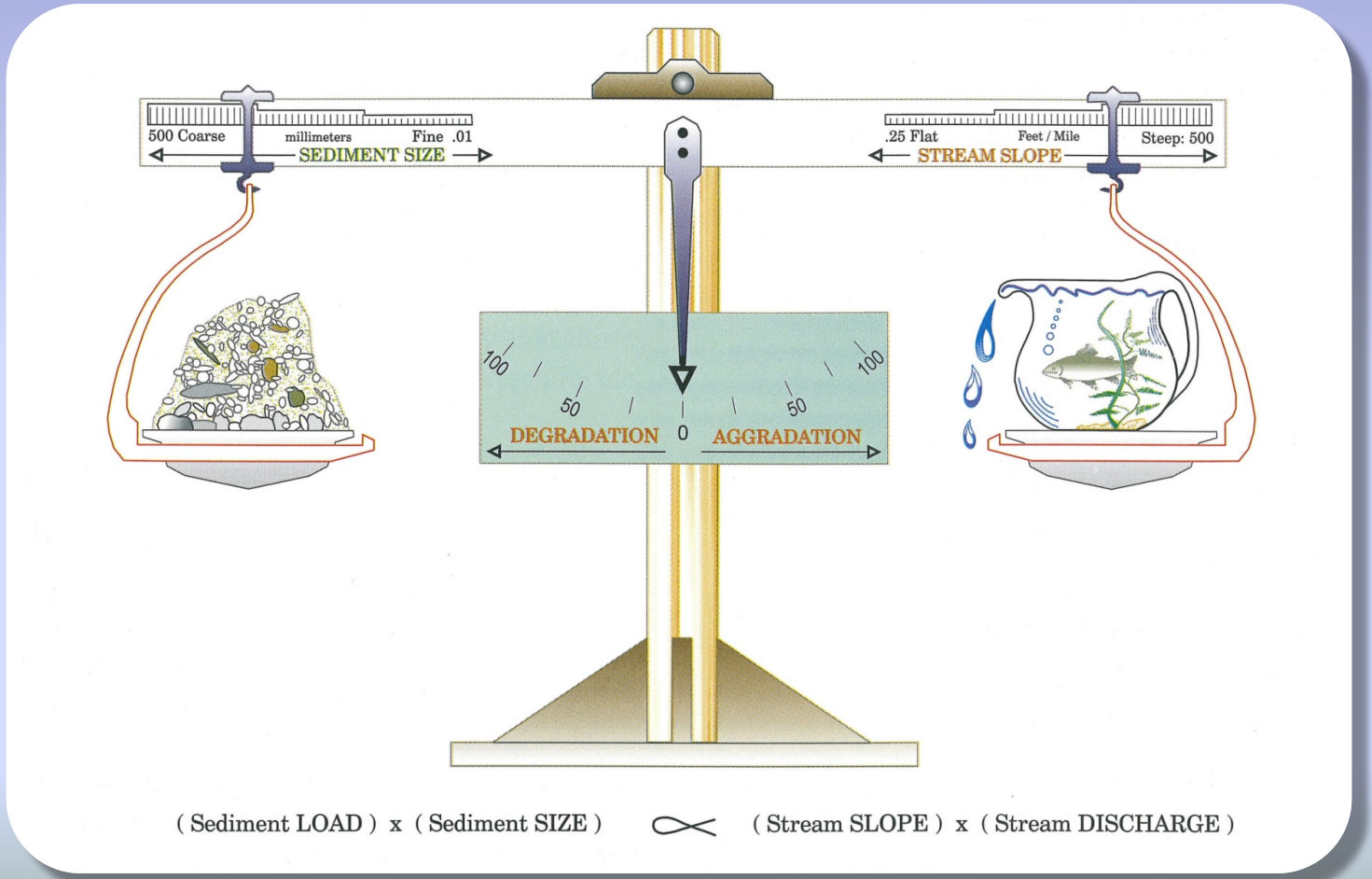
some of which do not settle out again easily.



http://www.physicalgeography.net/fundamentals/10w.html

Lane's Balance:

Illustrates how steeper, more forceful streams will move more and larger sediments.



David Rosgen, *Applied River Morphology* (1996).

Problems with Reaming:

Maintenance costs can soar!

- Faster water moves more sediment.
- Moving sediment will fill in abrupt drops in stream slope, created by over-dredging.
- Over-steepened & straightened streams will readjust… perhaps in undesirable ways.

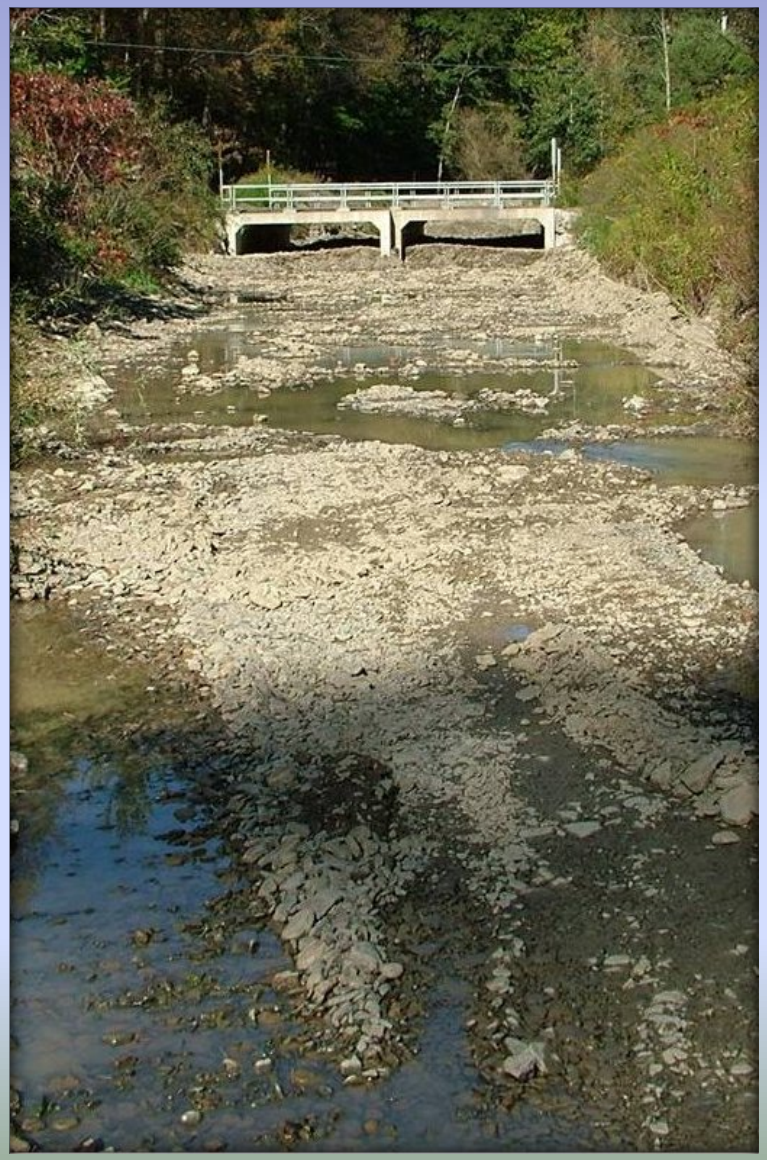


Image: Chemung County Soil & Water Conservation District

Problems with Reaming:

Disrupts aquatic ecosystems. Harms stream life.

Images: Brian Gratwicke, Tom Meijer, Eric Engbretson (FWS)

Stream “Reaming” Doesn’t: Reduce the Power of the Water.

Image: Chemung County Soil & Water Conservation District

Faster Water increases **Scour**

Image: Chemung County Soil & Water Conservation District

Scour can lead to **Undermining**

Image: Chemung County Soil & Water Conservation District

Faster water transports more **Debris**

Image: Chemung County Soil & Water Conservation District

Debris transport can lead to **Blockage**

Image: Chemung County Soil & Water Conservation District

Stream "Reaming" Doesn't:
Provide enough room for large floods.

Image: NASA/NOAA GOES Project

Getting Real About Rainfall Rates

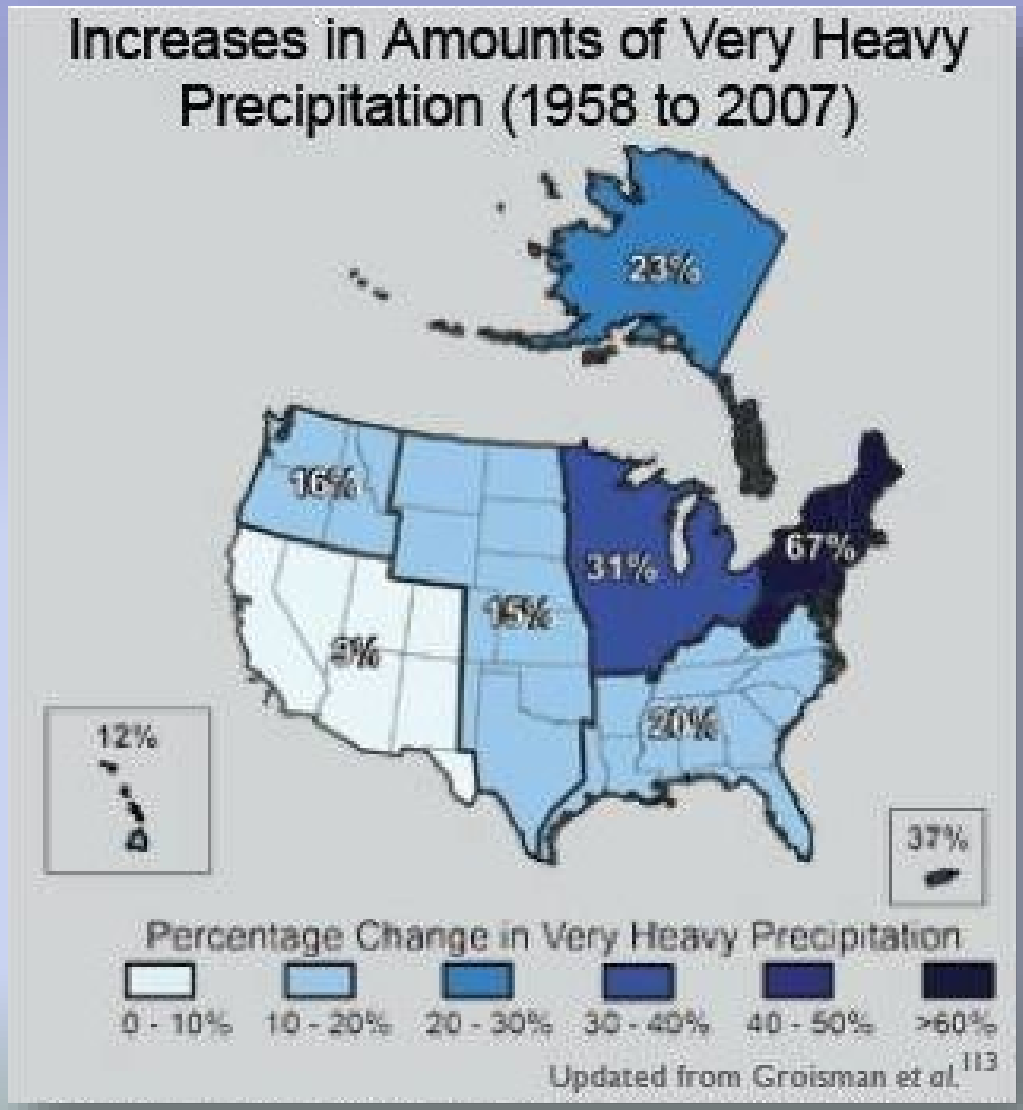
"We have seen a 67% increase in the number of 2-inch rainfall events occurring over a 48-hour period since the 1950s."

Climate Change Facts, Dept. of Earth & Atmospheric Sciences, Cornell University

Storms are *more frequent* and *more extreme* than they used to be. Have you noticed?

Image: Bidgee

Increase in Rainfall Rates, Nationwide



The map shows the percent increase in very heavy precipitation events (defined as the heaviest 1 percent of all daily events).

There are clear trends toward more heavy precipitation for the nation as a whole, particularly in the Northeast and Midwest.

Info: Pavel Groisman, University Corp. for Atmospheric Research & National Climatic Data Center

What does this rainfall increase mean?

Increased rainfall intensity means higher flows happen more often, creating more damage; particularly in areas already altered by previous flooding events.

What does this rainfall increase mean?

Proper awareness is essential, as is learning to work *with* natural stream processes to help minimize future damage.

“All that water will go ***somewhere***.”

“Floods are acts of God, but flood losses are largely acts of man.”

Gilbert F. White, “the father of floodplain management”

Image: Asybaris01 (NASA)

Image: Bidgee

High water will take the room it needs.

Image: Rook

Here it rose above road.

Abrupt changes in stream slope and high flows leave deposition behind.

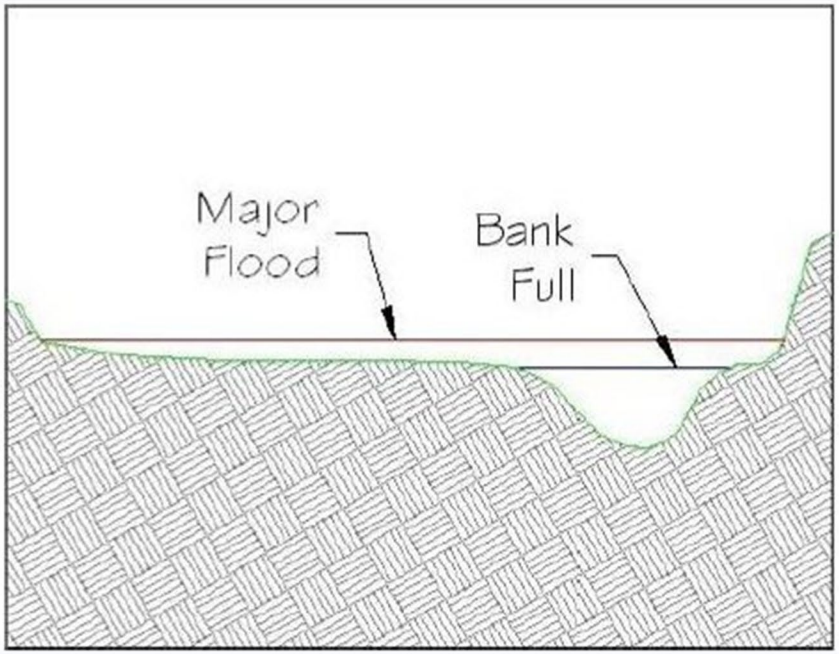
The photo shows the aftermath of the previous slide. Worse conditions can also occur.

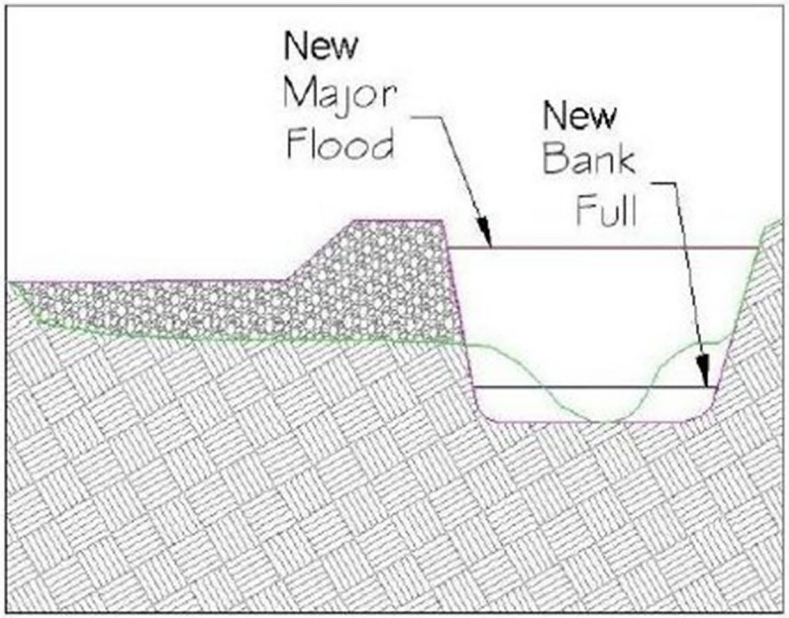
High water is forced to rise and the higher flow carries more debris, which is released at an abrupt slope change.

It's an example of an overly-restricted stream flowing into a larger stream.

Image: Rook

Reaming and Berming
Don't Fix The Problem





Images: Delaware County Soil & Water District, Delaware County Planning, NYSDEC

- Higher flow is best handled by allowing it to spread out.
- If it can't spread "out," it will rise, or sometimes dig deeper, resulting in a greater chance of catastrophic results.

Headcuts from Over-Dredging:

It doesn't stop there!

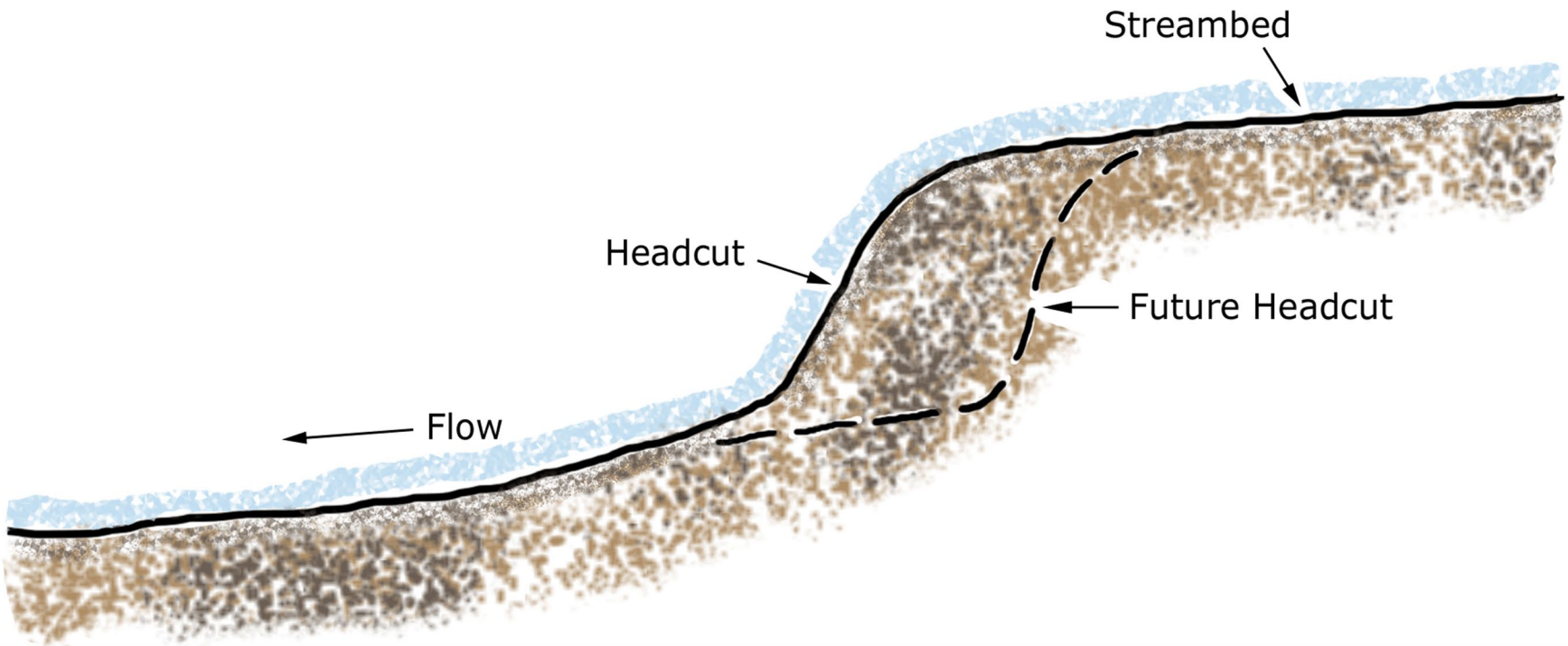


Image: Chemung County Soil & Water Conservation District

Headcuts Can Move Upstream

http://www.mvk.usace.army.mil/offices/pp/projects/mdhp/index.htm

Headcuts Can Move Upstream

Image: Chemung County Soil & Water Conservation District

A Better Approach

- Work with an under-standing of natural stream processes.
- Where possible, spread it out, so the friction from moving over land slows the force of the water.
- More infiltration, less conveyance.

Image: Inajeep

A Better Approach

Post-Flood Emergency Stream Intervention

Training Manual

Originally prepared by:
Delaware County Soil and Water Conservati0on District
Delaware County planning Department

In cooperation with:
The New York City Department of Environmental Protection,
Bureau of Water Supply, Stream Management Program

With permission, this document was edited and expanded for state-wide application by:
New York Department of Environmental Conservation

Work with an understanding of natural stream processes.

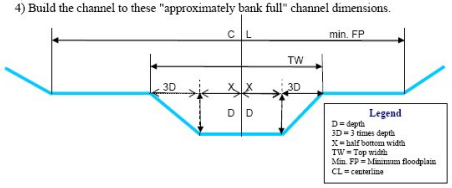
HYDROLOGIC REGION 6 (SOUTHERN TIER)

Bank Full Hydraulic Geometry vs. Drainage Area for Selected Hydrologic Regions

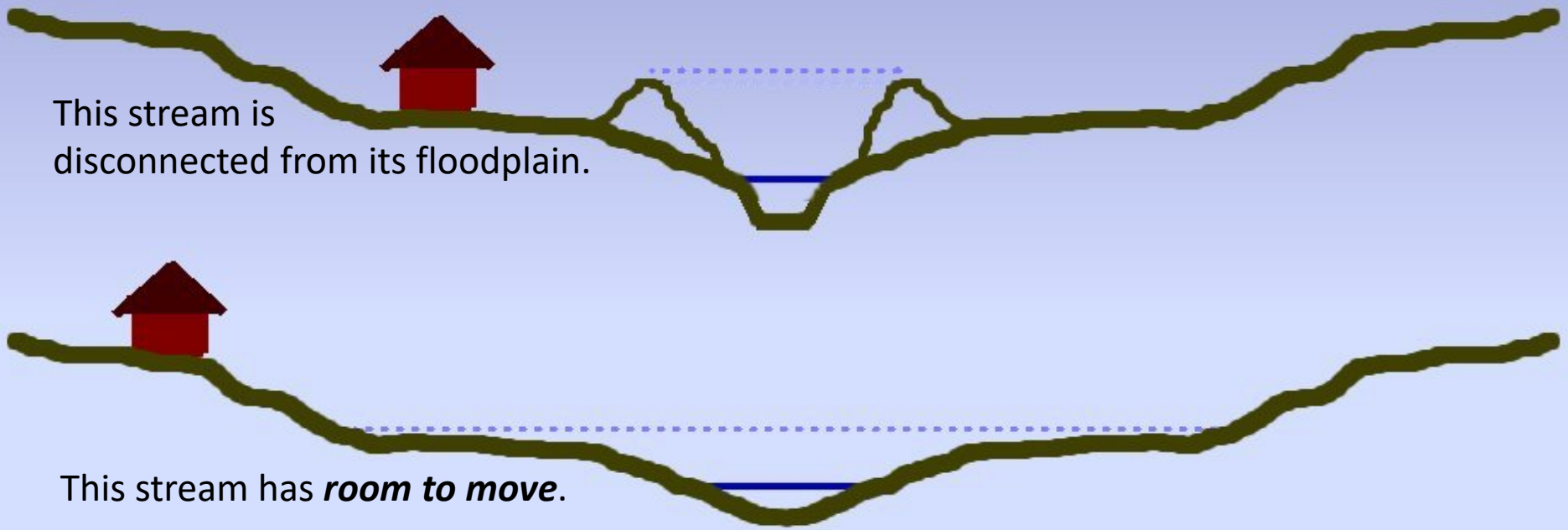
DA (sq. mile)	Bank Full Area (sq. ft)	Bank Full Width (ft)	Bank Full Depth (ft)	Construction Dimensions: channel bank side slope	D (ft)	3D (ft)	X (ft)	TW (ft)	Min. FP (ft)
1	17.6	16.9	1.0	3:1	1.4	4.1	4.3	16.9	37.2
2.5	32.3	24.8	1.3	3:1	1.6	4.8	7.6	24.8	54.6
5	51.1	33.2	1.5	3:1	1.8	5.5	11.0	33.2	73.0
7.5	66.8	39.3	1.7	3:1	2.0	6.0	13.6	39.3	86.5
10	80.8	44.3	1.8	3:1	2.1	6.4	15.8	44.3	97.6
12.5	93.7	48.7	1.9	3:1	2.2	6.7	17.6	48.7	107.1
15	105.7	52.6	2.0	3:1	2.3	7.0	19.3	52.6	115.6
17.5	117.1	56.1	2.1	3:1	2.4	7.2	20.8	56.1	123.4
20	127.9	59.3	2.2	3:1	2.5	7.4	22.2	59.3	130.4
22.5	138.2	62.3	2.2	3:1	2.5	7.6	23.6	62.3	137.0
25	148.2	65.1	2.3	3:1	2.6	7.8	24.8	65.1	143.2
27.5	157.9	67.8	2.3	3:1	2.6	7.9	25.9	67.8	149.1
30	167.3	70.3	2.4	3:1	2.7	8.1	27.1	70.3	154.6
32.5	176.4	72.7	2.4	3:1	2.7	8.2	28.1	72.7	159.9
35	185.2	75.0	2.5	3:1	2.8	8.4	29.1	75.0	164.9
37.5	193.9	77.2	2.5	3:1	2.8	8.5	30.1	77.2	169.8
40	202.3	79.3	2.6	3:1	2.9	8.6	31.0	79.3	174.4
42.5	210.6	81.3	2.6	3:1	2.9	8.7	31.9	81.3	178.9
45	218.7	83.3	2.6	3:1	2.9	8.8	32.8	83.3	183.2
47.5	226.7	85.2	2.7	3:1	3.0	8.9	33.7	85.2	187.4
50	234.5	87.0	2.7	3:1	3.0	9.0	34.5	87.0	191.5

Instructions:

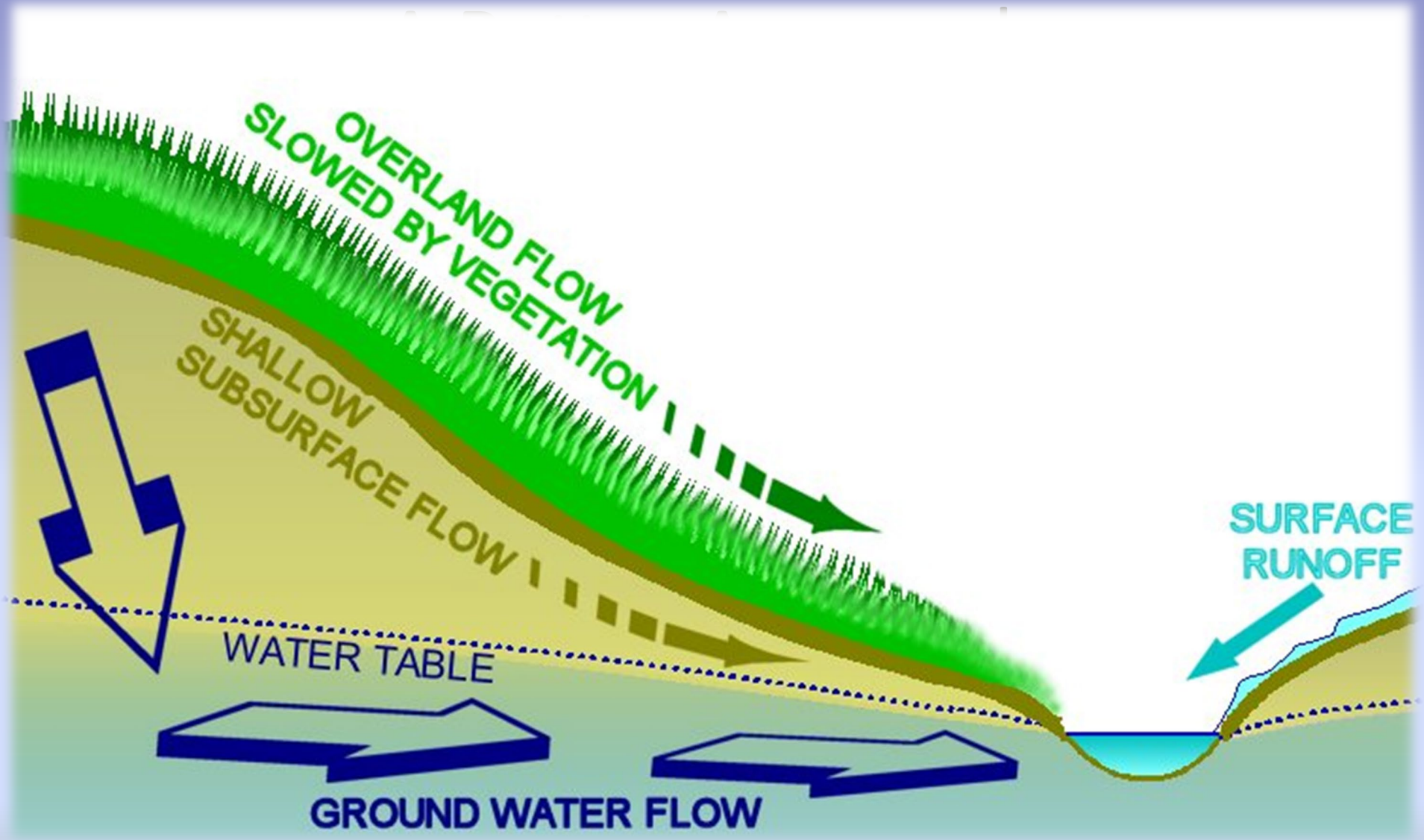
1) Select the table for the drainage basin that your project is in.
2) Select the drainage area (DA) in the selected table that most closely matches the DA at your project site.
3) Under "Construction Dimensions" read the channel dimensions tabulated.
4) Build the channel to these "approximately bank full" channel dimensions.



A Better Approach

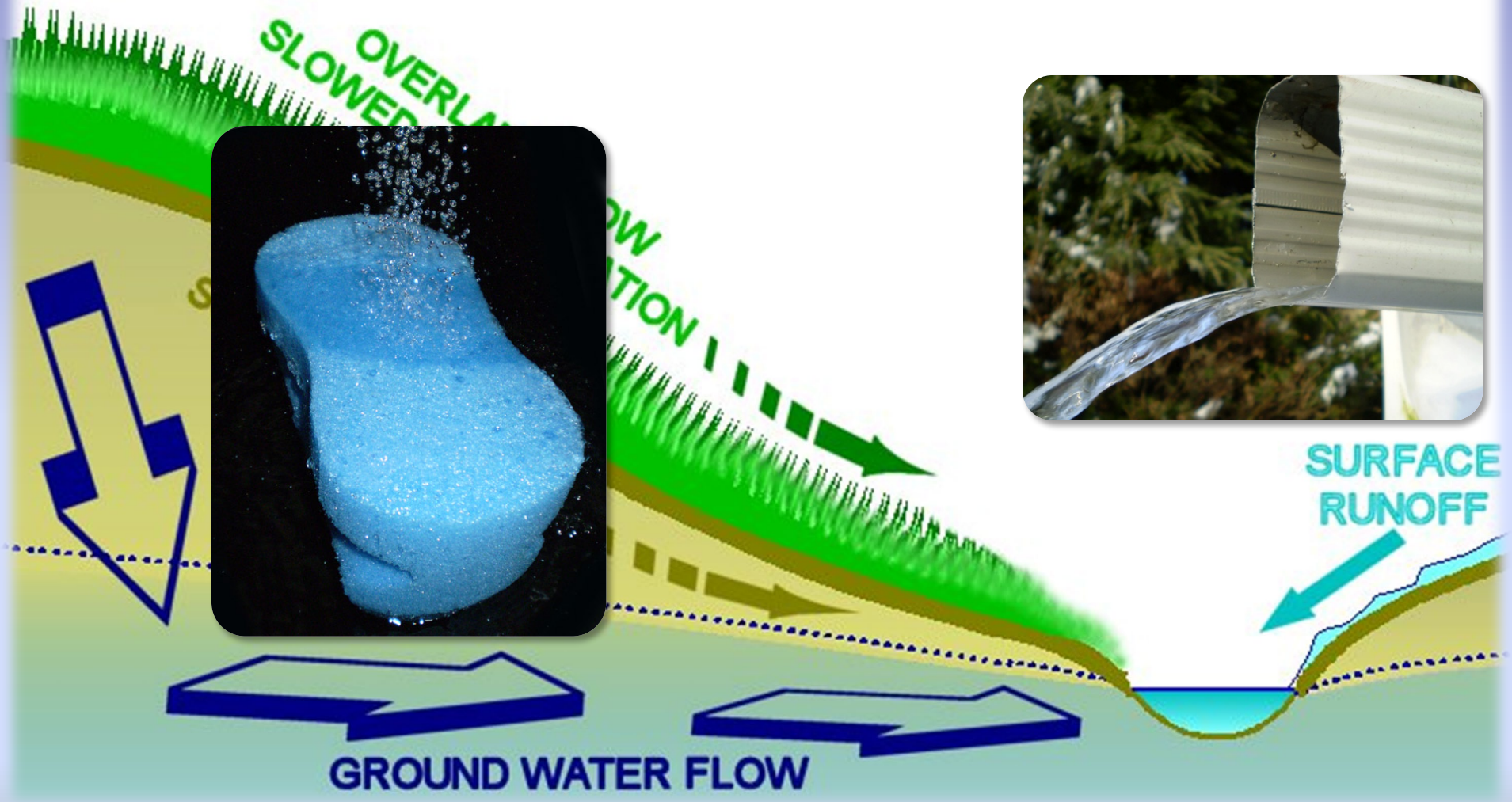


Protecting the floodplain helps protect property and property values.



More infiltration, less conveyance.

A Better Approach



"Sponges" vs. "Gutters"

Pervious surfaces allow water infiltration like a sponge

Slow water and soak it in. (This also filters pollutants & recharges groundwater.)

- Forests and vegetation, deep, uncompacted soils.
- Wetlands
- Floodplains
- Stormwater treatment areas
- Rain gardens
- Green roofs

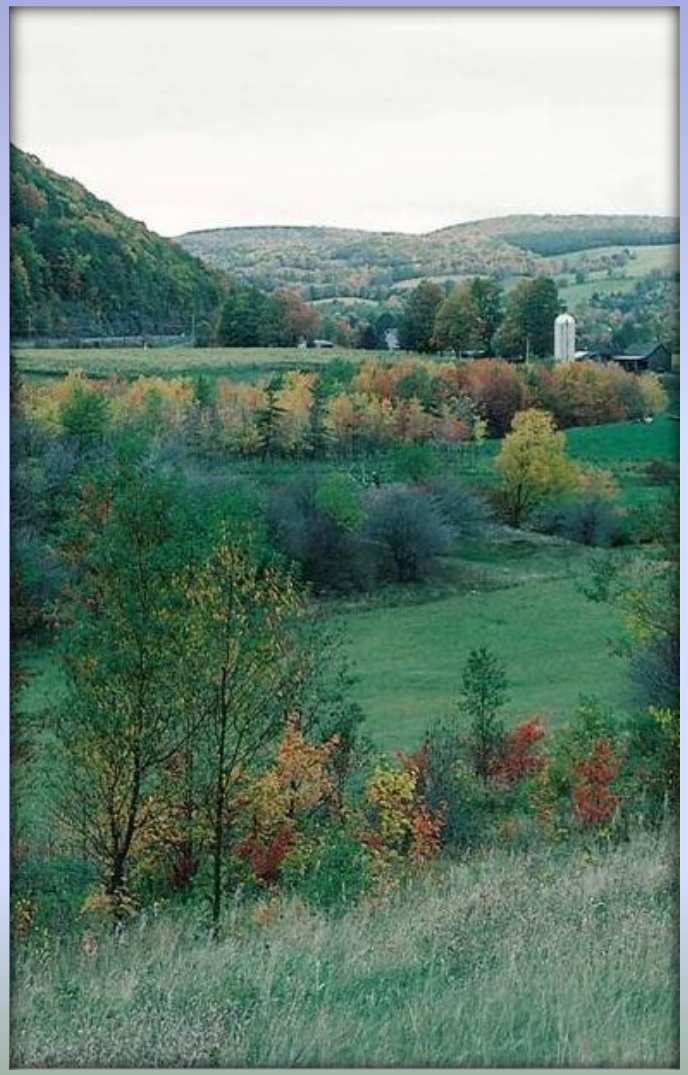


Image: Chemung County Soil & Water Conservation District

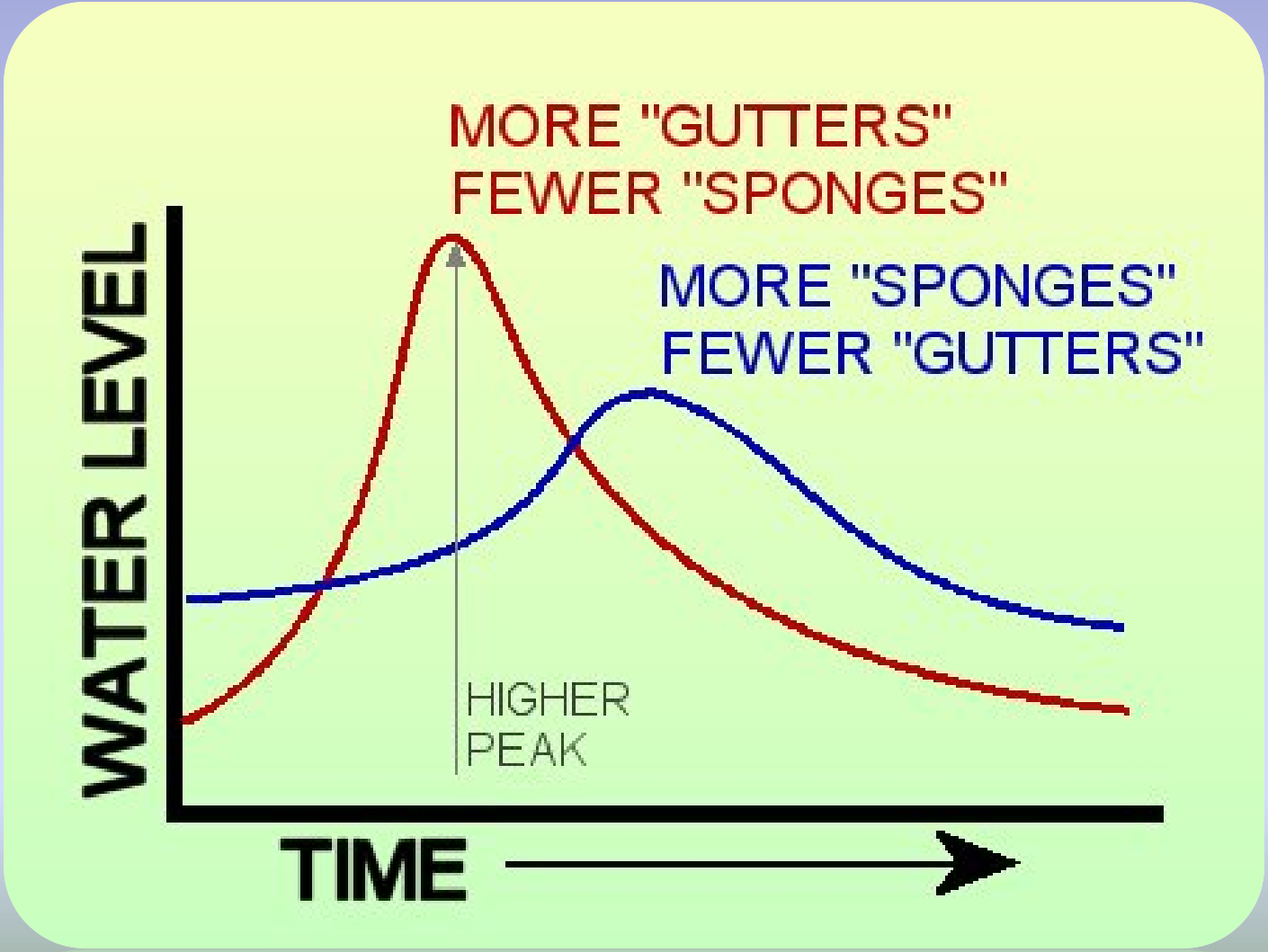
Impervious surfaces result in more water conveyance, like a gutter.

Water “rushed” through an area collects faster and causes higher flood peaks than when it soaks in.

- Hard surfaces (pavement, roofs, concrete channels).
- Compacted soils.
- Channelized streams.

Images: heartbeaz, Jim.henderson

Fewer “sponges” upstream cause worse flooding downstream



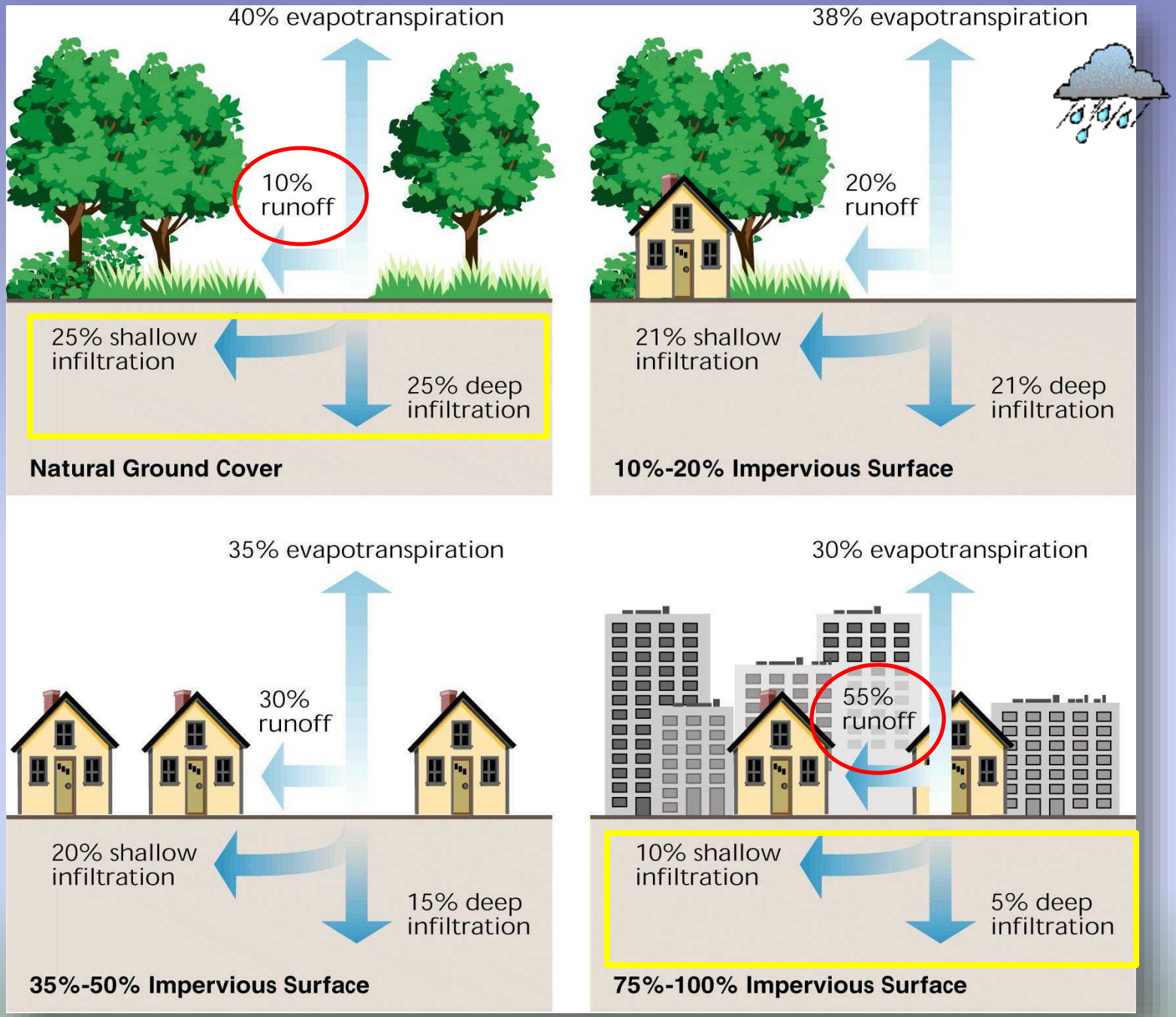


Image: Chemung County Soil & Water Conservation District

Save existing sponges!

Image: kgilbert

- Minimize soil disturbance
- Avoid wetlands.
- Stay out of floodplains.
- Allow stream meandering.
- Preserve natural vegetation along stream edges.

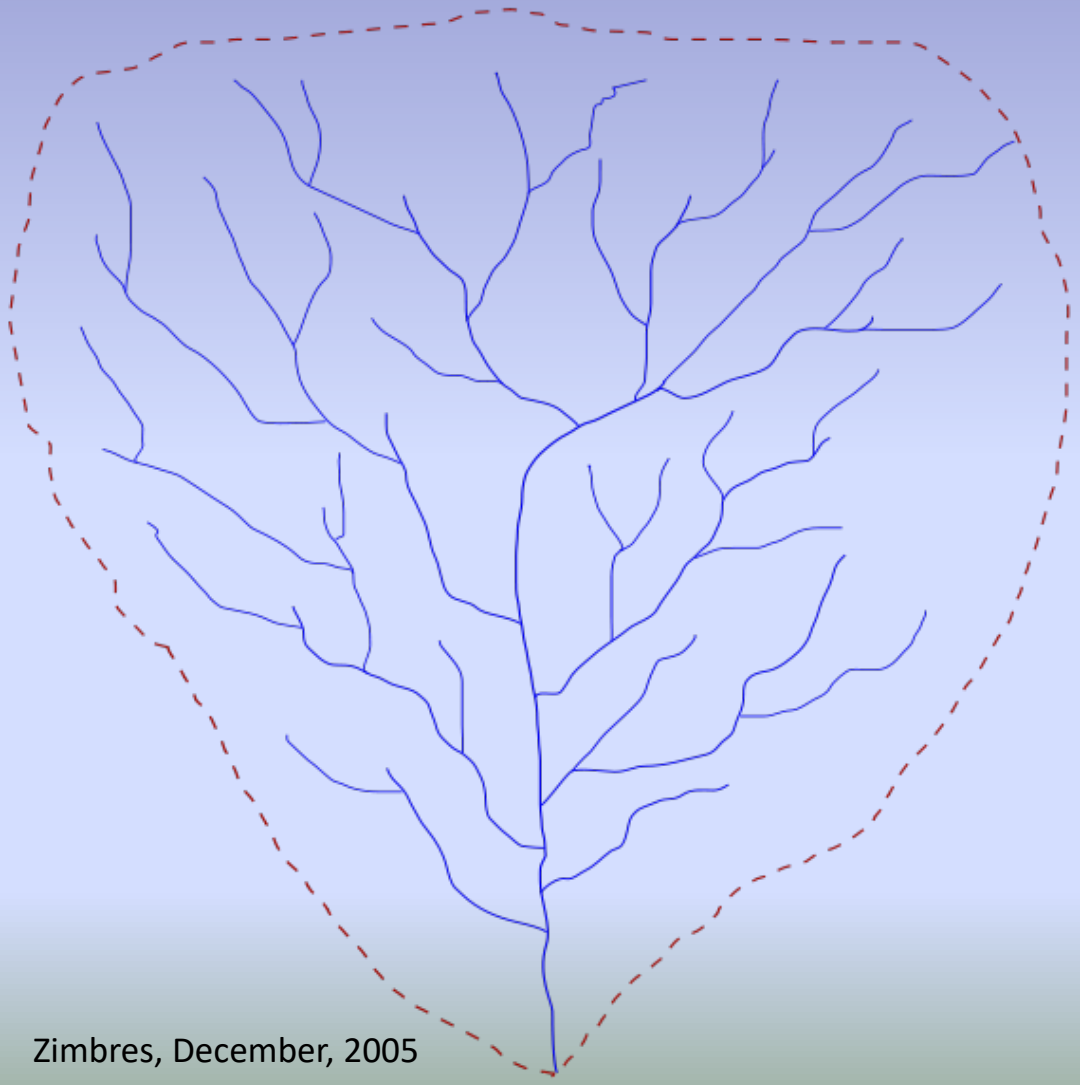
Replace lost sponges!

Image: Rogersoh

Or create new ones!

- water infiltration areas
- rain gardens
- floodplain reconnection
- wetland mitigation
- green roofs

Start upstream!



Zimbres, December, 2005

It all adds up.

- **Be aware of upstream changes.** These can greatly affect what happens downstream, where most of the people are.
- The faster water moves, the quicker and higher the water level will peak downstream.

Slow it down.

- Vegetated filter strips and buffers
- Meanders
- Check dams
- Detention areas
- Weirs

Images: Chemung County Soil & Water Conservation District

Spread it out.

- Wetlands
- Floodplains
- Room for water to move outward

Image: Chemung County Soil & Water Conservation District, Daniel Case

Soak it in.

- Wetlands
- Infiltration areas
- Rain gardens
- Green roofs
- Permeable pavement

Images: EPA, J.J. Harrison, Brian Ash

Conclusions

- Over-dredging creates more problems than it solves, and maintenance can be costly.
  - scour, headcutting, habitat loss, sedimentation, lower water quality, droughty riverbank tops
- Increasing infiltration (sponges) and slowing water down throughout upstream areas also mitigates flooding.
- More infiltration means less flooding, cleaner, and healthier streams all the way down.

Slow it down.
Spread it out.
Soak it in.

Image: Chemung County Soil & Water Conservation District

Slow it down.
Spread it out.
Soak it in.

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