

WATER 101

An Introduction to the Oriskany Creek Watershed

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For: Oriskany Creek Watershed Commission

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RAMBOLL

Bright ideas.
Sustainable change.



WATER 101

AGENDA

- Basic Hydrology
- How to Solve Problems in Watershed
- Nature Based Solutions
- Sauquoit Creek Channel & Floodplain Restoration Program
- Next Steps
- Questions & Answers

BASIC HYDROLOGY

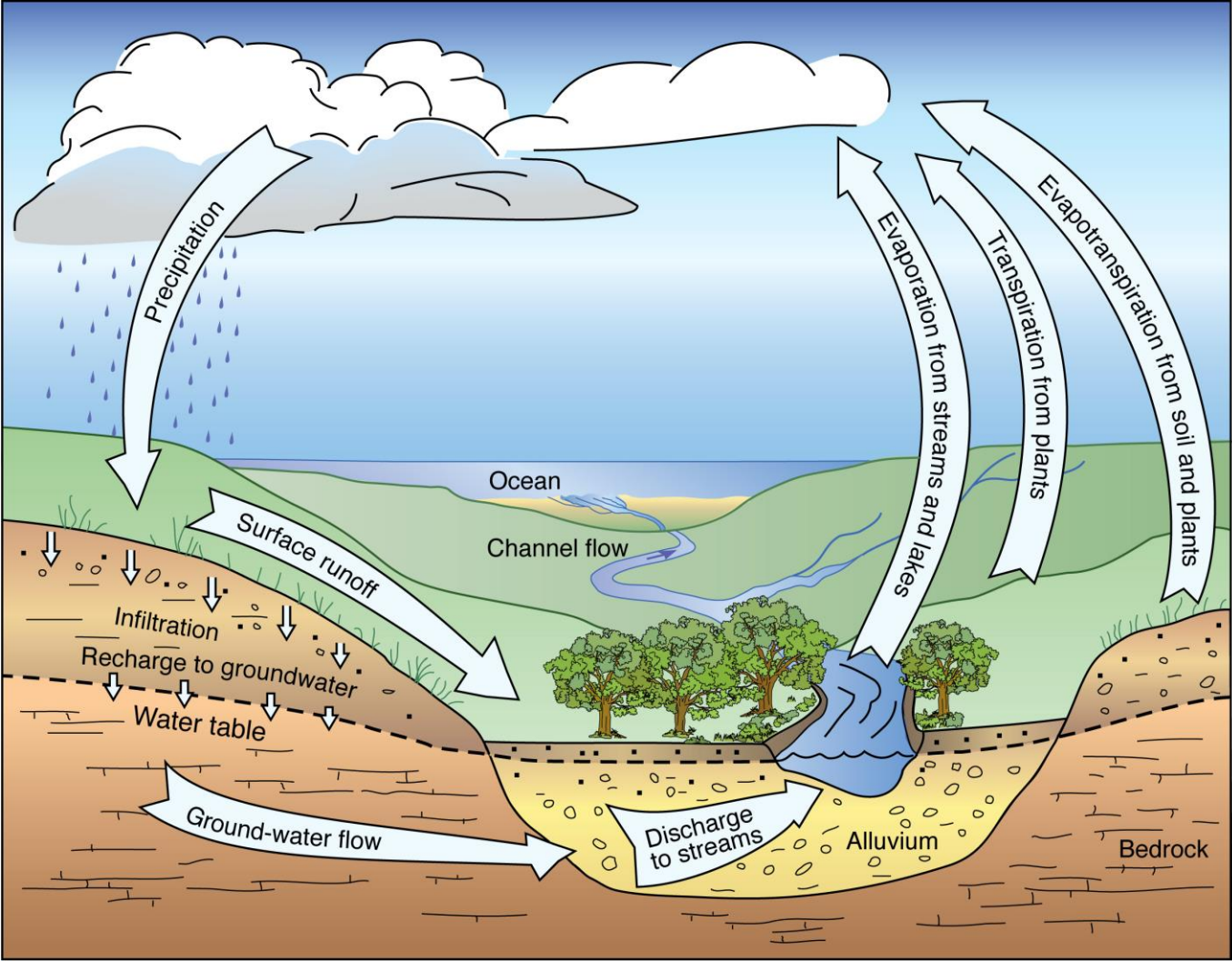


HYDROLOGY

Branch of earth science that is concerned with the distribution and movement of water on and under the Earth's surface.

“How water moves in relation to land.”

HYDROLOGIC CYCLE



WHAT INFLUENCES INFILTRATION RATE

- Porosity of Surface (void spaces in material)
- Slope of Land
- Soil Type & Condition
 - Frozen ground
 - Saturated or too dry
- Presence or Lack of Plant Life
- Intensity of Rainfall (Heavy vs. Light Rain)
- Land Use (Impervious vs. Pervious)

PRECIPITATION

- Storm
 - Random natural event of certain amount of rainfall, with a certain intensity for a certain duration.
- Predict how many times a similar storm can be expected to occur over the next year or several years. (Data & Statistics)
- Northeast: Increased rainfall amount by $\sim 70\%$

PRECIPITATION

- **Science Based/Data Driven**

- **NRCC:** Northeast Regional Climate Center at Cornell University
<http://www.nrcc.cornell.edu/>

- **NOAA:** National Oceanic and Atmospheric Administration
<https://hdsc.nws.noaa.gov/hdsc/pfds/>

RAINFALL INTENSITY

- How much rain falls in a certain time period.
Rate at which rain falls during a storm (inches/hour)
- Varies during storm event
- Very Significant in scientific calculations/work
- Short duration storms have higher average rainfall intensity than longer duration storms.
(Recent storms have proved this statement wrong)

N-YEAR STORM

- **Recurrence Interval/Return Period**

- Time span between similar storms

- **N-Year Storm**

- $N =$ Recurrence Interval in years

- **10-Year Storm**

- Over a long period of time, the average time period between similar storms is 10 years

PROBABILITY OF N-YEAR STORM

- $P = 1/N * 100\%$
 - Probability (%) of event being equaled or exceeded in any given year.
- Larger N (N = 100-year storm)
 - More intense storms with smaller probability, P

STORM PROBABILITY EXAMPLE

- What is the probability precipitation amounts will be similar to that of a 5-year storm?

- $P = 1/5 = 0.2 \times 100\% = 20\%$

- (Each year there is a 20% chance that precipitation will equal or exceed that of a 5-yr storm.)

- Probability of a 100-year storm?

- $P = 1/100 \times 100\% = 1\%$

- (Each year there is a 1% chance that precipitation will equal/exceed that of a 100-yr storm.)

WATERSHEDS

- **Watershed/Drainage Basin/Catchment Area**

- A well-defined area of land that intercepts the rainfall and transports it to the creek/stream.

- **Topography** (Contour map)

- **Similar to a Funnel**

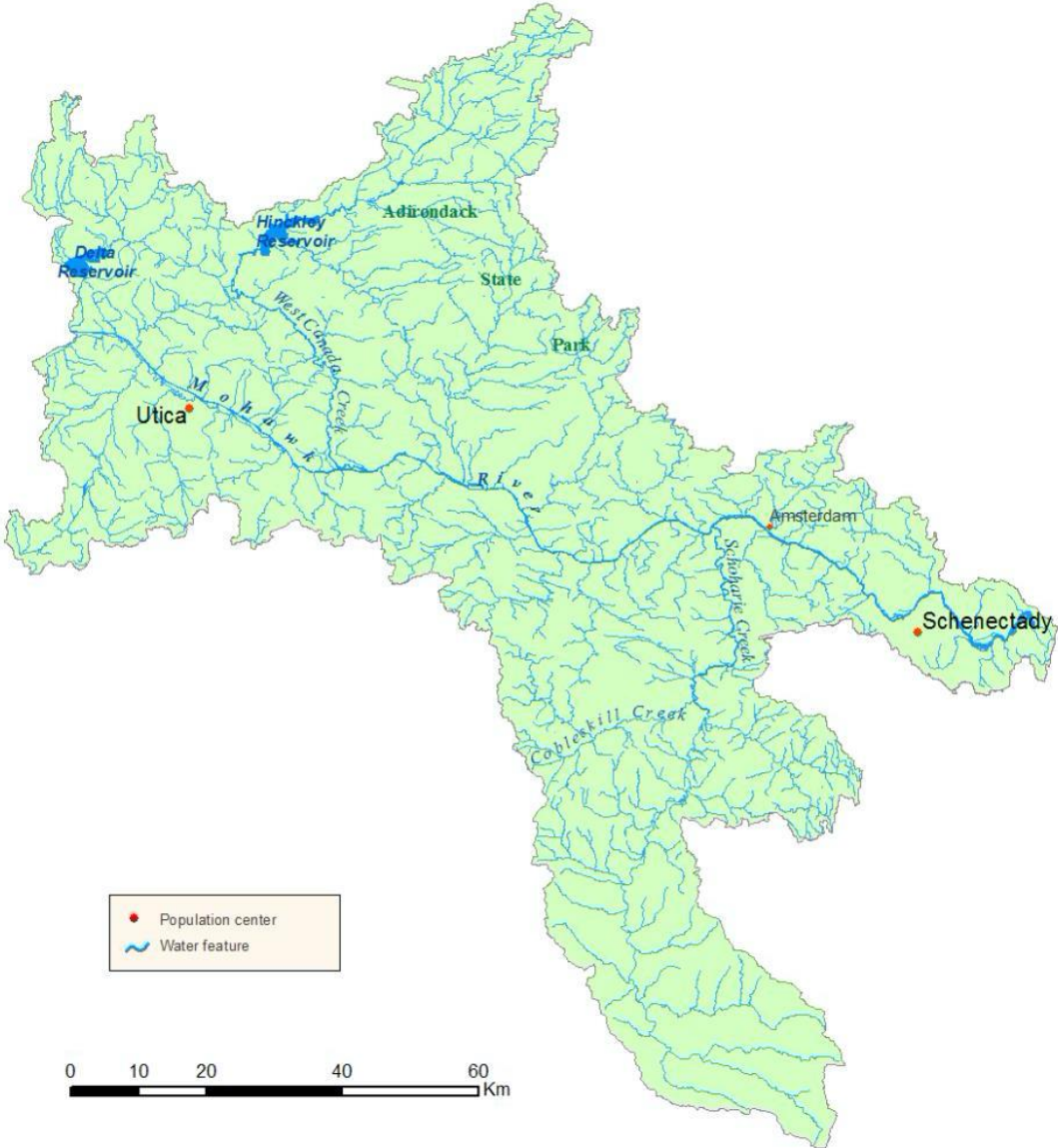
- Where all water in watershed gets to the point of interest (creek/stream).

NY State Basins (Watersheds)

We ALL Live in a Watershed



MOHAWK RIVER BASIN/WATERSHED

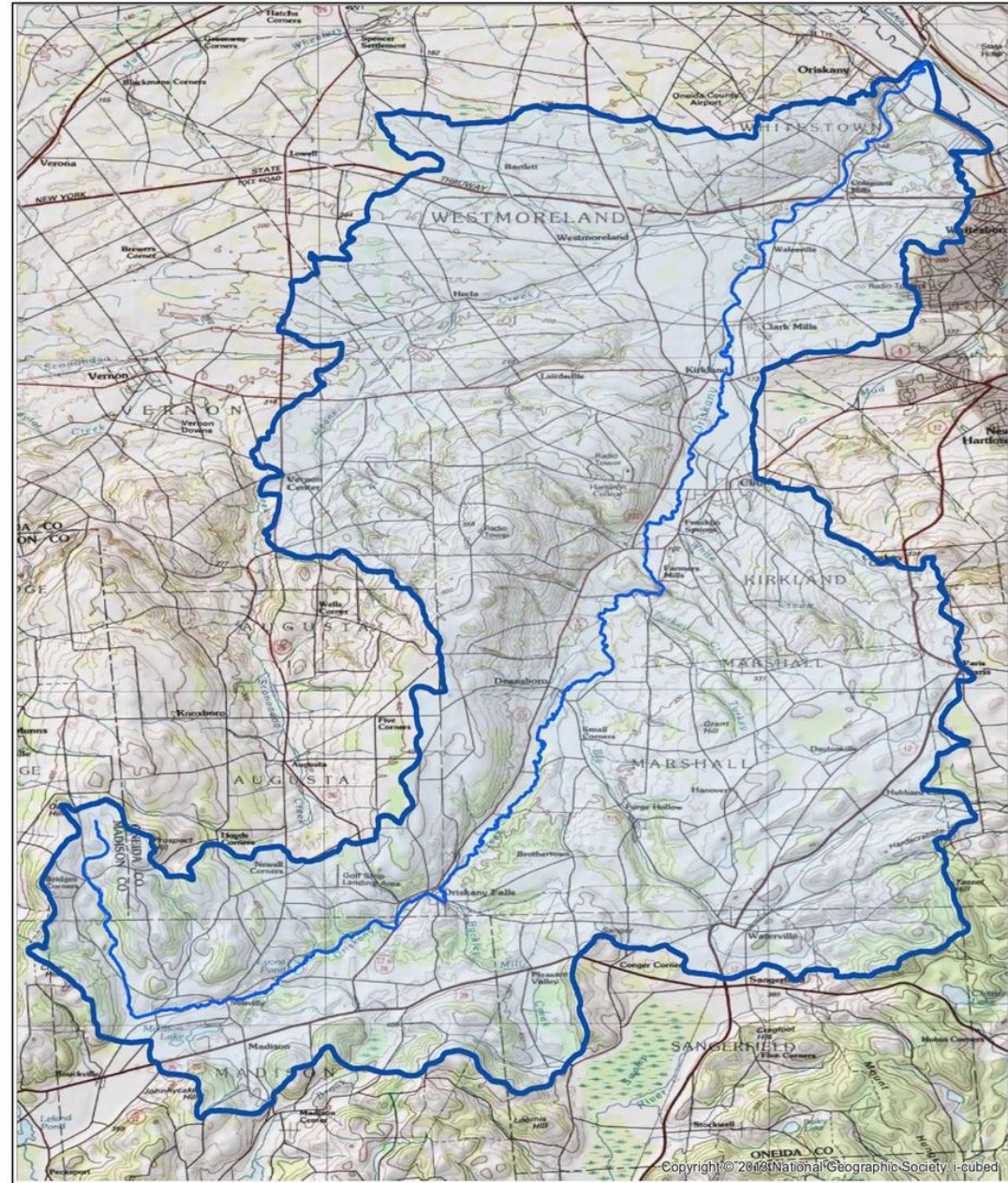


ORISKANY CREEK BASIN/WATERSHED MAP

Drainage Area – 147 Square Miles

Channel Length – 34.22 Miles

Slope – 0.6 feet/mile



WHAT EFFECTS THE VOLUME AND RATE OF RUNOFF IN WATERSHED

- **How Much????**

- **How Fast????**



VOLUME AND RATE OF RUNOFF

- Basin Area (Size)
- Rainfall Intensity and Duration
- Slope (Steeper then faster and can be more)
- Soil Type (Infiltration rate)
- Vegetation cover (Infiltration & slows down)
- Presence of Channels vs. Over Ground
- Storage (Ponds, Wetlands, Retention Basins)
- Roughness Characteristics
- Land Use (% Impervious vs. Pervious)

FLOODPLAINS

- **Floodplains**

- Flooding occurs periodically when the waters of a stream or river overflows its banks and inundates adjacent low-lying land. This low-lying area is referred to as the floodplain.

FLOODPLAINS



FLOODPLAINS



FLOODPLAINS

- **Flood Hazard Area**

- Portion of the floodplain that is inundated by the 100-year storm.

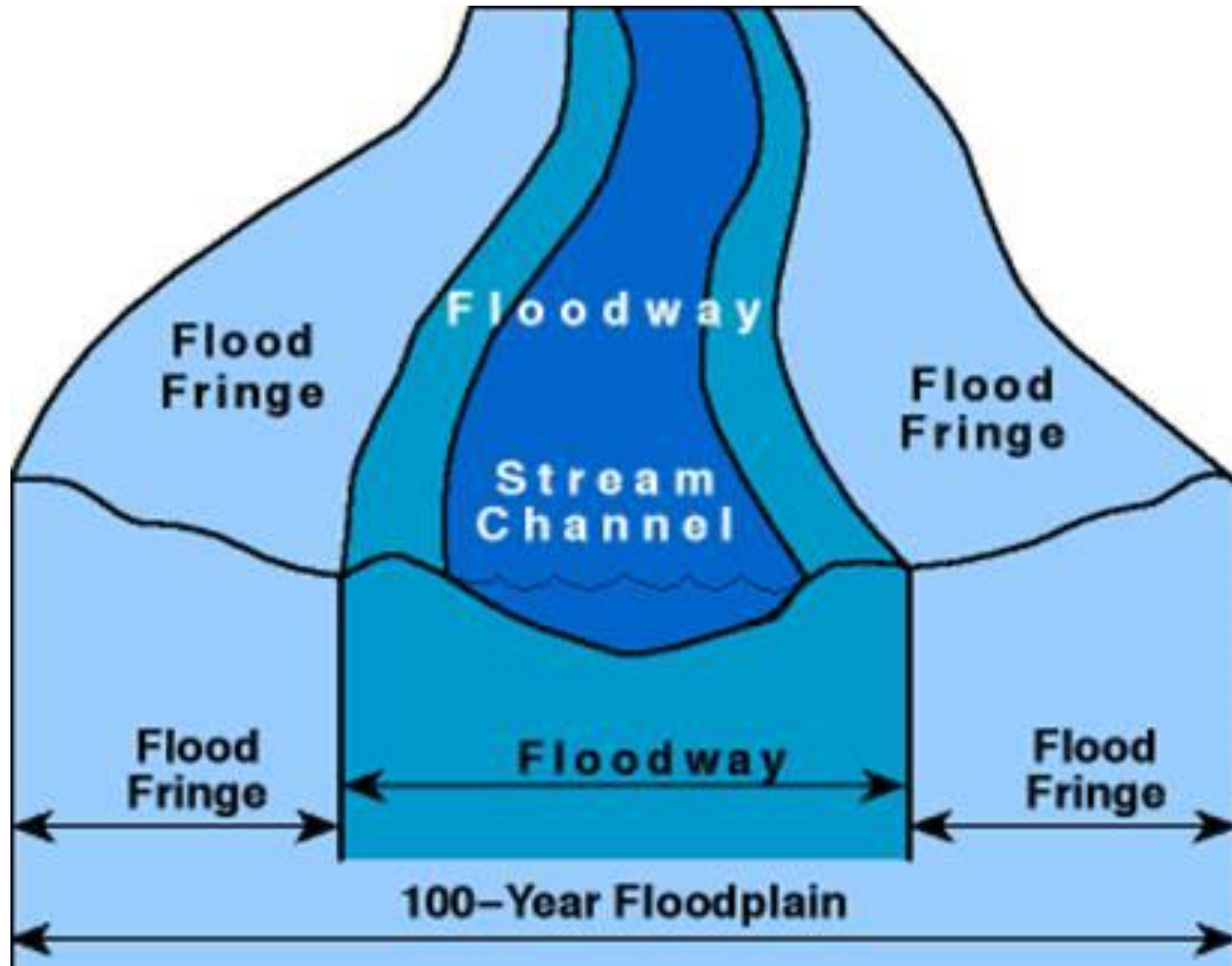
- **Floodway**

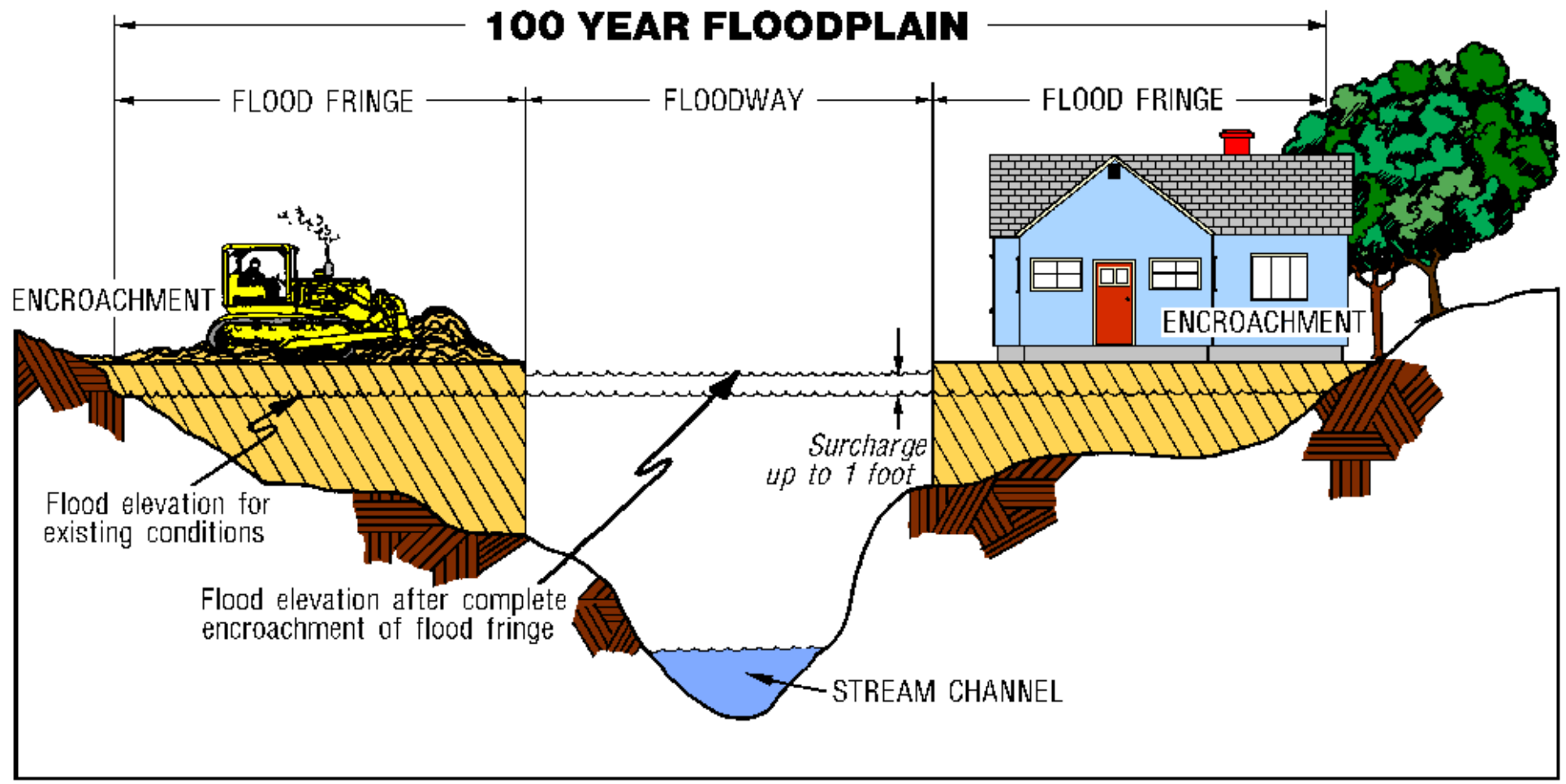
- Within the flood hazard area that carries the major portion of the flood at high speeds.

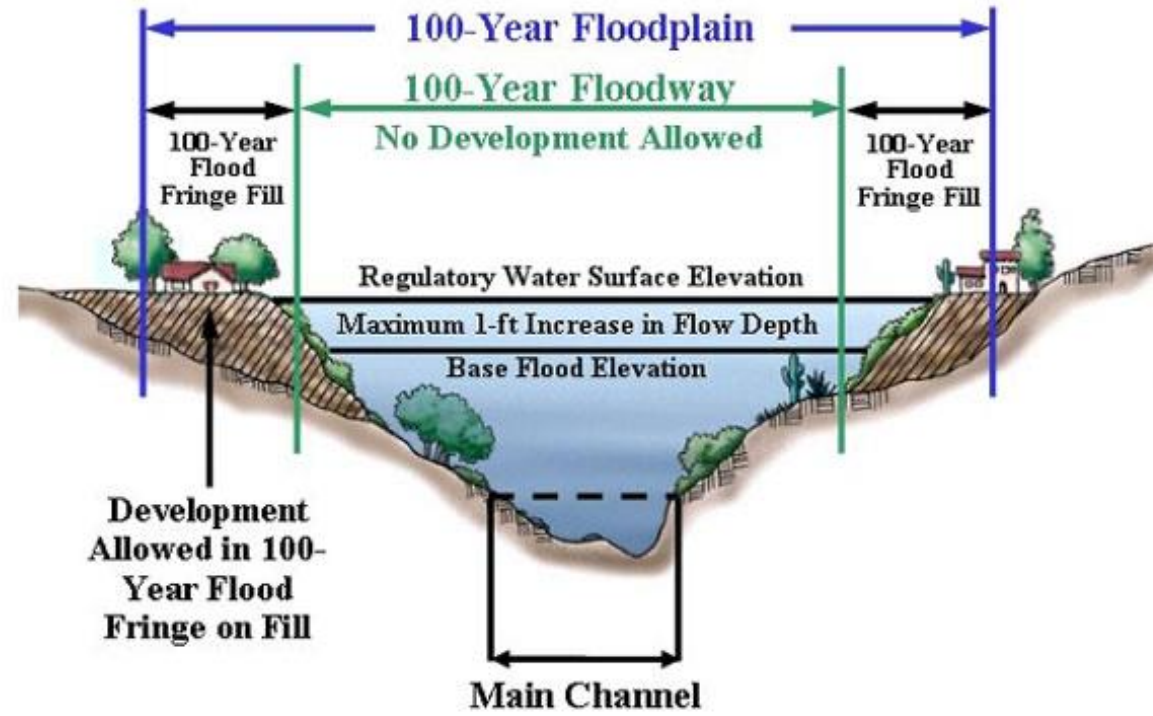
- **Flood Fringe**

- Covered with shallower, slow-moving water.

FLOODPLAINS







EFFECT OF LAND DEVELOPMENT

- Woodland, meadow, farmland (pervious surfaces) are replaced with relatively impervious surfaces (roads, driveways, parking lots, buildings)
- Infiltration decreases; volume of direct runoff increases.
- More rainfall gets to creek quicker; more runoff flowing faster can result in flooding.

HOW TO SOLVE PROBLEMS IN WATERSHED



RAMBOLL

Bright ideas.
Sustainable change.

HOW TO SOLVE PROBLEMS IN WATERSHED

- **TEAMWORK**
 - Oriskany Creek Watershed Commission
 - Municipalities, residents, agencies, scientists, engineers, etc.
 - Maintain on-going involvement/cooperation
 - Propose programs/projects with net positive benefit

HOW TO SOLVE PROBLEMS IN WATERSHED

- **OVERALL STUDY OF WATERSHED**
 - Obtain Information from Municipalities/Residents
 - Identify Areas of Concern
 - Identify Possible Solutions

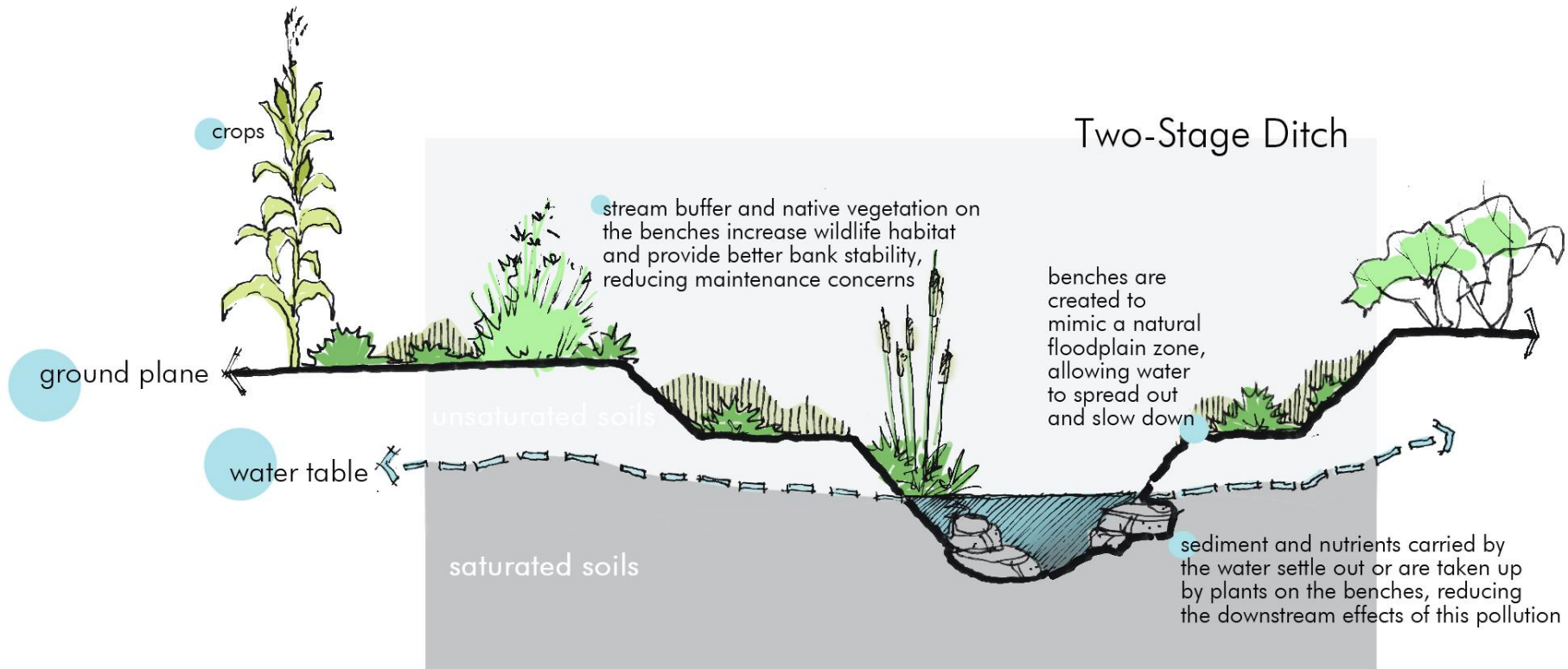
NATURE BASED SOLUTIONS



NATURE BASED SOLUTIONS

- Emphasize long-term **NATURE-BASED** solutions
 - Natural sustainable part of ecosystem
 - Less maintenance
 - Native plantings
 - Reducing Erosion
 - Beneficial to Ecosystem
 - Beneficial to Wildlife
 - Overall, more economical

FLOODPLAIN BENCH



FLOODPLAIN BENCH



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FLOODPLAIN BENCH



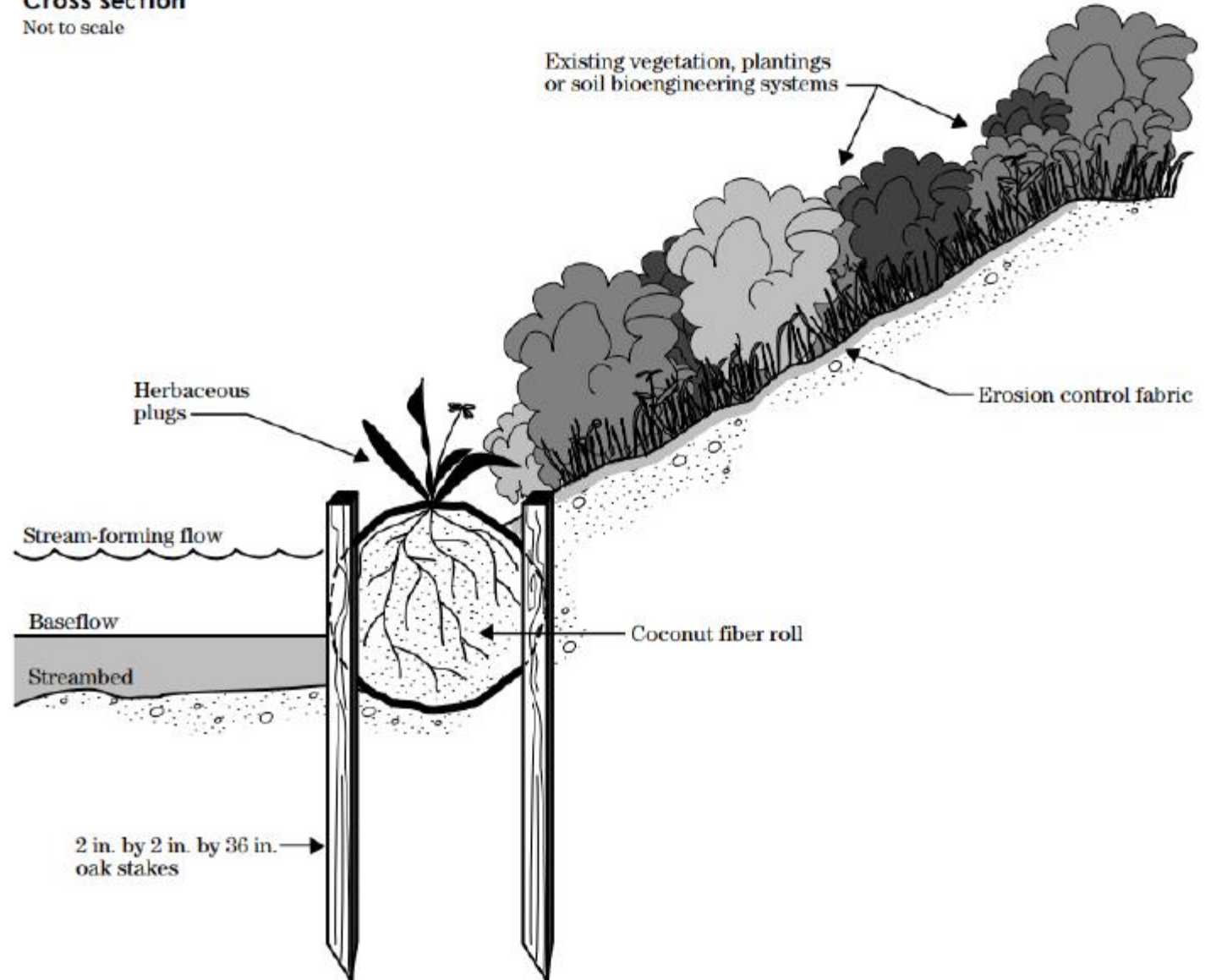
VEGETATED COIR FIBER ROLLS

Vegetated Coir Logs

Vegetative plugs placed in densely-packed coconut fiber rolls (Figure 1)

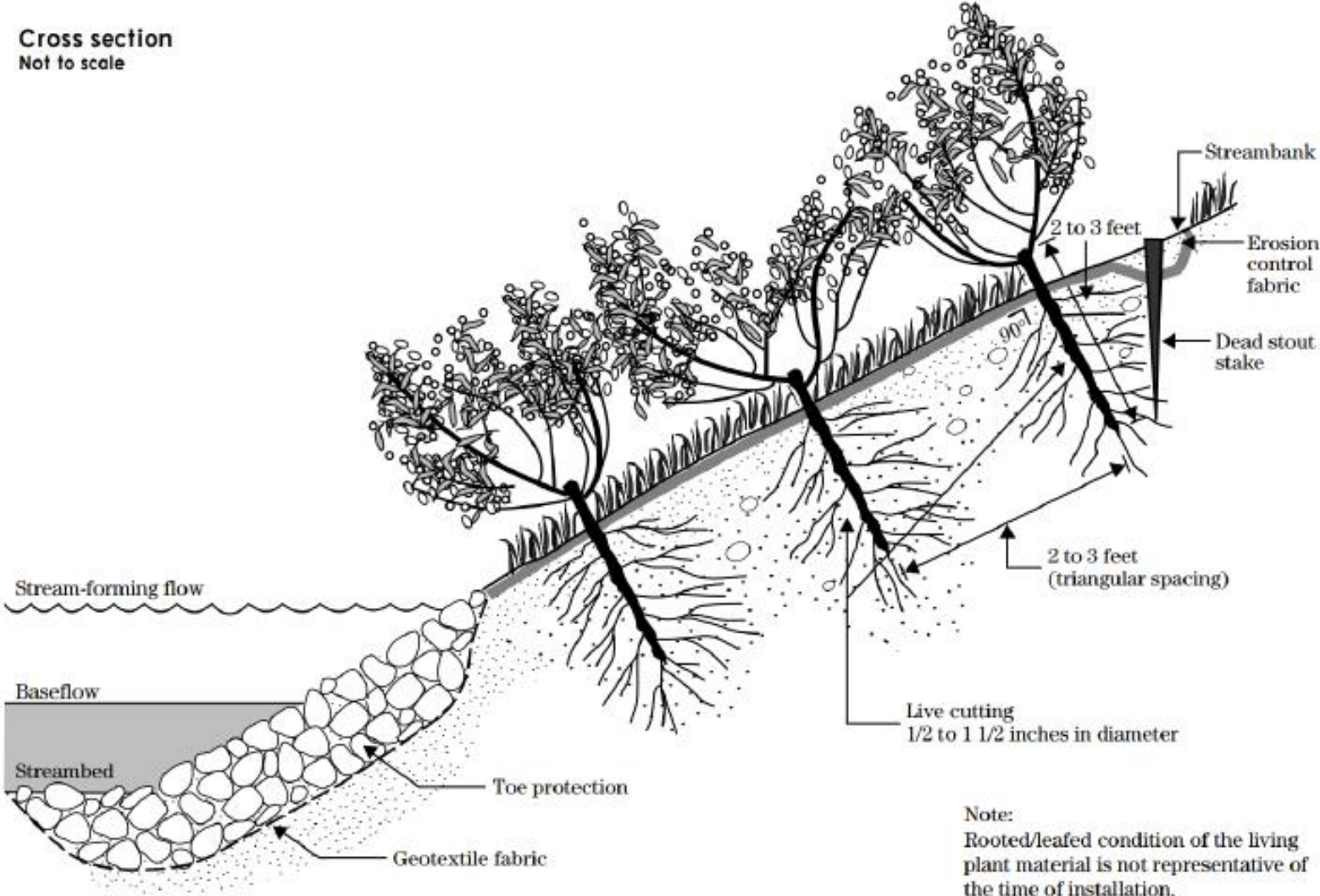
Cross section

Not to scale



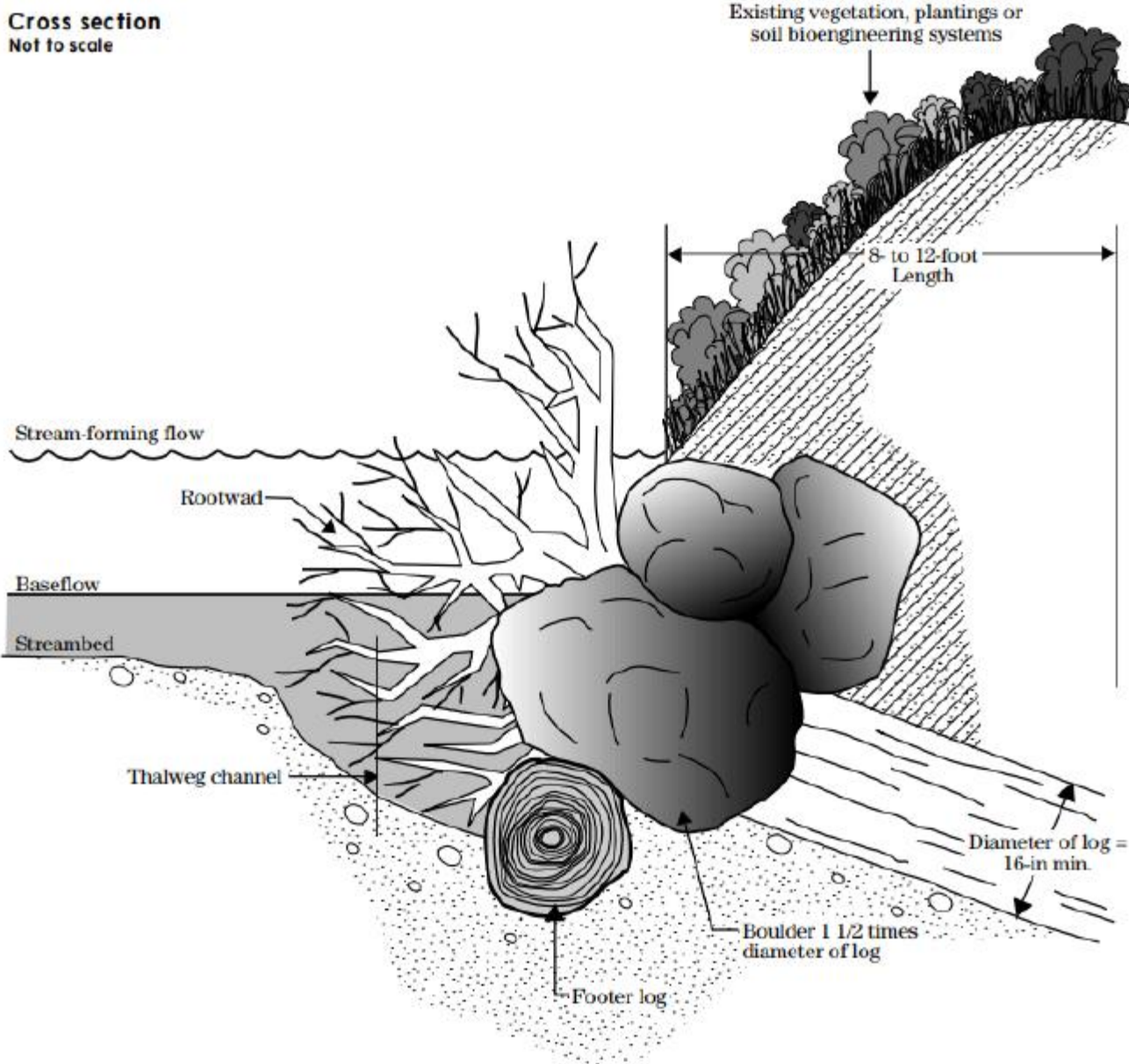
WILLOW STAKES

Cross section
Not to scale

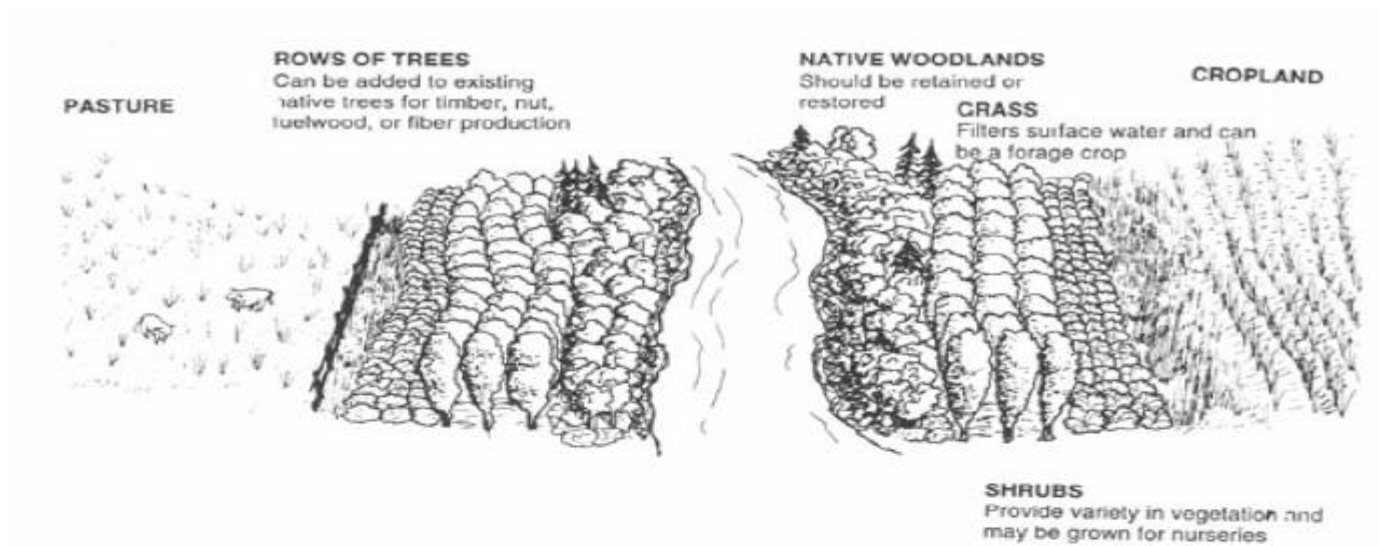


ROOTWAD WITH BOULDERS

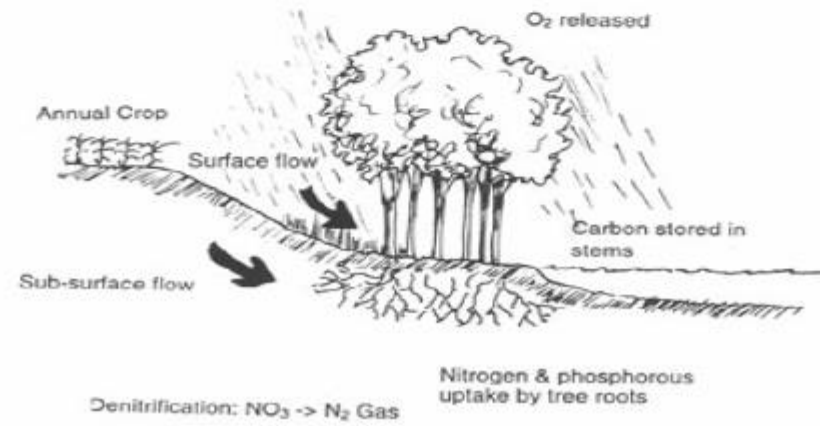
Cross section
Not to scale



VEGETATED RIPARIAN BUFFER



TRAP NUTRIENTS
Riparian forests retain significant amounts of nutrients in runoff from agricultural fields.



SAUQUOIT CREEK CHANNEL & FLOODPLAIN RESTORATION PROGRAM (WHITESTOWN)



SAUQUOIT CREEK CHANNEL & FLOODPLAIN RESTORATION PROGRAM

- **TEAMWORK & SCIENCE**

- **COMPONENTS**

- Mitigation (Natural Approach)
- Adaptation (NRCS Property Buy-Out Program: Whitesboro)
- Infrastructure Improvements (Bridges & Culverts)
- Floodplain Management (Smarter Development)
- Debris Management (Routine Maintenance)

NEXT STEPS



NEXT STEPS

- **Overall Study of Watershed (Commission)**
 - Studies already completed
 - Studies to be performed
- **Municipality Decision**
 - Identify Project(s) to Pursue
- **Funding Sources**
 - Grants Available
- **Conceptual Design/Permits Required**
 - SEQR Review Process, NYSDEC & USACE Permits
- **Final Design**
 - Engineering Plan for Construction (Bidding Purposes)
- **Construction**

WATER 101

Questions/Answers

THANK YOU!