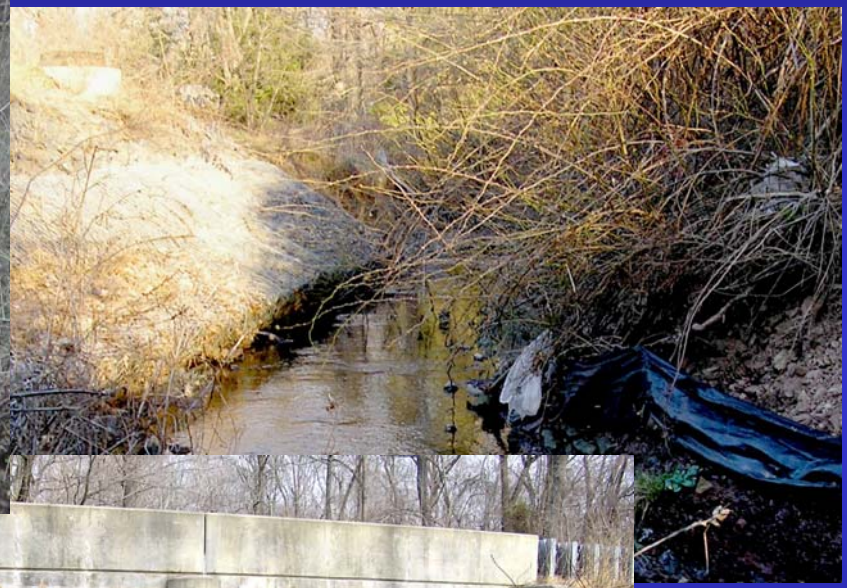
Fluvial Geomorphic Investigation
UNT Neshaminy Creek
The Estates, Doylestown Twp, Bucks County, PA

Allen Whitehead, Kevin Munley,
Edward Filip

PA DEP

Upstream of Kelly Drive



Bankfull Stage

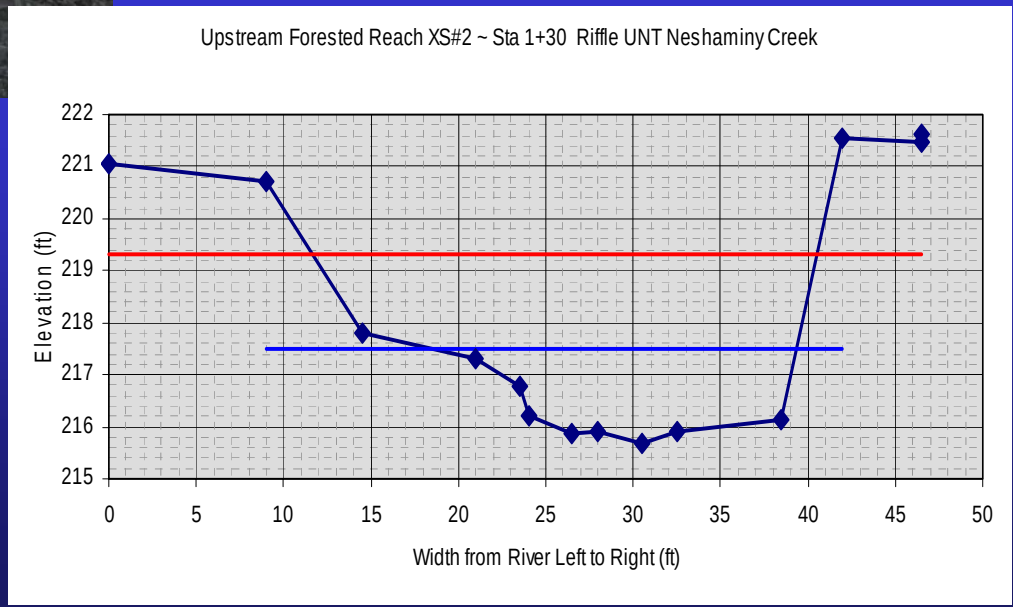
The stream flow which most effectively moves sediment, forms bars, bends, and meanders which result in the general characteristics of the channel.

It is a flow which recurs, on average, every 1.5* years.

Dunne and Leopold, 1978

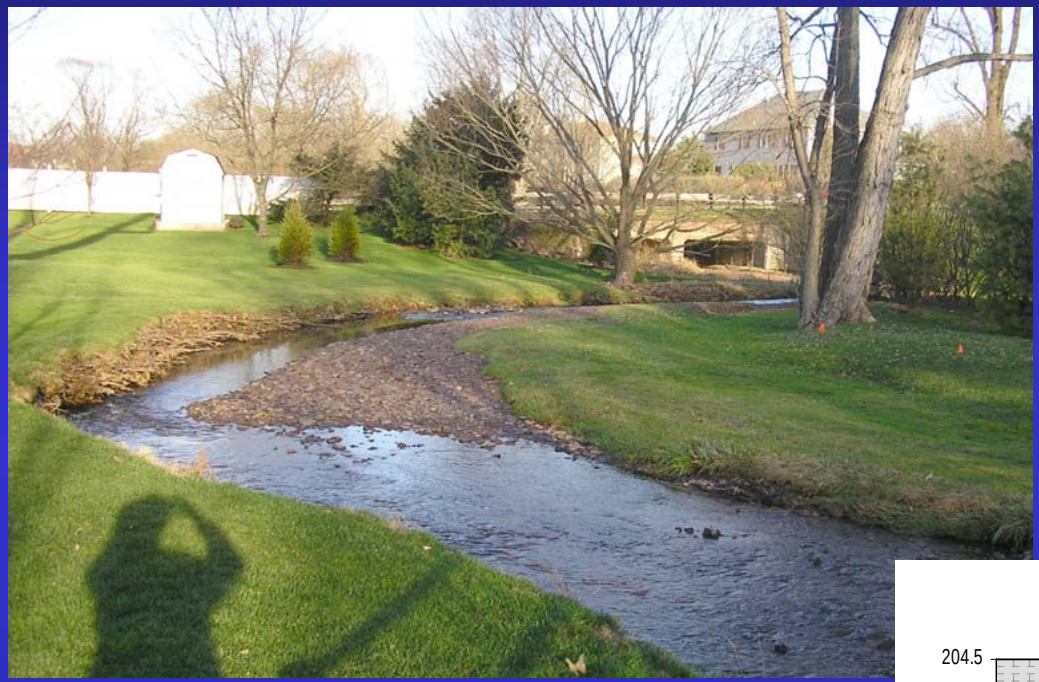
* In Urbanized SE PA: 1.1 – 1.2 Years.

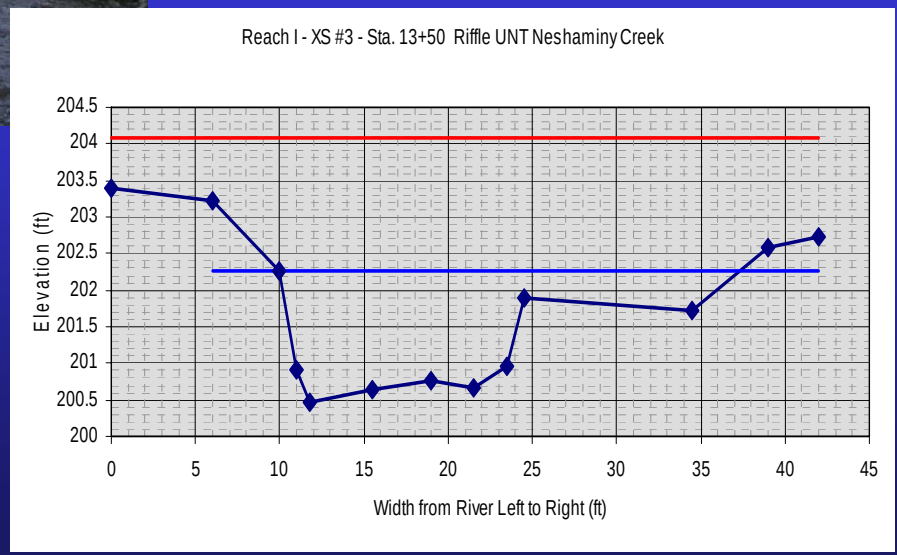
100ft. Downstream of Kelly Drive



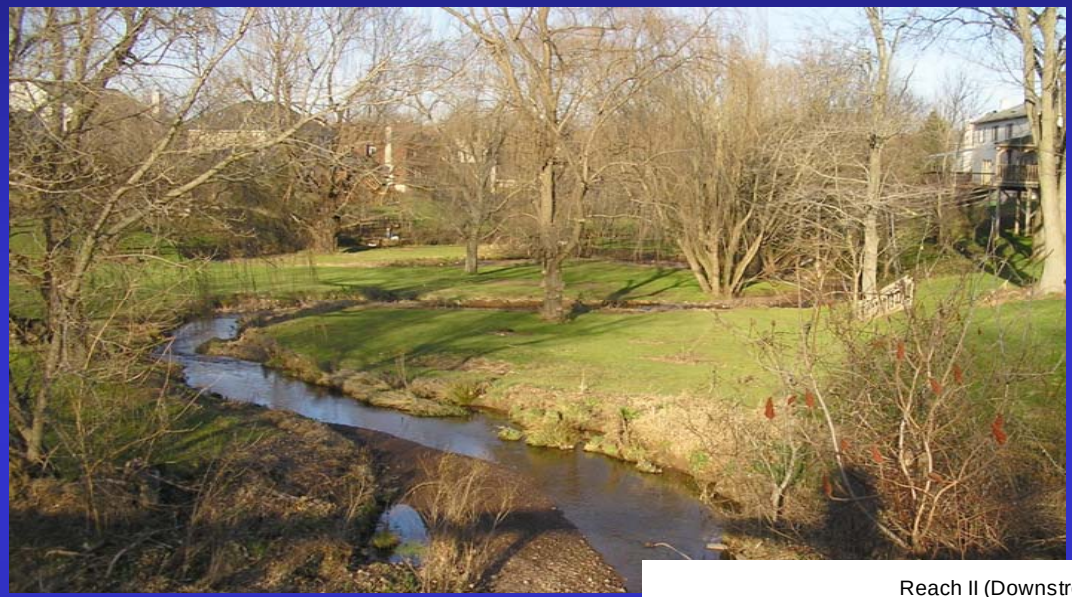
250ft. Downstream

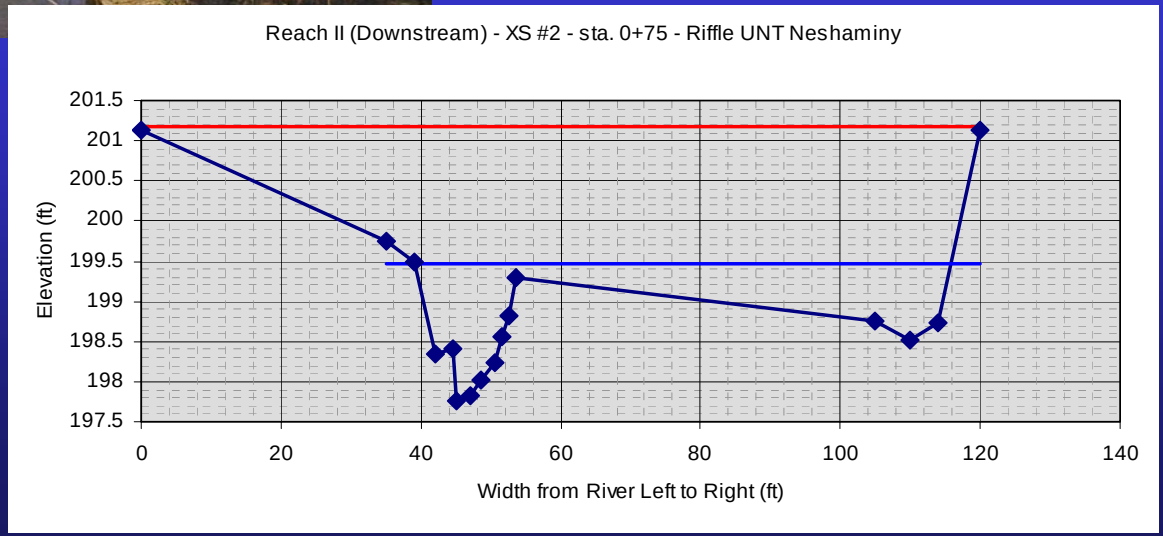
1350ft. Downstream



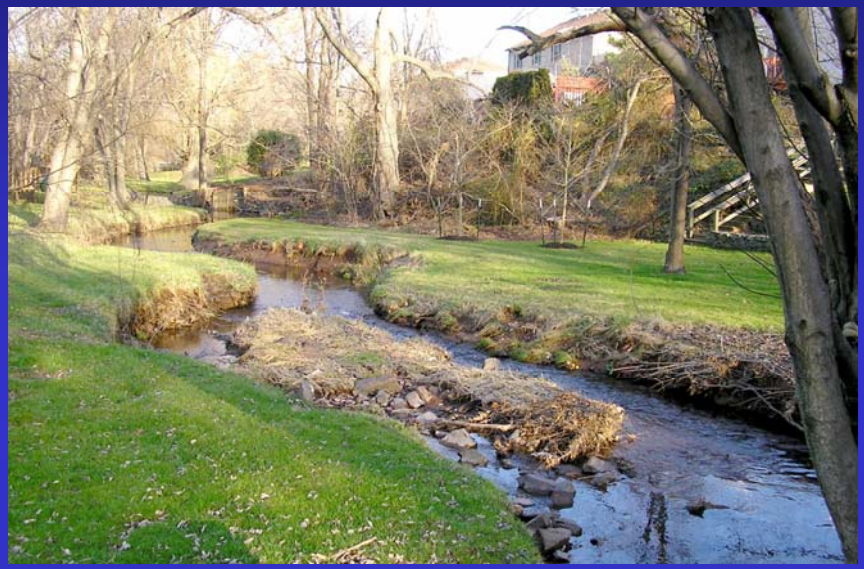


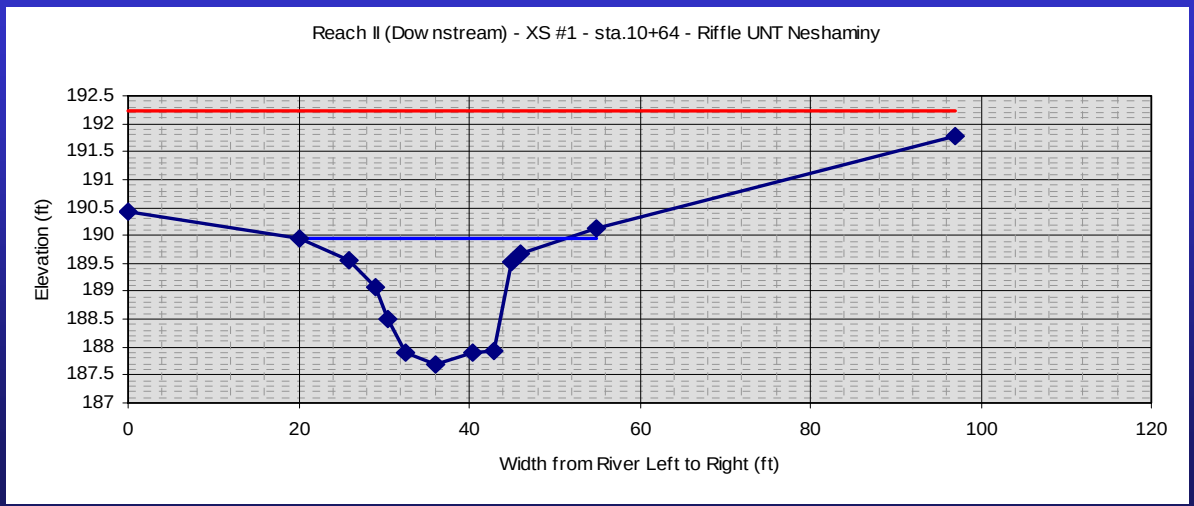
1700ft. Downstream
(Below Nicklaus Drive)





2500ft. Downstream





4000ft. Downstream
(Below Last Dam)

What Makes a Stable Stream?

- The balancing of competing forces to achieve “Dynamic Equilibrium”
  - Slope vs. Sinuosity
    - Dependant on particle sizes
    - In Balance with Valley Slope
  - Correct Width/Depth Ratio (15 – 20)
    - Essential for Sediment Transport
  - Channel Connected with Floodplain
    - >2.2 x Bankfull Channel Width

What Are The Major Problems?

DAMS

- Reduced Slope
- Impaired Sediment Transport
- Sediment Accumulation
- Reduced Channel Capacity

Culverts

- Increased W/D Ratio
- Impaired Sediment Transport

Upstream Channelization and Armoring

- Increased Slope and Velocity, Leading to:
  - Bank Erosion
  - Channel incision
  - High Sediment Supply
  - Loss of Floodplain Access

Unmanaged Stormwater

- Volume and Timing of Peak Flows

What is the Goal?

Newly Restored Stream Channel

Plan A - The Ideal Solution
(From DEP's Perspective)

- Restore from Kelly Dr. to Almshouse Rd.
  - Multiple phases possible.
- Reduce peak stormwater discharges.
- Remove all dams.
- Re-grade floodplain.
- Restore natural dimension, pattern, and profile.
- Modify or eliminate footbridges.
- Plant native riparian vegetation.

Plan B – A Limited (More Realistic) Solution

- Same as Plan A, but in a more limited area.
- Stormwater issue handled separately and at a later time.
- Some sediment issues may persist.

Plan C – A Minimal Solution

- Restore between the two upstream dams only.
  - Natural dimension, pattern, and profile.
  - Bankfull bench at the Nicklaus Drive culvert.
  - Floodplain re-grading and channel relocation where needed.
  - Minimal (10ft.) native riparian buffer.
  - Modify footbridge.

Plan D – Do Nothing

- Accept Present Flooding and Erosion.
  - Patch and armor as necessary.
- Remove Unwanted Sediment.

Restoration Pros and Cons

- Flooding frequency and extent drastically reduced.
- Sediment stays in the channel.
- Better stream habitat, greater aquatic diversity.
  - A BIG plus for DEP grant consideration*.
- Stream access may be limited, views reduced.
- Dam removal may be seen as a scenic loss.
- Fewer and/or larger footbridges.
- Stream channel position may be different.
- Floodplain may be lower, lawn area reduced.
  - Yards may be perceived as “less tidy.”
- ***If the scope of the project is too limited, DEP may consider the project less fund-worthy.**