Stream Crossing Guidance -- Constructed Banks Connected to Natural Stream Banks

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Purposes:

1) Focuses flow within natural channel dimensions, providing deeper water for fish passage at low flows,
2) Built-in armoring to protect footings/abutments from scour, and
3) Provides for terrestrial animal passage along a relatively smooth and flat surface connected to natural stream banks away from the crossing at all four corners.

Phillips
2018

Bank foundations are built up of properly sized* angular rock to remain stable in high flows.

* see USACOE Engineer Manual 1110-2-1601 for sizing based on slope, active width & discharge

Charleston
2020

Banks foundations are built up in layers with finer material (e.g., 6-inch-minus gravel) "watered in" to fill voids and to provide a relatively flat surface for animals.

Phillips
2018

Charleston
2020

Charleston
2020

Freeport 2018

Banks are continuous and connect at all four corners of the crossing to the natural banks.

Whitefield 2020
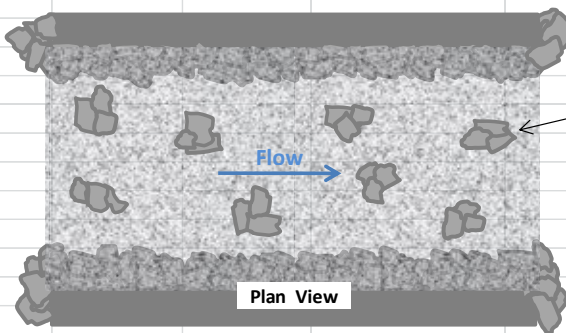
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Starks 2017

Banks are built of large rock,
with voids filled by smaller rock
and fines "watered in",
with a relatively flat top surface.
Note active/low-flow channel.

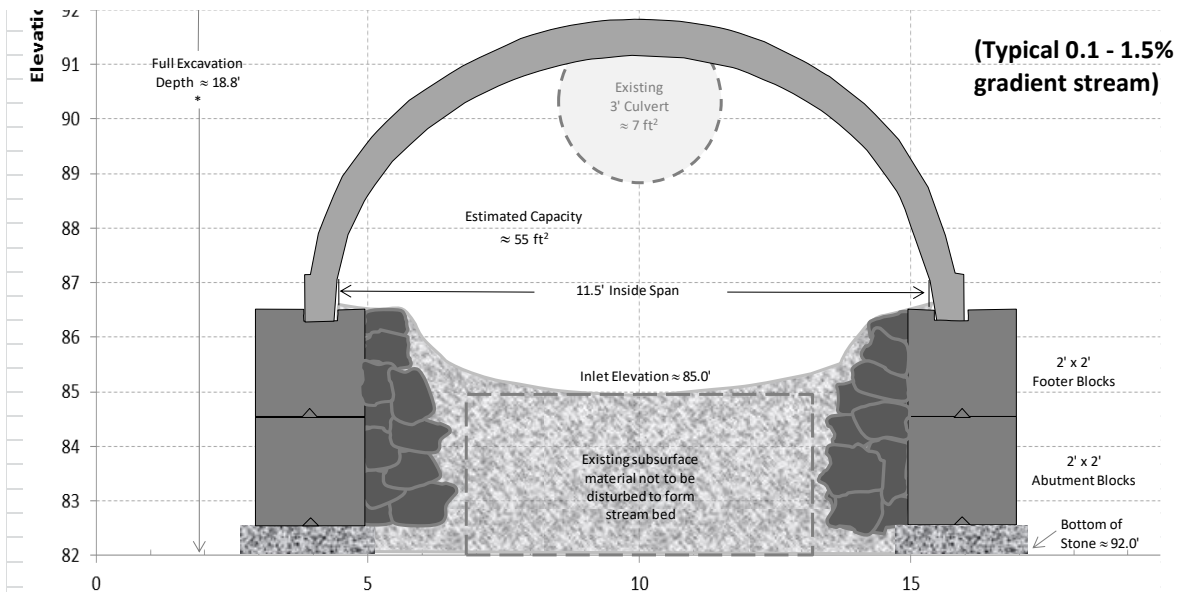**Bed and Bank Schematic:** **(Typical 1.5-3% gradient stream)** **General schematic examples ONLY**
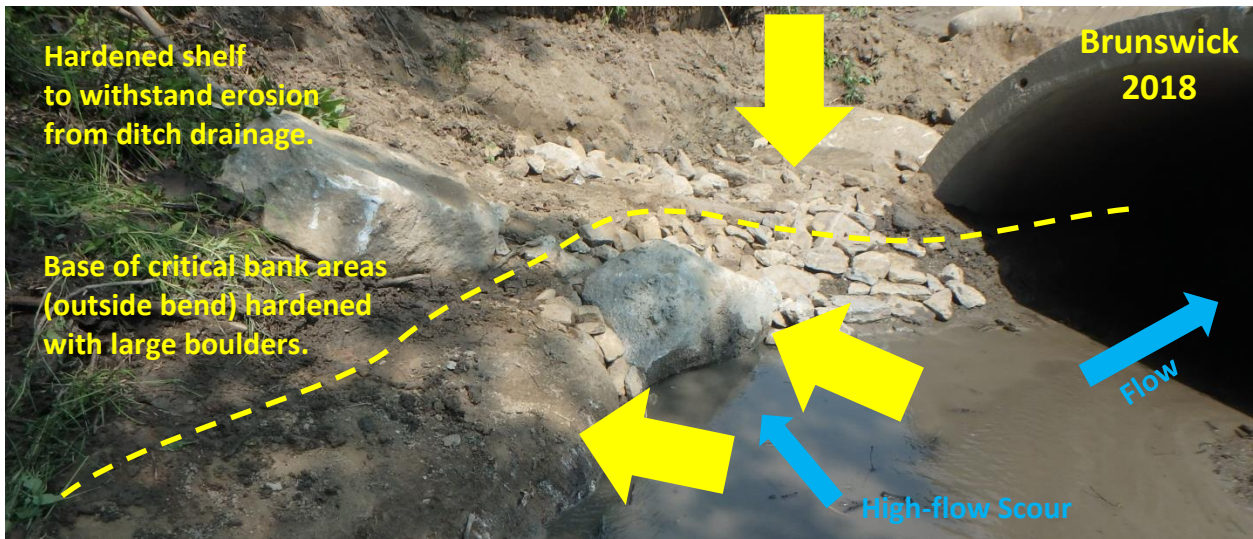
Banklines are composed of 6-18 inch (average intermediate dimension – not longest or shortest measure) competent, angular to sub-angular rock.

Bed roughness elements are to be set in clusters of larger rock, 12-18 inches, with 3-6 inches protruding above the stream bed--minimum of 3 pieces per cluster to lock together.

Banklines are meant to connect to the natural stream banks on both sides upstream and downstream to improve scour protection and terrestrial organism passage. Additional smaller rock and fine material is necessary for filling voids in the larger material to provde a stable bed and banklines. Fines must be watered into bed and banks to fill voids, and to avoid stream flow percolating into bed and banks.

Flow

Plan View

(Typical 0.1 - 1.5% gradient stream)

Full Excavation Depth ≈ 18.8' *

Existing 3' Culvert ≈ 7 ft²

Estimated Capacity ≈ 55 ft²

11.5' Inside Span

Inlet Elevation ≈ 85.0'

Existing subsurface material not to be disturbed to form stream bed

2' x 2' Footer Blocks

2' x 2' Abutment Blocks

Bottom of Stone ≈ 92.0'

Elevation

92
91
90
89
88
87
86
85
84
83
82

0   5   10   15

Hardened shelf to withstand erosion from ditch drainage.

Base of critical bank areas (outside bend) hardened with large boulders.

Brunswick 2018

Flow

High-flow Scour

Base of critical bank areas (bottom of road embankment) hardened with large boulders.

Brunswick 2018

Hardened wildlife-passable shelf to withstand erosion from ditch drainage.

Brunswick 2018

Phillips 2016

Phillips 2018

Whitefield 2016

Phillips 2020

Phillips 2019

Farmington 2020

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Buckfield 2019

Charleston
2020

Hampden 2020

Katahdin Woods and Waters National Monument 2020
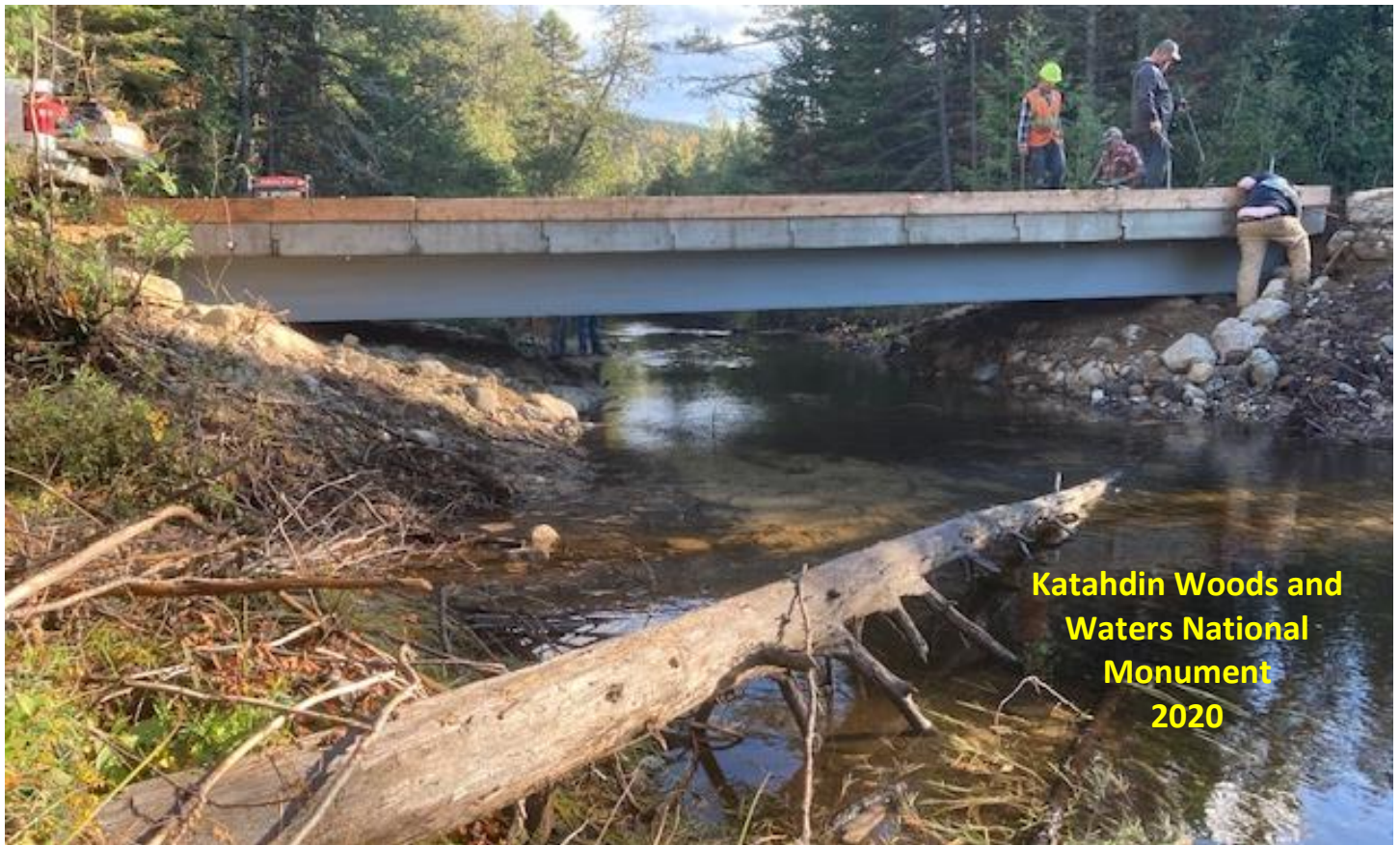
Katahdin Woods and
Waters National
Monument
2020

Newburgh
2017