Technical Rationale in Fish Passage

Fish passage effectiveness and considerations

Dam Removal

- Most complete restoration
- Eliminates dam function(s)
- Sediment accumulation may require significant restoration

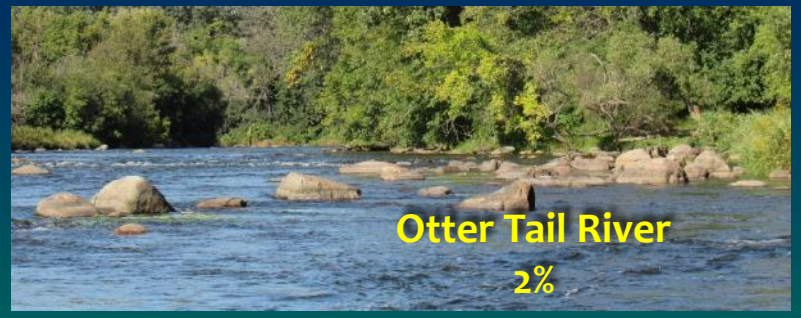
Full-width Rock Arch Rapids

- Slope dependent (flatter is better)
- Natural river width
- No attraction issues
- Practical limits for dam height
- Allow room for large-bodied fish
- Potential spawning habitat for rheophilic spawners

Partial-width By-pass Fishway

- Slope dependent (flatter is better)
- Size dependent (bigger is better)
- Attraction critical (entrance near dam best)
- High dams require long fishway/land
- Small fishways can be bottleneck for large numbers of fish and large-bodied fish
- Habitat is size-dependent

Natural Rapids Reference Reaches



Lower Velocity -
Most Passable

Centerline Slope (near-bank slopes are 1-2% lower)

Slopes over 3% should be avoided and result in:

- High shear stress
- Pools that are short for fish passage and energy dissipation
- Excessive head-loss over weirs
- Lower initial cost may be lost in long-term stability and maintenance
- Site hydrology and geology affect slope efficacy

Dunton Locks Fishway

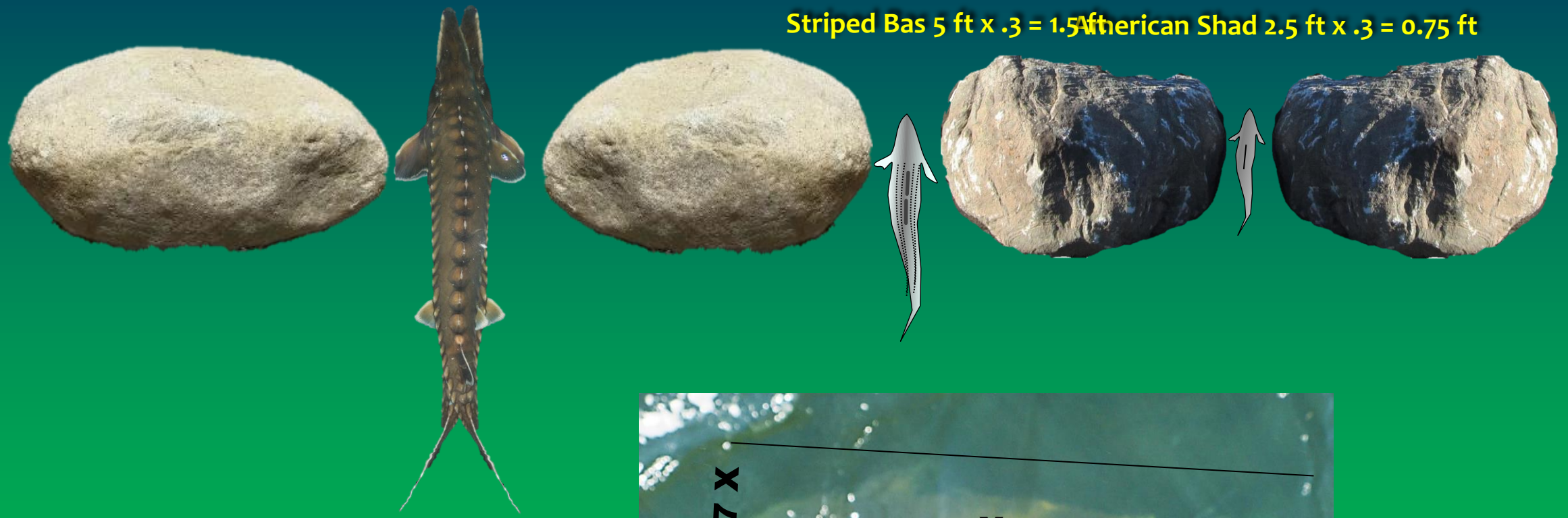
6% initial slope (too steep)

Weir Gap Width Rationale

Hydrodynamic:
Minimum width of swimming path
Example: Atlantic sturgeon = 14 ft x 0.27 = 3.8 ft

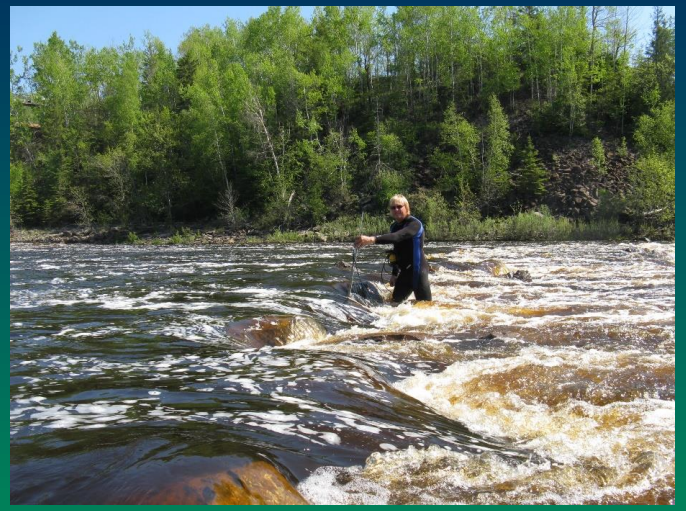
Striped Bas 5 ft x .3 = 1.5 ft

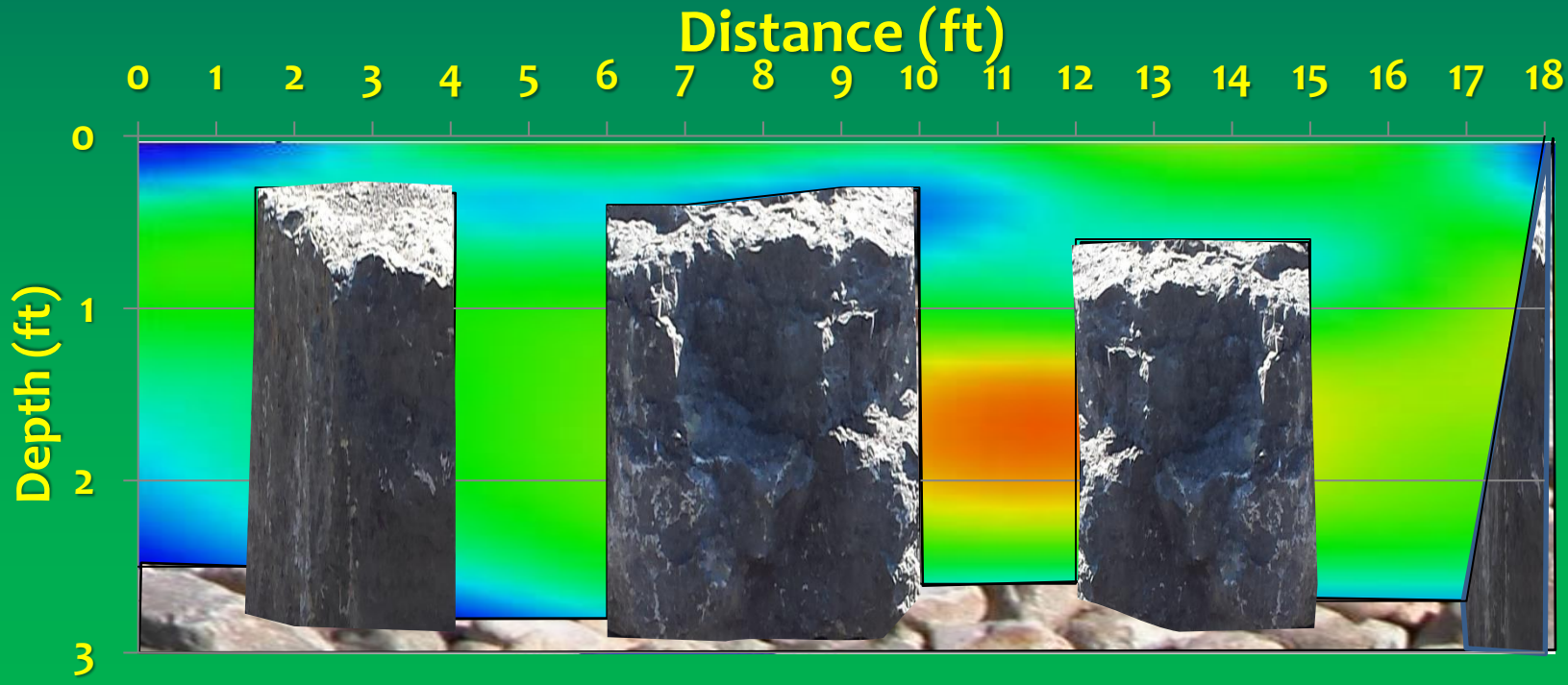
American Shad 2.5 ft x .3 = 0.75 ft



Atlantic Sturgeon –swimming in moderate velocity water

St. Louis River Rock Arch Rapids
3% slope
Built to provide sturgeon spawning habitat





Velocity (ft/s)
7
6
5
4
3
2
1
0

Velocity Versus Weir Height
(based on gravitational acceleration)

Velocity (ft/s)

10
9
8
7
6
5
4
3
2
1
0

This is a simplification of weir hydraulics and other factors affect actual velocities

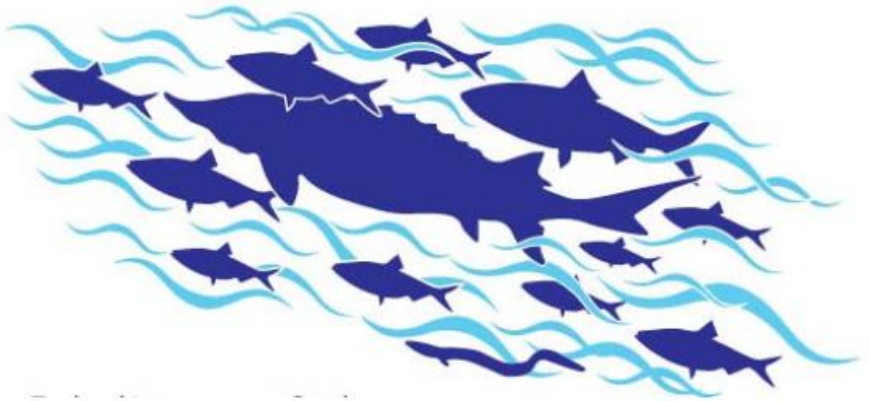
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5

Weir head-loss


Drayton Fishway
Red River of the North
3% slope

Technical Memorandum

Federal Interagency Nature-like Fishway Passage Design Guidelines for Atlantic Coast Diadromous Fishes



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NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

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