Stream Smart Road Crossings on Maine's Forest Lands

Stream Smart Road Crossing Workshop Partners

For more information, go to StreamSmartMaine.org

Workshops are made possible by support from USDA Natural Resources Conservation Service (NRCS), Poland Spring, the Elmina B. Sewall Foundation, the Sally Mead Hands Foundation, the NLT Foundation and the Maine Outdoor Heritage Fund (MOHF).

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Stream Smart Crossings…

Maintain fish and wildlife habitat

while protecting roads and public safety.

Roads and Streams in Maine

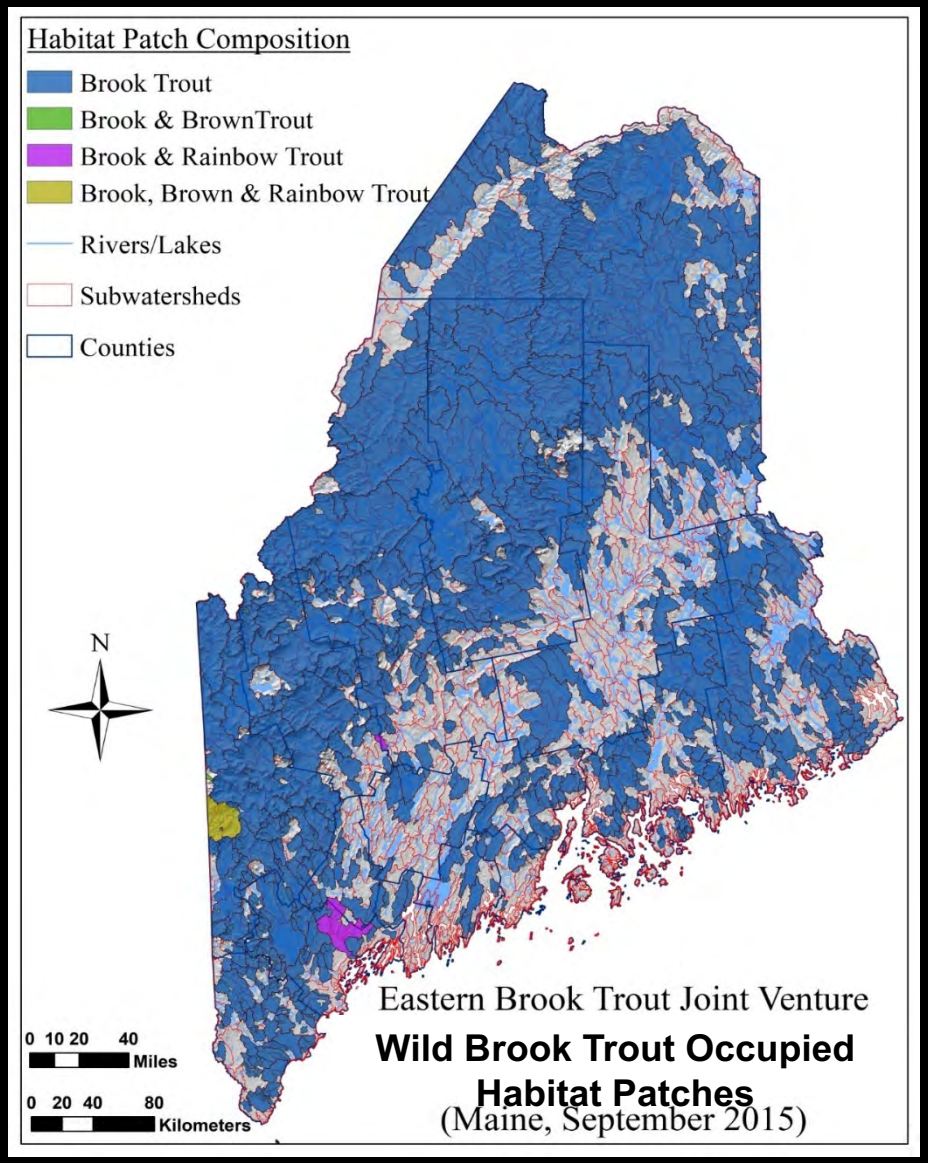
Maine by the numbers

- Maine has about 6,000 lakes and ponds, and **over 45,000 miles of streams and rivers**
- Maine has **over 30,000 miles of road**
  - ~1/3 owned by state
  - ~1/3 owned by towns
  - ~1/3 private
- **>28,000 culverts**

Maine's amazing fisheries: Recreational and economic benefits

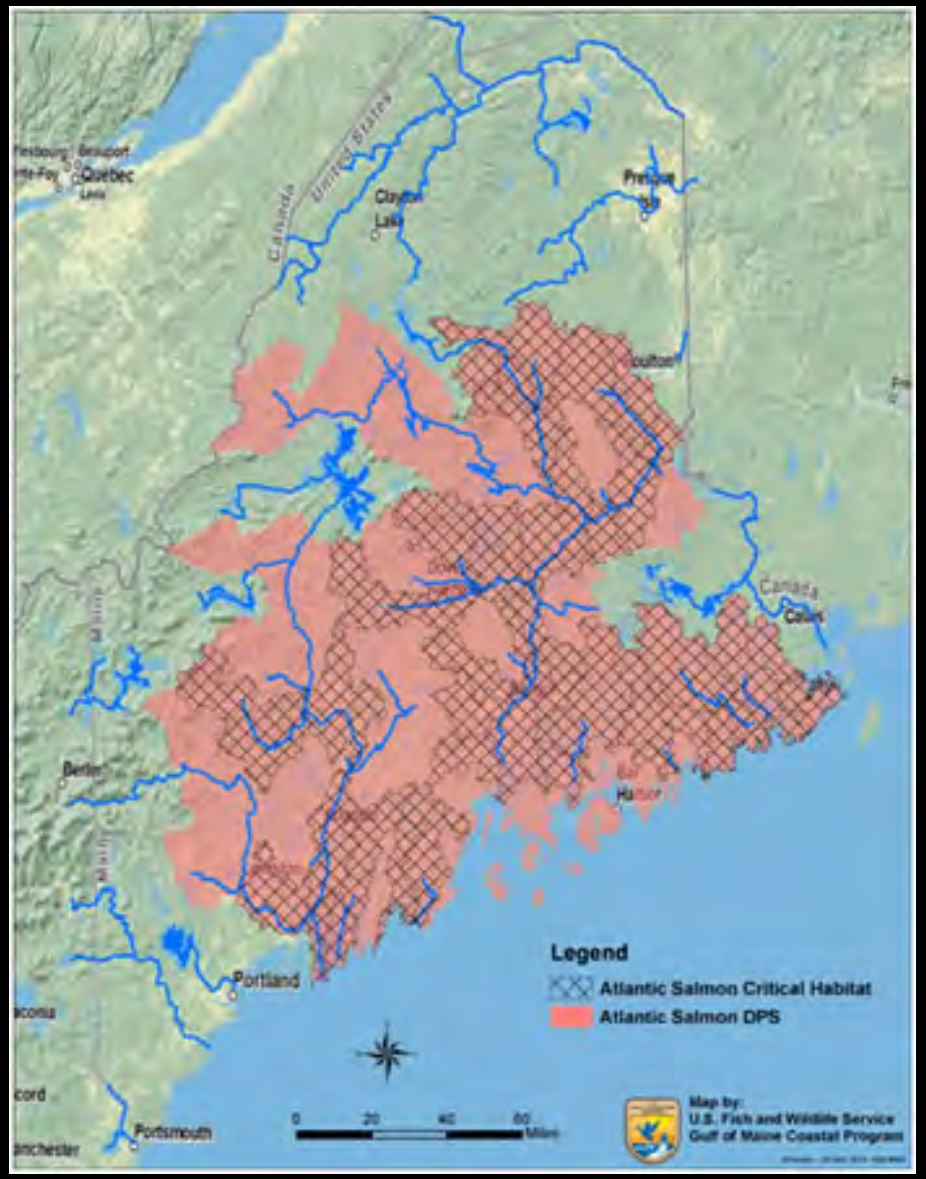
- Most popular outdoor sport
- 270,500 anglers
- World Class fisheries
- $97 million in wages and salaries*
- $192.5 million in retail sales*
- $21 million in tax revenues*
- 3,314 jobs*

* Figures based on 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Report

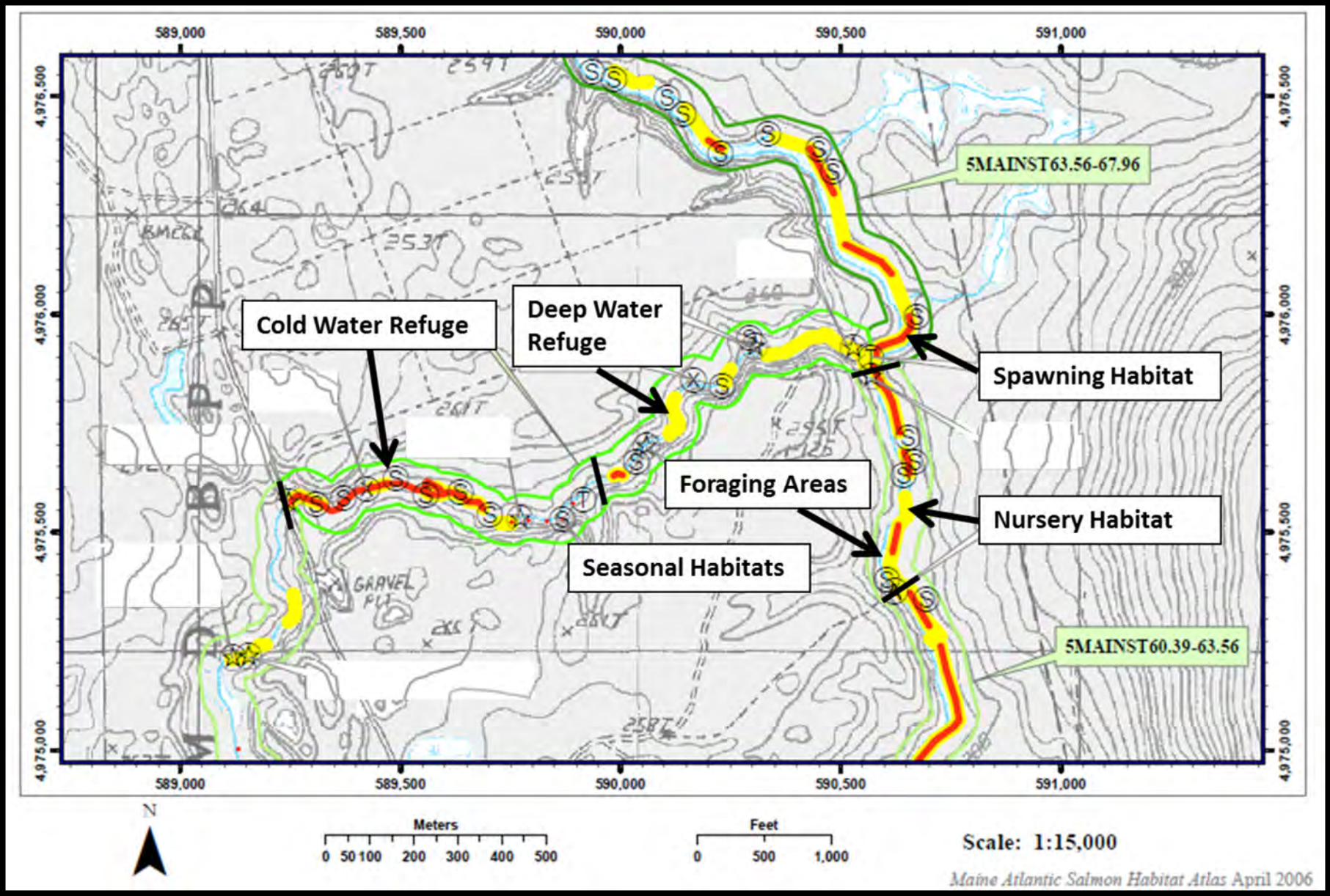


Eastern Brook Trout

Atlantic Salmon



Fish need to move…



It’s not just fish

It’s also about what the stream does

Regulates the flow of water

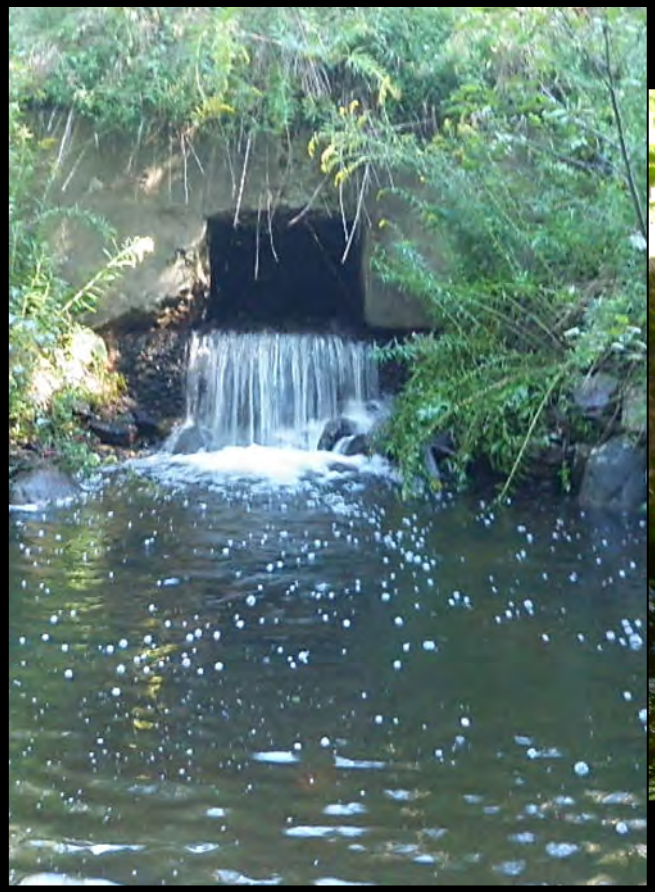
What the Stream Does

Maintains water temperature

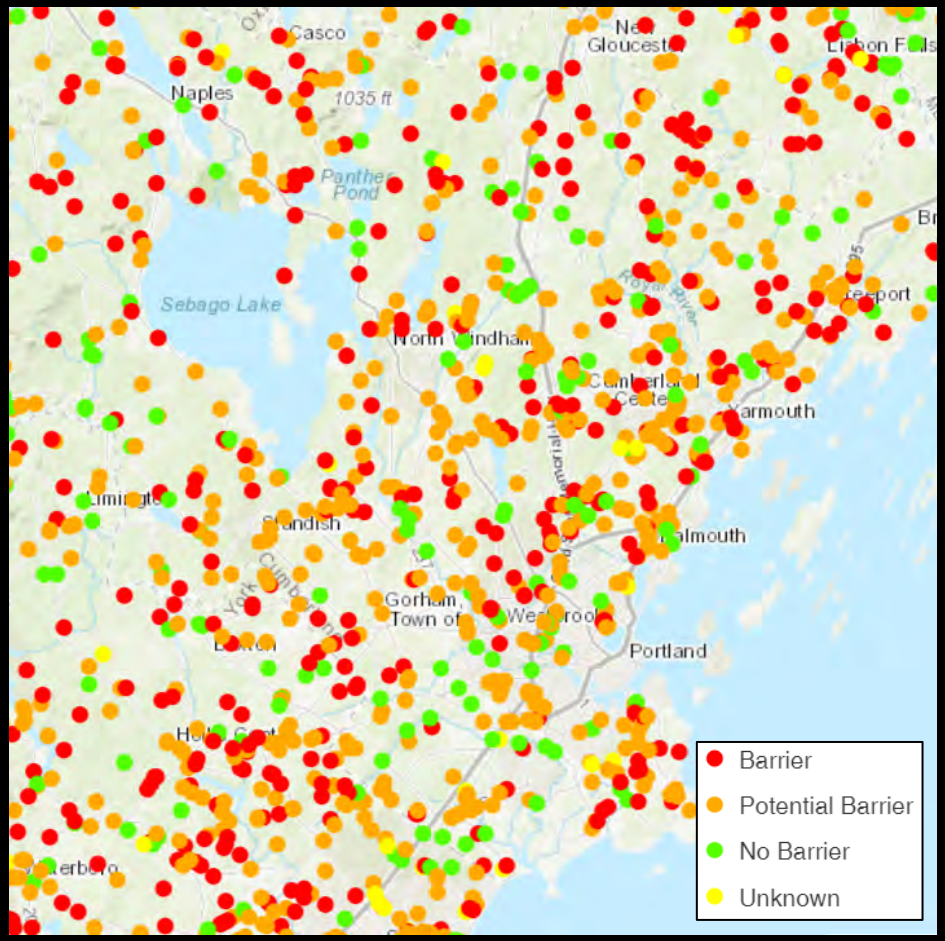
What the Stream Does

Moves organisms and material

The Problem: most road/stream crossings are <u>Barriers!</u>

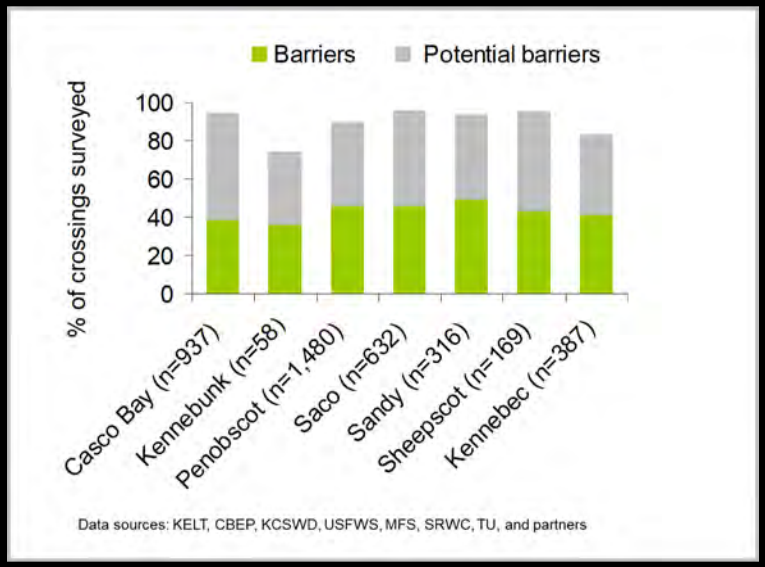


Road/Stream Crossings



Private vs. Public

- **Private crossings**
  - Barrier = 32%
  - Potential = 35%
  - No Barrier = 33%
- **Public crossings**
  - Barrier = 35%
  - Potential = 42%
  - No Barrier = 24%



How do culverts block fish passage?

(1) Flow too fast
(2) Water depth too shallow
(3) Perched
(4) A combination of the above.

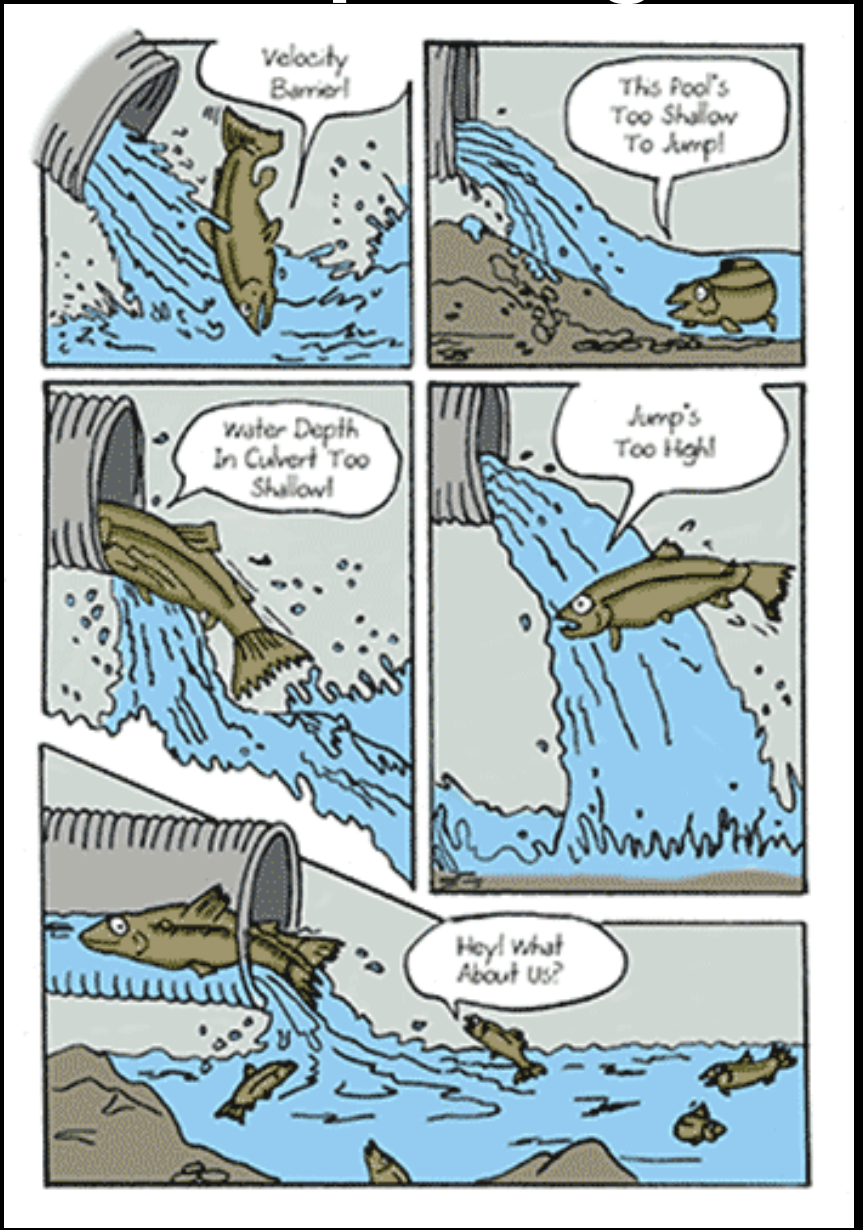


Photo: Washington State Department of Transportation. Photo redrawn by John Runyon

Undersized crossings -> road failure

Catastrophic failures are:

- **Bad for fish & wildlife**
- **Bad for budgets**
- **Bad for safety**

Failures…also bad for habitat


Luckily, there are solutions.
Stream Smart crossings
maintain fish and wildlife habitat
while protecting roads and public safety.

What makes a solution Stream Smart?

- Enables passage of fish and other organisms when *they* want or need to move
- Passes sediment and woody debris
- Maintains natural channel flow characteristics
- Supports your intended use/budget

How to Create Stream Smart Crossings

The Golden Rule:
Let the stream act like a stream

Rules of Thumb (4 S's)

Span the stream

Set elevation right

Slope and skew match stream

Substrate in the crossing

Don’t pinch the stream

Span the stream (and exceed it where possible)

How undersized culverts constrict stream flow and become perched

Culvert that does not span the channel set at stream grade

Water backs up at inlet

Flow accelerates in culvert

Turbulence scours at end of culvert

Over Time…

Low flow barrier

Free Fall (perch)

Plunge pool created

Real World – Blanchard

2008

2010

Rules of Thumb (4 S's)

Span the stream

Set elevation right

Slope and skew match stream

Substrate in the crossing

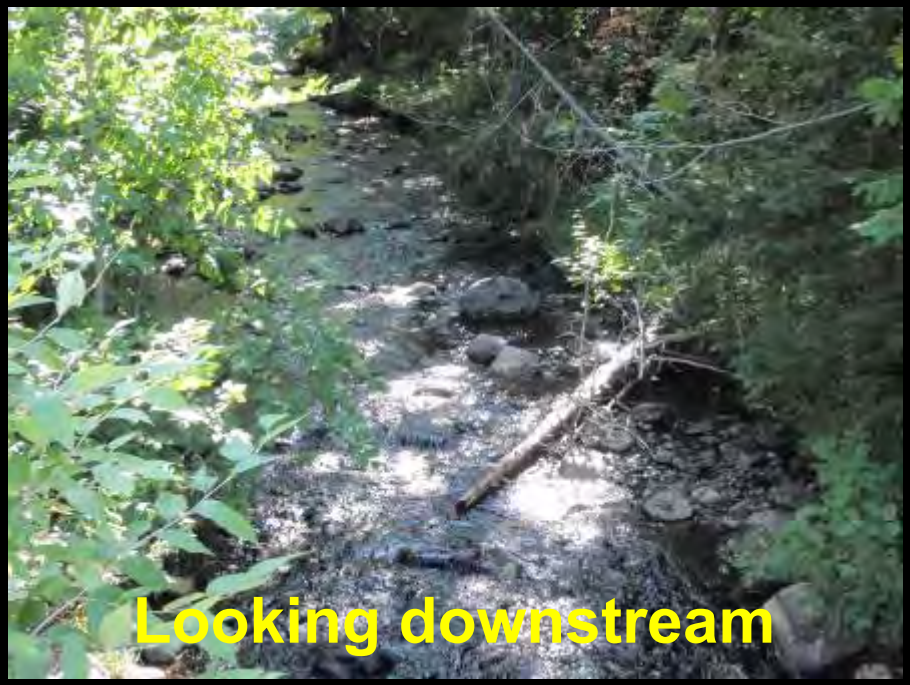
Set elevation right

Upstream

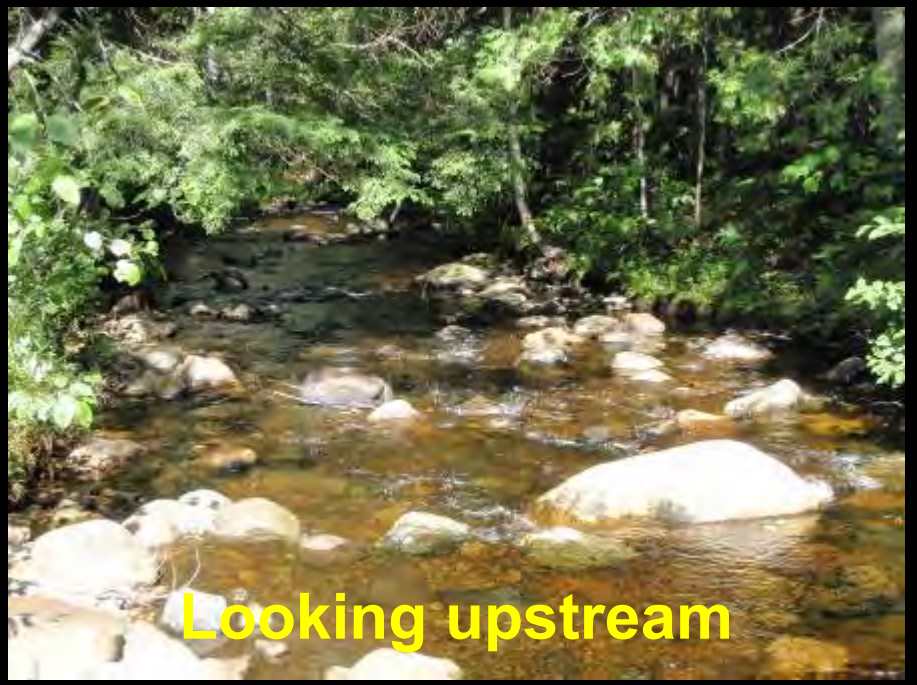
Indicators of elevation problems

A stream channel rediscovered!

Indicators of correct elevation



Looking downstream

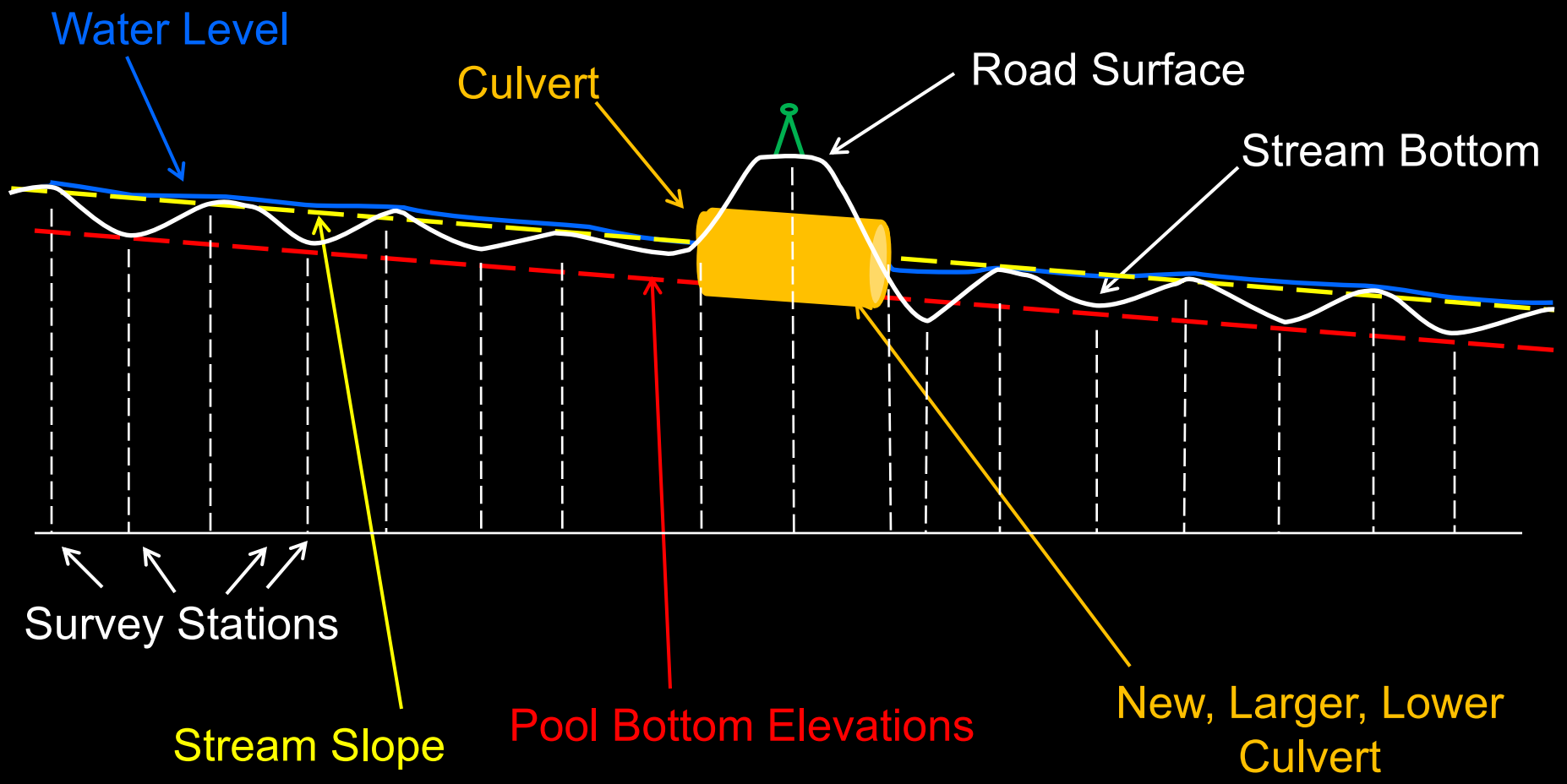


Looking upstream

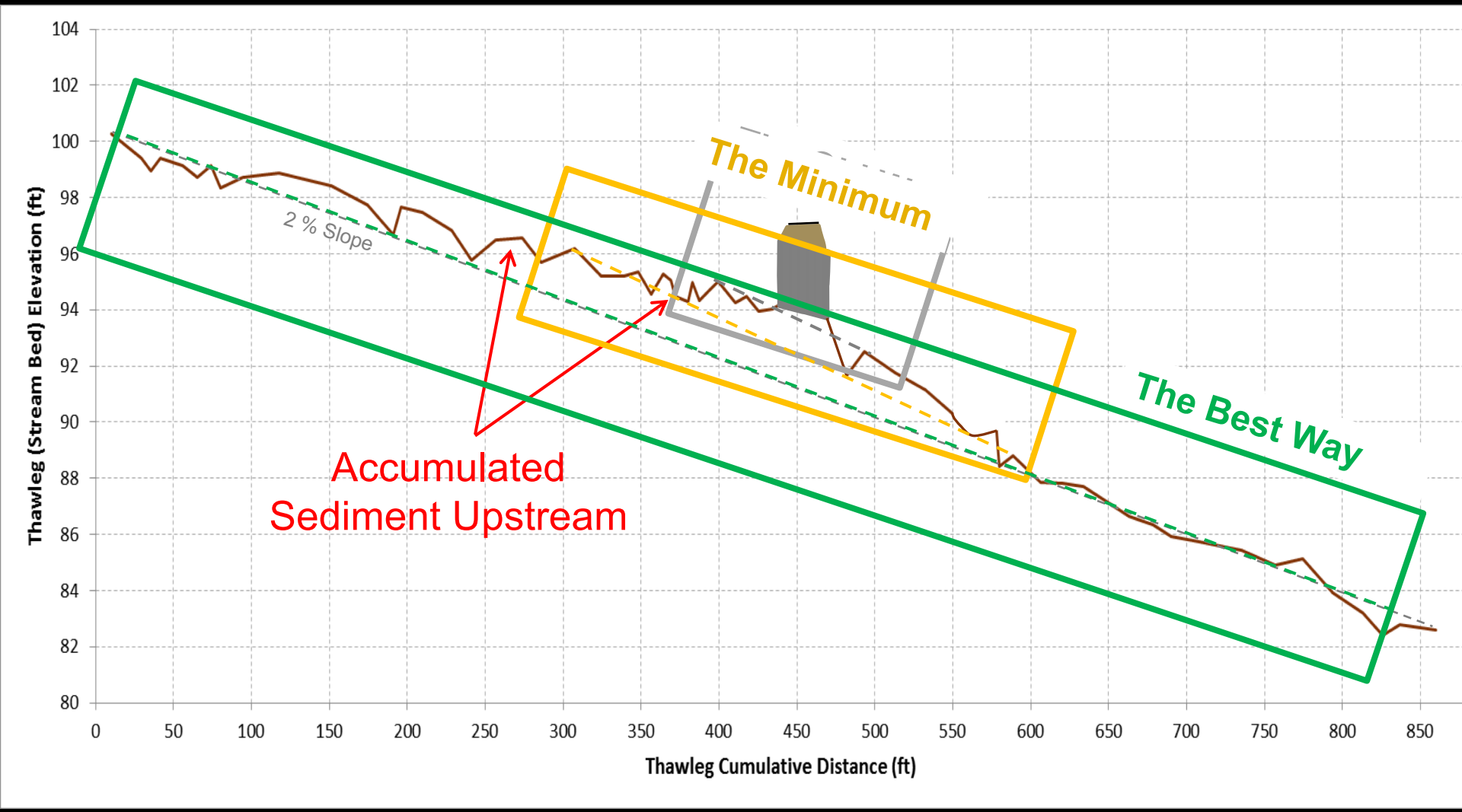
Seamless inlets and outlets

Stream Profile

Used to find correct elevation and slope



Stream Profile Example 1



Rules of Thumb (4 S's)

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Set elevation right

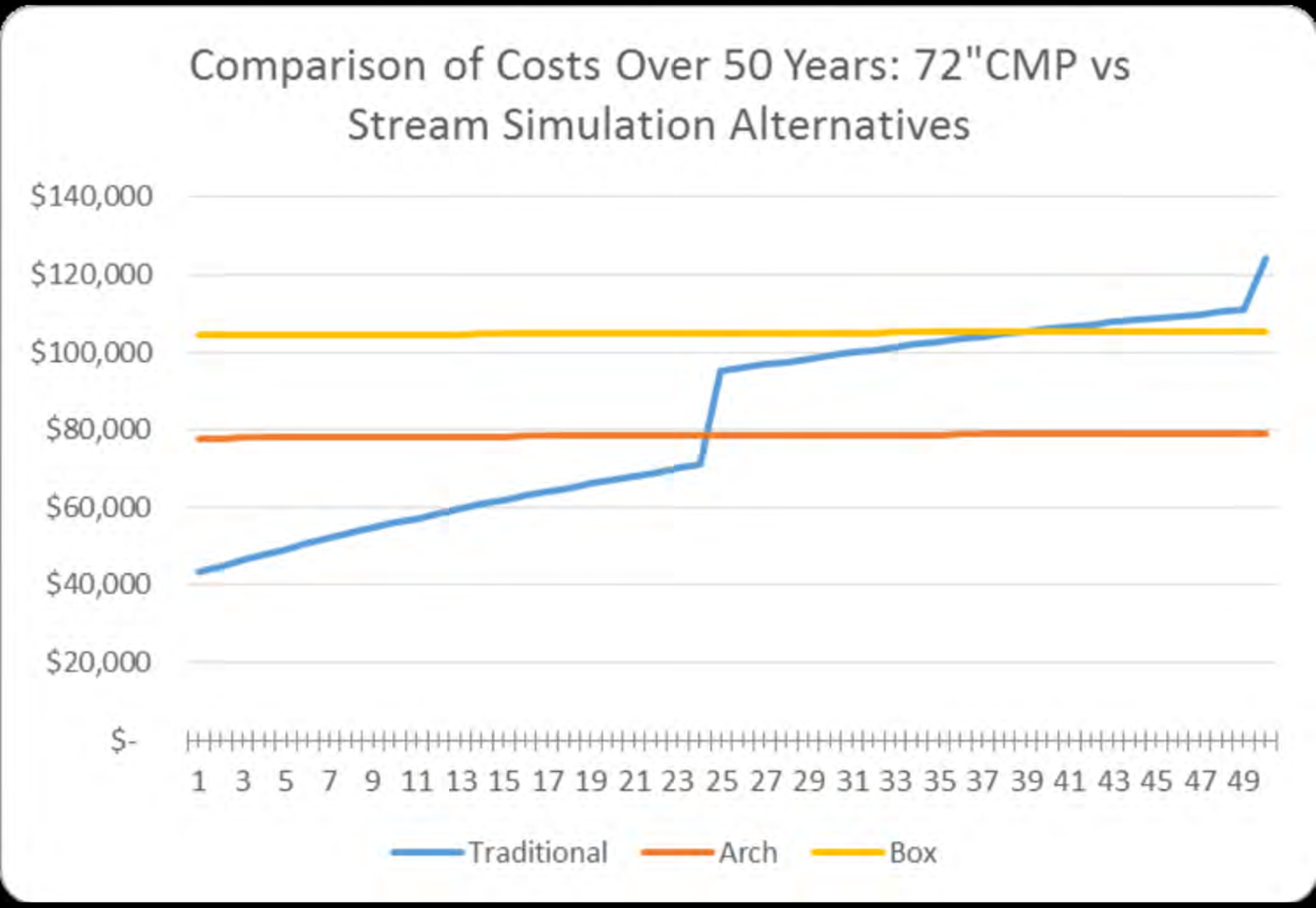
Slope and skew match stream

<u>Substrate in the crossing</u>

Substrate in the crossing

Comparison of Stream Crossing Structures

Crossing Structure Type	Material	Cost	Life Span (years)	Advantages	Disadvantages
Bridge A	Steel-reinforced concrete abutments (poured in-place) and decking on steel I-beam stringers	$$$	50-75	Natural bottom, durability, snow-plowable	High cost
Bridge B	Precast concrete block abutments with steel I-beam stringers and timber deck (possibly paved or alternate decking)	$	50-75; timber redeck 5-10	Natural bottom, low cost; simplicity	Limited abutment height and deck life; snow plowing may be limited
Bridge C (3-Sided Box Culvert)	Steel-reinforced concrete, galvanized steel or aluminum	$$	50-75	Natural bottom, simplicity	Span/weight of sections can limit installation options; assembly required for metal plate structures
Open Bottom Arch	Galvanized Steel, aluminum, steel-reinforced concrete	$$	50-75	Natural bottom, ease of transport, can be low profile	Care must be taken to install and protect footings, assembly required for metal plate structures
Embedded Box Culvert	Steel-reinforced concrete, galvanized steel, aluminum	$$	50-75	Natural bottom; variety of configurations	Must span stream and be set below stream elevation to avoid outlet perch; limited by bedrock
Embedded Pipe Arch	Galvanized steel, aluminum	$ - $$	20-50	Natural bottom; wide for given volume; low cost of steel	Short life (steel); not for use with ledge; limited sizes
Embedded Round Pipe	Galvanized steel, aluminum, plastic, steel-reinforced concrete	$	20-75	Natural bottom; lowest cost	Limited to smaller sizes; not for use with ledge
Round Pipe (at stream grade) *Not Recommended*	Galvanized steel, aluminum, plastic, steel-reinforced concrete	$	20-75	Lowest cost	Rarely adequate for fish passage (develops outlet perch); limited to smaller sizes


Comparison of Costs Over 50 Years: 72"CMP vs Stream Simulation Alternatives
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$-
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49
Traditional
Arch
Box

Stream Smart on logging roads

Before

After

Stream Smart on logging roads

Before

After

Stream Smart on logging roads

Before

After

Stream Smart on logging roads

Before

After

Technical and Financial Assistance

Maine Forest Service

Type of Assistance

- Technical Assistance for Forestry, BMPs

Geographic Area

- Statewide

NRCS

Type of Assistance

- Financial Assistance
- Technical Assistance

Geographic Area

- Statewide, field offices for each county

For more information go to StreamSmartMaine.org

Technical and Financial Assistance

ProjectSHARE

Type of Assistance

- Technical Assistance
- Financial Assistance

Geographic Area

- Downeast Maine Atlantic Salmon rivers

The Nature Conservancy

Type of Assistance

- Technical assistance
- Financial assistance

Geographic Area

- Statewide

For more information go to StreamSmartMaine.org

Technical and Financial Assistance

United States Fish & Wildlife Service

Gulf of Maine Coastal Program

Type of Assistance

- Technical assistance
- Financial assistance

Geographic Area

- Statewide – some limitations for some types of assistance

Maine Field Office

Type of Assistance

- Technical assistance
- Financial assistance

Geographic Area

- Statewide – focus on Atlantic Salmon habitat

Partners for Fish and Wildlife Program

For more information go to StreamSmartMaine.org

Problem Culvert Impacts to Fish and Habitat

Traditional undersized or hung round culverts are barriers to fish passage that fragment and degrade streams for native fishes that depend on timely access to different habitat types (i.e. spawning habitat, cold water refuge) and other resources (i.e. food and space). Marshy backwaters often kill trees along the stream, reduce shade, increase water temperature and reduce stream flow which promotes conditions for warm water and invasive fish species.

Species Focus

NRCS stream restoration benefits a variety of species. Over 50 Maine native fish species will experience increased stream access and positive changes to their stream habitat, particularly native brook trout and sea-run fish species. Non-fish wildlife benefiting from culvert replacement include:

- Freshwater mussels
- Salamanders and frogs
- Aquatic invertebrates
- Turtles

NRCS Program Eligibility

NRCS programs assist private landowners. Eligibility requirements vary from program to program. Additional information concerning NRCS programs can be found at www.me.usda.gov

NRCS Funding Opportunities

NRCS is working with partners on two Regional Conservation Partnership Program (RCPP) projects with a Aquatic Organism Passage (AOP) focus:

- "Maine Aquatic Connectivity Restoration Project"
  - Focus area outlined in RED
  - Lead partner The Nature Conservancy
  - Total $,4,000,000 for AOP projects!
  - Project ends in 2022
- Maine Mountain Collaborative For Fish and Wildlife."
  - Focus area outlined in BLUE
  - Lead partner Trust For Public Lands
  - Total $200,000 for AOP projects.
  - Project ends in 2021.

Contact Information

We are interested in discussing stream restoration with you. If there is any question concerning fish passage or determination if your culvert might be a barrier to fish and other aquatic life please contact your local NRCS office or Ben Naumann at 990-9504.

USDA is an equal opportunity provider and employer.

Rules of Thumb (4 S's)

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Slope and skew match stream

Substrate in the crossing

For more information go to
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Stream Smart Crossings…

Maintain fish and wildlife habitat while protecting roads and public safety.

Allow the stream to act like a stream, passing fish and wildlife as well as the higher flows that come with larger, more frequent storms.