Biologically Sound Stream Crossings

Dams

Sub-standard Culverts


Micrographia


Scott Jackson


Scott Jackson


Radu Guiasu


Micrographia


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Barry Wicklow


Kenneth Catania


Robert Jenkins & Noel Burkhead

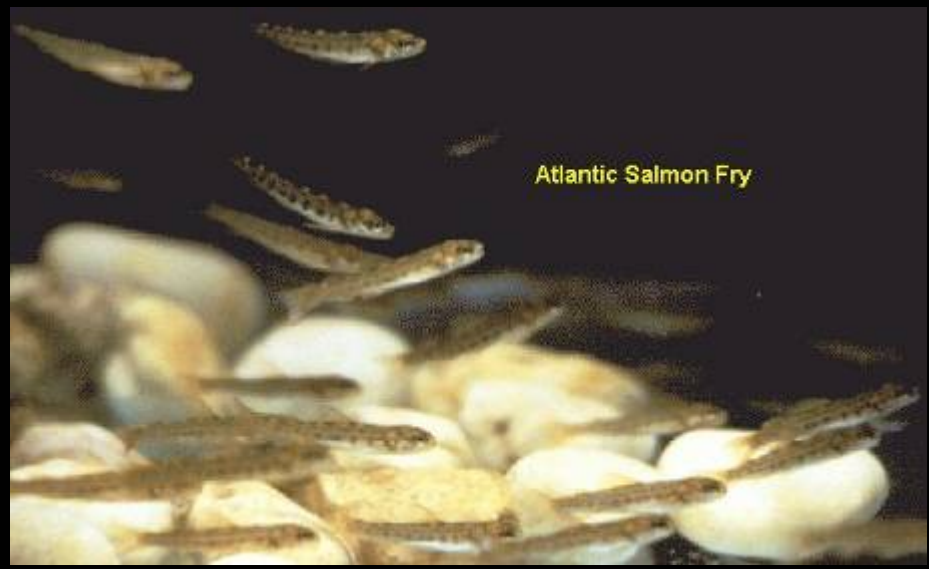
Adult Spawning Migrations

Spawning Habitat
Eggs & Alevin

Requirements:

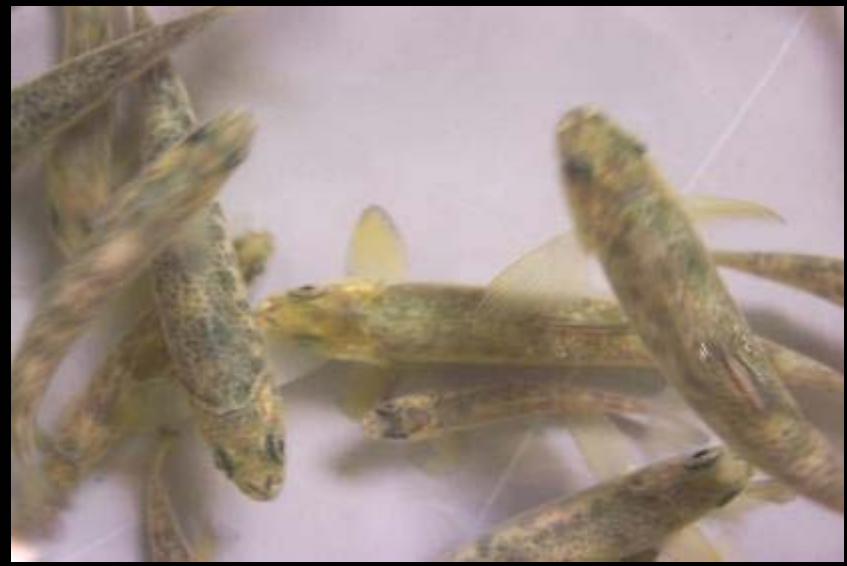
- **Clean, well oxygenated gravels**

Salmon Fry



Requirements:

- **Margin habitats with slow-moderate current**
- **Sufficient invertebrate prey**
- **Interstitial spaces**



Early Parr

Requirements:

- **Habitat with moderate-swift current**
- **Sufficient invertebrate prey**
- **Adequate interstitial spaces**

Late Parr / Pre-smolt

Requirements:

- Require larger shelters
- Appropriate water chemistry
- Ability to emigrate from natal streams at certain times of the year
- Overwinter cover

At this stage salmon make extensive movements seeking appropriate winter habitat

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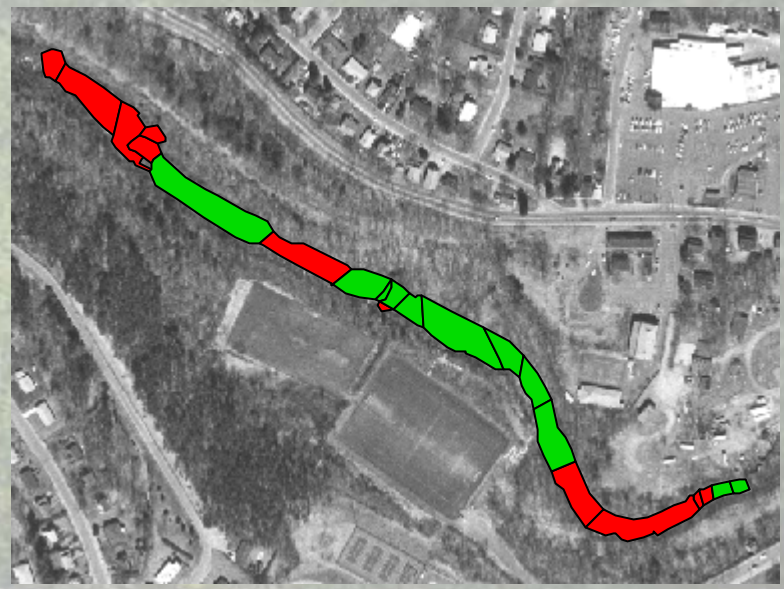

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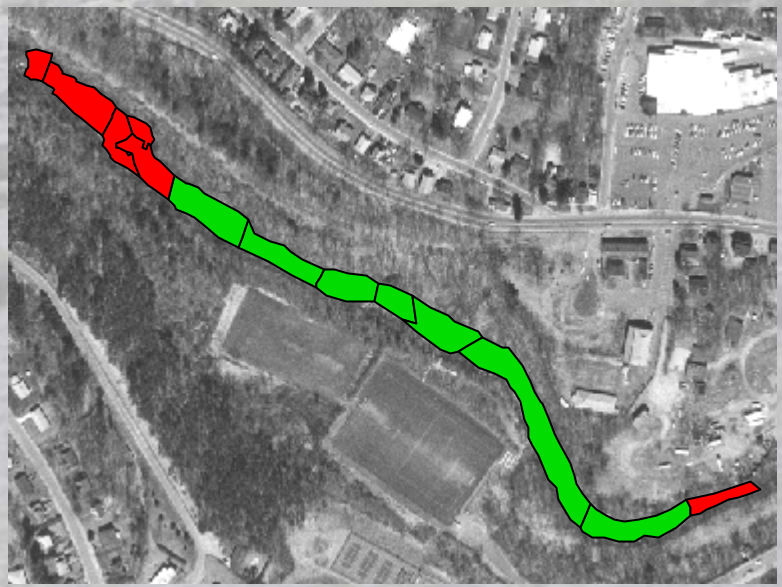

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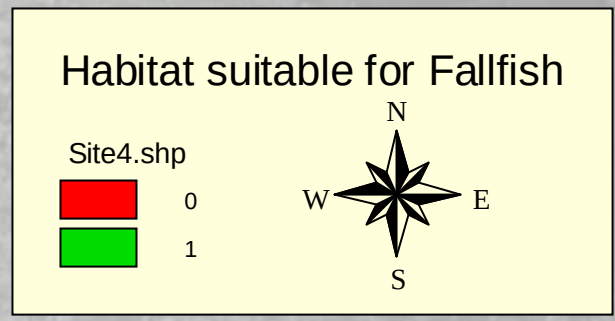


Piotr Parasiewicz

Importance of Movement

- Daily movements
- Changes in habitat conditions
- Reproduction
- Exploit vacant habitat
- Population continuity
- Dispersal

Culvert Problems

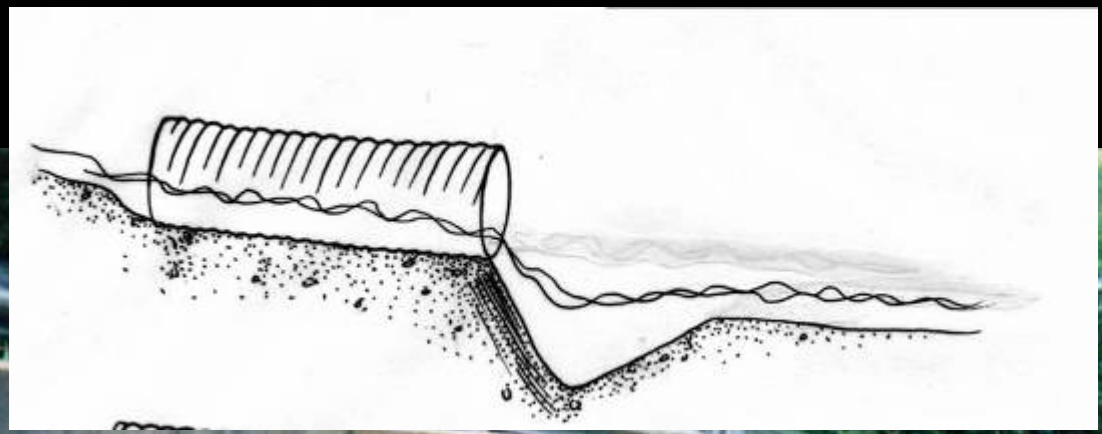
- Flow contraction (turbulence)
- Inlet or Outlet drop
- Excessive velocities
- Insufficient water depth
- Physical barriers
- Debris accumulation
- Absence of bank edge areas
- Discontinuity of channel substrate

Flow Contraction

Inlet Drop

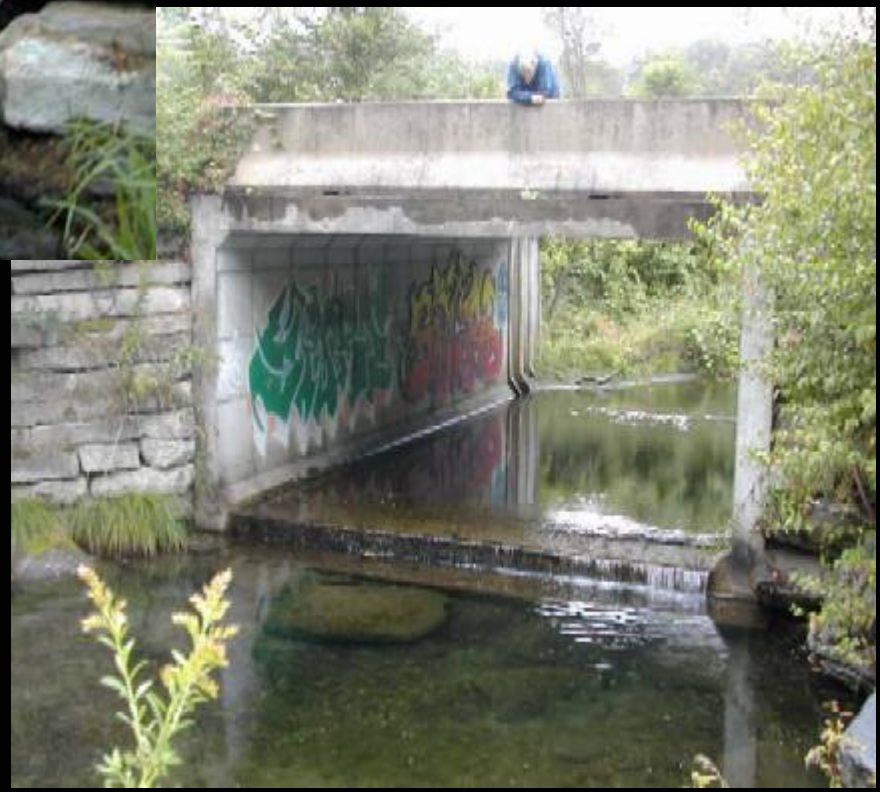
Excessive Velocities

Scour Hole



Outlet Drop (Perching)

Tail Water Armoring



Insufficient Water Depth

Physical Barriers

Douglas Smith

Robert Jenkins & Noel Bur

Alan Richmond

Scott Jackson

Radu Guiasu

Micrographia

Micrographia

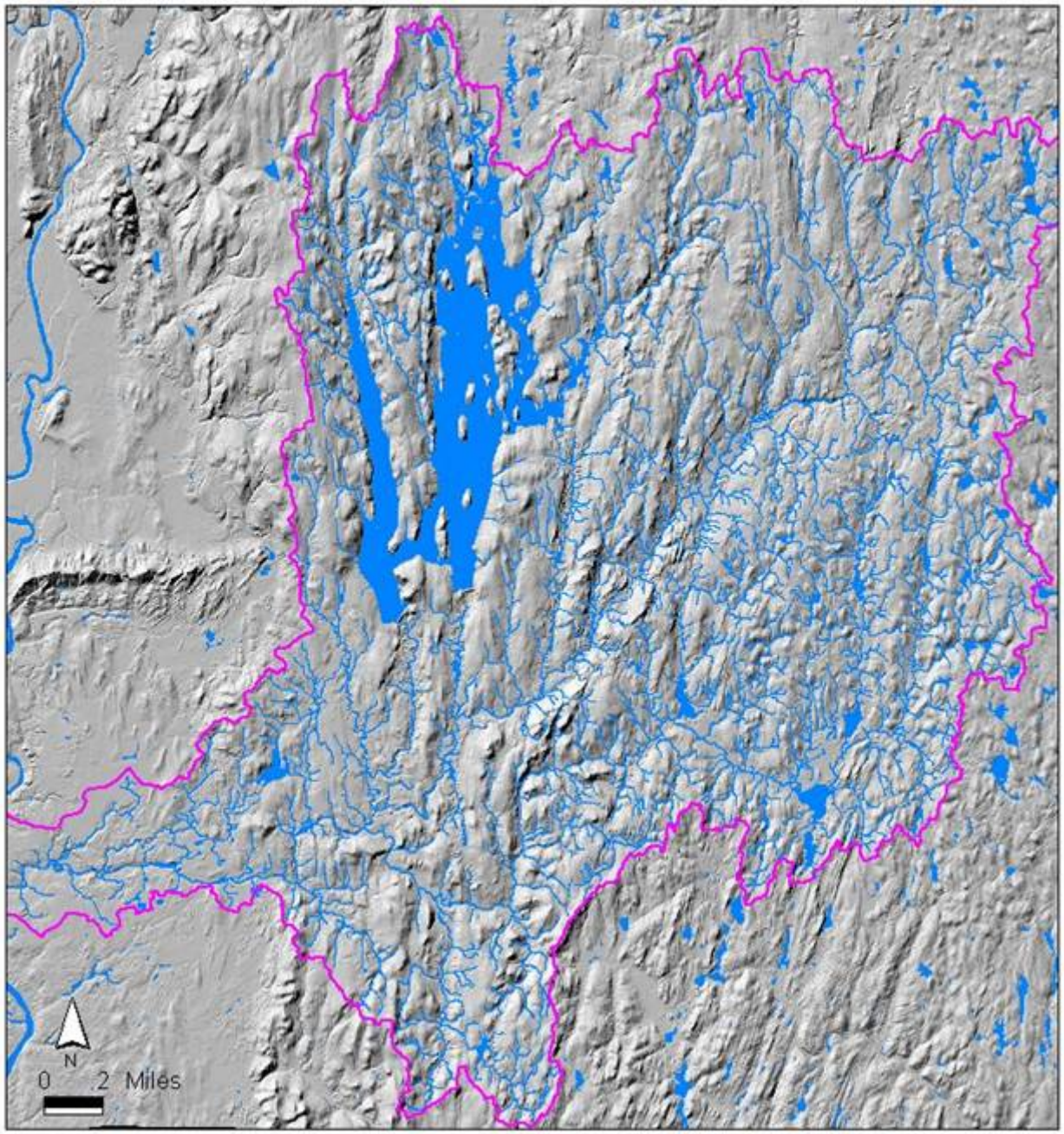
Importance of Small Streams

- Make up a large percentage of stream miles
- Cumulatively provide more habitat than large rivers
- Support species not found in larger streams and rivers
- Provide important spawning & nursery habitat for fish

Impacts of River & Stream Crossings

- Habitat loss and degradation
- Roadkill leading to loss of populations
- Alteration of Ecological Processes
- Reduced access to vital habitats
- Population fragmentation & isolation
- Disruption of processes that maintain regional populations

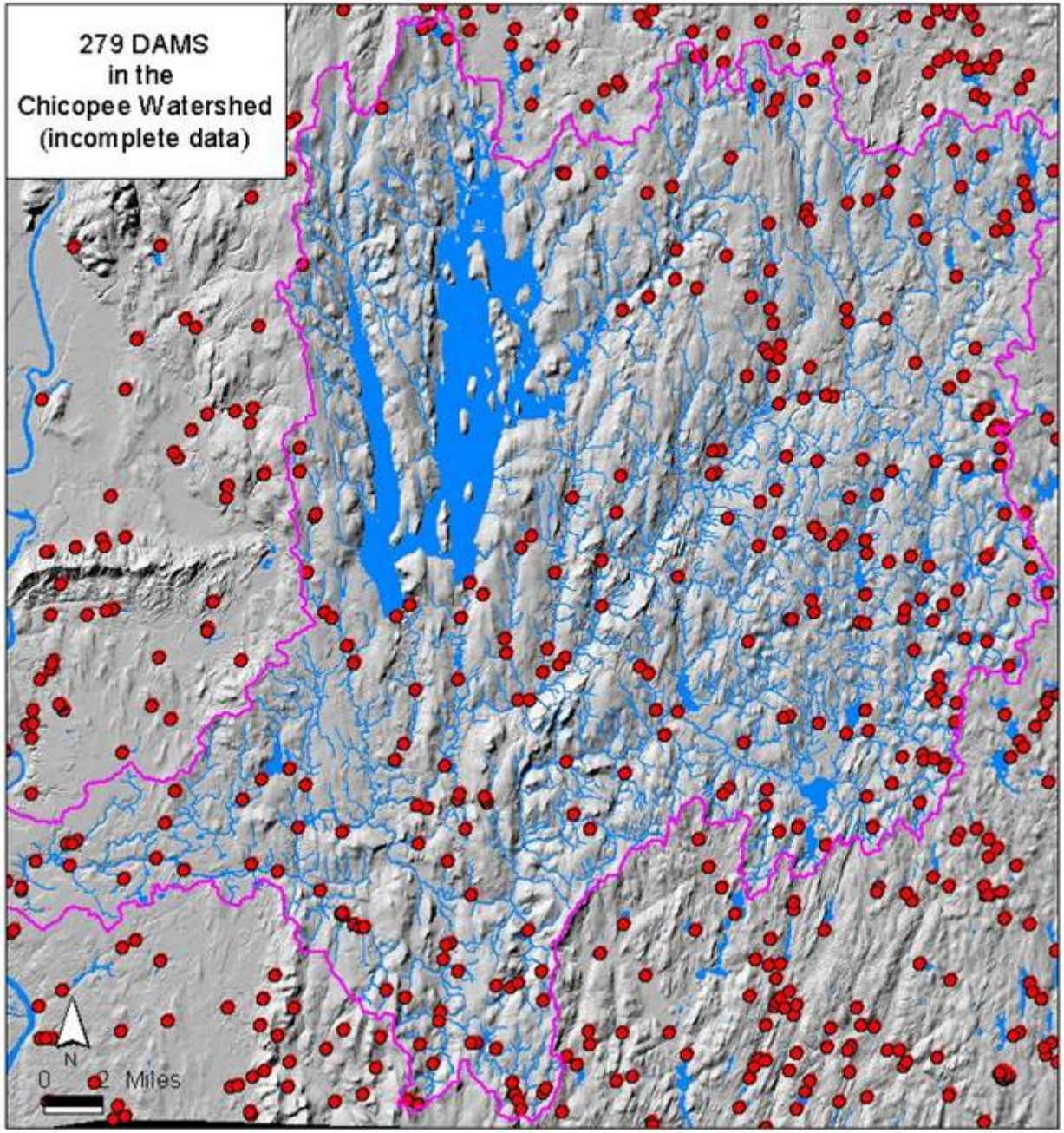
CHICOPEE WATERSHED



721 sq.mi.

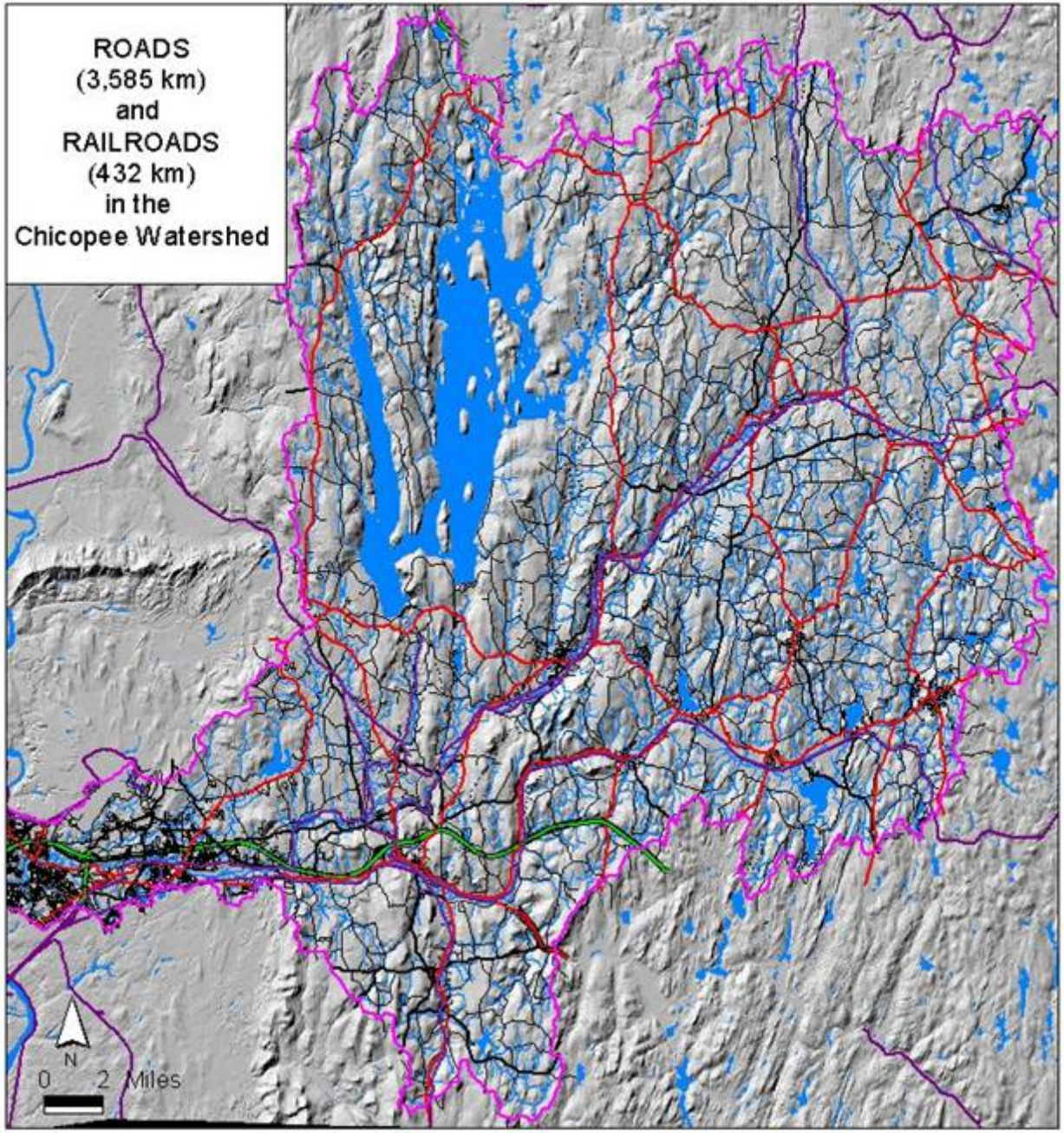
Source:
MA Riverways Program

CHICOPEE WATERSHED



Source:
MA Riverways
Program

CHICOPEE WATERSHED



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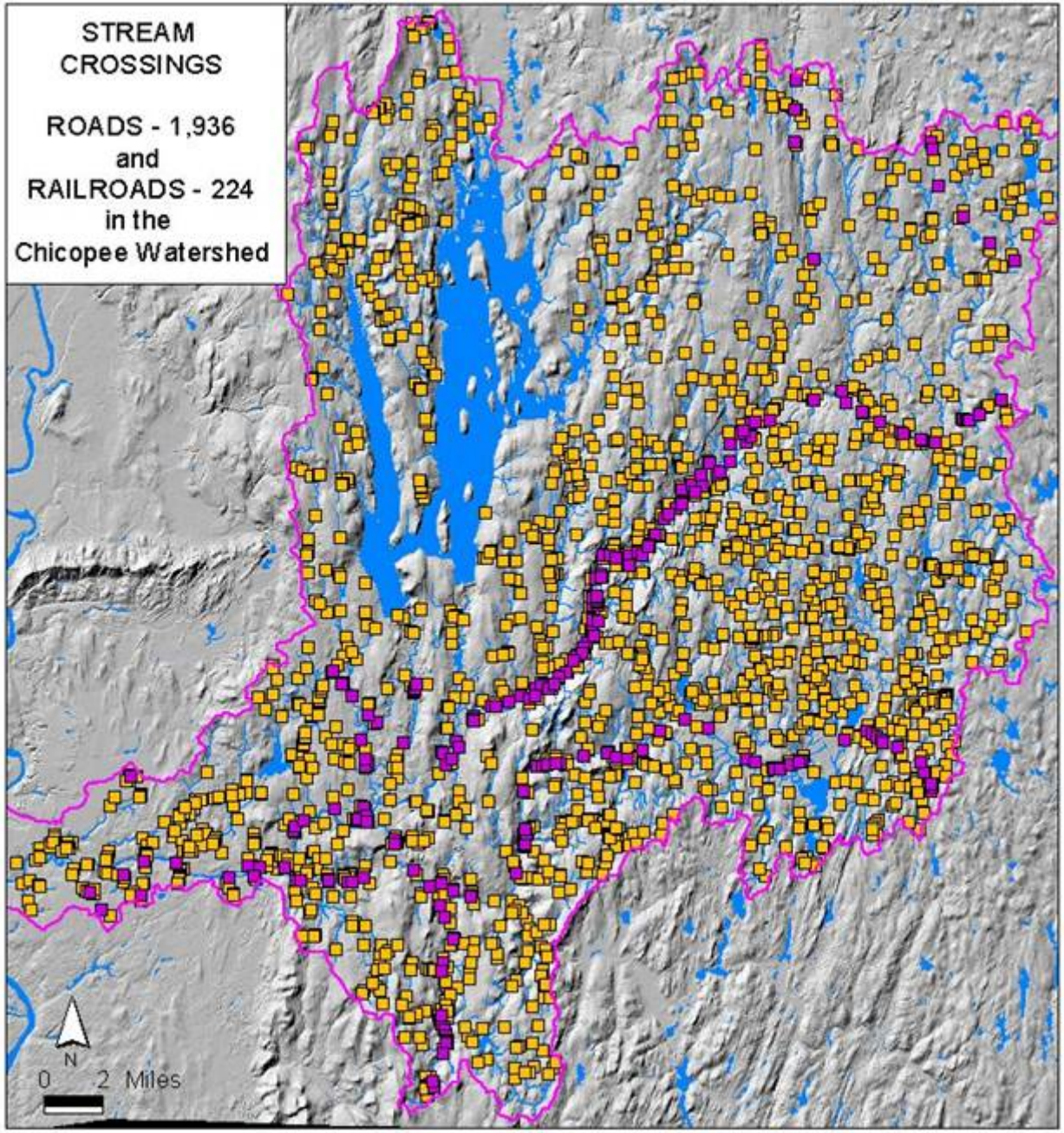

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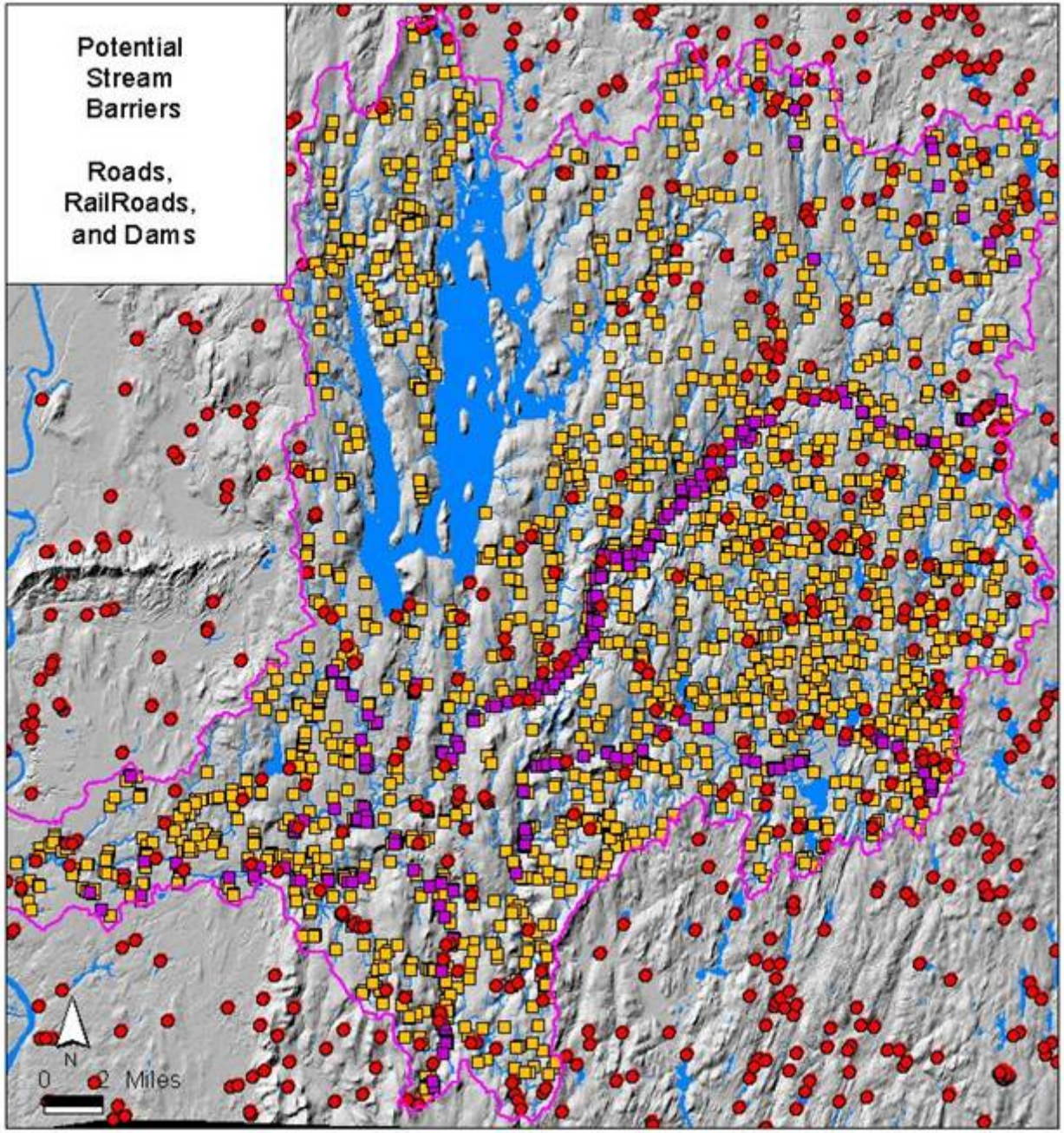


Source:
MA Riverways
Program

River and Stream Continuity Partnership

- University of Massachusetts Amherst
- MA Riverways Program
- The Nature Conservancy

River & Stream Continuity Project

Objectives of the River/Stream Continuity Project

- Technical guidance and standards for river/stream crossings
- Volunteer program to inventory and evaluate dams, culverts and other stream crossing structures
- System for prioritizing crossing structures for upgrade or replacement

MA Programmatic General Permit (PGP)

All temporary and permanent crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed to withstand and to prevent the restriction of high flows, and so as not to obstruct the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction.

MA Programmatic General Permit (PGP)

- New permanent crossings shall conform with the General Standards contained in the August 6, 2004 "Massachusetts River and Stream Crossing Standards: Technical Guidelines"
- Open bottom arches or bridge spans are generally preferred over traditional culverts and are required for Category 1/non-reporting projects.
- Well-designed culverts may be used where site constraints make use of an open bottom arch or bridge span impractical (requires consultation with the Corps under the Category 2 or IP review process)

MA River & Stream Crossing Standards: General Standards

Where:

- Fish bearing streams and rivers

Goals:

- Fish passage
- River/stream continuity
- Some wildlife passage

General Standards

- **Bridge span preferred**
- **If a culvert then embedded ≥ 2 foot; ≥ 1 foot and 25% for round corrugated culverts**
- **Natural bottom substrate within culvert (matching upstream and downstream substrates)**
- **Spans channel (1.2 x bankful width)**
- **Designed to provide water depths and velocities at a variety of flows that are comparable to those found in upstream and downstream natural stream segments (e.g. low flow channel)**
- **Openness ratio ≥ 0.25 (calculated in meters)**


Bridge


Open-bottom Box

Open-Bottom Arch


Stream Simulation
Culvert


Wood turtle
Scott Jackson


Beaver


Muskrat
© 2003 John White


Scott Jackson
Snapping turtle


Star-nosed mole
Kenneth Catania


Otter


Spring Salamander

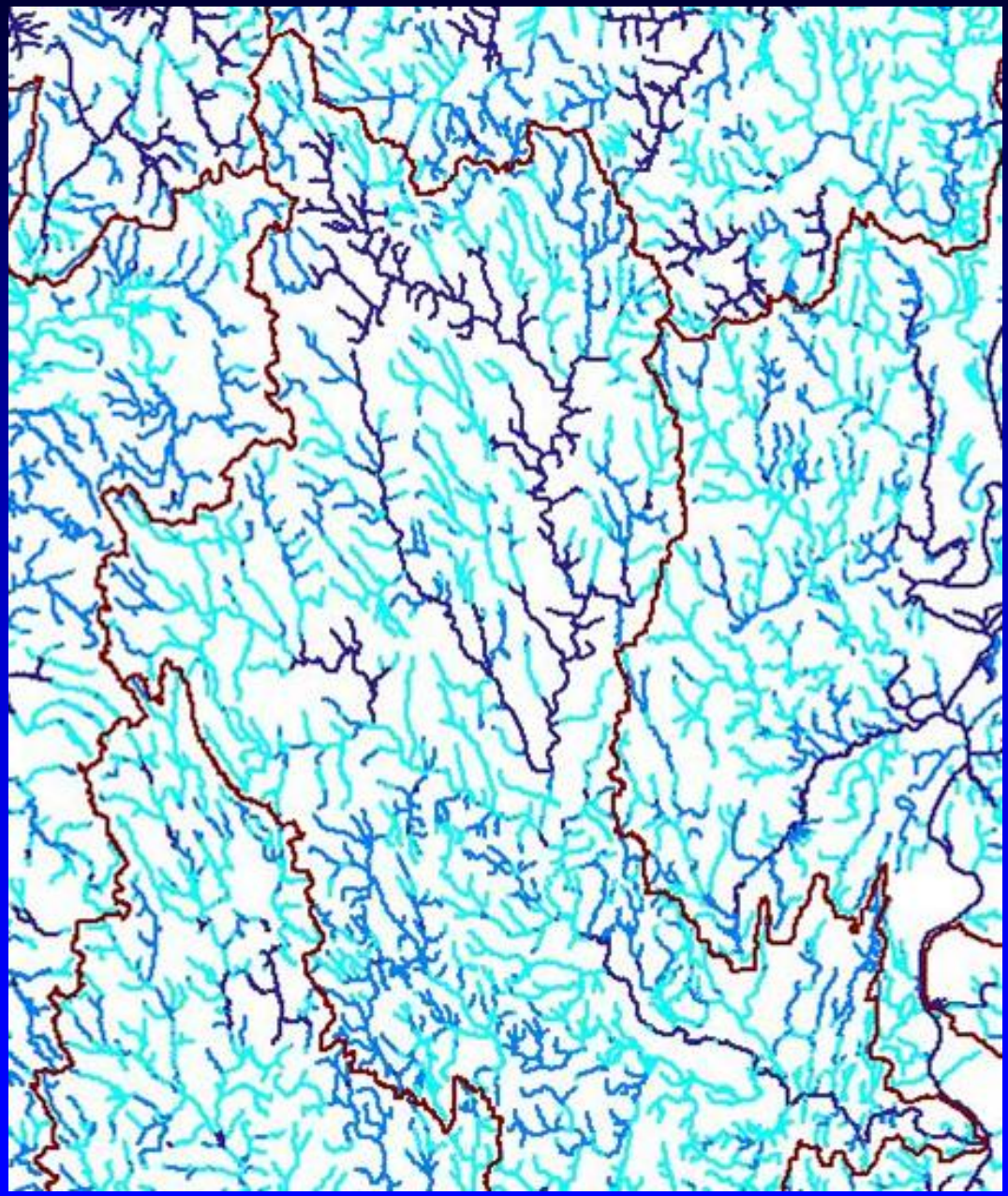

Scott Jackson
Dusky salamander


Mink

Openness Ratio (meters)

Important Considerations for Culvert Replacement/Upgrades

- Stream channel adjustments and structure stability
- Upstream head cutting
- Loss or degradation of upstream wetlands
- Loss of flood control in developed watersheds



Designating Stream Standards

Optimum

High priority

General

Assessment Field Forms

Field Data Form : Road-Stream Crossing Inventory

Coordinator → Crossing ID# →

Date: → Stream/River: → Road: → Town: →

Location: → GPS Coordinate (lat/long): →

Observer: → Phone #: → Email address: →

Photo ID: →

Road/Railway Characteristics

1. Number of Travel Lanes → Shoulder/ Breakdown lane: 0 Yes → 0 No → Road Surface: 0 Paved → 0 Unpaved

2. Are any of the following condition present that would significantly inhibit wildlife crossing over the road?

- High traffic volume (> 60 cars per minute) → 0 Yes → 0 No
- Steep embankments → 0 Yes → 0 No
- Retaining walls → 0 Yes → 0 No
- Jersey barriers → 0 Yes → 0 No
- Fencing → 0 Yes → 0 No
- Other (specify) →

Crossing/Stream Characteristics (during general low-flow conditions)

3. Crossing Type: → 0 Ford 0 Bridge 0 Open Bottom Arch 0 Single Culvert 0 Multiple Culverts (# of culverts) →

4. Condition of culvert → 0 Good → 0 Fair → 0 Collapsing → 0 Eroding → 0 Rusted through → 0 Broken

5. Does the stream at the crossing contain fish? → 0 Yes → 0 No → 0 Don't Know

6. Is the stream flowing in the natural channel? → 0 Yes → 0 No

7. Flow condition during the survey are:

0 unusually low 0 typical low flow 0 average flow 0 higher than average

8. Are any of the following problems present? (see attached glossary and illustrations)

- Inlet drop (> 8") → 0 Yes → → 0 No
- Outlet drop (> 8") → 0 Yes → → 0 No
- Flow constriction → 0 Yes → → 0 No

9. Tailwater armoring: → 0 Extensive → → 0 Not Extensive → 0 None

10. Tailwater scour pool: → 0 Large → 0 Small → 0 None

11. Physical barrier to fish and wildlife passage: → 0 Permanent → → 0 Temporary → 0 None

Describe any barriers: →

12. Culvert Embedded? → 0 Not embedded 0 Partially embedded → 0 Fully embedded < 1' → 0 Fully embedded > 1'

13. Crossing substrate: → 0 None → 0 Inappropriate (large rip rap, concrete) → 0 Contrasting 0 Comparable

14. Water depth matches that of the stream? → → 0 Yes (comparable) → 0 No (significantly different)

15. Water velocity matches that of the stream? → → 0 Yes (comparable) → 0 No (significantly different)

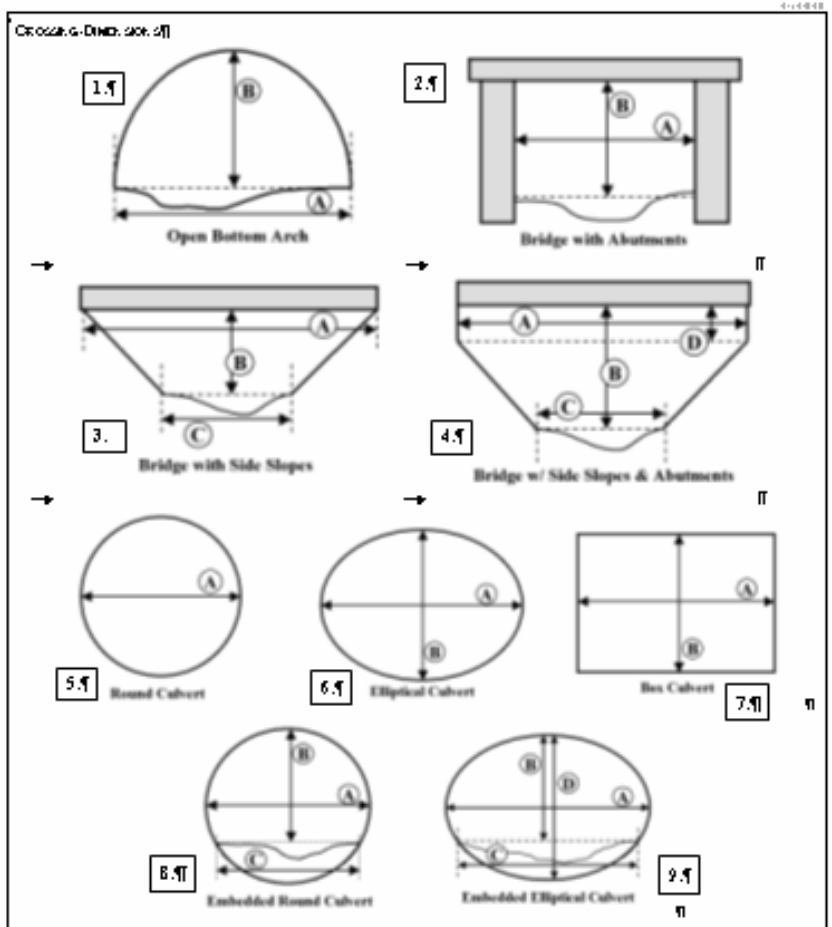
16. Crossing span: → 0 Constricts channel 0 Spans active channel → 0 Spans bankfull width 0 Spans channel & banks

17. Minimum structure height below water → 0 < 6 in. → 0 < 6 in. → 0 < 6 in. (from water level to the roof inside the structure)

18. Comments: →

→

→



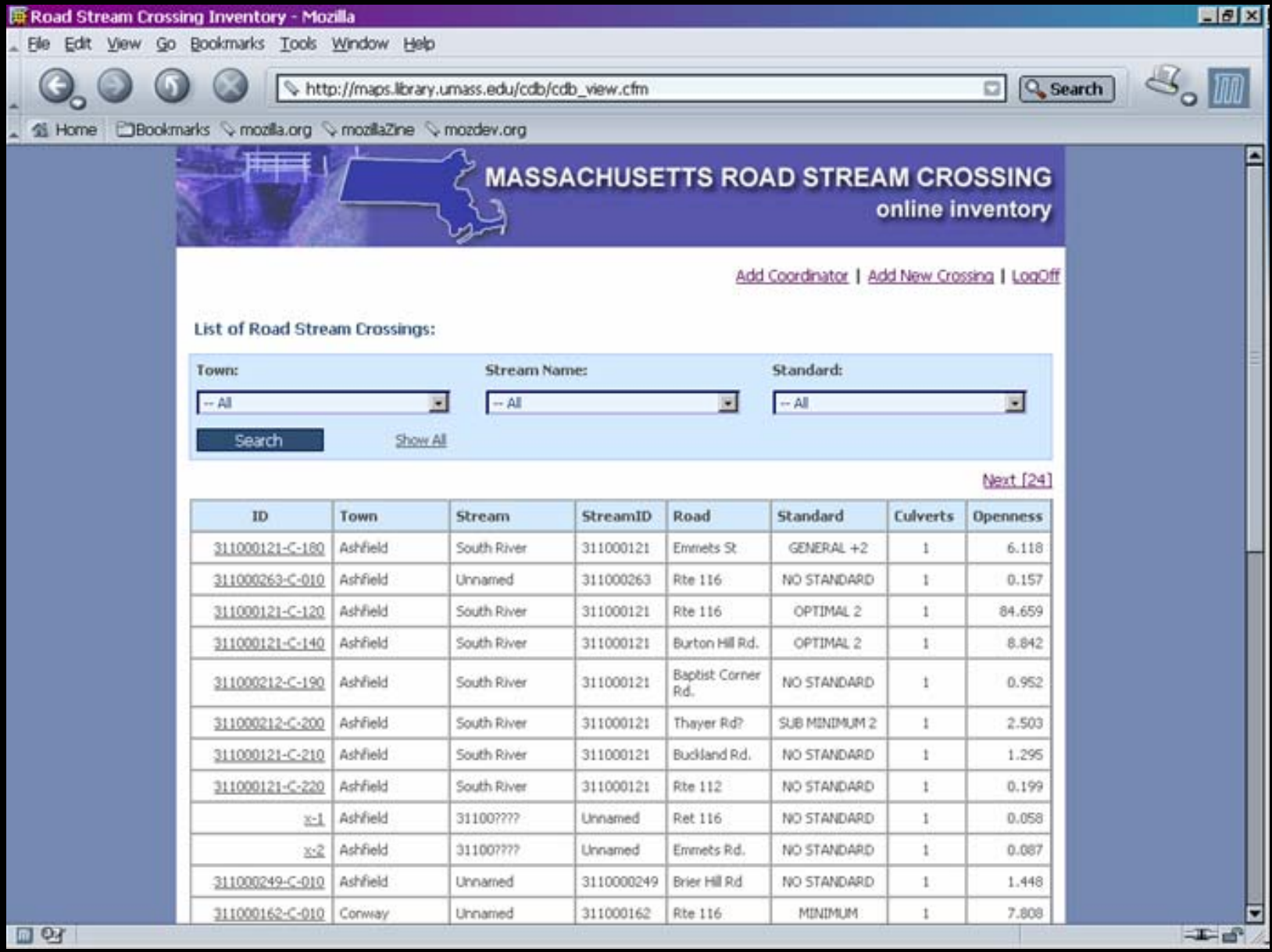
Crossing Type (from above): → 0 1 → 0 2 → 0 3 → 0 4 → 0 5 → 0 6 → 0 7 → 0 8 → 0 9 → 0 Ford

Upstream Dimensions (ft): A) → B) → C) → D) →

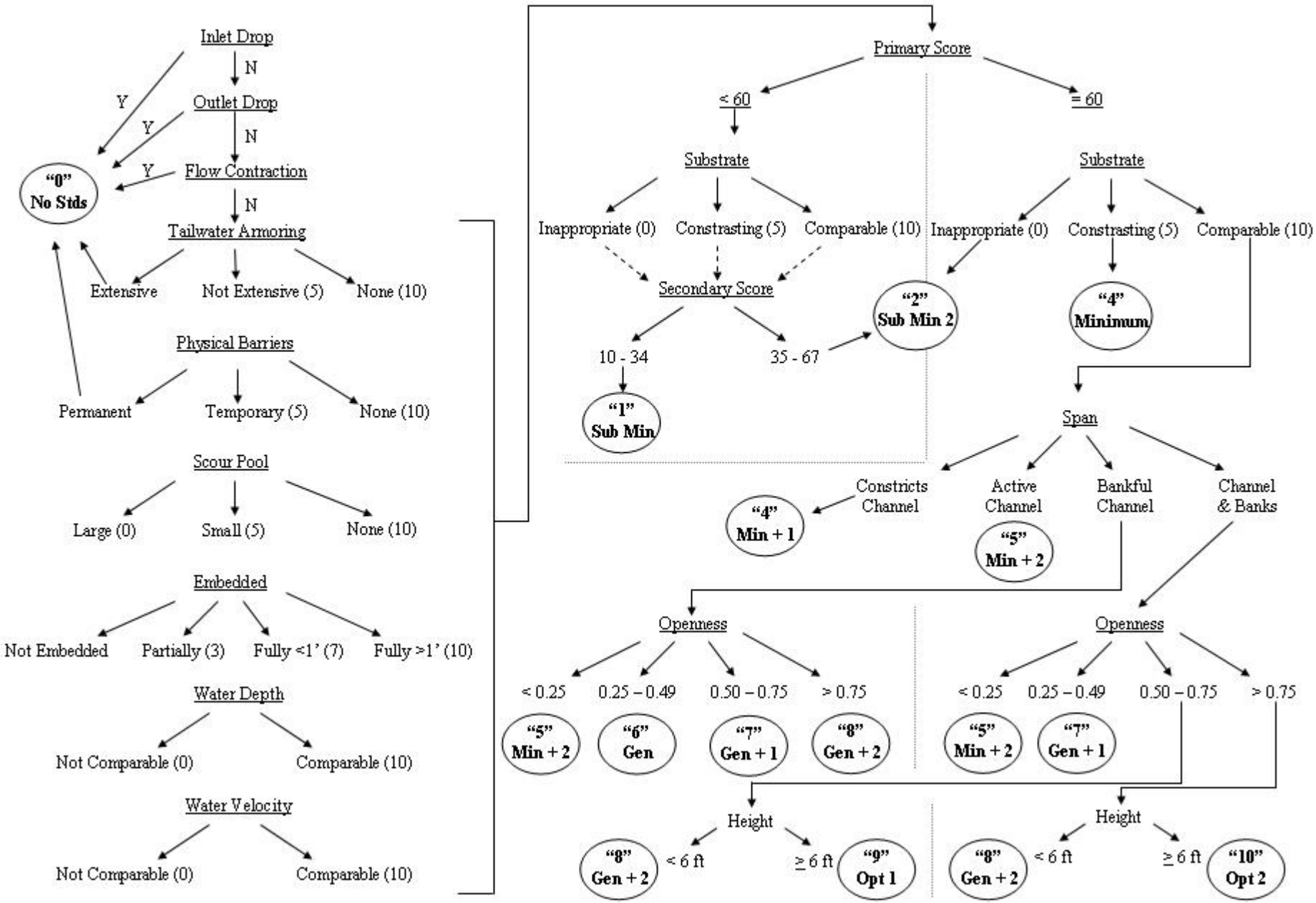
Downstream Dimensions (ft): A) → B) → C) → D) →

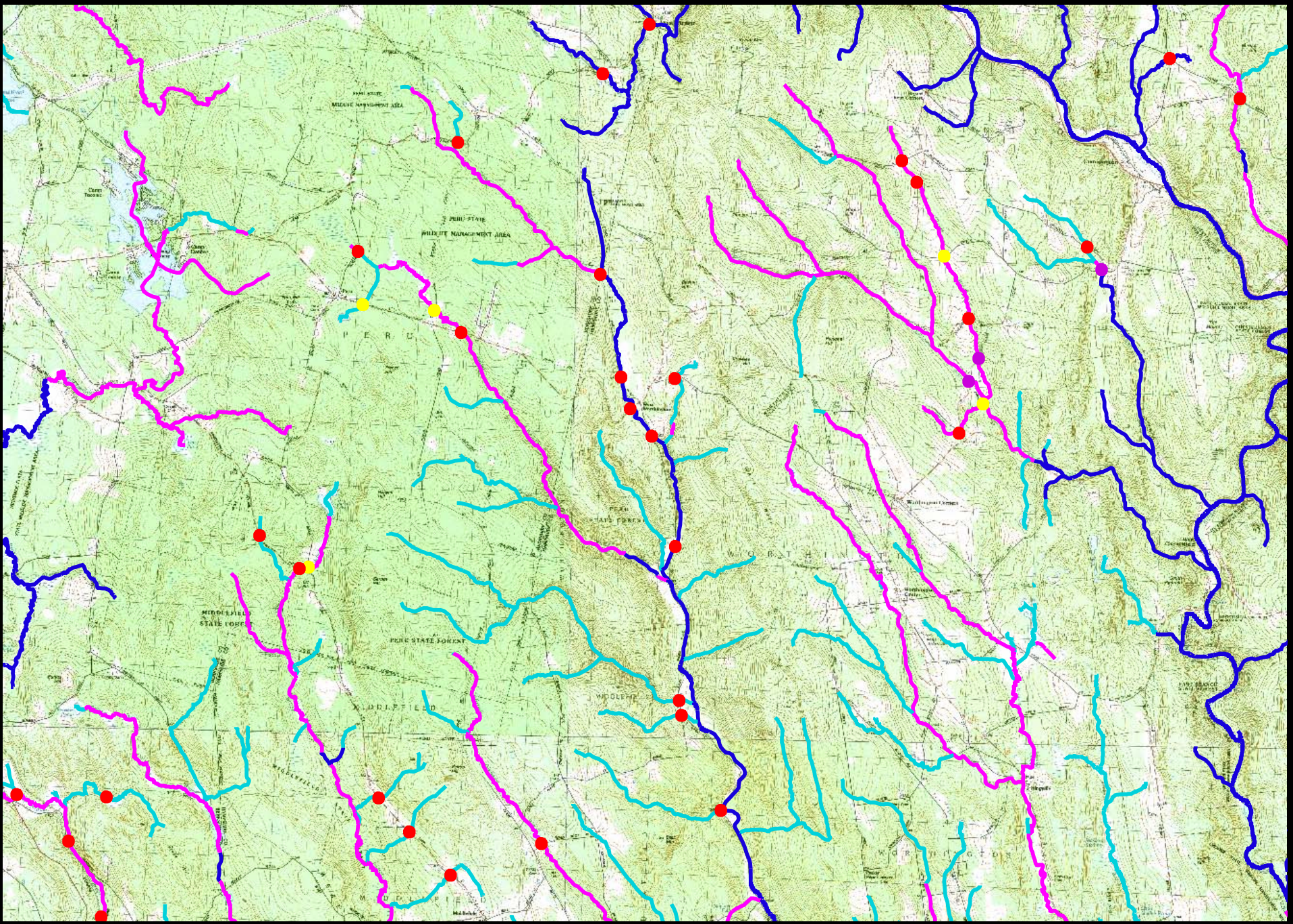
Length of stream through crossing (ft): →

Page Break


Road Stream Crossing Inventory - Mozilla
File Edit View Go Bookmarks Tools Window Help
http://maps.library.umass.edu/cdb/cdb_view.cfm
Search
Home Bookmarks mozilla.org mozillaZine mozdev.org
MASSACHUSETTS ROAD STREAM CROSSING
online inventory
Add Coordinator | Add New Crossing | LogOff
List of Road Stream Crossings:
Town:
-- All
Stream Name:
-- All
Standard:
-- All
Search
Show All
Next [24]
ID Town Stream StreamID Road Standard Culverts Openness
311000121-C-180 Ashfield South River 311000121 Emmets St GENERAL +2 1 6.118
311000263-C-010 Ashfield Unnamed 311000263 Rte 116 NO STANDARD 1 0.157
311000121-C-120 Ashfield South River 311000121 Rte 116 OPTIMAL 2 1 84.659
311000121-C-140 Ashfield South River 311000121 Burton Hill Rd. OPTIMAL 2 1 8.842
311000212-C-190 Ashfield South River 311000121 Baptist Corner Rd. NO STANDARD 1 0.952
311000212-C-200 Ashfield South River 311000121 Thayer Rd? SUB MINIMUM 2 1 2.503
311000121-C-210 Ashfield South River 311000121 Buckland Rd. NO STANDARD 1 1.295
311000121-C-220 Ashfield South River 311000121 Rte 112 NO STANDARD 1 0.199
x-1 Ashfield 31100???? Unnamed Ret 116 NO STANDARD 1 0.058
x-2 Ashfield 31100???? Unnamed Emmets Rd. NO STANDARD 1 0.087
311000249-C-010 Ashfield Unnamed 3110000249 Brier Hill Rd NO STANDARD 1 1.448
311000162-C-010 Conway Unnamed 311000162 Rte 116 MINIMUM 1 7.808

MA Crossing Structures Scoring System




PERU STATE
WILDLIFE MANAGEMENT AREA
PERU STATE FOREST
MIDDLEFIELD
STATE FOREST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