

# FISHERIES CONSIDERATIONS IN DOT PROJECTS – A COLLABORATIVE APPROACH CASE STUDY

*Amanda M. Saul, Connecticut Department of Transportation (CTDOT),  
Office of Environmental Planning, Newington, CT 06131*

*Brian D. Murphy, Connecticut Department of Energy and Environmental  
Protection (CTDEEP), Fisheries Division, Marlborough, CT 06447*





*For every 100 miles of stream –  
an average of 7 dams and 106  
roads interrupt migratory fish  
passage in New England*

*-The Nature Conservancy, 2012*



Image: MD-DNR



# DOT-DEEP FISHERIES COORDINATION



- 3,450 DOT inspected Bridges/Culverts over water
  - Numerous smaller/uninspected
- DEEP Fisheries Division reviews all DOT projects with in-water work
  - Identify fisheries resources and barriers to fish movement (perched culverts, shallow flows, velocity barriers, lack of diverse habitat, etc.)
  - Provide recommendations for preferred rehab option and habitat enhancement, passage restoration, or off-site mitigation options
- DEEP has conducted ~330 Reviews since 2011 (State and Municipal projects)



Image: J. Prosek



# DOT-DEEP FISHERIES COORDINATION



- DOT & DEEP work collaboratively on the design of passage restoration projects
  - Work directly with Designers on baffle/weir designs
  - Evaluate flows/velocities for suitability of passage during spawning
- DEEP Fisheries Staff works in the field with DOT Environmental staff during construction
  - Review and approve streambed materials
  - Provide oversight for the installation of enhancements
  - ~\$2.2 M in contract items for fisheries enhancements (10-15yrs)



Image: MD-DNR





## CASE STUDY:



# FISH PASSAGE RESTORATION - MARLBOROUGH

Twin - 6 ft. CMPs: 262 FT. at 4.5% slope under Route 2

- Outlet: Barrier due to drop/perch of 1½ ft.
- Inlet: Prone to clogging with woody debris.
- In-culvert issues: Seasonal excessive water velocities, shallow water, lack of roughness & velocity refugia.







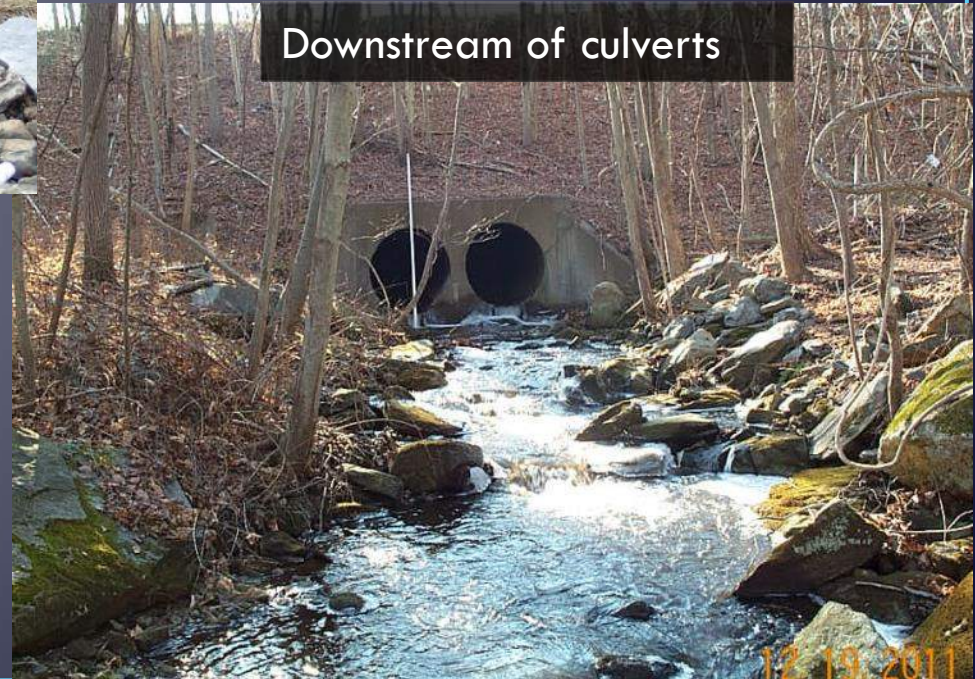
# STREAM HABITAT FEATURES

Upstream of culverts



- Steep gradient  $> 7\%$
- Large boulder step-pool habitats

Downstream of culverts



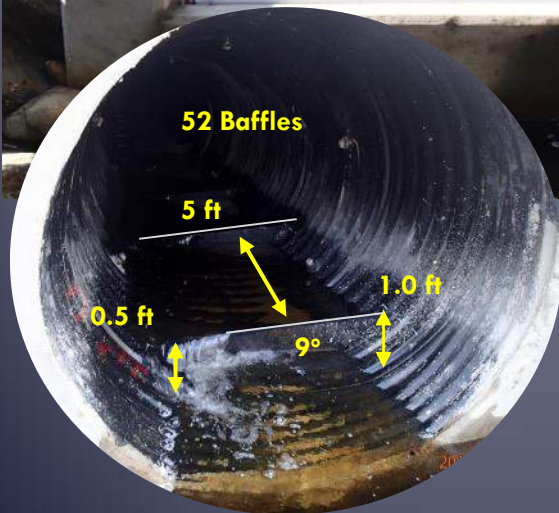
- Lower gradient  $2\%$
- Small boulder & cobble substrate: riffle/run/pool habitats



# DESIGN FEATURE: OUTLET CAST-IN-PLACE POOL/WEIR FISHWAY



- 29 feet long
- 6 pools/weirs at 4" drop/pool
- 3" backwater into culvert
- Weirs notched (2' x 1') with weir board slots
- Substrate installed on fishway floor



- Diversion wall to guide fish into fishway
- Holding pool below fishway







# INLET TRASH RACK & DIVERSION WALL



Hybrid Deflect and Collect Trash Rack to Minimize Debris & Maintenance in Baffled Culvert

Diversion wall: average daily flows directed into baffled culvert. Flood flows conveyed into both culverts.



## WHAT MAKES THIS PROJECT UNIQUE?

- MOA developed between agencies to support a 3 year fish passage study (2015-18) during fall spawning period.
- DOT purchased passive integrated transponder (PIT) equipment & provided to DEEP Fisheries Division (\$27k)
- Goal: Utilize study findings to assess fish passage performance & develop passage design features for future sliplining projects



R Jacobs





# PIT MONITORING: TAGGING PROTOCOL



- Tags: 12 mm x 2 mm
- Inserted into body cavity
- No anesthesia
- Tagged 155 fish (4-11 in. TL)





# FOUR ANTENNA LOCATIONS/ OREGON RFID SYSTEM



The receiver energizes a looped antenna creating an electromagnetic field.



Culvert Outlet



When a PIT tagged fish is detected by an antenna, the date, time, fish ID number and antenna number is recorded by the reader.



# MOVEMENT BETWEEN TRIBUTARY & MAINSTREAM LYMAN BROOK



- Conduct monthly fish location searches with mobile antenna system to track movements between mainstem and tributary/culvert



# RESULTS

- Fish Passage is Successful!
- 0.96 mi of additional habitat opened up because of the passage
  - Native Brook Trout populations upstream and downstream of the culvert are no longer isolated.

---

	<b>Upstream Movement</b>	<b>Downstream Movement</b>
2016	9 (22 events)	7 (18 events)
2017	3 (6 events)	3 (6 events)

---

- Fish that were tagged in tributary below culverts most likely to move upstream.
  - Generally little movement between mainstem and tributary, however there are exceptions of a few wide ranging fish.
- DEEP now monitoring depth/velocity readings at culvert baffle and entrance to characterize hydraulic conditions during upstream movements.



# RESULTS



NEST DISCOVERED OCTOBER 20, 2017 AT FISHWAY POOL #6  
FISH #302 & 486 (WATER TEMP. 52 F)





# CONCLUSIONS/FUTURE EFFORTS



PIT tag evaluation is helping to guide the design of fish passage features at future sliplining projects. While we are still learning, some take-aways are:

- Corner baffle design for round culverts has successfully passed Brook Trout.
- Install rebar trashracks - Culverts (<6 ft. dia.) are too small maintain
- Upstream Movement related to increased streamflow.
- Increased movement activity in early-mid October when trout searching for spawning areas.
- DOT State and Consultant Designers continue to collaborate with Fisheries to address fish passage at State bridge and culvert projects.



Image: MD-DNR