



Culverts and Climate Resilience

Photo credit: CTDOT

East Flat Hill Road over Transylvania Brook, Southbury, CT, before and after culvert replacement.

Culvert Introduction

Culverts are tubes, tunnels, large pipes or structures designed to channel water under roadways, railways and other pathways, allowing roads and transportation to be unaffected by waterflow passing beneath.

The Connecticut Department of Transportation (CTDOT) defines culverts as the following:

- A structure which is usually designed hydraulically to take advantage of submergence to increase hydraulic capacity.
- A structure used to convey surface runoff or a watercourse through an embankment.
- A structure, as distinguished from bridges, which is usually covered with embankment and is composed of structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert.
- Requires a structural design. In addition to its hydraulic function, it must also carry construction and highway traffic and earth loads.

Of the estimated 11,500 culverts in Connecticut, approximately 4,200 bridges and culverts are maintained by local municipalities with some state grant support. The average age of CT State culverts is 68 years old, and more than half of the ~20% that have been inspected so far are in good condition. However, changing hydrology and precipitation, increased development pressure, increasing temperatures or road use may mean older culverts are not adequate to handle flow loads from present and future severe storms. Culvert failure can lead to catastrophic road damage, flooding, erosion, property damage, disrupted transportation and in extreme cases, lead to stranded citizens with no access to emergency services. Past funding for culvert repair, rehabilitation, and replacement has been insufficient, meaning Connecticut's aging infrastructure creates a risk for injury, property damage and increased flooding as climate change intensifies storms in the region. Because culverts are susceptible to corrosion, abrasion and deterioration, inspections are necessary. While the Connecticut Department of Transportation has made culvert inspection a priority, many municipalities have not planned for culvert replacement or repair on a local level, leading to financial hardship when emergencies occur.

Bridges vs. Culverts

Culverts with a diameter of 6' and larger are considered bridge structures. Culverts smaller than 6' in diameter (<72" horizontal dimension for box culverts) are considered drainage culverts (CTDOT).

Climate Resilience and Culverts

Heavy rainfall events have increased over the last century, particularly in the Northeast. Development pressure and more impervious surface area can also increase runoff into waterways, creating rapid and larger volumes of water flow that quickly fill inadequate drainage systems, making it difficult for aging culverts to pass the additional water without damage or failure. Predicting which culverts are at risk for failure requires knowledge of culvert age, built engineering tolerances, maintenance status, and changing watershed characteristics. Across Connecticut, in just the past few years, we have seen increasing culvert failures leading to catastrophic events.



Connecticut Towns in Action

Woodbury, Connecticut

In the summer of 2024, the Woodbury region experienced the largest flood in the town's history. Extreme weather events like this effect everyone in the area as roads collapse, infrastructure is submerged in flood water, severe damage to crops and farmland occurs, and property is washed away. As information on neglected and outdated culverts and bridges arose, updates were advocated to the General Assembly. "With over 100 culverts assessed in Woodbury, over 20 of the culverts were classified as "severe barriers," which means aquatic life cannot get through, usually meaning there is limited to no water getting through the structure ((North Atlantic Aquatic Connectivity Collaborative-NAACC (Harwood, 2025))." The residents of Woodbury came together to support flooding solutions such as updated size and quality of culverts, to avoid costly repairs in the future as stormwater intensifies.

- **MS4-** The Town of Woodbury is registered under the CT DEEP General Permit for the *Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems*. As part of its registration, the Town is required to file an annual report of activities undertaken to meet the Minimum Control Measures specified in the Permit and in the Town's Stormwater Management Plan. Check out [Woodbury's Draft Stormwater Management Plan](#).
- Woodbury's MS4 Annual Report DRAFT is climate resiliency forward focused with their public education and outreach activities for the coming year concentrated on working "with the town to prioritize repair or replacement of the bridges and culverts through the lens of fish migration and climate resiliency and to seek grant funding in support of long-range infrastructure improvement projects in Woodbury."
- Woodbury also hired interns in 2024 that completed all remaining accessible road-stream crossing assessments (bridges and culverts) following North Atlantic Aquatic Connectivity Collaborative (NAACC) protocols to evaluate suitability for aquatic life passage.

Municipalities in urban settings are encouraged to think about culvert replacement priority within their jurisdiction with forward thinking climate resilience in their MS4 plans. Towns may receive direct funding which can be used for MS4 compliance. In addition, Connecticut's first, [The Eastern CT Stormwater Collaborative](#), formed in 2018, has set an example of communities coming together to share the costs of these initiatives.

Southbury, Connecticut

With a “build back better” attitude, the town of Southbury proved that building for the future instead of building back to pre-storm condition is money well spent. Just before the record 1,000-year storm hit the Southbury area in August 2024, a new culvert project was nearly finished. The rebuilt culvert performed well during Connecticut’s all-time 24-hour rainfall record in less than 12 hours. This catastrophic storm had no effect on the other upgraded culverts and bridges throughout town that had recently replaced outdated culverts. However, damage to most of the nonupgraded culverts and roads totaled an estimated \$91 million in municipal damages. Had the town not replaced and upgraded some culverts before the storm, damage costs would have been 20% greater. It is important to note that 90% of the flood damage from this storm occurred outside of a FEMA designated floodplain. This historic weather event was declared a major disaster and federal funding was requested and received in recovery support. Investing more in resilience and mitigation saves money and damages in the future as flooding and precipitation events accelerate in Connecticut.

What about the future?

As rainfall becomes more extreme, these changes have led to increasing river and stream flooding in the Northeast region of the U.S., making infrastructure planning a priority. The dated culverts across CT that were at one time adequate size, may no longer be equipped to handle the volume of more frequent flood and storm water. This makes them more prone to failure with an increased chance of private, municipal or state property damage, disrupted transportation, increased erosion, reduced water quality, localized flooding and damage to ecosystems.

Unfortunately, current modeling for precipitation is not precise enough to predict where heavier rainfall will occur in the state. While culverts can be built or replaced with climate resilience in mind, relying on historical data and budgeting may not be enough for what the future holds. At the same time, it may not be financially feasible to prepare for a worst-case scenario. A best strategy for municipalities is to map and assess locally maintained culverts, then evaluate conditions and plan budgets to replace those that are aging or currently inadequate. In 2025, the Connecticut legislature introduced Senate Bill 9, Sec. 10, which would require each municipality to annually submit a geospatial data file locating each bridge and culvert. Without upgrades to culverts, municipalities may spend more money rebuilding the same culvert multiple times as heavier storms become more frequent and inadequate culverts fail.



Mitigation saves!

"U.S. disaster losses from wind, floods, earthquakes, and fires now average \$100 billion per year, and in 2017 exceeded \$300 billion—25% of the \$1.3 trillion building value put in place that year (NIBS)." Strategies such as adopting and strengthening building codes, utilizing more stringent land use standards upriver, upgrading existing buildings and improving utilities and transportation systems, are affordable and highly cost-effective strategies that policymakers, building owners, and the building industry can utilize to reduce these climate impacts (NIBS).

New Connecticut Culvert Database

In March of 2025, the Connecticut Department of Transportation published an interactive map with open data to represent the State owned and maintained Stormwater Drainage Network across Connecticut. Among other interconnected drainage systems, culverts are included in this database. Municipalities and the public now have access to information such as location, water source, material makeup, conveyance type, diameter, length, date of last inspection, and maintenance activity on Connecticut's culverts. Municipalities can use this organized information to push for federal or state funding for culvert locations in need of repair or larger diameter replacement as climate change poses increased flooding challenges to aging infrastructure. Understanding culvert conditions paired with storm prediction information can aid municipalities in storm preparation such as advanced road closure in areas with already weakened culverts. Visit [Culverts | CTDOT Open Data](#) for information on culverts surrounding your town.

Funding

State

State Local Bridge Program

Construction and maintenance of local bridges and culverts is the responsibility of the towns who own them. Municipalities who seek funding for their locally owned bridges and culverts can apply for a grant through the CTDOT *State Local Bridge Program*. This program was created in 1984 as part of the State's Infrastructure Renewal Program. The State Local Bridge Program provides a cost-matching 50% reconstruction funding opportunity and has awarded more than \$129 million in grants for projects across Connecticut since 2016. While municipalities manage project design and construction, CTDOT provides guidance and oversees project milestones for the length of construction. To see more information on 18 recently funded projects visit [CTDOT Awards State Local Bridge Funding for 18 Projects in Connecticut](#).

Federal

Hazard Mitigation Assistance Programs

Eligible mitigation projects are funded through FEMA's *Hazard Mitigation Assistance Programs (HMA)*. The goal for these grant programs is to increase climate resilience and to protect life and property from future disaster, which can include upgraded culvert projects. Visit [Hazard Mitigation Assistance Program and Policy Guide | FEMA.gov](#) for the updated guide on project eligibility, and guidance on climate resilience.

The National Culvert Removal, Replacement, and Restoration Grant Program

With a cost sharing or matching requirement, *The National Culvert Removal, Replacement, and Restoration Grant Program (Culvert Aquatic Organism Passage (AOP) Program)* provides funding for the replacement, removal or repairment of culverts and weirs. This \$1 billion budgeted program is administered by the U.S. Department of Transportation in consultation with NOAA and the U.S. Fish and Wildlife Service. The focus of this program is to restore and improve anadromous fish passage, but climate resilience and sustainability benefits such as flood mitigation, increased ecological connectivity and strengthened local economies are added benefits. Eligible applicants for this federal funding include state, local and tribal governments. This multi-year funding opportunity allows project applications to be submitted through FY 2026. For more information on application deadlines, visit [Culvert AOP Program - Aquatic Organism Passage - Culvert Hydraulics - Hydraulics - Bridges & Structures - Federal Highway Administration](#).

More Information

Visit CTDOT's [CT Transportation Asset Management Plan Fact Sheet](#) to learn more quick facts on culvert inventory and conditions.

Visit the CTDOT [Drainage Manual](#) **Chapter 4: Culvert Repair, Materials and Structural Design** and **Chapter 8: Culverts** for more specific culvert information.

Visit the [Connecticut DOT Active Projects Dashboard](#) to track construction progress for various projects like culvert/bridge replacement.

Check out [FEMA's Fact Sheet: Drainage and Culverts](#) for culvert failure mitigation solutions and much more!

Check out [Governor Ned Lamont's 2025 Legislative Proposal](#) to strengthen resilience against extreme weather events. This proposal includes the requirement of municipalities to acquire the geolocation of culverts.

With a wildlife and habitat focus, visit the Habitat Conservation and Enhancement Program (HCE) for recommendations on culvert design and construction periods to best suit wildlife passage. Also available, a [Large Woody Debris Fact Sheet](#) with suggestions on how to not clog culverts and [Stream Crossing Guidelines](#) for recommendations on culvert modifications.

To track other culvert/drainage projects across the state, learn how the Naugatuck Valley Council of Governments (NVCOG) received a grant from [CTDEEP's Climate Resilience Fund](#) to upgrade culverts and drainage sites in 9 towns across NVCOG.



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