

The Role of Roads in Our Environment

Roads fulfill a strange category of communal property. Falling somewhere between the picturesque and the utilitarian, roads line our landscape as neither beloved parks nor proud historic monuments. We love them for their convenience and hate them for their inherent dangers. We embrace their ability to connect us, yet we admit that they also divide. We fund them mercilessly, but with the expectation that our children's children will still bear the burden of their continued maintenance.

Just like the forests we cut, the plastic we discard, and the water treatment plants we haven't fixed, the roads we build and maintain are an environmental issue. Road creep causes forest fragmentation, slope instability, water quality degradation, and habitat destruction. Roads also act as avenues for noise pollution, community division, and loss of local identity. And despite their long, winding, and often rural nature, roads are not wildlife corridors; one glimpse of roadkill reminds us of that.

Yet now we have realized that roads are also polluters. Road runoff and washouts, particularly from our scenic and historic backroads, are a source of sediment pollution that alters stream and river channels and carries excess phosphorous to Vermont's waters. The most visible consequence of this contamination is the blue-green algae that bloom in our state's lakes and ponds. Lake Champlain, the poster child of water quality degradation in Vermont, is no stranger to excess sediment and phosphorous originating in the fields and on the roads of the uplands of its main rivers and streams. Even in forested landscapes, backroads are the source of between 6% and 30% of sediment and between 2% and 11% of phosphorous transported by the Winooski River to Lake Champlain. That's a mathematical reminder of where roads go when the rains come: downhill and downstream.

Road foremen in small Vermont towns have always known this fact of gravity. Road crews dedicate days or even weeks of summer roadwork to rebuilding roads lost to the last rainstorm. Foremen know the "problem spots" in their towns, roads earmarked each year for repeated grading, hauling, and ditching.

In an effort to reduce both road erosion and town expenses, some cities and towns have turned to a program called [Better Backroads](#) for advice and funding necessary for cost-effective erosion control. The program's permanent fixes save towns money and reduce road-derived sediment bound for streams, rivers, and lakes. And now, new research from the University of Vermont is helping to make Better Backroads even more effective.

Better Backroads in Vermont

First, some history. Started in 1997 with the slogan "Clean Water You Can Afford," Better Backroads works with town officers and road crews to secure grants and technical advice for erosion control projects on unpaved roads. Now under the direction of the Vermont Agency of Transportation, the program continues to fund two types of erosion-control measures:

- road erosion inventories that help towns rank and estimate costs of road improvements that affect water quality, and;
- construction of any of the recommended "best management practices" on unpaved roads, including stone-lined ditches, check dams, plunge pools, properly-sized culverts, revetments, site-specific plantings, and waterbars.

Although staff at Better Backroads carefully monitor and approve the construction of their grant-funded roadwork, no one had evaluated how well they worked over the long term. As part of a three-year study on the

effects of road erosion on water quality, I conducted field assessments of 100 erosion-control structures at 43 different project sites. Results showed that erosion-control practices worked well for at least eight years. If maintained properly, they can last for over a decade.

My study compared the condition of the erosion-control projects to six environmental factors that could play a role in their effectiveness: project age, exposure to significant flood events, the extent of vegetation between the road and the structure, and the road grade, profile, and orientation across a slope. Among the study's other findings, I found that:

- Stone-lined ditches can provide a 90% reduction in sediment run-off. They remain effective until they capture enough sediment that the stones become buried, or until an extreme storm event dislodges the stones. Routine maintenance fixes this problem and quickly restores the stonework to its initial condition without complete ditch reconstruction.
- Properly-sized culverts effectively channel water under roads but malfunction more often than ditches, check dams, or swales. Large washouts can be avoided by keeping an eye on the most susceptible culverts: old ones on steep slopes.
- Revetments, or stonework used to stabilize cut hillsides, lakeshores, and river banks, remain completely intact for at least eight years. They are an effective use of funds intended to reduce road washouts, although hardened river shorelines do cause downstream bank erosion.
- Vegetative controls, such as grass-lined ditches, are effective when road grade is shallow and seeds can take root before a storm event. Strategically placed compost socks create dams within wide grass-lined ditches, increasing the longevity of ditchwork along low-slope roads by slowing stormwater runoff.



Vegetative controls can become compromised on steep slopes, as shown on this Calais roadside bank.

As the success stories of erosion-control roadwork spread around the state, more and more towns are being convinced to invest in their backroads. However, few road budgets have the additional money to spend on the time and materials needed to reduce erosion from their most problematic unpaved roads. To discover if towns might save money over the long term by spending it in the short term on erosion-control structures, I delved into the road budgets of five Vermont towns – Corinth, Huntington, Hyde Park, Waitsfield, and West Windsor – that have limited funds to maintain a network of unpaved roads in mountainous environments. Road foremen and town administrators shed light on how they spend their workdays on their paved and unpaved roads, and how the tasks at hand change with the seasons. Analysis of one year's worth of recent costs revealed that towns spend only 5% to 28% of their non-winter unpaved road budgets on constructing or repairing erosion-control structures, but spend between 12% and 70% of this same budget fixing repeating erosion-related problems each year. Spread out over their lifetime, these erosion-control management practices offer significant savings to towns that keep their backroads open year-round.

The Department of Environmental Conservation is using a carrot-and-stick approach to reduce excess phosphorous and sediment heading to state waters. Better Backroads is the incentive, but it may not be long

before towns with repeated road erosion problems are required to get state permits to correct the problem or do additional roadwork. Given the high cost of repairing backroads and the low availability of funds in many of Vermont's small towns, investments in erosion control may prove to be among the most cost-effective ways to clean up Lake Champlain.



Stone revetments stabilize both river banks and roadside banks in East Montpelier.

Stewards of Public Space. Most of us still use roads to go from here to there as quickly as possible. Long gone are the Sunday drivers. So on most major routes, there is little promise that we may learn to view roads as anything other than privileged surfaces. But we must. Whether or not the cleanliness of Lake Champlain is the ultimate goal of Vermont's road stewardship, it is time to re-envision the role of roads in our environment.

Although they are no longer romanticized, roads are still our public spaces. In a society that spends more time in cars than on foot, roads are some of our most popular shared lands. Maintaining their health and longevity carries more weight than almost any other public service, save perhaps schools and hospitals, neither of which are accessible without a road. If we forget that we are also environmental stewards of roads, we lose our chance to leave our state a little better than we found it. Immortalized on maps and in our taxes, roads, we've already agreed, are all but eternal, their legacy etched in dirt and tarmac across the landscapes we love. Being smarter in how we maintain them will ensure that the money we pour into them stays where it belongs: on the road, not in our waters.

Joanne Garton

[Joanne Garton is a 2015 graduate of the University of Vermont's Field Naturalist and Ecological Planning program. Her Master's project mined the archives of the non-profit Better Backroads and assessed how Best Management Practices have reduced road erosion and improved water quality downstream. She also examined how small road crews spend their time and resources on backroad maintenance, ultimately putting a price on road erosion control and repair in five case study towns. Her work will help both towns and the Vermont Agency of Transportation determine how to efficiently fund compliance with road and bridge standards and flood readiness.]

For information and assistance on water quality issues associated with municipal road erosion, contact Milly Archer, VLCT's Water Resources Coordinator, at marcher@vlct.org.