

# Research & Policy Brief Series

## Re-plumbing New York State's Roadside Ditches: Identifying a Critical Role for Decision-Makers

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### What is the Issue?

The quantity and quality of New York State's (NYS) water resources have significant consequences for our economy, community well-being, and overall environmental sustainability. Recent analysis has highlighted the critical role that roadside ditches play in flooding, water pollution, and stream dry-outs. In NYS, networks of ditches crisscross the landscape, intercepting runoff from adjacent watersheds, rapidly shunting it farther down in the stream channel network where it is discharged as a high velocity faucet<sup>1</sup>. These inputs increase the magnitude of stream heights and peak water discharges by as much as 300 percent, contributing to flooding. Ditches are also highly efficient and rapid conduits of sediments, nutrients, de-icers, and fecal coliforms from adjacent land activities to downstream drinking water supplies<sup>2</sup>. Ditches are a significant source of sediment to streams and lakes when highway staff overscrape them and leave the bottom substrates exposed and unvegetated. As pressures from climatic extremes increase, the need for more thoughtful management of water resources and the role of roadside ditches is essential.



Municipal decision-makers are on the front lines of managing water purveyance infrastructure, and specifically the networks of roadside ditches under their jurisdiction. Our research is interested in how NYS currently manages its roadside ditch network. This issue is particularly relevant given the Chesapeake Bay Program's (CBP) recent adoption of roadside ditch practices as a credible strategy for reducing pollution<sup>3</sup>.

### Our Study

Our project objectives included 1) assessing the current status of roadside ditch management among NYS town and county highway staff, 2) identifying factors possibly impeding the improvement of these practices, and 3) suggesting policy recommendations that can help NYS address these impediments. We surveyed town and county highway managers across NYS in 2014, employing online and postal distribution methods with four successive contact efforts. We asked 82 questions about responder responsibilities, ditch management practices, perspectives, availability of resources, and

training. Of the 941 town highway representatives and 58 county highway representatives we initially targeted, 408 responded (45.8% via mail, 54.2% via online).

There was good representation across NYS with 56 of 57 counties represented by one or more respondents. Of the 84% who were elected officials, half had held their position for eight or more years while one third had been in their current position for four years or less. On average, each highway manager was responsible for maintaining 84 miles of road with associated roadside ditches miles averaging 98 miles, but this ranged widely, up to a maximum of 1,080 miles. Ditch management constitutes a significant part of the work effort for most highway departments. Forty percent reported that 25-49% of their total work hours were devoted to ditch maintenance, and 16% noted that their staff dedicated more than half of their time to ditches.

### Condition of NYS ditches and management practices

Protecting downstream water resources does not seem to be a priority within current NYS roadside ditch management practices. Most respondents indicated that few or none of municipal ditches discharge into infiltration basins or any type of green infrastructure. While 35% reported that more than half their ditches discharge straight to streams, the majority (65%) reported that less than one quarter of their municipal ditches did so. This was surprising, and counter to our findings in central New York where on-the-ground mapping indicated 63% of all ditches discharged into streams. However, over two-thirds of respondents said they would consider redirecting existing ditch water outflow away from surface water sources and into infiltration basins or similar structures, citing reducing sedimentation and pollution, and improving water quality as their main motivations. Perceived costs, time, equipment, and the space needed to make such changes were the primary reasons provided by those not considering redirecting ditch water outflow.

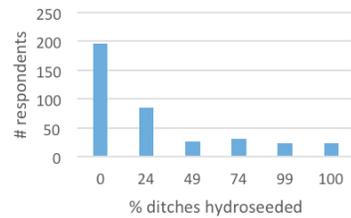
In order to move stormwater out of the landscape, roadside ditches need to be maintained and cleared. The methods most frequently used by highway managers (73%) to "clean" all or parts of the ditch involves scraping out the ditch substrates with a backhoe or rubber-tired excavator. About half (49%) of highway managers report scraping once every 1-4 years. While this practice removes accumulated debris, soil and plant roots are also removed, leaving the exposed soil vulnerable to the next storm event. Re-seeding can help counteract some of the negative impacts of scraping by facilitating plant regrowth, although 50% of survey respondents do not reseed immediately following ditch cleaning. In fact, only one in five reported that even a quarter of their ditches are hydroseeded immediately after cleaning (Fig. 1). Maintaining vegetative soil cover in ditches was a priority for just

1 Buchanan, B.P., Z.M. Easton, R.L. Schneider, M.T. Walter. 2013. Modeling the hydrological and water quality impacts of roadside ditch networks on receiving waters. *Journal of Hydrology* 486: 293-305.

2 Falbo, K., R.L. Schneider, D.H. Buckley, M. T. Walter, P.W. Bergholz, and B.P. Buchanan. 2013. Roadside ditches as conduits of fecal indicator organisms and sediment: implications for water quality management. *Journal of Environmental Management* 128: 1050-1059. doi: 10.1016/j.jenvman.2013.05.021.

3 Chesapeake Bay Program. 2016. Re-plumbing the Chesapeake Watershed: Improving roadside ditch management to meet TMDL water quality goals. [http://www.chesapeake.org/pubs/349\\_Boomer2016.pdf](http://www.chesapeake.org/pubs/349_Boomer2016.pdf)

FIGURE 1:  
% of Scraped Ditches  
that are Hydroseeded  
Immediately



over half (52%) of the respondents. Those interested in maintaining vegetative soil cover identified erosion and pollution control as priorities, along with complying with environmental regulations. Those who did not prioritize maintenance of vegetative soil cover listed time and expense as limiting factors, along with the lack of precedents or incentives. Only 15% of respondents use mowing as their main management strategy, typically mowing more than once per year.

## Barriers to Change

Highway managers face many challenges with ditch maintenance. Insufficient critical “resources” was identified as the biggest challenge for 290 respondents, further described as “time” (n=107), “manpower” (n=53), “money” (n=31) and “equipment” (n=22). A second challenge, identified by 55 respondents, concerned interactions with landowners voicing objections to various ditch activities or right-of-way (ROW) requirements. A small number (n=15) of managers mentioned weather and the increase in severe rains as a growing problem. Several noted the difficulties that arise from unannounced changes in farm drainage, i.e. by tiling, which are deliberately coupled to the roadside ditch network. Limited training and access to expertise was not perceived to be a problem. NYS highway superintendents largely rely on their Soil and Water Conservation District staff, the Cornell Local Roads Program (CLRP), and other highway departments for assistance. The annual Highway School offered by the CLRP and the Association of Towns of the State of New York was highly ranked for providing valuable training.

## Local and State-Level Policy Recommendations

This assessment identifies several critical issues that underscore the importance of improving roadside ditch management across NYS. From the survey responses and subsequent analyses we offer several strategies for NYS highway managers. First, we find that ditches throughout the State are in overall fair to poor condition, with roughly half being scraped at frequent intervals and left unvegetated. This translates to thousands of miles of exposed substrate vulnerable to storms, acting as a source of sediment and pollution to our drinking water supplies. There has been little to no adoption and implementation of green infrastructures, such as bioswales or constructed wetlands, to help mitigate these stormwater impacts.

**Recommendation: At the minimum, ditches should be hydroseeded as soon as possible after cleaning, with mowing replacing scraping as the primary mode of maintenance. Green infrastructure should be adopted wherever feasible. Cleaning should be limited to removing as little material as is needed to meet the drainage needs of the highway.**

Second, we find that entrenched practices, isolated and localized administrative systems, and limiting resources are perpetuating

the poor management of roadside ditches. The vast majority of highway supervisors are elected positions, and therefore dependent on the support of local citizens to keep their jobs. However, most residents are unaware of the impacts that ditch practices have on pollution, flooding or other water issues. Highway departments are further constrained by their limited budgets from which to cover multiple responsibilities, e.g. repairing potholes, clearing snow, as well as ditch maintenance. Although the State provides comprehensive guidance on stormwater and ditch management (NYSDEC Stormwater Management Design Manual), these are recommendations, not requirements, and rarely are the associated expenses covered. In addition, with frequent turnover of highway department personnel, scraping ditches often becomes the simple, default solution. These findings emphasize the need for scaling up of policies, greater oversight, and for engaging upper level decision-makers in order for roadside ditch management to be an integral component of NYS’s ongoing programs in community resilience, smart-growth, climate change adaptation, and water resource management.

**Recommendation: A comprehensive state-wide program is needed to improve ditch management, involving a complete toolbox of strategies from financial support and training to regulatory mandates and penalties. Incentives to improve ditch management (in the form of grants, funding, shared services) should be offered by state agencies in collaboration with local agencies.**

Initiating a program of ditch mapping as the foundation for highway asset management would also address several issues. There were surprising inconsistencies in respondents’ awareness about how much their ditches actually discharge into streams. We hypothesize that with limited time and resources, highway staff necessarily focus only on their own jurisdictional issues, as defined by municipal borders, which would amplify their perception of ditches as isolated and disconnected from a larger interconnected network of extended ditches and stream channels.

**Recommendation: Agencies should inventory roadside ditches as part of a comprehensive infrastructure and stormwater assessment, and work cooperatively among state, county and town agencies to incorporate these assets into a GIS-based mapping system as the basis for improving management.**

These maps would highlight the interconnections with the stream and other jurisdictions, would provide a useful tool for optimizing, prioritizing, and documenting ditch maintenance, and institutionalize a management program that is less vulnerable to high staff turnover. The maps could also provide a powerful tool for encouraging cross-agency communication. County agencies, such as Soil and Water Conservation Districts or highway departments, could take the lead responsibility for this mapping initiative, taking advantage of computer resources already available, and work closely with municipal highway staff.

Finally, it is essential to educate private landowners across NYS about the key roles that town highway staff play in the management of our water resources, particularly as extreme weather events become more frequent. Valuing highway department managers as water stewards and supporting the improved management of roadside ditches would provide an important new mechanism for protecting New York’s valuable water resources.

