

SECTION 7 ROADS

Goal: Navigate toward better roadway drainage.

- Recognizing the significant impacts that transportation systems have on the landscape and water resources, promote improved practices for designing new roads, managing road and railroad drainage, improving stream crossings, and preventing erosion.

CHALLENGE

The Upper Susquehanna and Chemung Watersheds have more than 15,000 miles of public roadways and untold additional miles of private roads and driveways. This extensive road network and the associated roadside drainage systems can have significant impacts on drainage patterns, water quality, and flooding. Paved and compacted road surfaces prevent water infiltration into the underlying soil. Roadside ditches capture water running off the road surface and also drainage from uphill areas. This concentrated drainage tends to erode ditches, banks, outfall areas, and the road itself, particularly if soils are exposed. Approximately 30 tons of material can be eroded from a mile of ditch before the damage can be seen. In addition to the maintenance headaches arising from this concentrated flow along roads, increased erosion contributes sediment and other pollutants to receiving waters. The water in roadside ditches also tends to reach streams quickly, contributing to increased peak flows — which means increased flooding and destabilized stream channels. Because less water soaks into the ground, this can also result in increased susceptibility to droughts, decreased base flow in streams, and impaired in-stream habitat.



Photo by Penn State Center for Dirt and Gravel Roads.

Streams and roads are closely related in the Susquehanna-Chemung region. As a result of the hilly terrain, many roads follow the streams, often resulting in threats to both the road (from erosion or flooding) and the stream (due to reduced floodplain capacity). Stream-road crossings frequently contribute to stream instability due to channel alterations and loss of floodplain flow. Maintenance activities, such as dredging, that are intended to protect this infrastructure may destabilize the stream and make problems worse.

The watershed has:

- 15,600 miles of road
- 14,100 miles of stream

The extensive network of roadside ditches and other drainage structures provide numerous conduits that can convey sediment and other pollutants (deicing materials, etc.) directly into streams. The resulting water quality impacts are most pronounced when soils are exposed, enabling erosion of sediment from the ditches, slopes, and un-stabilized outfall areas.

Stabilizing road ditches and road banks is a local priority, not only to minimize stream pollution, but also to improve highway safety, prevent washouts, and reduce maintenance expenses. Every year, the most serious roadway erosion problems are addressed by implementing drainage improvement and soil stabilization projects. Unfortunately, the problem areas typically exceed the resources available for restoration. And new erosion problems continue to develop. This highlights the need for improved maintenance practices and “re-build smarter” policies. In the long run, it is less costly to prevent erosion problems than to fix them.

Public roadways are maintained by numerous municipal, county, and state highway departments. These public entities have access to training and technical assistance from the Cornell Local Roads Program, County

Soil and Water Conservation Districts, and other sources. However, they often lack the resources and experience needed to implement recommended management practices. Additional drainage concerns arise on private roads and driveways, for which financial considerations may be compounded by limited knowledge about roadway management practices. The anticipated expansion of the natural gas industry may provide additional resources for improving roads (to support the industry's transportation needs), but is also likely to result in construction of many new roads, with the associated impacts on rural landscapes and water resources. Sustainable design, construction, and maintenance thus pose ongoing challenges for roads and driveways throughout the watershed.

RECOMMENDATIONS

Although there are many issues associated with the road system, the following action recommendations focus on improved drainage, reduced erosion, and improved water quality. Highest priority is given to those practices that protect and enhance the watershed's lakes and streams, while saving money in the long run through reduced maintenance expenses. Recommendations related to stream crossings and stream management issues are addressed in Section 4.

Drainage: Maintain and improve roadway, driveway, and railroad drainage systems, with increased use of practices that disperse water, rather than concentrating flow. Spreading out the water also slows it down, which reduces the potential for erosion and flooding.

- 7a. Map and inventory highway drainage infrastructure. Use this information as the basis for routine inspection of all drainage structures, documentation of problems, records of maintenance/repairs, and prioritization of improvement projects.

Immediate action: Building on existing information (such as data available through the NYS Department of Transportation (NYS DOT), culvert mapping conducted for the STC region, and Highway Management Plans developed for Delaware County towns), provide municipal and county highway departments with technical assistance to develop inventories and maps of drainage structures (culverts, bridges, storm sewers, and other infrastructure).

Immediate action: Using infrastructure inventories and existing resources (such as the database format developed by STC), provide municipal and county highway departments with technical assistance to improve recordkeeping for routine inspection, maintenance, and repairs to drainage infrastructure. These records can be used to verify that all structures are routinely inspected, schedule routine work, and prioritize drainage improvement projects.

Measure: Number of highway departments receiving technical assistance.

- 7b. Promote increased implementation of drainage improvements, with an emphasis on preventing problems (rather than just making repairs) and utilizing strategies that disperse and slow down runoff from roads and surrounding areas. When appropriate, involve Soil and Water Conservation District (SWCD) staff or professional engineers in project design. (Chapter 8 of the NYS DOT Highway Design Manual concentrates on drainage.)

Immediate action: Provide training and technical assistance on roadway drainage issues for highway department staff and industries involved in road construction and maintenance. Topics include: drainage solutions, off right-of-way issues (for managing water entering and leaving the right-of-way), strategies for reducing impervious surfaces, drainage law, and roadway standards.

Immediate action: Implement road drainage demonstration projects that



Courtesy of Steuben County Emergency Management Office.

provide local examples of the benefits (and limitations) of new or innovative management practices. Potential demonstration projects include: grade breaks (to force water to flow off of the road), French mattresses (instead of a cross pipes), and eliminating ditches (by removing berms, changing the road slope, or elevating the road).

Immediate action: Following federally-declared flood disasters, provide highway departments with information about mitigation opportunities through FEMA's Public Assistance program (Section 406 Mitigation), which enables funding to improve damaged features during the repair. Encourage departments to look for mitigation opportunities and request funding for improvements, such as increasing the size of a damaged culvert or including wing walls.

Immediate action: Promote improved driveway drainage by distributing educational materials (such as the "Building a Rural Driveway" handout developed by STC) and providing technical assistance. Assist interested municipalities with development of regulatory language regarding drainage from driveways and private roads (including logging roads).

Immediate action: Support county-led efforts (by natural gas task forces and others) to develop and implement strategies for requiring the gas industry to maintain and improve roadway drainage when they are involved in construction of new, improved, and repaired roads. Provide information and assistance to local highway departments, including options for road condition assessment, road use and repair agreements, road protection ordinances, posting and bonding roads, and adopting an industrial driveway permitting system.

5-year target: Seek funding to enable increased training, technical assistance, research, and project funding for roadway drainage projects. Project funding should supplement that currently available through the state Consolidated Highway Improvement Project System (CHIPS), which is not sufficient. Pennsylvania's Dirt and Gravel Road Program may serve as a model program.

5-year target: Seek funding to develop model culvert and ditch standards that can be adopted by municipalities. Distribute to all municipal governments in the watershed.

Measure: Number of workshops. Number of municipalities utilizing road use agreements or adopting road protection ordinances. Number of roadway drainage improvement projects.

Erosion Control: Utilize roadway maintenance practices that prevent erosion. Implement stabilization projects to correct existing erosion problems and sediment management practices where needed to prevent sediment pollution.

7c. Conduct periodic assessments of road bank and road ditch conditions to identify and prioritize unstable sites. Maintain inspection results in geo-referenced databases.

Immediate action: Seek funding for interns to conduct road bank and road ditch assessments and enter data into a GIS database. Train interns and highway department staff on assessment methodology and documentation procedures. Prioritize documented problem areas based on soil erosion estimates and other criteria.

Long-range target: All public and private roads are inspected for erosion problems every three years by trained staff. Permanent erosion control structures and known erosion hot spots are checked more frequently. These inspection results are used to prioritize implementation measures.

Measure: Miles of roadway assessed.

7d. Adopt maintenance practices that reduce the potential for erosion of roadside ditches, culvert inlets and outfalls, unpaved road surfaces, and adjacent areas.

Immediate action: Provide highway department staff with training and technical assistance on erosion and sediment control. This should include the 4-hour contractor training (for the NYS Stormwater Construction permit), as well as topics related directly to roads, such as maintenance of drainage ditches, road grading, and road surface materials.

Immediate action: Provide highway departments with resources and training about beneficial roadside trees that provide bank stabilization benefits versus those that pose a threat due to the potential for fallen branches and blow downs.

Immediate action: Expand existing SWCD programs that assist municipal and county highway departments with establishing protective vegetation on disturbed soils. This assistance can include: hydroseeding, loaning equipment, providing manpower, and discounted price on seed. (Many districts already provide this assistance, but additional funding is needed to expand these programs.)

Timely re-vegetation of road ditches and banks is the single most effective deterrent to water pollution originating from roads and road ditches. Vegetation slows the flow of water, consumes water, encourages infiltration, and anchors the soil.

5-year target: Monitor demonstration areas where environmentally sensitive maintenance practices have been used and document the effectiveness and long-term costs compared to traditional maintenance practices. For example, are the increased cost and labor required to seed and mulch ditches after cleaning offset by reduced cleaning frequency? Provide assistance as needed so that each highway department can evaluate costs and benefits within their own operations to determine which erosion control practices pay for themselves and what extra costs are warranted due to the environmental benefits.

Measure: Number of training events. Number of municipalities receiving assistance. Number of demonstration sites monitored for performance and cost.

- 7e. Promote roadway improvements and stabilization projects that prevent erosion and reduce sediment transport into waterways. When appropriate, involve SWCD staff in project design.

Immediate action: Implement erosion control demonstration projects that provide local examples of the benefits (and limitations) of new or innovative management practices. Potential demonstration projects include use of geotextile products in road ditches and driving surface aggregate with the particle size distribution developed by Penn State's Center for Dirt and Gravel Road Studies (to evaluate the local cost and effectiveness of this product and work with local gravel companies to provide it).

5-year target: Seek funding to enable increased training, technical assistance, research, and project funding for roadway erosion control projects. (Existing CHIPS funding is not sufficient.) Pennsylvania's Dirt and Gravel Road Program, which ties project funding to training, may serve as a model program.

Measure: Number of stabilization and erosion control projects. Number of demonstration projects.

Downstream Water Quality: Implement and document cost-effective measures that reduce the pollution loads delivered to the Chesapeake Bay. Quantify load reductions for incorporation into the Chesapeake Bay Watershed Model. Roadway Best Management Practices (BMPs) may represent an important opportunity for cost-effective projects that benefit both the Bay and local roadway drainage.

- 7f. Promote implementation of roadway drainage improvements and erosion control practices that support Chesapeake Bay restoration objectives and contribute to New York's sediment and nutrient load reductions for the Chesapeake Bay TMDL (such as bio-retention and infiltration).

Immediate action: Provide the research support needed to evaluate the nutrient and sediment reduction associated with potential improvements in the design and of maintenance practices of roadside drainage. Work with EPA to integrate this information into the Chesapeake Bay Watershed Model.

Immediate action: Develop and implement a strategy for documenting roadway drainage BMPs for incorporation into the watershed model.

5-year target: Develop funding opportunities for roadway drainage projects that provide nutrient and sediment reductions for the Chesapeake Bay TMDL.

Measure: Number of studies. Number of roadway BMPs reported to the Chesapeake Bay Program and the pounds of nitrogen, phosphorus, and sediment reduction credited for these practices.

- 7g. Promote increased street sweeping to remove contaminants that would otherwise be washed into waterways. Document the miles and frequency of sweeping for incorporation into the Chesapeake Bay Watershed Model.

Immediate action: Develop a system for documenting street sweeping of paved roads and parking areas throughout the watershed for reporting to the Chesapeake Bay Program.

5-year target: Explore opportunities for sharing equipment and other strategies for encouraging increased sweeping of paved roads and parking areas.

Measure: Miles of road sweeping documented and reported to the Chesapeake Bay Program.

Chemical and Waste Management: Prevent pollution through responsible use, storage, and disposal of hazardous substances, chemicals, waste, and other materials.

- 7h. Select and use deicing materials in a manner that minimizes environmental impacts without compromising safety.

Immediate action: Provide highway department staff with snow and ice management training, including: procedures for determining the most cost effective chemical application rates (based on weather and pavement conditions), use of calibration devices, alternative deicing materials, disposal strategies for accumulated snow (discourage dumping into surface waters), and guidance for identifying environmentally sensitive areas where alternative practices (such as sand or gravel) are recommended.

Measure: Number of training events.

- 7i. Store road salt and other deicing materials in structures that prevent contact with stormwater and are located outside of flood-prone areas.

Immediate action: Seek funding to construct salt barns for those highway departments that currently store deicing materials in open locations. Consider shared services for the storage of salt and seek funding through the NYS Department of State shared services grant program to fund construction of shared facilities.

Long-range target: Eliminate outdoor storage and loading of road salt and other deicing materials.

Measure: Number of outdoor salt storage practices eliminated.

- 7j. Minimize roadside dumping and the use of environmentally harmful substances along roadways.

Immediate action: Provide highway departments with training and technical assistance on environmentally sound practices for weed management, pest management, dust control, bridge cleaning, and other roadway maintenance activities.

Immediate action: Provide public recognition of Adopt-a-Highway volunteers (through news reports, newsletters, signage, or other means).

5-year target: Distribute to counties and MS4 municipalities examples of anti-litter campaigns, local litter and dumping laws, and local Adopt-a-Highway programs (such as that in Steuben County).

Measure: Number of training events. Number of publications or news reports providing public recognition of volunteers. Number of counties and municipalities receiving information.

- 7k. Incorporate pollution prevention strategies into daily operations of highway department facilities. This is part of the "stormwater good housekeeping" requirement for regulated MS4 municipalities. It encompasses vehicle washing, fueling, vehicle maintenance, chemical storage, waste disposal, and stormwater runoff.

Immediate action: Provide training and assistance with facility self-audits to identify opportunities for improved pollution prevention practices at highway garages. Share self-audit forms for MS4 Good Housekeeping programs (such as that developed by the Chemung County Stormwater Coalition) with other MS4s and rural municipalities.

5-year target: Seek funding to implement facility and operational improvements identified during highway department self-audits.

Long-range target: All municipal and county highway departments conduct periodic self-audits of highway garages to assess the potential for pollution and incrementally implement improvements as resources permit. The recommended Best Management Practice is to perform a self-audit twice a year, once prior to summer operations and once prior to winter operations. (NYS DEC requires each municipality operating under a MS4 Permit to perform a self-audit once every three years.)

Measure: Number of training events. Number of MS4s that conduct self-audits more frequently than required. Number of self-audits by rural highway departments.