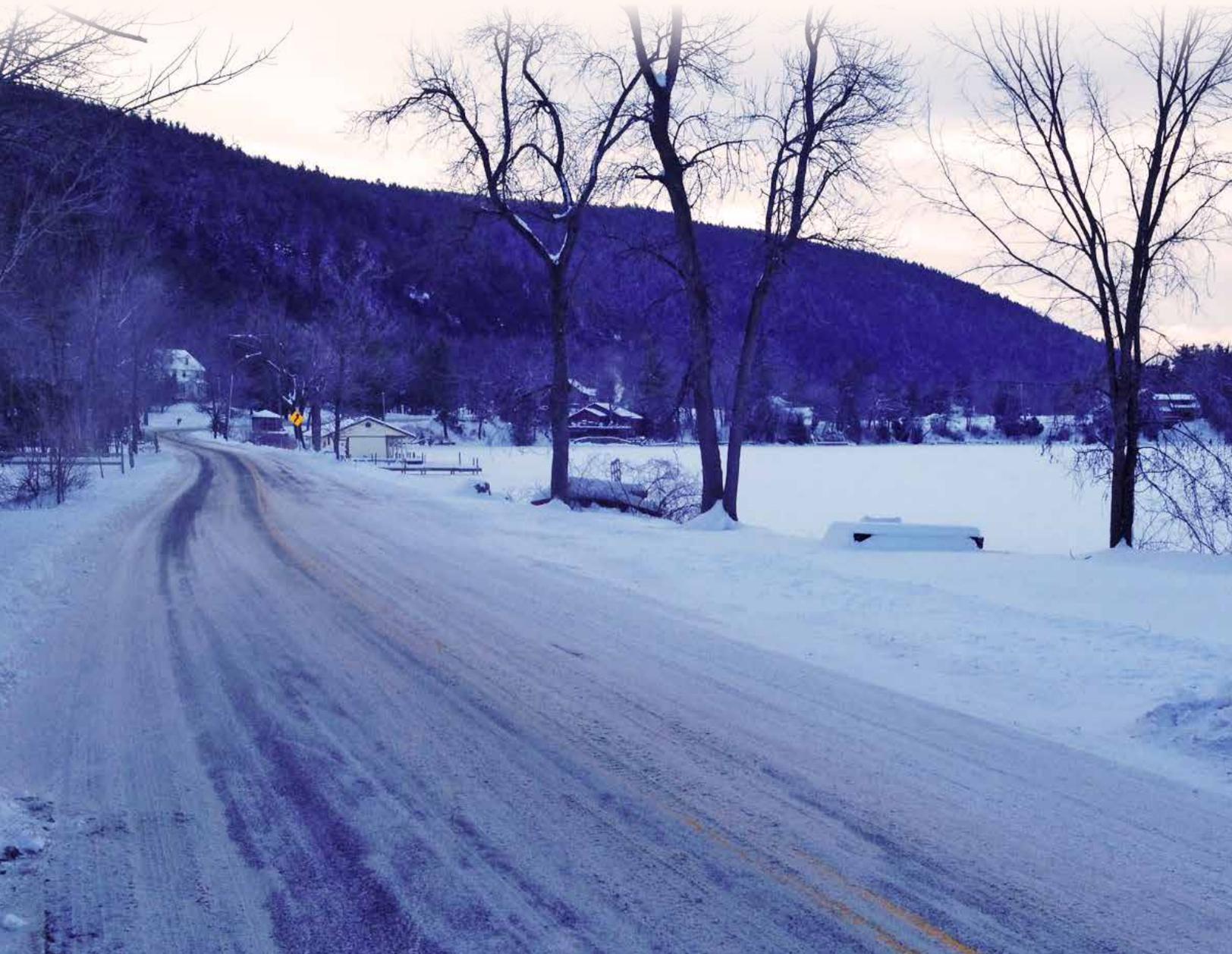


Lake George Winter Road Maintenance Best Practices Initiative for Water Quality Protection



March 2014

The Lake Champlain-Lake George
Regional Planning Board *and*
The Lake George Association



The Lake George Association (LGA) is a 501(c) (3) non-profit membership organization dedicated to protecting, conserving and improving the beauty and quality of Lake George. Founded in 1885, the LGA is the oldest lake protection organization in the U.S and the leading citizen group responsible for the protection of Lake George. The LGA strives for a balanced approach to conservation and land development, ensuring a healthy future for Lake George, both environmentally and economically.

The Lake Champlain-Lake George Regional Planning Board (LCLGRP) is one of ten regional planning and development organizations operating in New York State. The LCLGRP covers the five counties of Clinton, Essex, Hamilton, Warren, and Washington. Created in 1967 as a development organization operating in New York State under Article 12-B, Section 239b of the General Municipal Law, the mission of the LCLGRP is to promote sustainable economic development that strengthens our communities, provides quality jobs and preserves the unique natural, historical and cultural characteristics of the region.

Funding for this report provided by the LGA through the Helen V. Froehlich Foundation and by the LCLGRP through the New York State 604 (b) funding. Front and back cover images courtesy LGA.

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This document can be found online at www.lakegeorgeassociation.org and www.lclgrp.org 3/10/2014



In the North Country, road salt application is necessary to maintain safe roads for locals and tourists to travel. Yet traditional road salt applications have been found to negatively impact surface water, groundwater, soils and vegetation throughout the Adirondack Park.

Previous reports have provided extensive documentation as to the harmful effects of road salt on the environment and recommendations for improving winter de-icing practices specific to the Adirondack Park (Kelting and Laxson, 2010 and Lindberg, et al 2009). It is not the intention of this document to duplicate these efforts, but rather to provide an update as to the status of implementation of best practices in winter road maintenance to protect the water quality of Lake George. Please refer to the references listed at the end of this document for more detailed examinations of the environmental impacts of winter maintenance activities and appropriate best management practices.



The Lake George Park is located within the Adirondack Park in upstate New York.

Just like many other waterbodies in the Park, there is concern over the impact of winter road sand and salt impacting Lake George's water quality. Lake George is classified as AA-special by NY State, with one of its best usages being drinking water. It is so special in fact as to deserve its own special park within a park. The Lake George Park was created in 1961. The unmatched natural beauty and outdoor recreation resources of the Lake George area were recognized statutorily as affording exceptional opportunities for recreation, just as the Adirondack Park as a whole was recognized for these purposes in 1892. That Lake George was identified as a "special place within a special place" bespeaks of its singular qualities. The Lake George Park is truly a critical environmental area of statewide and even national importance.

With the completion of the Adirondack Northway (Interstate Route 87) in 1967, the accessibility of the area was enhanced substantially. This development, combined with the investment over many years by New York State in approximately 54,000 acres of "forever wild" Forest Preserve and in the development of attractive recreational facilities, such as island and shoreline campsites, boat launch sites and a large bathing beach, led to Lake George becoming one of the premier vacation spots in the Northeast. Land subdivision and development during the last several decades has accelerated greatly, with the result that the waters of Lake George have been subjected to a variety of increasingly intensive uses.

As of 2002, Lake George and many of its main tributaries were listed on the New York State Section 303(d) List of Impaired/TMDL Waters due to silt and sediment entering the lake caused by urban runoff, stormwater, and erosion. As deltas began to form decades ago at the mouth of many of the major streams around the lake, concern over sand and sediment building up in the lake led to more salt being used in the winter to decrease the accumulation of sand at the mouth of streams.



October 9, 2013 The delta at the mouth of English Brook.
Image courtesy LGA

However, recent studies showing increasing chloride and sodium levels in the Lake over the past thirty years are cause for concern over the effects the salt is having. Finding the balance between winter road maintenance activities and public safety with protection of the lake's water quality has proven to not be a simple task over the years. This document provides an overview of the success of recent initiatives to address these issues and outlines future steps and priorities for moving forward.

1987 *The Plan for the Future of the Lake George Park*

Storage of salt and sand for winter road maintenance activities was addressed in the 1987 *Plan for the Future of the Lake George Park* as an issue of concern, particularly in reference to the formation of deltas within the lake.

“The greatest impact to Lake George from highway spreading practices is that of delta formation at the mouth of tributaries that flow close to major highways within the watershed. Deltas are continually increasing in size, reducing the viable surface area of the lake... The accumulation of material (mostly sand) at the mouth of English Brook is primarily attributable to highway spreading operations along Route 9 and 1-87 (NYS DEC, 1980).”

The resulting recommendations of the Plan to address non-point source pollution included a recommendation specific to the sand-salt storage issue identified earlier in the document.

“Highway-related activity. State, county and town highway maintenance programs should be reviewed with a view towards reducing and/or eliminating salt and sediment that ends up in the lake or its tributary streams as a result of sanding activity. Maintenance yards should be located or relocated well away from the lake and its tributary streams and screened from the view of the motoring public. Drainage from such yards should be monitored with respect to its impact on the lake, its tributary streams and groundwaters. Plans for new or reconstructed State, county and local highways in the Lake George Park should be carefully reviewed by the Lake George Park commission for impacts on water quality, scenic resources and other resource values. Review procedures should be established in interagency agreements, consistent with SEQR and NEPA requirements.”

2001 *Lake George - Planning for the Future*

In 2001 an update of the 1987 Plan, ‘Lake George- Planning for the Future’, was completed after over a year and a half of work. Among several conclusions of the document, one of the main findings addressed winter road maintenance activities and its impact on water quality.

*“Non-point source pollution continues to be the greatest threat to water quality in Lake George, emanating from a host of sources, most notably: septic disposal systems; unabated storm water runoff; including recognized contributions of **sand and salt from winter road maintenance operations**; and stream bank erosion generated siltation caused by poor land use practices in upland sections of the watershed.”*

Included in the seven recommendations to address stormwater management issues was the implementation of best management practices for winter road maintenance activities. A cost estimate of 0.750 million dollars was attached to the recommendation and NYSDOT and the local municipalities were identified as the lead.

“Implement best management practices for highway de-icing that minimize discharge of contaminants to the Lake, as identified by the recent collaborative investigative and research efforts of the NYSDOT, the Darrin Fresh Water Institute and local public works departments. These actions should include the identification of, and operator training for, state-of-the-art winter, road maintenance equipment by the NYSDOT for the benefit of local highway departments.”

2006 *Status of Accomplishments and Future Priorities*

In 2006 the updated document *Status of Accomplishments and Future Priorities* provided a review of accomplishments since the 2001 document *Lake George - Planning for the Future* and provided a list of future priorities for moving ahead with water quality protection activities for the Lake George watershed. The update reported that a Coalition task force was examining the potential effect of salt and sand used for winter road maintenance on Lake water quality. All municipal highway departments and the Department of Transportation were participating in the project. The project is being financed through a grant from the EPF LWRP, with local match from all the watershed municipalities.

In the Future Priorities section, runoff from roadways was identified as a major source of both chemical and sediment loadings to the Lake, involving grease, oils, and winter road de-icing materials. Under the priorities for road corridor management, incorporating best management practices for winter road maintenance activities was identified. A total budget of \$650,000 was assigned to the task and the lead agencies were identified as the NYSDOT and local municipalities and counties.

“Incorporate best management practices for protecting water quality in highway maintenance activities, particularly the use of environmentally sensitive alternatives to traditional road salts for winter road de-icing.”

Progress to Date

As a result of the Lake George Watershed Coalition’s efforts described in the above 2006 document, a survey was completed in 2007 to attain a better understanding of the current state of sand and salt use within the Lake George watershed. It was determined that within the watershed, there are 680 lane miles of road, 111 of which are county, 403 local, and 166 state and federal. It was also calculated that on average the sand application in tons per year per lane mile was 42.44 and the average salt application in tons per year per lane mile was 13.17. Based upon these calculations, an estimated 29,000 tons of sand and 9,000 tons of salt are applied throughout the watershed each year based on a ten year average.

In 2008, \$130,000 in state funding was secured through the NYS DEC for the Lake George Watershed Coalition with the help of Senator Betty Little. The funding is being used to further efforts to implement winter road maintenance best management practices throughout the watershed.

In 2009 the Village of Lake George began using alternative de-icing products and has been pleased with the results. They have been able to reduce their salt usage, which reduces the amount of chlorides in roadway runoff. The Town of Bolton recently built a new salt storage facility and is planning to begin to use an alternative de-icing product as well now that they have a place to store it.



In 2009 the Village of Lake George began using alternative de-icing products and has been pleased with the results to date.

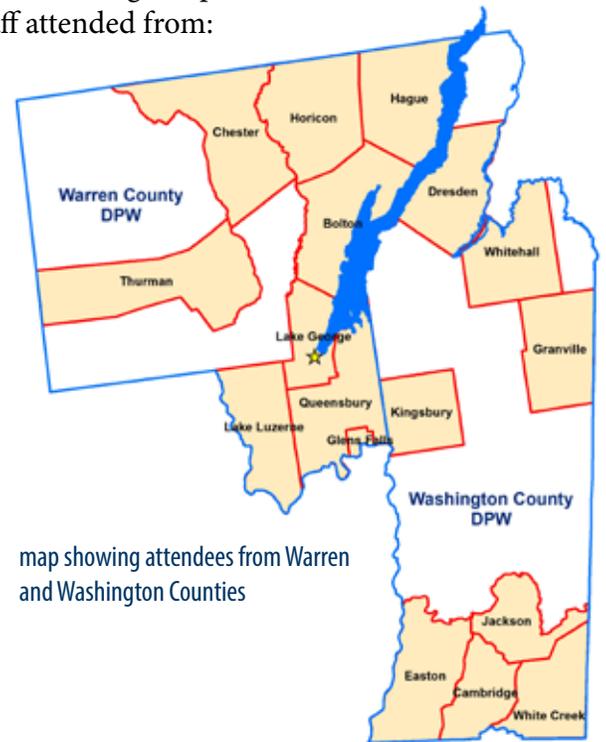
In 2012 the Lake Champlain – Lake George Regional Planning Board (LCLGRP), Lake George Association (LGA) and Warren County Soil and Water Conservation District (SWCD) began working together on an initiative to educate local, County and State Highway crews on the benefit of improved winter road maintenance Best Management Practices (BMPs). On April 17, 2013 the Municipal De-Icing Best Management Practices Forum was held in Lake George at the Fort William Henry Conference Center, sponsored by the Lake Champlain Basin Program and the NYS Department of Environmental Conservation. The Regional Planning Board, LGA and SWCD worked closely with the NYS Department of Transportation (DOT), Cornell Local Roads Program, Warren County Department of Public Works and the Village of Lake George Department of Public Works to plan the Forum. Over 65 local Highway Superintendents and staff attended from:



Warren County:
 City of Glens Falls
 Town of Bolton
 Town of Chester
 Town of Hague
 Town of Horicon
 Town of Lake George
 Town of Lake Luzerne
 Town of Queensbury
 Town of Thurman
 Village of Lake George
 Warren County DPW

Saratoga County:
 Town of Halfmoon

Washington County:
 Town of Cambridge
 Town of Dresden
 Town of Easton
 Town of Jackson
 Town of Kingsbury
 Town of White Creek
 Town of Whitehall
 Village of Granville
 Washington County DPW



map showing attendees from Warren and Washington Counties

Also in attendance were NYS DOT employees from Warren, Washington, Clinton, Essex and Hamilton Counties.



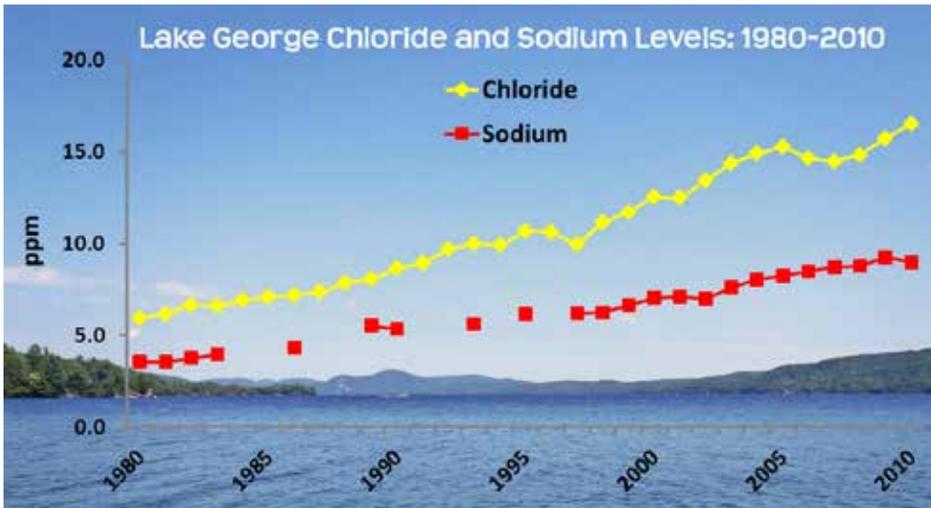
Image courtesy LGA

The Forum in April 2013 was well attended by the local municipalities.

The Forum brought together regional and local experts to discuss the impacts of de-icing materials on local water resources and the BMPs that can be implemented to reduce road salt usage and its subsequent effects.

The Impact of De-Icing Salt on Lake George and its Watershed

Larry Eichler, Research Scientist with the Darrin Fresh Water Institute, presented on the effects of de-icing materials on waterbodies, specifically Lake George. The graph below was compiled utilizing research conducted by the Darrin Fresh Water Institute over the past 30 years and shows that chloride and sodium levels have more than doubled in Lake George from 1980 to 2010.



Data courtesy Darrin Fresh Water Institute and the Fund for Lake George. Image courtesy Lake George Association.

Since 1980 both chloride and sodium levels in Lake George have increased. Over the past 30 years, levels have almost tripled. From 1980 to 2010, average lakewide chloride levels increased from 5.94 mg/l to 16.53 mg/l, and average lakewide sodium levels increased from 3.54 mg/l to 8.99 mg/l. The main source of chlorides to Lake George are road de-icing salts and both municipal and private wastewater treatment. Due to its high solubility and lack of biotic utilization, chloride concentrations are controlled by the sources to the lake and the in-lake flow of water. This makes chlorides a good indicator of stormwater runoff, which also carries other nutrients and pollutants with it.

Snow and Ice Control in New York State

Another main component of the Forum was information presented by representatives from NYS DOT's Main Office. Opening remarks were given by Bob Winans, PE, Acting Co-Director, Office of Transportation Maintenance, focusing on the importance of improved winter road maintenance and the strides that the NYS DOT has made to improve its program in the past several years.

Mike Lashmet, PE, Snow and Ice Program Engineer, presented on NYS DOT's winter road maintenance program, including their Operator Trainer Program which utilizes classroom, shop, and on-the-road components to train operators on proper plowing and salting techniques. The NYS DOT certifies every operator after they demonstrate their ability during a snow storm, and will revoke any certification if an operator performs unsafely or inappropriately. The training is conducted on a yearly basis, and is one of the most comprehensive and formal training programs in the nation.

Adirondack Salt Pilot Program

NYS DOT also presented on their Adirondack Salt Pilot Program, which was initiated as a response to the 2010 report *Review of Effects and Costs of Road De-icing with Recommendations for Winter Road Management in the Adirondack Park*, prepared



Image courtesy LGA

NYSDOT by the numbers

Lane-miles of Responsibility: 43,350
 36,000 lane-miles by state forces
 7350 lane-miles by 163 municipal contractors

Field Staff:	Winter Maintenance Equipment:
Operators: 3,300	Large Plow Trucks: 1,429
Supervisors: 380	Loaders: 326
	Snow blowers: 50

by Dan Kelting and Corey Laxson of the Adirondack Watershed Institute. The Pilot Project aims to improve salt application practices through the use of new technologies within the Adirondack Park and throughout the State. Four plow beats within the Adirondack Park were chosen and include Route 8 in Hamilton County, Route 3 in Franklin County, and Routes 86 and 73 in Essex County. Their target goal includes the use of no more than 200 lbs. of salt per spread-mile at 23 – 32 degrees and no more than 250 lbs. of salt per spread-mile at 15 – 23 degrees. Their 2012-2013 data results for the average amount of salt per spread-mile for each plow beat include;

Route 8, Hamilton County	196 lbs. per spread-mile
Route 73, Essex County	198 lbs. per spread-mile
Route 86, Essex County	218 lbs. per spread-mile
Route 3, Franklin County	223 lbs. per spread-mile

The NYS DOT's future plan for the salt pilot includes expanding the pilot routes and tracking salt use trends while limiting public expectations by placing additional signage to reduce speeds because of icy conditions.

De-Icing Policy, Planning, Materials Management, Training and Legal Issues

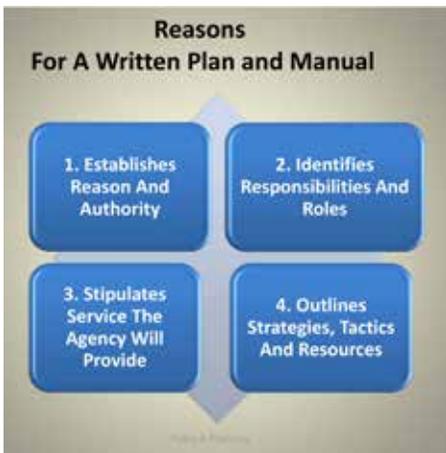


Image courtesy Duane Amsler.

Duane Amsler, PE, of AFM Engineering Services and Cornell Local Roads Program relayed the importance of establishing written Winter Road Maintenance Policies to institute protocols, identify responsibilities and liabilities, and improve the overall effectiveness of Highway Winter Road Maintenance operations. He suggested including representatives from all levels of Highway employees, fire, police and emergency response, and school districts in the development of the policies. These policies will establish the level of service that a municipality will routinely supply, which will establish public expectations for winter road maintenance activities.

These policies will also establish protocols for winter road maintenance including materials specifications, spread patterns and plow beats, materials and snow disposal, storage and yard practices, loading and handling practices, equipment washing, good housekeeping, and training requirements. This will ensure that all employees are provided with the same information and level of training and establish expectations of the operators for winter operations.

MASS DOT Environmental Impact: Snow and Ice

The Forum's keynote speaker, Paul Brown, PE, District Snow and Ice Engineer for the Commonwealth of Massachusetts DOT, presented on his experience in developing more efficient and environmentally sound de-icing practices. In his role at the Massachusetts DOT, Paul has made significant changes in the state's operations to reduce the amount of salt spread used by 30 – 40%. He has been involved in national forums relative to snow and ice research and is the past Chairman of Clear Roads and Pooled Fund Research Program, which involves 26



After environmentally sensitive highway segments were identified four pilot plow beats were identified. Image courtesy NYS DOT.

states dedicated to Snow and Ice issues. For the past 20 years Paul has worked with municipal and state agencies throughout New England, helping implement more effective snow and ice operations and has had articles published in national magazines such as Public Works, Roads and Bridges and Better Roads.

Paul's presentation focused on providing a Better Level of Service during winter road maintenance activities, which includes becoming more efficient, working as a team, acquiring new and improved technology, and communicating with the public to manage their expectations. It is also critical to the operations of the Department to have an educated workforce so the management team and personnel have the same level of understanding about the municipalities operations. Paul provided several BMPs that have been implemented in Massachusetts, which included changing operations to utilize pre-treatment methods instead of de-icing methods. Pre-treating pertains to utilizing brine, for example magnesium chloride or pre-wetted salt, in an early deployment system to treat the roads before much snow accumulates. This prevents snow from freezing to the road and avoids hard pack. Other BMPs presented included;

1. Improved Equipment and Technology such as Closed Loop Ground Speed Controllers and other automated spreaders,
2. Implementing GPS/AVL Operations Efficiency to improves accountability,
3. Calibrating spreaders before winter and producing a calibration chart to be placed in each snow plow,
4. Establishing calibration teams that spot check all trucks gates and calibrations at the Depot, and
5. Lowering spinner speed on manually controlled trucks to reduce unneeded salt spread onto lane shoulders.

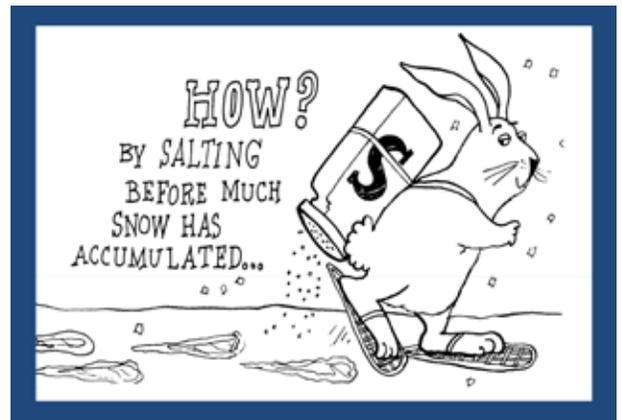


Image courtesy MASS DOT

The Challenges of Moving Forward with Improved BMPs

The Forum also included a presentation from Jeff Tennyson, PE, Highway Superintendent, Warren County DPW, followed by a Municipal Panel consisting of local Highway Superintendents who spoke about the hurdles of being able to implement new Best Management Practices. The needs identified by the panel and those that attended the Forum in the open discussion, coupled with information derived from the presentations given, are outlined below as identified needs to improve winter road maintenance in the Lake George Watershed.



Image courtesy LGA

Identified Needs

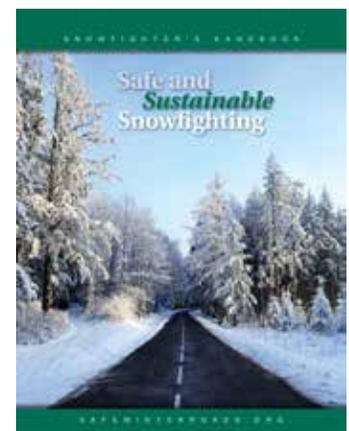
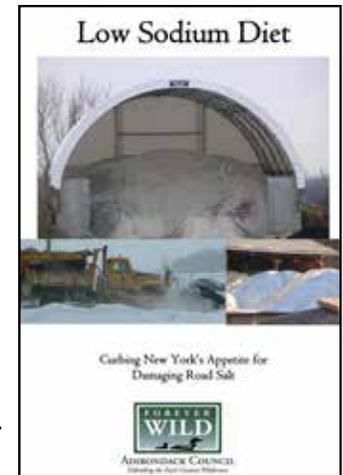
- **Improve equipment.** Technology has advanced over the years to utilize a standardized and automated system of spreading de-icing material. By utilizing improved equipment, including pavement temperature sensors, bucket scales, automated vehicle location systems, and automated spreaders, winter road maintenance operations can become more efficient, saving the municipality money and reducing impacts on the environment.
- **Explore use of pre-wetting systems.** The Commonwealth of Massachusetts performs all their winter road maintenance by utilizing a pre-wetting system, which includes deploying their workforce before the storm event to spread a magnesium chloride brine on the roads preventing the snow from sticking and creating an easier situation for plowing. By increasing efficiency and pre-treating roads with the brine, the Commonwealth of Massachusetts has decreased their salt usage from 600,000 – 800,000 tons to around 400,000 tons. This also equates to a decrease in plowing overtime, from \$20 million to \$1.2 million.
- **Establish written winter road maintenance policies.** Many municipalities do not have written policies, which creates a disconnect between the expectations of the management force, operators, and the public. By creating and adopting a Winter Road Maintenance Policy, protocols and expectations will be set and the overall efficiency and level of service provided will be improved.
- **Train all applicable staff.** Winter Road Maintenance operations can be improved by training all applicable staff in their roles and expectations, methods of deployment and equipment calibration and utilization, and good housekeeping practices. A trained workforce will improve operations and aid in providing a better level of service to the public.
- **Educate elected officials, most notably those on Town and County DPW Budget Committees.** The elected officials and Municipal Board Members in charge of setting a municipality's budget should be educated on the needs and methods for improved winter road maintenance so they can fully understand the needs of their Highway Department. Those in charge of budget decisions have the ability to allocate resources for improved technology and equipment that will make road salt application more efficient.

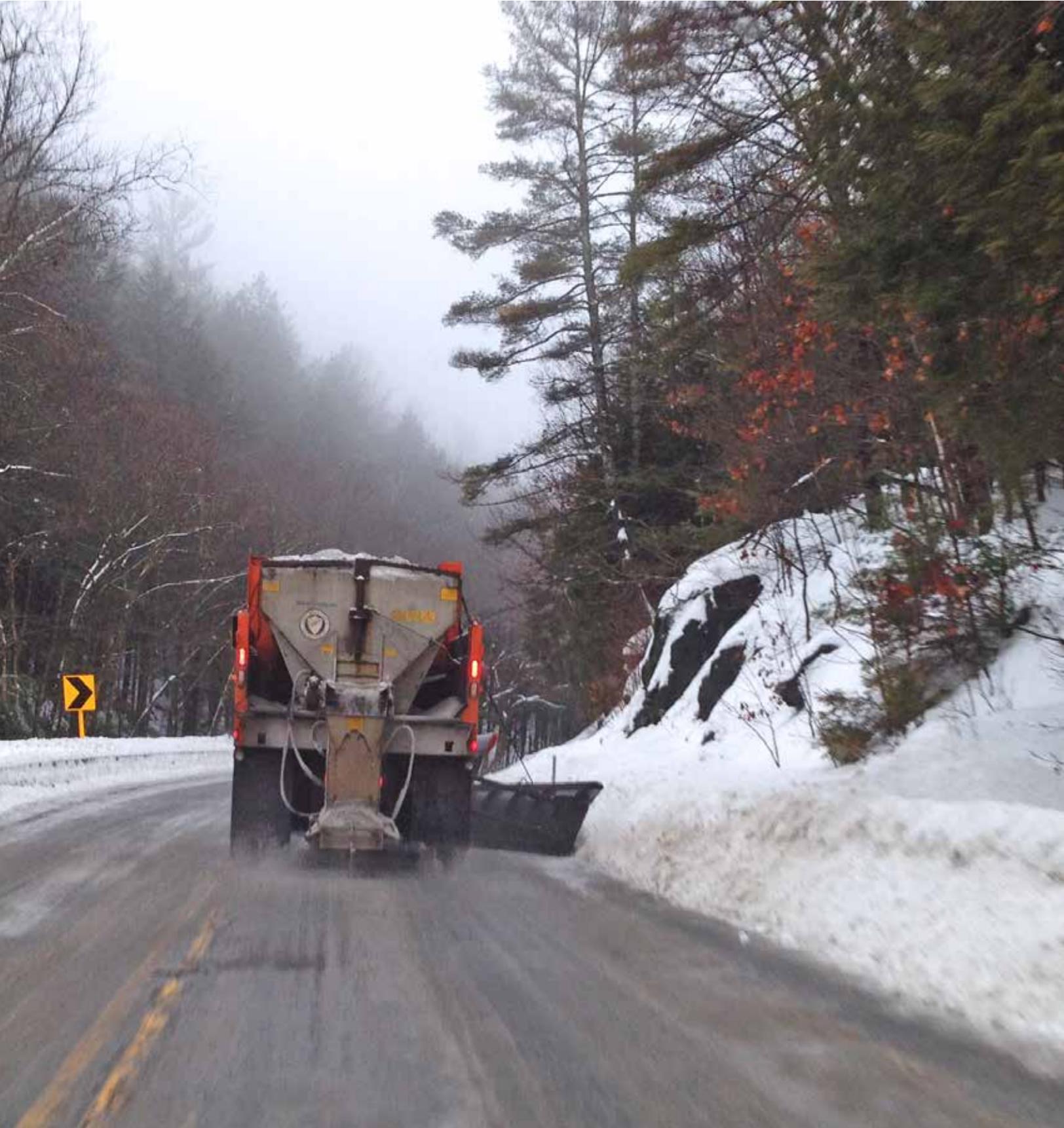
Next Steps

- **Identify individual municipal needs.** Staff at the Lake Champlain – Lake George Regional Planning Board and Lake George Association will conduct a survey of Highway Departments in the Lake George Watershed to collect an array of information related to winter road maintenance activities, including number of lane miles plowed, tons of salt used, tons of sand used, number of trucks, salt storage facilities, and current technologies utilized. Once the current level of maintenance is identified, the Regional Planning Board and LGA can utilize that information to put together a more comprehensive needs document for the municipalities within the Lake George Watershed.
- **Identify funding sources.** Outside funding sources will be needed in addition to increasing local budgets to aid the local municipalities in purchasing improved technology. Once the technology has been purchased, the municipalities can utilize local dollars to maintain the new equipment and educate their operators and staff.
- **Expand program.** The Lake George Watershed was chosen for this initiative based on its relatively small size, cooperative municipalities and focus on water quality issues. However, it is the ultimate goal of the Lake Champlain – Lake George Regional Planning Board to expand this program into the entire New York portion of the Lake Champlain Watershed for the improvement of winter road maintenance throughout the North Country.

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