C-02-06: Winter Impacts along Cascade Lakes in the Adirondacks

Date 9/19/02

FULL TITLE:

Impacts of Winter Snow and Ice Control Practices to Water Quality and Birch Tree Survival along the "Cascade Lakes" Section of Route 73 in the Adirondack Mountains of New York State

RESEARCH PROBLEM STATEMENT

The Cascade Lakes Region of the Central Adirondacks has a unique combination of climate, geology and ecology that has resulted in increased public concern over snow and ice control practices on this section of Route 73. Over the last 20 years, in this area, increased chloride levels in Upper and Lower Cascade Lakes and local stress/die-off of birch trees has been observed, especially in the area that lies between the southerly edge of Route 73 and the Cascade Lakes. Past and present highway snow and ice control practices have been suggested as a primary factor influencing these conditions. Particular concern exists regarding:

- The potential impacts of rising chloride levels to the endangered Round Whitefish populations in Upper and Lower Cascade Lakes; and,
- The dead and stressed birch trees along this section of Route 73, especially between Route 73 and the Cascade Lakes.

The Cascade Lakes Region of the Adirondack Mountains exhibits a microclimate of severe winter weather conditions that require higher than normal application rates of snow and ice control materials to keep Route 73 safe for motorists. The extreme climatic condition is exacerbated by poor highway drainage conditions, local geology and site morphology. During the last 20 years, at least two unpublished studies have identified increased chloride levels in the Cascade Lakes. During the same time period, birch trees located between Route 73 and the Upper and Lower Cascade Lakes have shown outward signs of severe stress, or in some cases have died and been subsequently removed. In addition, birch trees located along this section of Route 73 have generally shown visible signs of stress, although to a lesser degree.

OBJECTIVES

The multiple goals of this study are:

1. Investigate the cause/effect relationship between past and present snow and ice control practices on Route 73 and chloride levels in the Cascade Lakes and impacts to lake ecology;
2. Investigate the cause/effect relationship of past snow and ice control practices and birch tree stress/die-off along this section of Route 73, especially in the area that lies between the southerly edge of Route 73 and the Cascade Lakes;
3. Predict future impacts of current snow and ice control practices on Cascade Lakes water quality and ecology; and,
4. Recommend future snow and ice control best practices and additional research needs.

The study should focus on assessment of water quality conditions in Upper and Lower Cascade Lakes, investigation of the role of snow and ice control practices on the Lakes' water quality and ecology and prediction of likely future conditions. The study should also assess the role of snow and ice control practices in the decline and die-off of birch trees located along this section of Route 73, particularly between the southerly edge of Route 73 and the Cascade Lakes. Finally, the study should make recommendations regarding snow and ice control "Best Practices" in the Cascades Lakes area and recommend additional research needs.

PROPOSED RESEARCH TASKS

Task descriptions are intended to provide a framework for conducting the research. NYSDOT is seeking the insights of proposers on how best to achieve the research objectives. Proposers are expected to describe research plans that can realistically be accomplished within the constraints of available funds and research period. Proposals must present the proposer's current thinking in sufficient detail to demonstrate their understanding of the issues and the soundness of their approach to meeting the research objectives.

Develop appropriate research protocols and conduct necessary studies and analysis to assess the fate, transport, and probable environmental effects of highway snow and ice control practices in the Cascade Lakes section of Route 73.

As currently envisioned by the NYSDOT Technical Working Group advancing this project, the study should include:

1. Conduct a thorough literature search and prepare summation of published information regarding the known effects of:
   - Salt applications on water quality and aquatic ecology; and,
   - Salt and sand applications on tree survival in locations with similar geology, ecology and climate;

2. Conduct a thorough literature search and prepare summation of published and unpublished information regarding snow and ice control practices, water quality, aquatic ecology, tree survival, etc. specific to the Cascade Lakes Region;

3. Design and implement field sampling/investigation and laboratory testing programs, as necessary, to:
   - Determine water quality conditions in the Cascade Lakes;
   - Assess the impacts of salt applications, if any, to water quality;
   - Determine probable impacts, if any, to aquatic life;
   - Determine pathways of salt loading; and,
   - Predict future trends in water quality.

This analysis will include, at a minimum:

- Two years of monthly water profile sampling for chlorides and dissolved oxygen in both Cascade Lakes;
- Seasonal grab samples of tributaries, inlets and outlets;
- Seasonal soil sampling for chlorides:
- Seasonal qualitative benthic community sampling;
- Seasonal zooplankton sampling;
- Lab analysis for chlorides and dissolved oxygen; and,
- Lab bioassay of macroinvertebrates, fish eggs and larvae.

4. Design and implement a sampling program to compare water quality and aquatic ecology information in the Cascade Lakes to a similar lake in the same general area, such as Chapel Pond. This analysis should include monthly water profile sampling for chlorides and dissolved oxygen, seasonal qualitative macroinvertebrate sampling and seasonal zoo plankton sampling;

5. Determine the role, if any, of past snow and ice control practices in the decline and die-off of birch trees along this section of Route 73, especially in the area that lies between the southerly edge of Route 73 and the Cascade Lakes;

6. Recommend snow and ice control "Best Practices", such as use of alternate equipment and/or chemicals, which will reduce impacts on water quality in the Cascade Lakes section of Route 73. Recommendations should include a discussion of operational feasibility, e.g. special equipment requirements, and preliminary cost estimates and comparisons; and,

7. Recommend additional research needs.

RESEARCH PRODUCTS

1. Report on results of two required literature searches including bibliography, summary and interpretation of the information;
2. Written sampling, investigation, testing and data analysis protocols;
3. Written Quarterly accomplishment reports;
4. Semi-annual forum for information exchange and update to TWG on project status;
5. Mid-term Report to include interim results and recommendations;
6. Final Report on:
   a. Results of sampling, investigation, testing and analysis program in the study area with interpretation of findings relative to water quality in the Cascade Lakes;
   b. Role of snow and ice control practices, if any;
   c. Probable affects to aquatic life, if any, in the Cascade Lakes; and,
   d. Prediction of future water quality in Cascade Lakes;
7. Assessment of impacts, if any, to birch trees along this section of Route 73, especially in the area that lies between the southerly edge of Route 73 and the Cascade Lakes, resulting from highway snow and ice control practices;

8. Recommendations for alternative snow and ice control measures which will reduce impacts to water quality and birch trees in the Cascade Lakes section of Route 73; and,
9. Recommendations for future research needs.

FUNDING $100,000 - $125,000

RESEARCH PERIOD

30 months

SPECIAL NOTES

- This request for proposals is being circulated among the membership of two separate, but overlapping research consortia - Transportation Infrastructure Research Consortium (TIRC) and the University Transportation Research Center (UTRC). Some universities belong to both consortia. If they wish to submit a proposal, they should do so through the consortia of their choice. The choice of consortia will not be a factor in deciding the winning proposal.

- In addition three hard copies of your proposal, please submit an electronic copy of your proposal on a disk (MS Word or WordPerfect).

- A Pre-Proposal Informational Meeting will be held to discuss the project with all universities potentially interested in submitting a proposal. Attendance is strongly recommended to ensure a better understanding of the problem and the desired outcomes from this research, however, selection of the winning proposal will consider only the merits of the written proposal and not whether the potential Principal Investigator attended the meeting. The meeting will be held on:

Date:	Friday, October 4, 2002
Time:	1:00 p.m.
Location:	NYSDOT Building 5, Room 112 1220 Washington Avenue Albany, NY 12232
RSVP:	Suzanne Sanduski (Ssanduski@gw.dot.state.ny.us) , who will alert the security desk. Please have a picture ID to show the security guard. She can also e-mail driving directions to those who need it.