University of Vermont
Transportation Research Center

Celebrating 10 Years of Innovation and Service in Research, Outreach, and Workforce Development
Developing Winter Performance Measures for the Vermont Agency of Transportation

Roadway snow and ice control (RSIC) serves a vital public safety function for the Vermont Agency of Transportation (VTrans). In order to maximize effectiveness and efficiency of its RSIC response, VTrans sponsored a research project with the UVM TRC to develop two winter maintenance performance measures. The research team, consisting of TRC researchers Jim Sullivan and Jonathan Dowds, David Novak from the UVM School of Business, and Darren Scott at McMaster University, developed a long-term, “time-to-normal” measure utilizing readily available speed data and pilot-tested a short-term measure utilizing thermal imagery data to compare roadway conditions in front of, and behind, an active RSIC vehicle.

The team developed a new long-term performance measure, the Average Distribution Deviation (ADD), to compare changes in the distribution of vehicle speeds during after winter weather events to the distribution of vehicle speeds during normal traffic conditions. The ADD is an implementation-ready methodology that provides winter maintenance practitioners with a measurement of the time required to return roadways to normal operating conditions on a storm-by-storm or seasonal basis.

In addition, the team pilot-tested a thermal imaging video system designed to provide near instantaneous feedback about the effectiveness of snow and ice control operations to RSIC vehicle drivers. Thermal imagery is capable of discerning temperature variations in the road surface that are indicative of snow and ice cover on the pavement and the recordings are unaffected by low light conditions. While a number of challenges remain before such a system could be implemented, the thermal cameras showed considerable promise as a winter maintenance data collection tool.

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The UVM Unmanned Aircraft Systems (UAS) Team, a joint project between the Transportation Research Center and UVM Spatial Analysis Lab, has taken off this year. The team purchased its second aircraft, an eBee RTK, with a much higher level of spatial accuracy and both aircraft have been flying missions all over Vermont. Some of the missions the team has taken on include deploying to a flooding disaster in Central Vermont, flying over construction projects, assisting with construction siting, and even working with Federal Agencies to test how UAS can respond to Federal Disasters.

The UAS team is now focused on better understanding how to get the data collected into the hands of those who need it. This includes how to get data from the field into the hands of decision makers. Future projects for the team include assisting farmers to assess the health of their fields using remotely sensed data, exploring the use of UAS for project planning, and continued development of use of UAS in disasters.

The National Center for Sustainable Transportation (NCST) is a 6-university effort, led by UC Davis, to enhance the environmental sustainability of the United States’ transportation system through reduction in fossil fuel consumption and greenhouse gas emissions. UVM researcher Sean Neely recently completed a report for NCST, Factors Influencing Mode Choice for Intercity Travel from Northern New England to Major Northeastern Cities. The research makes use of a unique survey dataset from The Intercity Travel, Information, and Technology Survey Questionnaire led by Dr. Brian H.Y. Lee. Long-distance travel from home locations in rural northern New England to major metropolitan areas in the Northeast United States is crucial for rural economies, multimodal planning and quality of life, yet limited research has been conducted on this type of travel.

Two on-going initiatives include Assessing Network Criticality for Climate Adaptation Planning (Dowds) and Advancing Models of Intercity Travel: Overnight Models and Mobile Device Data (Aultman-Hall). The first project is evaluating the efficacy of using regional and statewide travel models for network criticality ranking by applying the Network Robustness Index, a well-established link criticality measurement tool, to travel models with varying networks resolutions. The second is assessing the reasonableness of surveying long-distance travel with a biased convenience sample by comparing the UVM’s one-year on-line 2012-2013 Longitudinal Survey of Overnight Travel (LSOT) with two more comprehensive data sources: AirSage mobile phone based travel data, and the 1995 American Travel Survey (ATS).
**TRC GRADUATE RESEARCH**

**Ben Kaufman**

Ben is pursuing a Masters in Natural Resources with a certificate in Sustainable Transportation Planning. He graduated from UVM with a B.S. in Environmental Studies with a focus on Sustainable Transportation Systems.  
http://www.uvm.edu/trc/ben-kaufman/

**Sean Neely**

Sean graduated with a Master’s in Civil and Environmental Engineering in May with a thesis entitled, Factors influencing mode choice for intercity travel from Northern New England to major Northeastern Cities.  
http://www.uvm.edu/trc/sean-neely/

**Jack Reed**

Jack is pursuing masters degree in Civil and Environmental Engineering. The scope of his research is to investigate the different compounds formed by the oxidation of biodiesel during storage and their effect on exhaust emissions.  
http://www.uvm.edu/trc/jack-reed/

**Hannah Ullman**

Hannah is pursuing a Masters in Community Development and Applied Economics. Her initial research is focused on interregional travel access in Vermont, addressing equity and perceived needs.  
http://www.uvm.edu/trc/hannah-ullman/

**Xiao Xiao**

Xiao Xiao completed her doctoral studies at UVM working at the Park Studies Lab. Her dissertation, The Role of Transportation in Expanding the Democratic Ideal of National Parks, was accepted this summer.  
http://www.uvm.edu/trc/xxiao/

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**FY16 Expenses**

- Administration: 5%
- Research: 41%
- Outreach: 54%
- Administration: 5%

**FY16 Funding by Source**

- Federal: 25%
- State: 44%
- Other: 31%

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**TRC Programs and Contacts**

National Center for Sustainable Transportation (UTC) – Lisa Aultman-Hall  
NE Transportation Workforce Center – Glenn McRae  
Graduate Certificate & Education – Glenn McRae  
Vermont Clean Cities Coalition – Abby Bleything  
New England Transportation Consortium – Jacob Leopold  
Vermont Transportation Research Collaborative – Glenn McRae  
VTrans Statewide Travel Demand Model – Jim Sullivan  
UVM Transportation Air Quality Lab – Britt A. Holmen  
Remotely Sensed Imagery for Disaster Response – Jarlath O’Neil-Dunne  
Unmanned Aerial Systems for Transportation Decision Support – Jarlath O’Neil-Dunne
The Vermont Clean Cities Coalition (VTCCC), one of over 80 U.S. Department of Energy designated coalitions, works with partners across the state to reduce the use of petroleum in the transportation sector. This work is achieved through direct outreach and education on alternative fuels and advanced fuel technologies. In 2015, VTCCC managed a workplace charging incentive program, created a sustainable transportation toolkit for Vermont’s higher education institutions, supported Vermont’s only national park to green transportation operations, supported Vermont’s first “Drive the Dream” event with Governor Shumlin, and carried the Northern Stars of the Northeast program into its second year of recognizing exceptional fleet achievements in petroleum reduction. In addition, VTCCC worked closely with the Northeast Transportation Workforce Center to evaluate the workforce needed to foster and sustain the growth of alternative fuels in the transportation market. In 2015, Vermont Clean Cities stakeholders were responsible for reducing 869,066 gallons of petroleum and 5,385 tons of greenhouse gas emissions.

Green Mountain Power was chosen as Vermont’s 2016 “Rising Star,” one of six in the Northeast to be honored for its efforts in cutting carbon emissions, reducing the use of petroleum, and promoting and using alternative fuels to power its vehicles. The Vermont Clean Cities Coalition presented the award to Green Mountain Power, which provides electricity to nearly three-quarters of Vermont and has the state’s third largest fleet. GMP was commended for its use of biodiesel, electricity, and propane in its on-and off-road vehicles, its active replacement and retirement of inefficient vehicles, and its comprehensive carpooling program to reduce single occupancy vehicles. Pictured: Vermont Clean Cities Coordinator Abby Bleything, Green Mountain Power Fleet Manager Matthew Haley, State Director for Congressman Welch’s office George Twigg, and Energy Transportation Outreach Specialist for Senator Sanders’ office Haley Pero.

The Northeast Transportation Workforce Center (NETWC) is organized to make a significant contribution to ensuring the U.S. surface transportation system has a workforce that is resilient, skilled, efficient and effective in designing, operating, building and maintaining a 21st century transportation system that best supports the region and country’s social and economic vitality. Based at the UVM Transportation Research Center, NETWC builds strategic partnerships and engages regional and national stakeholders to develop a skilled and career-ready transportation workforce throughout the region. The Center is one of 5 FHWA designated regional surface transportation centers.

Over the past year the Center has been focused on creating a robust and dynamic resource tool for identifying education and training programs throughout the region; hosting and organizing regional and national virtual meetings on model approaches to addressing workforce issues; producing an overview of labor market data for the region on the transportation workforce; and creating portals to provide direct access to resources for Employers, Educators and Job-Seekers.

The Center is forging its future agenda around five key tools and initiatives:

- Toolkit for attracting the next generation workforce
- Career path guide for employers
- Green Careers in Transportation promotion and marketing initiative
- Handbook and pilot program for implementing succession planning and knowledge management systems
- Initiative to upskill the current workforce to take advantage of emerging technologies

http://netwc.net/
February 2016
Data and Images from UVM UAS Improve Bridge Design, Prevent Flooding

March 2016
Seminar: Mr. Chunka Mui “Trillions Will Depend on Whether Driverless Cars Require Human Drivers”
Robert Manning Publishes a Commentary in the Chronicle of Higher Education on Using National Parks as Living Laboratories

April 2016
Transportation Radio Talked with Dr. Glenn McRae and Dr. Lisa Aultman-Hall

May 2016
UVM, BED Unveil On-Campus Electric Vehicle Charging Stations

June 2016
Seminar: Xiao Xiao “The Role of Transportation in Expanding the Democratic Ideal of National Parks”
VTrans Awards New Research Funding to UVM Team Led by Glenn McRae

July 2015
TDM Roundtable - How are Programs Designed to Promote Alternatives to SOVs Working?
Vermont Unmanned Aircraft Systems Team Deploys to Vermont Flood Event
Transportation and Geography - A Roundtable Discussion
Use of Sacrificial Embankments to Prevent Bridge Collapse Due to Scour Under Extreme Events

August 2015
Using Unmanned Aerial Systems in Transportation Planning and Emergency Response
Measuring Streetscape Design for Livability with Chester Harvey

September 2015
Drive the Dream Vermont

October 2015
UAS Team Deployed to Aid in Train Derailment
AltWheels Fleet Day Conference

November 2015
Webinar: “Partners in Transportation Workforce Solutions”
Webinar: “Innovative Teaching and Transportation Industry Partnerships”
“Livable Communities” - VT AARP Summit

January 2016
Annual Meeting of the Transportation Research Board - 14 UVM TRC Presentations

TRC Team Members 2015-2016:
Lisa Aultman-Hall, Zack Borst, Greer Cowan, Charles Chittick, Jon Dowds, Kensey Hanson, Chester Harvey, Britt Holmen, Brian H.Y. Lee, Jacob Leopold, Abby Bleything, Glenn McRae, Linnea Myers, Jarlath O’Neil-Dunne, Karen Sentoff, Cara Sheridan, Jim Sullivan, Samantha Tilton, Carol Vallett, Robbie Wolfe