



### From the Director



The UVM Transportation Research Center (TRC) has had a busy start to the academic year. We welcomed nine TRC Scholars from five disciplines (Natural Resources, Public Administration, Community Development, Mechanical Engineering and Civil Engineering). Graduates who worked closely with the TRC as GRAs and scholars continue to do well taking their experience and skills developed at UVM forward into the world. Nathan Belz finished his PhD this past summer

and secured a faculty position at the University of Alaska - Fairbanks where he will continue his work on roundabouts and also focus on transportation issues in rural and cold climates. Ben Carlson, a graduate of the MPA program and a TRC Scholar is in Washington DC as a Presidential Management Fellow at the VA.

Enriching our graduate certificate program this year will be John Adams, Planning Coordinator for the Vermont Department of Housing and Community Development, who will join us to teach the Land Use Planning and Economics course. He will be giving an introductory lecture on November 8th at the TRC.

The TRC joined a new National UTC consortium lead by the University of California at Davis, which will allow us to take many of the themes from our original UTC work forward in this new and exciting collaboration. In addition to organizing a number of seminars and programs we are very pleased to be hosting Dr. José Holguin-Veras (RPI) as a UVM Burack President's Distinguished Lecturer, who will discuss his research on the Lessons From the Haiti and Japan Disasters for Humanitarian Logistics on Thursday November 14th. Dr. Holguin-Veras is recognized internationally as a leading expert in humanitarian logistics, the study of logistics in organizing the delivery, warehousing and distribution of supplies during and after disasters or other emergencies to people in affected areas.

I invite you to explore our other efforts and explorations in this update and communicate your news and research efforts in Sustainable Transportation Systems to us.

Sincerely,

A handwritten signature in blue ink that reads 'Glenn McRae'.

Glenn McRae, Ph.D.

TRC Associate Director

Read our 2012-2013 Annual Report

# Fall 2013 News

## UVM Transportation Research Center (TRC)

The TRC is a hub for innovative and interdisciplinary research, education and outreach focused on sustainable transportation systems supporting livable communities, particularly in northern, rural, ex-urban and micropolitan contexts.

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#### TRC Reliciency Program Featured in Recent AASHTO article

<http://www.uvm.edu/~transctr/research/documents/AASHTO%20Lead%20Article,%20Technology,%20FINANCIAL,%209-30-13.pdf>

#### TRC Annual Report for 2012-2013

<http://www.uvm.edu/~transctr/pdf/Annual%20Report%202012-2013%20Portrait.pdf>

# How will we grow and support the transportation workforce of the future?

10/3/13

By: TRC Staff

The UVM TRC has been engaged in transportation workforce development since its inception crafting a strong program to support students (well over 100 now), particularly in graduate education, through research assistantships and the development of a Graduate Certificate of Study in Sustainable Transportation Systems and Planning. Recently TRC staff members have helped organize and present at several key forums addressing the future of workforce development in the field.

Associate Director Glenn McRae and Outreach Professional Michelle McCutcheon-Schour attended the New England Transportation Workforce Summit that they helped to organize in Boston. McRae lead the opening panel discussion, The Three C's in Workforce Development Leadership: Coordination, Communication, and Collaboration, emphasizing the need for cooperation across sectors (labor, education and transportation), between modes, beyond the public-private workforce divide, and connecting individual state efforts. Joined by Frank Depaola, Highway Administrator, MassDOT, Fran Beauman, National Transportation Distribution and Logistics Career Cluster Leader, and Bill Perez, Assistant Secretary of Human Resources, MassDOT & MBTA. The conversation focused on current and concrete examples of building partnerships across traditional silos as a value proposition that was able to meet multiple goals and return measurable results. Examples continued to be surfaced throughout the two day summit and this theme was central to work in the closing session on future action steps.

McCutcheon-Schour participated actively throughout the two days and served as a discussant in the final action session providing input on steps necessary to address increased effectiveness in the Changing Roles for Colleges and Universities and their Partners in Industry and Government.



TRC's Michelle McCutcheon-Schour (left) discusses strategies for higher education in transportation workforce development at the final action panel of the New England Summit.

Glenn McRae returned to Boston to participate in the National Transportation Training Directors' (NTTD) Annual Meeting. He presented out on the lessons learned from the TRC's Transportation Education Development Pilot Program in building partnerships between educational institutions, transportation employers and workforce development programs and initiatives. NTTD is a professional Network of state DOTs working together to develop more effective workforce training and retention programs. At last year's meetings in Seattle McRae reported out on the results of the National Transportation Workforce Summit. This year he also joined a panel to discuss the recent outcomes of the regional New England summit and the opportunities for more

regional cooperation and joint programs.

Michelle McCutcheon-Schour will be presenting on the development of Transportation specific Career Pathways in Vermont as part of an overall workforce initiative at the National Career Pathways Network meetings in San Antonio later in October. Last spring she had organized a national Leadership Certificate Training in career pathways with a focus on transportation for the Vermont network of partners including high schools, community colleges, universities, departments of labor, education and transportation as well as key workforce development partners.

# UVM TRC on the ITS Davis team selected by US DOT as the National Center for Sustainable Transportation

09-24-2013

By TRC Staff

UVM PhD student Phoebe Spencer is studying bicycling and bike infrastructure in Davis this fall as a first collaboration in this partnership (pictured here, the oldest bicycle roundabout on the UC Davis campus). The University of California, Davis, Institute of Transportation Studies (ITS-Davis) was selected in a national competition to lead a new two-year, \$11.2 million research consortium for the U.S. Department of Transportation. UVM's TRC is one of the institutional partners lead by Lisa Aultman-Hall who spent last year on research assignment at ITS Davis with the organizing team.

The new National Center for Sustainable Transportation will help the federal agency reduce the greenhouse-gas emissions from passenger and freight travel that contribute to climate change, and also prepare U.S. transportation infrastructure for the extreme weather that climate change is expected to produce.

In addition to ITS-Davis and UVM TRC, the other consortium members are University of California, Riverside (UC Riverside); University of Southern California (USC); California State University, Long Beach (CSULB); and Georgia Institute of Technology (Georgia Tech).

Dr. Aultman-Hall observed that "Vermont and California are very different states that have shared vision and passion, for not only sustainable transportation systems, but the solutions, including education and research needed for the future. This will be a very fruitful partnership."

The United States has sharply reduced many of the transportation sector's most damaging environmental impacts on air, water, natural ecosystems and human health," said UC Davis professor of environmental science and policy Susan Handy, who is director of the UC Davis Urban Land Use and Transportation Center, and will be the director of the new National Center for Sustainable Transportation. Dr. Handy is currently hosting UVM PhD student, Phoebe Spencer in her research group this fall, the first of many joint endeavors in this partnership.

The National Center will receive \$5.6 million from the U.S. DOT and \$5.6 million in matching funds from state, regional and local agencies to support its research. Caltrans, the California Air Resources Board, and the South Coast Air Quality Management District have committed to providing matching funds for projects at UC Davis, USC/CSULB and UC Riverside. Georgia DOT has agreed to match projects at Georgia Tech.

"The goal of the National Center is to transform the transportation system to improve environmental sustainability nationwide. We aim to provide leadership that produces meaningful action by mobilizing innovative research teams and partnering with influential stakeholders," said Dan Sperling, director of ITS-Davis, and the new national center's executive director.

The National Center will:

Mobilize a network of universities to generate knowledge and tools that address climate change and environmental sustainability in transportation;



UVM PhD student Phoebe Spencer is studying bicycling and bike infrastructure in Davis this fall as a first collaboration in this partnership (pictured here, the oldest bicycle roundabout on the UC Davis campus).

Design and evaluate real-world strategies that contribute to mitigation of GHG emissions and other environmental impacts; and

Deliver knowledge and tools to state DOTs, Metropolitan Planning Organizations (MPOs) and local governments to support implementation of these real-world strategies.

The new Center includes a Leadership Council that will guide its work and Brian Searles, VTrans Secretary has agreed to serve on this prestigious group with other national leaders.

## New Developments at the UVM Transportation Air Quality Lab

09-11-2013

By Karen Sentoff

*Barrett/Liston Scholar Anna Nadler Joins the MOVES Minds at the Transportation Air Quality Laboratory for Summer and Fall 2013*



Anna Nadler was awarded a Barrett/Liston Scholarship through the College of Engineering and Mathematical Sciences to conduct undergraduate research under the direction of Dr. Britt Holmén for the summer of 2013. Anna, originally from Rutland, Vermont, will be a senior civil engineering student at UVM in fall 2013. She joined a team of researchers, the “MOVES Minds”, who use the Environmental Protection Agency’s Motor Vehicle Emissions Simulator (MOVES) model to estimate tailpipe emissions and compare them to measured values collected by Transportation Air Quality (TAQ) Laboratory graduate students.

MOVES model results are used widely by other researchers, municipalities, engineers, and policymakers to assess the implications of improved technologies, infrastructure changes, and policy implementations on tailpipe emissions and energy consumption of the current and projected motor vehicle fleet. Inputs to MOVES include fuel composition and meteorology, as well as real-world second-by-second speed and road grade.

MOVES emission rates for tailpipe criteria pollutants (carbon monoxide, hydrocarbons, oxides of nitrogen), greenhouse gases (carbon dioxide, methane, nitrous oxide), and air toxics (benzene, formaldehyde, etc.) will be compared to the real-world data collected as part of the Transportation Research Center Signature Project 2 onboard tailpipe emissions study. The research aims to validate and improve model estimates, particularly for real-world operation and hybrid-electric gasoline vehicles.

Anna was awarded the opportunity to continue this research through the 2013/2014 academic year with an Undergraduate Research Assistantship (URA) through the Transportation Research Center.

### Biodiesel Emissions Testing at the Transportation Air Quality Laboratory

With concerns of climate change, energy security and independence, and air quality, there is increasing interest in alternatives to petroleum-based fuels, like biodiesel, to power the on- and off-road vehicle fleets. Although many alternative fuels are well characterized based on their physical and chemical properties, the emissions resulting from operating vehicles with these alternative fuel sources is largely unknown.

Testing in the Transportation Air Quality (TAQ) Laboratory is underway to compare the emissions from dif-

ferent blends and feedstocks of biodiesel. Tyler Feralio, a Transportation Research Center Scholar and the 2012 University Transportation Center's Student of the Year, heads the data collection campaign with Jim Dunshee, M.S. candidate, under the direction of Dr. Britt Holmén. This research will compare particle and gas-phase emissions from waste grease and soybean biodiesel blends of B10, B20, B50, and B100 to ultra-low sulfur on-road petrodiesel fuel (B0). alternatives to petroleum-based fuels, like biodiesel, to power the on- and off-road vehicle fleets. Although many alternative fuels are well characterized based on their physical and chemical properties, the emissions resulting from operating vehicles with these alternative fuel sources is largely unknown.

The TAQ Lab's Volkswagen four-cylinder light-duty diesel engine dynamometer is used to run a real-world transient drive cycle for each emissions test. In addition to quantifying the second-by-second gas and particle emissions in real-time, John Kasumba, PhD candidate in the School of Engineering, evaluates the organic chemical composition of the emitted particles with recent Civil and Environmental Engineering graduate Phil Cannata. Particles collected on filters are analyzed for pollutants of interest including polycyclic aromatic hydrocarbons (PAHs), fatty-acid methyl esters (FAMEs), polar organic compounds, alkanes, and carbonyls. Subsequent experiments will compare the reactivity of biodiesel versus petrodiesel particles to gas-phase ozone. These data will help us understand the secondary atmospheric effects (e.g. smog) of vehicle exhaust.

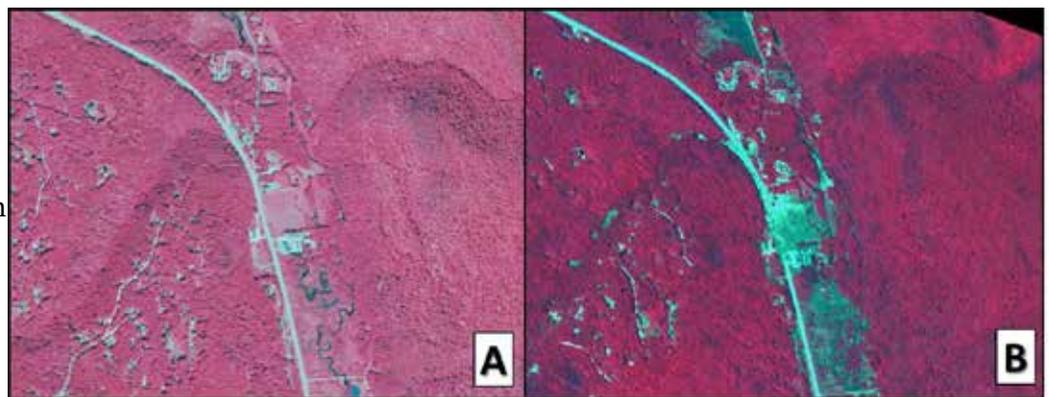
## Rapid Exploitation of Commercial Remotely Sensed Imagery for Disaster Response & Recovery

Principal Investigator: Jarlath O'neil-Dunne

Funding Agency: USDOT

Natural disasters can severely impact transportation networks. In the hours and days following a major flooding event, knowing the location and extent of the damage is crucial for incident managers for a number of reasons: it allows for emergency vehicle access to affected areas; it facilitates the efficient rerouting of traffic; it raises the quality and reduces the cost of repairs; and it allows repairs to be completed faster, in turn reducing the duration of costly detours. Commercial Remote Sensing (CRS) imagery is increasingly being used in disaster response and recovery, but acquiring imagery is far easier than extracting actionable information from it. An automated approach to damage assessment is needed, but traditional automated image analysis techniques are inadequate for identifying or characterizing road and bridge damage from high resolution imagery. We propose a

project with two objectives: 1) to develop, calibrate and deploy a decision support system capable of identifying road and bridge damage from high-resolution commercial satellite images and; 2) to estimate the amount and type of fill material required for repairs using digital



surface models derived from Figure 1A. Image of Vermont roads pre-Irene. Figure 1B. Image of Vermont roads lightweight Unmanned Aerialpost-Irene (copyright DigitalGlobe)

Vehicles (UAV) programmed

to fly over damage road segments. This approach would employ state-of-the-art, object-based image analysis techniques, cost-based image matching, and other advanced computing techniques. We also propose to collaborate with state departments of transportation to develop a web-based interface to share information derived from the CRS imagery.

## **Project Team**

Caesar Singh, Program Manager (PM), US DOT

Austin Troy, PhD, Director of the University of Vermont (UVM) Transportation Research Center (TRC) - Principal Investigator

Jarlath O'Neil-Dunne, Faculty Research Associate and Director of the UVM Spatial Analysis Laboratory (SAL)

Amanda Hanaway-Corrente, Professional Engineer (PE) at UVM

James Sullivan, Research Analyst at UVM TRC

Sean MacFaden, Research Specialist at UVM SAL

Ernest Buford, Research Specialist at UVM SAL

## **Technical Advisory Committee**

Guy Rouelle, Aviation Program Administrator, Vermont Agency of Transportation (VTrans)

Stephanie Magnan, Asset Management Specialist, VTrans

Wayne Gammell, Maintenance Administrator, VTrans

Johnathan Croft, GIS Database Administrator, VTrans

Michele Boomhower, Chittenden County Regional Planning Commission (CCRPC) Assistant/Metropolitan Planning Organization (MPO) Director

Christopher Jolly, Planning & Programming Engineer, Federal Highway Association (FHWA) - Vermont Division

Roger Thompson, ITS/Safety Engineer, FHWA - Vermont Division

Charles Hebson, Manager of Surface Water Resources, Maine Department of Transportation (DOT)

Staci Pomeroy, River Scientist, Vermont Department of Environmental Conservation

## **UVM TRC Recent Research reports 2013**

Optimization of Snow Removal in Vermont

Author(s): Dowds, Jonathan; Sullivan, Jim; Scott, Darren; Novak, David

TRC Report # 13-005

Multi-Scale Model of the U.S. Transportation Energy Market for Policy Assessment

Author(s): Eppistein, Margaret J.; Rizzo, Donna M.; Marshall, Jeffrey S.

TRC Report # 13-004

Refugees and Transportation in Vermont: Travel Behaviour and Critical Questions Based on Gender, Age and Transportation Hierarchies

Author(s): Bose, Pablo S.

TRC Report # 13-002

Transportation Education Development Pilot Program (TEDPP)

Final report

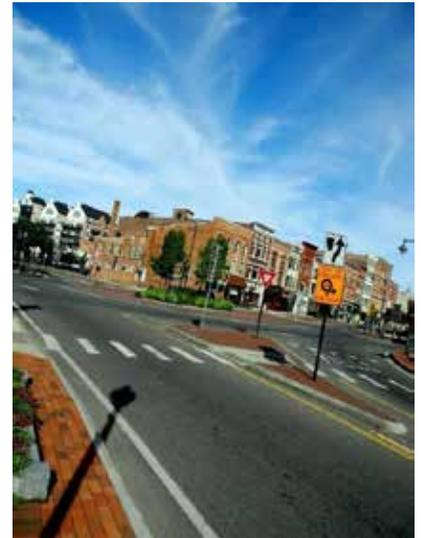
Transportation Education Development Pilot Program (TEDPP)

Developmental Evaluation

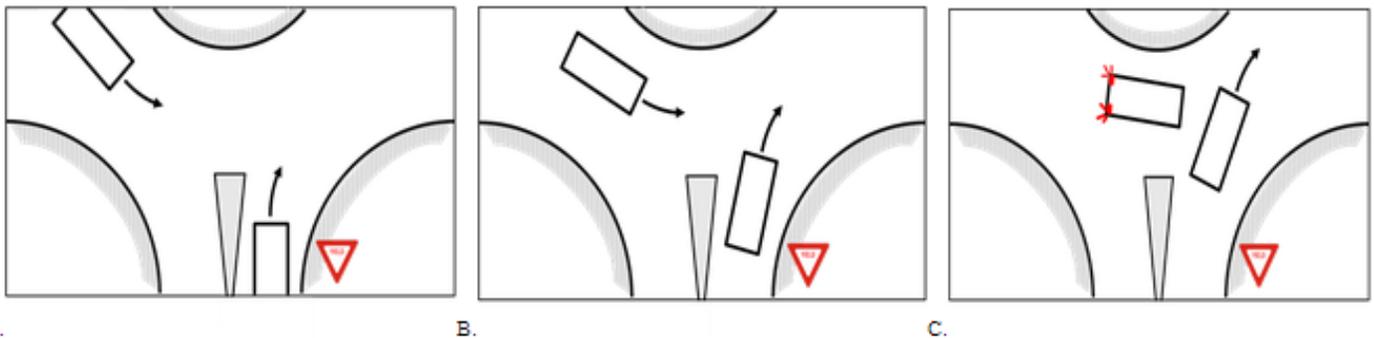
# Nathan Belz Dissertation on Roundabouts

08-05-2013  
By TRC Staff

Nathan Belz is a graduate research assistant at the Transportation Research Center and will receive his Ph.D. through the College of Engineering and Mathematical sciences. Belz presented his dissertation work focused on planning and traffic operations modeling of roundabouts on August 2nd. Roundabouts are an emerging type of intersection design in the United States. As such, the lack of exposure and driver confusion affect traffic operations and public acceptance. Much of the knowledge of roundabout operations has also been based on data collected internationally where roundabouts are more common. Belz saw a need to address these gaps in order to better design, plan, and implement roundabouts in the United States.



Using video-based real-world data of traffic operations, Belz identified types of driver behavior that are inconsistent with the traffic theories on which existing roundabout models are based. These behaviors (termed priority taking, abstaining, and surrendering) relate to incorrect negotiations of circulating and entering drivers which directly affect how efficiently a roundabout is able to operate (refer to the figure below for an example). His research advances the knowledge of how non-geometric factors such as prevailing conditions and driver familiarity impact driver behavior. This data further informed a new roundabout model developed by Belz using a cellular automata approach where agents (vehicles) move from one cell to another over units of time. The model provides a quantitative assessment of how these incorrect negotiations impact roundabout performance measures such as capacity, queue length, and delay. In addition, Belz applied spatial analysis techniques to evaluate roundabout implementation trends in northern New England and examine factors that affect where technically feasible roundabouts are and are not being built.



(Above) An example of priority taking where an entering vehicle (a) approaches the roundabout entry, (b) enters into the roundabout in front of a circulating vehicle, and (c) causes that circulating vehicles to either stop or slow considerably in order to avoid collision.

Also during his time at UVM, Belz contributed to and published research on transportation applications of Geographic Information Systems, transit planning and ridesharing in Vermont, livability in small-urban and rural communities, second-by-second driver behavior using in-vehicle instrumentation, and ridesharing in Vermont. Belz defended his dissertation in early August and is moving on to a tenure-track faculty position at the University of Alaska – Fairbanks. He will continue his work on roundabouts and also focus on transportation issues in rural and cold climates.

You can read about Belz's dissertation at: <http://www.uvm.edu/~transctr/pdf/Abstract-belz.pdf>

# TRC 2013-14 UTC GRA Scholars

## UVM Transportation Research Center GRA Scholars 2013-2014



Assessing the transportation barriers to health care among Vermont's rural elderly.

**Geoff Batistta**  
CDAE (MS)  
Advisor: Jane Kolodinsky



Working at the Transportation Air Quality Lab with a focus on transportation and public health.

**Jim Dunshee**  
CEE (MS)  
Advisor: Britt Holmén



Applied research on scour phenomena on transportation infrastructure, taking into account the effects of climate change.

**Daniel Hagan**  
ME (MS - PhD)  
Advisors: Mandar Dewoolkar & Yves Dubief



Studying urban livability and active transportation to determine micro-scale measures of physical street environments

**Chester Harvey**  
RSENr (MS)  
Advisors: Austin Troy & Lisa Aultman-Hall



Developing an energy use indicator for an Integrated Land Use and Transportation Model.

**Tim Pede**  
RSENr (MS)  
Advisor: Austin Troy



Research focus on accessibility and Independent mobility in Rural built environments, and bicycle transport.

**Paola Rekalde Aizpuru**  
CEE (MS)  
Advisor: Brian Lee



Transportation infrastructure governance and resiliency risk assessment needs of statewide actors.

**Anna Schulz**  
Public Administration (MPA)  
Advisors: Chris Koliba & Asim Zia



Researching seasonal walking and bicycling behavior.

**Phoebe Girouard Spencer**  
RSENr (PhD)  
Advisor: Lisa Aultman-Hall



Studying sustainable transportation planning for rural, recreational and park landscapes.

**Xiao Xiao**  
RSENr (PhD)  
Advisor: Robert Manning

**UVM Transportation Research Center Graduate Research Assistants & Scholars 2013-2014**

TRC Scholar GRA	Faculty Research Advisor	Research Working Title	Research Questions
<b>Anna Schulz</b> Masters of Public Administration Program	Chris Koliba / Asim Zia	<b>Transportation Infrastructure Governance</b>	This research seeks to expand Koliba and Zia's current regional transportation planning agent-based model to include a land use transition competent that takes into consideration the vulnerability and resiliency risk assessment needs of statewide actors. The model will also be extended to different classes of transportation projects, particularly those relevant to improved flood resiliency such as bridges and culverts. Part of Koliba and Zia's work analyzes how intergovernmental arrangements impact the process of prioritizing transportation projects in Vermont. This investigation will be examining prioritization processes in other states in the region to see whether or not they are consistent with the Vermont model. Koliba and Zia also have a systems dynamic model (developed by a former GRA) that is used to analyze the stocks and flows of transportation-related financial resources. New work will be done to scale up that model from its current scope to one that covers the full State of Vermont. The specific research questions include: <ol style="list-style-type: none"> <li>How do other states structure their transportation prioritization processes?</li> <li>How can the current prioritization system be redesigned to accommodate assessed risks to the transportation infrastructure resulting from climate change and increased flooding?</li> <li>How sensitive to changes in criteria weighting schemes are bridge projects?</li> <li>Do the systems dynamic patterns identified for Chittenden County hold for other regions across the state?</li> </ol>
<b>Chester Harvey</b> (MS program Resources, Rubenstein School for Environment and Natural Resources)	Lisa Aultman-Hall with Austin Troy	<b>Developing a Typology of streetscape enclosure environments &amp; how this related to measures of livability across the urban landscape</b>	To complete requirements for the MS two papers will be produced: The first paper will develop a typology of streetscape enclosure environments based on a novel GIS measurement technique of street dimensions and remotely sensed tree canopy. The second will investigate how the enclosure-based typology relates to measures of livability across the urban landscape, using one or all of the following independent variables: real estate prices modeled with a hedonic function, geo-coded preferential language from aggregated social media records (e.g. Twitter feeds), or responses from one or several city-wide surveys on environmental satisfaction.
<b>Daniel Hagan</b> (MS program, School of Engineering, Mechanical Engineering)	Mandar Dewoolkar with Yves Dubief	<b>Prediction and Mitigation of Scour for Vermont Bridges</b>	Fast timescale scour, or catastrophic erosion, is the main cause of bridge failure in Vermont. However, the bulk of scour research is focused on slow timescale phenomena. There is also very little research regarding the influence of repeat events. Additionally, the sediment particle models are generally passive (once the sediment particles are entrained by the flow, it is assumed they do not have any effect on the fluid). Our work will examine the mechanisms of fast timescale repeat events in catastrophic scour using computational fluid dynamics (CFD). This will consist of numerical simulations of flow-sediment configurations similar to the physical experiments. These experiments are simple, so the computational cost is not prohibitive. Thus, 2D and 3D simulations are feasible on the VACC, and will provide finely detailed data. Ultimately, the experiments are appealing because the resulting physics involved are complex, and the numerical simulations will allow for an examination of the flow and particle bed that is not possible in the experimental tests. Unlike the experimental work mentioned above, the contribution of our work will be the exploration of the effects of repeated impacts on the same particle bed.

TRC Scholar GRA	Faculty Research Advisor	Research Working Title	Research Questions
<b>Geoffrey Battista</b> (MS Program, Community Development and Applied Economics)	Jane Kolodinsky	<b>Assessing Healthcare Access Among Vermont's Rural Elderly</b>	The US Census Bureau predicts that the number of Americans over 65 will double by 2050. Vermont's low birth and immigration rates will exacerbate the impact of this demographic shift on social services. Policymakers have a tacit obligation to consider the quality of life of their older constituents through the adequate provision of healthcare and transportation. However, a large segment of seniors face barriers to care. Twenty percent of elderly Americans reported that transportation difficulties affected their ability to see a doctor in the past year, and other data indicates the elderly are significantly less likely to have a driver's license. These barriers are exacerbated among rural residents who face greater driving distances and less public transit access than their urban counterparts. Vermont – a rural state within a northern climate – deserves special consideration in order to ensure robust healthcare accessibility. This research will address the issue with two questions: <ol style="list-style-type: none"> <li>Where in Vermont is healthcare theoretically accessible to the elderly, given healthcare locations and characteristics of the transportation network?</li> <li>Does this potential accessibility accurately reflect the experiences of the rural elderly as they access healthcare?</li> </ol> The first question will be answered through geospatial analysis. The second question will be addressed through qualitative research. This combination of qualitative and geospatial techniques will more accurately portray the reality of healthcare access than an arbitrarily-created and objective geospatial model. Qualitative research will also add the dimension of multiple truths, in which individual stories are tied into a greater narrative.
<b>Jim Dunshee</b> (MS Program, School of Engineering, Civil and Environmental Engineering)	Britt A. Holmén	<b>Evaluation of EPA'S Motor Vehicle Emissions Simulator (MOVES) Model for Tailpipe Emissions from Hybrid-Electric Vehicles</b>	Despite the recent increases in the number of hybrid-electric light-duty vehicles in the on-road fleet, there is surprisingly little quantitative information on hybrid emissions and fuel economy. This is especially true for particulate and air toxic emissions. Furthermore, the MOVES model that is required for transportation project planning and conformity (with air quality objectives), lacks a module for estimating hybrid vehicle emission. The proposed work will address the following key questions in this area: <ol style="list-style-type: none"> <li>How do the air toxic and particle number emissions of the conventional and hybrid light duty vehicles (cars) vary with aggregate driving conditions (facility (road) type, road grade and ambient temperature)?</li> <li>How do air toxic emissions modeled by MOVES2010a compare to those measured in the real-world using TOTEMS, for the conventional vehicle?</li> <li>How do conventional vehicle PM2.5 emissions modeled by MOVES2010a compare to the particle number emission rates measured in the real-world using TOTEMS?</li> <li>How can ratios of TOTEMS conventional/hybrid vehicle emissions of air toxics and particle number be used to estimate the hybrid's emission rates with MOVES? What error is associated with these emission rate estimates?</li> </ol>

TRC Scholar GRA	Faculty Research Advisor	Research Working Title	Research Questions
Paola Rekalde Aizpuru (MS Program, School of Engineering, Civil and Environmental Engineering)	Brian Lee	<b>Personal Transportation Plan Pilot Program: Creation of a planning tool for Vermonters with disabilities to meet transportation needs.</b>	<p>The goal of this work is to follow up on findings from an exploratory research project entitled, <i>Accessibility and Independent Mobility in Rural Built Environments: Challenges and Opportunities for Young People</i>. Following the preliminary analysis of the data from parent and youth surveys on teens and transportation, research is going to be expanded analyzing other disadvantaged groups such as disabled population. Because they are both marginalized segments of the population who have unique transportation needs different from the majority, the methods used for the <i>Teens and Transportation</i> project can be applied for the study of the <i>Transportation for Disabled Population</i>.</p> <p>This work has the goal of creating a planning tool that would be used by Vermonters with disabilities. This transportation planning tool would be used by target population as well as their families, friends, and other caretakers to match transportation resources with their travel needs. This is a collaborative investigation with the Vermont Agency of Transportation (VAOT).</p> <p>This work will contribute to an up-to-date understanding of the following research questions:</p> <p>a) Which are the mobility needs of Vermonters with disabilities? b) Which are the abilities with which Vermonters with disabilities can meet these needs with existing private and public transportation?</p>
Phoebe Spencer (PhD program, Rubenstein School for Environment and Natural Resources)	Lisa Aultman-Hall	<b>Seasonal Walking &amp; Cycling Behavior</b>	<p>Active transportation is a critical element of sustainable transportation because it reduces transportation energy use, tailpipe emissions, land required for parking, and reliance on the automobile. Moreover, active transportation options such as walking and bicycling are important for public health and can reduce the risks associated with inactive lifestyles. These modes also provide opportunity for increased mobility for those who are unable to own or operate a motor vehicle. The UVM TRC team has recently observed effects of weather and season on active transportation through web-based surveying and continuous automated infra-red counts of pedestrians on downtown sidewalks. In order to delve deeper into these connections, the fall 2013 component of this work uses the American Time Use Survey (ATUS) to expand to the nation-wide context to study active transportation behavior. This research measures active transportation behavior between and among climatic regions while controlling for socio-demographic characteristics of the respondents and their household.</p> <p>The spring 2014 portion of this work will focus on the equity associated with geographic differences in transportation enhancement project funding related to socioeconomic characteristics. By exploring equity in walking and bicycling investments, we can evaluate the current state of active transportation infrastructure in the United States, as well as its relation to sociodemographic characteristics of communities including underserved populations. This study will use data from the US Census and the National Transportation Alternatives Clearinghouse related to transportation enhancement projects (replaced by the Transportation Alternatives Program in 2012), which focus predominantly on bicycle and pedestrian projects. Data will be analyzed spatially using GIS and considered with respect to sociodemographic variables at the census tract level. Identifying underserved areas and populations provides an opportunity to better direct future investments and promote active transportation in equitable ways. These 2013-2014 efforts will lead to a PhD thesis focused on social justice and equity in active transportation.</p>

TRC Scholar GRA	Faculty Research Advisor	Research Working Title	Research Questions
Tim Pede (MS program Resources, Rubenstein School for Environment and Natural Resources)	Austin Troy with Brian Lee	<b>The interrelationship between land use, transportation, and energy consumption</b>	<p>For my thesis, I am examining the interrelationship between land use, transportation, and energy consumption. The first section will involve a regression analysis of residential energy use, identifying significant building and demographic characteristics. Although the plan is to conduct this analysis at the household level for Chittenden County, it may be necessary to use a different metropolitan area or aggregated data. The second portion will determine how strongly residential energy use and transportation demand are related, using zone vehicle miles travelled (VMT) output from the Chittenden County Regional Planning Commission's (CCRPC's) Travel Demand Model (TDM). The last will assess the outcome of various land use and transportation investment policies in Chittenden County, using household and TDM output from the UVM Transportation Research Center's 1990 UrbanSim model for this area. The idea is to not only estimate the energy savings of improving building efficiency, encouraging transit use and non-motorized travel, altering the vehicle fleet, and promoting compact development, but to also determine how these energy reduction strategies will interact with one another, in order to identify the most effective combination of policies for Chittenden County.</p>
Xiao Xiao (PhD program, Rubenstein School for Environment and Natural Resources)	Robert Manning	<b>Sustainable Transportation Planning for Rural, Recreational and Park Landscapes: Calibrating Levels of Service for Multiple Modes</b>	<p>For many years, parks and public lands have been linked closely to the sustainability of transportation systems. These include sustainable management of transportation settings like greenways, hiking trails, and scenic by-ways. Although the quality of a transportation system and a traveler's experience seems independent, recent research has built conceptual relationships between level of service (LOS) in transportation studies and indicators and standards of quality in leisure and outdoor recreation. The indicators of traveler experiences are effective measures of sustainability for transportation, posing research questions aimed to extend our understanding of the quantitative relationships between LOS and indicators of travelers' experiences to a broader array of sustainable transportation management frameworks. This research will investigate these measures and relationships, focusing on development and application of the Transportation Recreation Opportunity Spectrum (T-ROS), a project funded by the TRC and the Office of Federal Lands Highway and supported by the National Park Service. A transportation system is not just a means of access, but a range of transportation settings that offer diverse recreational opportunities. T-ROS is defined by a series of indicators and standards. In order to explore what indicators influence travelers' perspectives toward a transportation recreational opportunity and how the influence mechanism works, we will conduct a case study on the roaded natural setting of Grand Canyon National Park aimed at producing management strategies that improve the quality of transportation systems at Grand Canyon National Park and other public lands with this type of transportation network.</p>

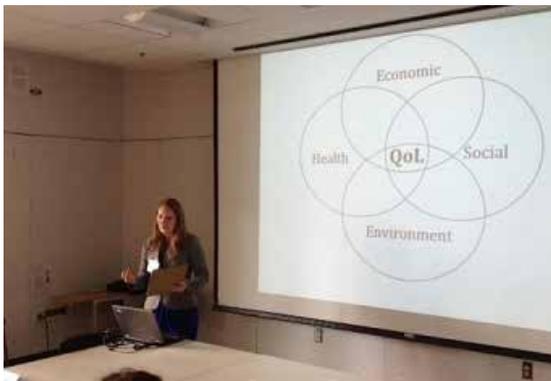
# TRC Students present at International Bicycle Urbanism Symposium

06-27-2013

By jposner

TRC Scholar Phoebe Spencer (CDAE) and undergrad researcher Ben Rouleau (CEMS) recently presented at the International Bicycle Urbanism Symposium in Seattle. The forum featured leading bicycle, urban design and built environment researchers from around the world.

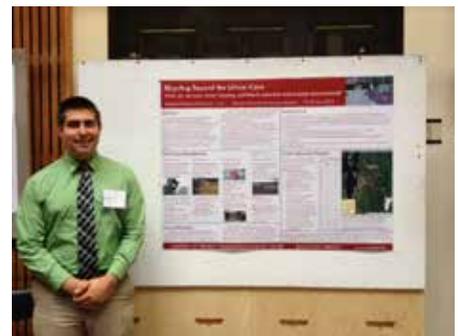
Phoebe Spencer presented a paper, “Understanding the Bicycle as a Vehicle of Quality of Life,” [Click Here to See Abstract] introducing research she has been undertaking as part of a UVM team with Professors Luis Vivanco, Richard Watts, Stephanie Kaza and Josh Farley. The Bicycling and Quality of Life project was funded through a University Transportation Center award from the TRC. Phoebe is currently finishing her Masters in Community Development and Applied Economics and her contribution to this effort represents a portion of her thesis research.



“The conference focused largely on bicycling within the context of urban planning, but also addressed various aspects of bike culture as well,” said Spencer on her return. “It was the first time this conference has been held, and it drew over 200 people from around the world. Keynote speakers were from the US, Netherlands, China, and New Zealand, so it had a very international vibe. Like other big bike conferences, there was a lot of praise for bicycle infrastructure in Europe and a push for similar models in the US and Oceania.”

Ben Rouleau participated in the poster session, presenting “Bicycling Beyond the Urban Core: What do we know about bicycling activities in suburban and exurban environments?” [Click To See the Poster] His research is based on work with TRC staff Jon Dowds and Jim Sullivan and faculty Brian Lee focused on collecting data on bikes and pedestrians throughout a variety of contexts within Chittenden County, from Burlington’s Church Street to dirt roads in Jericho and everywhere in between. “There is little data on bikes and pedestrians and how their volumes can be measured and predicted, so our work on data collection is important in advancing the field. There is even less data or research on bicycles in rural areas, which were a special focus of our work and a major research interest of mine” explained Rouleau.

In discussing why the conference was of value, Rouleau said, “While bicycling in cities is not my specific area of research, it is important to have a good understanding of the research that has been done there and how it is being applied. It is one thing to read the articles and studies, but meeting professors, graduate students, city planners, bicycle activists, and transportation engineers from all over the world who are working to advance our understanding of bicycling was an amazing experience. It was energizing to hear and feel the necessity of advancing non-motorized transportation modes and the safety of those who use them. There is much to be said about meeting a whole bunch of people you don’t know, ride bikes with them in the Seattle rain, then slowly meet and talk to them over coffee after a presentation.” Rouleau and Spencer found that many of the conference participants, especially those who work nationally (Continued from previous page) in the US or other countries were interested in the research they had conducted. The conference was also productive as an introduction to new cutting edge data collection and analysis techniques and new modeling capabilities as well as being exposed to different ways to present findings. Several new conversations on future collaborations were also started.



# TRC Alum at Work: Jonathan Maddison, Travel Training Coordinator, Ithaca, NY

05-21-2013

By Jordan Posner

As the Travel Training Coordinator at Way2Go, a program of Cornell Cooperative Extension of Tompkins County, Jonathan Maddison (MPA 2012), has the opportunity to apply his knowledge of transportation governance and transportation systems on a regular basis. As a Transportation graduate research assistant and a student of the Masters of Public Administration program, he worked with Drs. Richard Watts and Tom Macias studying the social construction and framing of tailpipe emissions in the media that led to a thesis of the same name. This research required him to synthesize a large quantity of research about transportation policy-making and how the public understands impacts of tailpipe emissions. “Participating in TRC seminars, transportation conferences and courses like “Critical Issues in Transportation” provided me with firm grasp of current issues in transportation and transportation governance” stated Maddison who was TRC’s UTC Student of the year in 2011.



The Way2Go mission is to transform our community’s culture of transportation among users, providers and decision makers, so that everyone can meet their transportation needs in an equitable and environmentally sustainable way. Jonathan’s position requires him to operate as a hub among diverse stakeholders from health, transportation, human services, education, etc. With such an expansive scope Maddison credits the foundation of knowledge he gained at the TRC and at the Master of Public Administration program to help him hit the ground running.

*“Participating in TRC seminars, transportation conferences and courses like “Critical Issues in Transportation” provided me with firm grasp of current issues in transportation and transportation governance”*

When he was hired at Way2Go in June 2012 he was tasked with creating a network of human service agencies with the goal of professionalizing travel training services for individuals with disabilities, older adults and people with limited English proficiency. Travel training is an emerging service typically provided by transit providers, schools, or disability service agencies in larger urban areas and supporting a vision of a more inclusive and accessible transportation system. Jonathan worked with this network to submit a proposal to fund a 2-year pilot travel training program in Tompkins County which is currently being reviewed by the New York State Department of Transportation.

Meanwhile, he has taken the initiative to start offering travel training to community members. Jonathan reflected that “this experience has led me to become much more aware of the transportation barriers that are present in all communities that prevent people with low vision, people who use mobility aides or people with mobility impairments from fully participating and accessing communities.”

His other role at Way2Go is to encourage community members to adopt environmentally friendly modes of transportation. The program does this through media outreach and talking with community members at workshops and community events.

Most recently he participated in organizing a community-wide event called Streets Alive. More than 12 blocks in downtown Ithaca were closed to cars in order to celebrate walking, cycling and other forms of active transportation.

## TRC Program Highlights

In addition to its research and education agenda the TRC hosts a number of other program initiatives. The TRC is the host to the New England Transportation Consortium (NETC), a research cooperative between the state DOTs of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. NETC recently executed contracts for four new projects:

NETC 06-4 Preventative Maintenance and Timing of Applications

NETC 07-1 In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations

NETC 09-3 Advanced Composite Materials: Prototype Development and Demonstration

NETC 10-3 Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology

NETC is also convening Technical Committees to write the SOWs for four new projects:

07-3 Determining Optimum Distance for a Lane Drop Downstream from a Signalized Intersection

13-1 Development of High Early Strength Connections for Accelerated Bridge Construction.

13-2 HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures

13-3 Improved Regionalization of QA Functions

The TRC is also host for the US Department of Energy sponsored Vermont Clean Cities Coalition (VTCCC). It will be holding two events before the New Year:

Compressed Natural Gas Workshop for Fleet Managers November 13, 2013 in Burlington.

CNG, Propane, and Hydrogen Workshop for First Responders December 6, 2013 held at Vermont Technical College, Randolph VT

Beyond these events, VTCCC has been closely working with UVM Transportation and Parking Services and UVM Office of Sustainability on proposals to fund electric vehicle charging stations on campus.

The VTCCC intern Carson Casey has been working on a semester long market research project that evaluates environmental transportation certificate programs. This research coincides with the efforts of VTCCC to develop the "New England Clean Fleets" program that will emphasize the use of alternative fuels. This project is a part of a multistate grant that brings together five New England Clean Cities Coalitions; Maine, New Hampshire, Massachusetts, Rhode Island, and Vermont.

In September, the Eastern Border Transportation Coalition (EBTC) contracted with the TRC to help organize and lead a strategic planning process and workshop for them after their Annual workshop on the Canadian-US Border: "Dynamics of Change." EBTC members work together to assist in the development of a seamless, multi-modal transportation network, which is secure, safe, efficient and environmentally sustainable. EBTC Members are the Transportation Agencies of the U.S. States of Michigan, New York, Vermont and Maine and the Canadian Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, and Newfoundland & Labrador. TRC Associate Director Glenn McRae is continuing to work with the group to advance the refinement of the organization's plan.

## TRB 2014 Papers Accepted

### TRC students, staff and associated faculty

Carol Vallett (CESS), Glenn McRae (TRC), Michelle McCutcheon-Schour (TRC)	<i>Bringing Developmental Evaluation Practices and Principles to the Transportation Education Development Pilot Program</i>
Tyler Feralio, Britt A. Holmen (CEMS-TAQ)	<i>Effect of Drive Cycle and Fuel Type on Ultrafine Particle Number Emissions Model Input Optimization</i>
Karen M. Sentoff, Britt A. Holmen (TRC, CEMS, TAQ)	<i>Fuel Economy Benefit of a Hybrid-Electric Light-Duty Vehicle across Real-World Operating Modes</i>
Eric Talbot (RSG), Bob Chamberlin (RSG), Britt A. Holmen (CEMS), Karen M. Sentoff (TRC-TAQ)	<i>Calibrating A Traffic Microsimulation Model To Real-world Operating Mode Distributions</i>
Lisa Aultman-Hall (TRC), Jeffrey LaMondia (Auburn University)	<i>Defining Long-distance Travel and Implications for Travel Forecasting</i>
Lisa Aultman-Hall (TRC), Jeffrey LaMondia (Auburn University), Elizabeth Greene (RSG)	<i>Long-distance Work and Leisure Travel Frequencies: An Ordered Probit Analysis of Stated Preference Data</i>
Kristine Harootunian (TRC), Brian H.Y. Lee (TRC), Lisa Aultman-Hall (TRC)	<i>Odds of Fault for Out-of-state Drivers in Crashes in Four States in the USA</i>
Nathan Belz (TRC-UAK), Lisa Aultman-Hall (TRC), Brian H.Y. Lee (TRC), Per Garder (UMO)	<i>An Event-Based Framework for Non-Compliant Behavior at Single-Lane Roundabouts</i>
Margaret J. Eppstein (CEMS), Donna M. Rizzo (CEMS), Brian H.Y. Lee (TRC), Joseph Krupa (CEMS) and Nadine Manukyan	<i>National Survey Respondents as Agents in a Model of Plug-In Hybrid Electric Vehicle Adoption</i>
Dea van Lierop (McGill), Brian H.Y. Lee (TRC), Ahmed M. El-Geneidy (McGill)	<i>Secure Investment for Active Transport: Willingness to Pay for Secured Bicycle Parking in Montreal, Canada</i>
B.W. Gomez, Mandar M. Dewoolkar (CEMS), J.E. Lens (CEMS), C.C. Benda	<i>Evaluation of design assumptions for structural backfill of abutments and retaining walls</i>

## TRC Staff updates



**Zack Borst** has joined the TRC staff as an Outreach and Communications Professional. He was most recently Regional Outreach Specialist at Vermont's Division of Emergency Management and Homeland Security. He has extensive experience in media development and services and graduated from UVM with a Geography Degree and background in Geospatial Technologies and Applied Design.



**Laurie Eddy** is taking up a position as a Program Support Coordinator starting work with the New England Transportation Consortium and will expand to provide key support to a number of the Center's programs. She has a long history in similar roles at UVM, most recently with the James M. Jeffords Center for Policy Research.



**Karen Sentoff** who finished her Masters in the spring became a permanent member of our Research Team, sharing her time between the Transportation Air Quality Lab and other TRC projects.



**Michelle McCutcheon-Schour** as the new coordinator for the Vermont Clean Cities Coalition (VTC-CC) at the University of Vermont Transportation Research Center (TRC). Michelle served as an intern for the coalition in the summer of 2011, and has been working at the TRC for the past year. She led an electric vehicle outreach project last summer, and has continued work at the TRC on workforce development initiatives.

### Certificate of Graduate Study in Sustainable Transportation Systems

Transportation is a transdisciplinary field of study that broadly examines the movement of people and goods over space as well as the economic, public health, environmental and social impacts of those systems. Local, regional and global transportation systems are vital to building community, the economy, and quality of life. Critical transportation system issues and problems in the 21st century will require interdisciplinary teams to design innovative solutions.

There are two ways in to earn a Certificate of Graduate Study:

- Graduate students can earn a Certificate through a number of Master's and/or Doctoral degree at the University of Vermont.
- The Certificate can also be earned as a "stand-alone" certificate for qualified professionals who already have an appropriate Master's or Ph.D., or equivalent work experience.

For more information: Glenn McRae (656-1317)



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