University of Minnesota
Center for Transportation Studies
Research E-News

May 2008 – Vol. 6, No. 5

CTS Research E-News brings you the latest research project milestones, published reports, and seminar coverage.

In this issue:

Policy & Planning

Metro project demonstrates equity aspects of public transit decisions

New public transit projects affect people unevenly, particularly minorities and those with low incomes who may not have the option to drive. These groups historically are not active in the planning process for public transportation, although they often provide the most reliable ridership numbers and rely most heavily on public transportation.

A proposed transit project in the Twin Cities metro area demonstrates these equity issues, say **Carrie Ann Fathman**, a master's candidate in landscape architecture, and **Kristine F. Miller**, associate professor in landscape architecture. They described their findings in an article in the Center for Urban and Regional Affairs Fall 2007 CURA Reporter (188 KB PDF).

The Bottineau Boulevard Bus Rapid Transit (BRT) project is a joint effort of Hennepin County, the seven municipalities along the boulevard, and Metro Transit. The primary goal is to connect northwest suburban communities to downtown Minneapolis. Although BRT offers clear benefits for commuters from these suburbs, the researchers write, there are questions about its effects on West Broadway, the main commercial corridor of North Minneapolis.

Their study, funded by a CURA Faculty Interactive Research Program grant, examined the potential impacts of the proposed Bottineau Boulevard BRT on the West Broadway neighborhood. The study was developed in collaboration with Juxtaposition Arts, a youth-focused, minority-directed, urban visual arts center based in the West Broadway neighborhood.

The article documents the researchers' methods and findings, the potential positive and negative impacts of BRT, and the experiences of their community partner.

Key aspects of the BRT project were in flux during the course of the study, and the entire project is now uncertain. The biggest change happened when Hennepin County announced that the BRT project might be dropped so that a light-rail transit (LRT) project could be pursued. The LRT route would not run on West Broadway.

"Both BRT and LRT have implications for transportation equity in the metro area because the goal of both kinds of transit is to entice drivers to become riders rather than to increase transit options for existing riders or to increase transportation equity," Fathman and Miller write. Regardless of whether or not BRT or LRT is built in the corridor, they believe the public participation process is essential. "Riders must be involved, information must be made available as changes occur, and community organizations that advocate for transit riders and for Northside residents must be included," they say.

To read the article, go to the Center for Urban and Regional Affairs Web site.

Transportation and the Environment

Giving native species an advantage in wetland restorations

Reed canarygrass *(Phalaris arundinacea)* is a persistent headache for agencies engaged in wetland restoration, often invading sites with little vegetative cover and preventing native plant species from establishing themselves. Professor **Susan Galatowitsch** from the University of Minnesota's Department of Horticultural Sciences and **Basil Iannone III** from the Department of Ecology, Evolution, and Behavior tried out a variety of techniques to prevent Phalaris invasion; their results will help guide transportation agencies charged with protecting wetlands and mitigating the environmental effects of road construction.

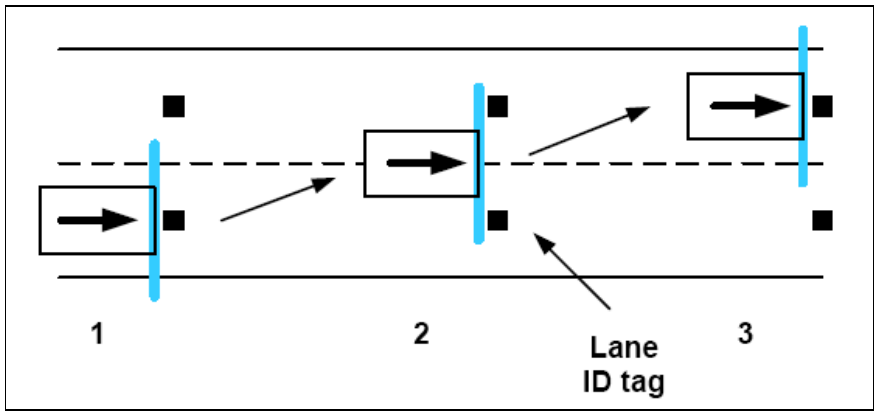
Galatowitsch and Iannone carried out their research at the University of Minnesota's Horticultural Research Center in Carver County over a two-year period, testing techniques that included the rapid establishment of perennial plant communities, planting vegetative cover crops to reduce light penetration, and reducing nitrogen in the soil by incorporating carbon from sawdust. The research was supported by the Minnesota Department of Transportation.

Quickly establishing a community of perennial plants proved to be more effective than reducing light or soil nitrogen levels. The researchers hypothesize that rapid establishment of a community of desirable native plants can both reduce the amount of light penetrating to the ground and reduce soil nitrogen levels without adding carbon, thus helping to suppress Phalaris colonization in areas where it has been removed. However, they note, continued maintenance will often be necessary to prevent Phalaris from reconquering sedge meadows where it has been eradicated.

Wet Meadow Revegetation Following Invasive Plant Control (Mn/DOT 2008-04) is available from the CTS Web site.

Intelligent Transportation Systems

RFID research supports new transportation applications



If you have ever been startled by an anti-theft alarm while shopping at the mall, you may have glimpsed the future of intelligent vehicle positioning systems. University of Minnesota researchers have demonstrated that radio frequency identification (RFID) tags, similar to the ones attached to expensive items in many stores, can be used by intelligent vehicles to track lane position and avoid rear-end collisions.

The RFID research was carried out by a team of researchers from the Intelligent Vehicles Laboratory, led by director **Craig Shankwitz** and including research associate **Pi-Ming Cheng** and research fellows **Lee Alexander**, **Alec Gorjestani**, **Arvind Menon**, and **Bryan Newstrom**. The team used commercially available RFID components to create robust vehicle positioning applications, which were then analyzed and tested to determine the parameters for successful use of RFID technology.

Many vehicle location and positioning applications are built around Global Positioning System (GPS) technology, which, in theory, provides the capability to locate a GPS-equipped vehicle anywhere on the Earth's surface. However, in practice, GPS is limited by the need for clear "views" of orbiting satellites; bridges, tunnels, and the urban canyons of downtown areas can block or interfere with GPS signals, resulting in unacceptable gaps in service.

The technique developed by the Minnesota team promises to help fill many of these gaps, augmenting GPS with a means of determining location that is not affected by the types of interference that plague satellite-based technologies. Coded RFID tags embedded directly in the roadway can be activated and read by sensors mounted on a vehicle, in the same way that sensors in the doors of shops activate and read RFID anti-theft tags. Because each tag in the road is programmed to read out the lane in which it is located and its linear distance along the road from a landmark point, the vehicle's onboard navigation system can find out exactly where it is every time it passes over a tag.

The rear-end collision avoidance system demonstrated by the Minnesota team combines RFID data with the emerging dedicated short-range communications (DSRC) standard for motor vehicles. DSRC allows vehicles traveling near each other to share information; sharing positioning data derived from the RFID system eliminates the need for the vehicles to be equipped with radar or other sensors.

This research was one of several Intelligent Vehicles Laboratory research projects designed to support bus rapid transit (BRT) operations—a form of transit in which buses provide services similar to those traditionally provided by rail-based systems on bus-only lanes or dedicated roadways. Driver-assistive systems that help bus operators do their jobs safely and efficiently are seen by many researchers as crucial for the widespread implementation of BRT services.

The research was funded by the Intelligent Transportation Systems Institute with support from the Minnesota Department of Transportation's MnROAD research facility and Nissan North America. For more on this research, see the Spring 2007 ITS Institute Sensor.

Advanced BRT Volume I: Innovative Technologies for Dedicated Roadways (CTS 08-06) is available from the CTS Web site.

Transit, Bicycling, and Walking

TCRP research publications available online

The federal Transit Cooperative Research Program (TCRP), administered by the Transportation Research Board, provides practical transit research to address technical and operational issues. TCRP emphasizes putting research results into the hands of organizations and individuals that can use them to solve problems.

Recent TCRP publications include:

- *Guidebook for Mitigating Fixed-Route Bus-and-Pedestrian Collisions* (TCRP Report 125)
- *Guidebook for Measuring, Assessing, and Improving Performance of Demand-Response Transportation* (TCRP Report 124)
- *Understanding How Individuals Make Travel and Location Decisions: Implications for Public Transportation* (TCRP Report 123)
- *Understanding How to Motivate Communities to Support and Ride Public Transportation* (TCRP Report 122)
- *Toolkit for Integrating Non-Dedicated Vehicles in Paratransit Service* (TCRP Report 121)
- *Transit Bus Stops: Ownership, Liability, and Access* (TCRP Legal Research Digest 24)

Journal of Public Transportation

The Journal of Public Transportation, Vol. 11, No. 1, 2008, published by the National Center for Transit Research at the University of South Florida, includes these articles available at http://www.nctr.usf.edu/jpt/journalfulltext.htm:

- Qualitative Research to Assess Interest in Public Transportation for Work Commute
- Managing Limited Access Highways for High Performance: Costs, Benefits, and Revenues
- Demand Responsive Route Design: GIS Application to Link Downtowns with Expansion Areas
- Does Government Structure Matter? A Comparative Analysis of Urban Bus Transit Efficiency
- Encouraging Sustainable Campus Travel: Self-Reported Impacts of a University TravelSmart Initiative
- Faith-Based Organizations: A Potential Partner in Rural Transportation

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Transportation Infrastructure

Test rolling methods put to the test by new models

The results of a recent study by University of Minnesota researchers offer insights into common methods employed to test soil compaction in road construction projects. Professor **Andrew Drescher** and graduate student **James Hambleton** of the civil engineering department created analytical and numeric models of test rolling methods for road embankment construction. Their findings can be used to improve the interpretation of test rolling data, as well as to assess the effects of modifications to test roller equipment.

Test rolling is commonly used in road construction to determine whether subgrade soils have been sufficiently compacted to support paving. Following compaction, the test roller—essentially a heavy, wheeled trailer carrying a known load—is passed over the ground to be tested, and the depth of wheel penetration is recorded. Among the advantages of this approach are its relative simplicity and the fact that it provides a continuous record of compaction over a large area, detecting specific areas of inadequate compaction in the process.

In practice, acceptable test roller penetration is determined empirically on a pass-fail basis, and does not relate roller penetration to factors such as the mechanical properties of the subgrade soil or the geometry and loading of the wheels. By creating mechanistic models of test rolling, the researchers sought to give engineers the information needed to more fully interpret test rolling results, as well as to modify test rolling equipment if necessary to produce more informative results.

Drescher and Hambleton used two distinct modeling methods. The first, an approximate analytic model based on the bearing capacity formula, is convenient for general use; the second, a finite element numeric model, relies more heavily on case-specific configuration.

To verify their models, the researchers carried out laboratory tests on a variety of combinations of soils and wheel geometries. Both models are capable of producing realistic predictions of how much the wheel of a test roller with given load and wheel geometry will penetrate into a soil with known mechanical properties, and conversely, estimating the properties of a soil based on the penetration of a test roller. The models can account for the behavior of both homologous and layered soils.

The research was supported by the Minnesota Department of Transportation and the Local Road Research Board.

Development of Improved Test Rolling Methods for Roadway Embankment Construction (Mn/DOT 2008-08) is available from the CTS Web site.

Upcoming Events

October 1-2

Fall Maintenance Expo, St. Cloud, Minnesota. Contact Kathy Warren, 651-351-7432, kwarren@usinternet.com.

October 7-8

Toward Zero Deaths Conference, Rochester, Minnesota.
