



# RESEARCH SERVICES & LIBRARY

OFFICE OF TRANSPORTATION  
SYSTEM MANAGEMENT

## TECHNICAL SUMMARY

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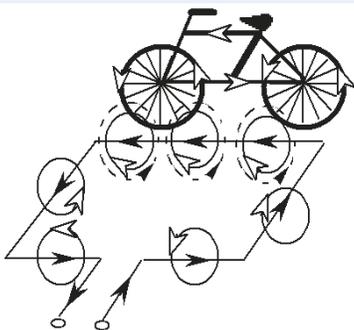
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### Principal Investigator:

Greg Lindsey, University of Minnesota

### PROJECT COST:

\$99,948



Inductive loops can count bicycles by measuring their effect on electrical current in wires embedded in the pavement.

# Protocols and Technologies for Monitoring Non-Motorized Traffic

## What Was the Need?

Many parties in Minnesota are interested in measuring bicycle and pedestrian travel: MnDOT and the Minnesota Complete Streets Coalition seek safety for all modes of transportation; the Department of Health encourages active transportation as a form of exercise; and the Department of Natural Resources and tourism agencies are interested in trail and other facility use.

But adequate bicycle and pedestrian traffic data is unavailable statewide. For example, safety cannot be assessed. The state knows the annual number of bicyclist deaths, but there is no data about the number of bicyclists or bicycle miles traveled to calculate accident rates. Similarly, a lack of usage data also makes it impossible to know the effectiveness of most infrastructure investments.

MnDOT has received many requests from local agencies to develop consistent counting methodologies that ensure accuracy and compatibility with other data sources. Guidance about automated counting technologies is also needed. While loop detectors, infrared sensors and other devices can collect large quantities of data, their accuracy is limited and they don't supply data that short-term manual counts can provide such as gender or helmet use.

## What Was Our Goal?

This project's goal was to launch the Minnesota Bicycle and Pedestrian Counting Initiative by developing guidance and count protocols and coordinating pilot field counts. It also sought to analyze automated continuous counts in the state to develop adjustment factors to extrapolate annual traffic volumes from short-duration counts.

## What Did We Do?

After assessing current non-motorized traffic monitoring programs in Minnesota and other states, and counting protocols used by the National Bicycle and Pedestrian Documentation Project and other organizations, researchers developed [guidance](#) for manual non-motorized traffic counts. MnDOT hosted five workshops and a webinar to introduce local officials to the initiative and to recruit participants for pilot field counts. After the pilot counts, researchers surveyed count managers for feedback and analyzed existing automated counts to illustrate how they can be used with field counts to extrapolate daily or annual data.

## What Did We Learn?

As of 2012, six agencies in Minnesota count non-motorized traffic, and even though comprehensive bicycle and pedestrian data are not yet available, Minnesota is a leader in this type of monitoring with more than 1,000 manual count locations and 32 automatic count sites. Because of Minnesota's experience, researchers were able to collaborate with the National Cooperative Highway Research Program's national Methodologies and Technologies for Collecting Pedestrian and Bicycle Volume Data research project, due for release in 2014, and contribute to the Federal Highway Administration's efforts to update its [Traffic Monitoring Guide](#) to include a chapter on non-motorized traffic.

*There is widespread interest in measuring bicycle and pedestrian traffic to determine health, safety and economic impacts. This project developed protocols and guidance for field counts of non-motorized traffic and analyzed automated counting technology.*

*“We have so much data about other modes of transportation, but we know almost nothing about bicycling and pedestrians. As we get into tougher funding times, we need data to better prioritize spending.”*

—Lisa Austin,  
MnDOT Bicycle and  
Pedestrian Planner

*“We’ve shown the state of the art for Minnesota and set the groundwork for further testing and equipment evaluation. We’re taking a systematic approach to institutionalizing monitoring in a way that’s technically credible and consistent with procedures for vehicle monitoring.”*

—Greg Lindsey,  
Professor, University of  
Minnesota Humphrey  
School of Public Affairs

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Manual field counts require more labor than automatic technologies, but they can collect deeper data about demographics and helmet use. Both forms of monitoring are necessary to give a complete picture of bicycle and pedestrian traffic in the state.

The [guidance](#) researchers developed for manual non-motorized traffic counts includes standard forms, checklists to ensure completion of valid counts, training materials, public information for distribution to passers-by, links to smartphone applications that provide counting locations and spreadsheets for reporting results.

Pilot field counts took place at 133 locations in 43 municipalities of varying sizes. Average volumes at all sites were 7.5 bicycles per hour and 19.3 pedestrians per hour, with significantly higher traffic levels in the largest cities. Count managers reported that training materials were useful, but the spreadsheet for reporting traffic levels was awkward to complete.

Both automatic and manual counts are necessary to get a complete picture of non-motorized traffic rates. Automatic counts obtain continuous data, but they cannot capture attributes such as gender and bicycle helmet use, and many cannot differentiate between bicyclists and pedestrians or only count one type of traveler. Manual counts can capture this information but are too labor-intensive for large-scale counts. Analysis showed that the techniques currently used to extrapolate motorized traffic data from short-term counts should be adaptable to bicycle and pedestrian traffic data.

## What’s Next?

To evaluate automated counting methods, MnDOT has begun an implementation project, [Implementing Bicycle and Pedestrian Traffic Counts and Data Collection](#), planned for completion in fall 2014. This project will install and evaluate several types of equipment (such as loop detectors, infrared sensors and portable equipment) in trails, bike lanes and shoulders, and other facilities in urban and rural areas around the state.

MnDOT Traffic Forecasting & Analysis is evaluating how to incorporate non-motorized traffic data into its existing traffic database. Researchers further recommend that MnDOT institutionalize its coordination of statewide bicycle and pedestrian counts, improve methods for reporting field counts, deploy and demonstrate the feasibility of new automated counting technologies, and work with local agencies to establish a network of permanent automated monitoring sites across the state.

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*This Technical Summary pertains to Report 2013-24, “The Minnesota Bicycle and Pedestrian Counting Initiative: Methodologies for Non-motorized Traffic Monitoring,” published October 2013. The full report can be accessed at <http://www.lrrb.org/PDF/201324.pdf>. Guidance for manual traffic counts developed in this research is available at <http://www.dot.state.mn.us/bike/>.*