Scattered throughout this report are quick facts from an economic impact study released by the University of Minnesota in spring 2011. For more about the study, please see http://impact.umn.edu.
Center for Transportation Studies

2011 Annual Report

This publication contains highlights of transportation research, education, and outreach activities conducted by the Center for Transportation Studies and its affiliated programs for the period July 2010 through June 2011 (fiscal year 2011).

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Because CTS makes an impact in many ways and places.
In these times of fiscal challenge, providing value is more essential than ever.

In 2011 the University of Minnesota completed an economic impact study that documented the deep value of our institution. For example, it found that every dollar invested in the U of M generates $13.20 in the statewide economy. A few other examples from the study are interspersed throughout this annual report.

CTS also makes an impact in many ways and places. Our innovative research helps to maintain the infrastructure, manage traffic, and make travel safer; our education programs strengthen the workforce; our outreach programs connect people and ideas to solve real-world problems.

But we’re not content. During my first year as director, CTS conducted a strategic planning process that assessed our strengths and opportunities in the context of a changing, globalized environment. The result is a strategic plan that supports our vision: “To be a premier transportation innovation resource to the world.”

Our plan has two overarching goals:
• Sustain and grow activities by securing diverse funding from local, national, and international sources.
• Demonstrate the clear value of CTS to the University and to our external stakeholders—in Minnesota and worldwide.

We are especially excited about the global aspect of our vision. International cooperation is becoming an increasing priority to solve critical challenges and get the most benefit from stretched resources. One example of this growing cooperation was the inaugural meeting of the World Society on Transport and Land Use Research this past July, which CTS organized. Spurring international research collaboration is also part of my work as a member of EUTRAIN, a two-year project funded by the European Union.

As part of the University of Minnesota, CTS is driven to discover the transportation innovations that will improve quality of life—whether that life is in St. Paul or Singapore, Bemidji or Brussels. This annual report showcases our recent activities.

We will continue to engage our stakeholders to guide our direction and ensure that the results of our work are valued and shared. Our success will depend on the support of our committee members, sponsors, and many partners, and we thank you for your commitment.

Laurie G. McGinnis
Director
More than three-fourths of employers in a state-sponsored program report that telework is leading to greater productivity.

Because research fuels innovations that make life better.

www.cts.umn.edu/Research
Giving people choices

Teleworking program helps employers, employees, community

eWorkPlace Minnesota, a state-sponsored program for Twin Cities metro-area employers, is delivering at least nine dollars in benefits for every one dollar invested in encouraging teleworking, according to research from the Humphrey School of Public Affairs.

eWorkPlace encourages employers to offer the option of working from a remote location via the Internet or other technology, or to implement a more dramatic workplace culture shift through the adoption of a results-only work environment strategy.

eWorkPlace addresses the telework element of the federal Urban Partnership Agreement program, under which the Minnesota Department of Transportation (MnDOT) and the Metropolitan Council were selected in 2007 to work toward reducing traffic congestion through a variety of methods including telework, tolling, transit, and technology and operations.

eWorkPlace has involved 48 employers and more than 4,200 employees.

Among the findings of the research:

- More than three-fourths of employers report that telework is leading to greater productivity. None report a loss of productivity. Employers also report lower costs and improved employee retention.
- Participants are saving about 7.5 million vehicle-miles traveled per year.
- Participation led to a reduction of more than 8 million pounds of CO₂ emissions/year.

Adeel Lari, director of innovative finance at the State and Local Policy Program at the Humphrey School and the eWorkPlace program director, said the program has "exceeded expectations and demonstrated a win-win-win for employers, employees, and the community."

eWorkPlace was a collaborative effort of MnDOT, the Humphrey School, Metro Transit, the region’s five transportation management organizations, and SRF Consulting Group.

Research funds competitively awarded to the U of M create $1.5 billion in total economic impact annually and support 16,193 jobs.

—University of Minnesota economic impact study (http://impact.umn.edu)
Transportation affordability is about more than the amount of money people spend on travel, yet traditional affordability measurement methods often fail to account for people’s time as a cost. They also ignore the variation in needs and available resources among diverse populations in different locations.

Yingling Fan, assistant professor at the Humphrey School of Public Affairs, and graduate student Arthur Huang developed a context-sensitive transportation affordability framework that considers how a variety of elements influence affordability. The new framework provides a foundation for transportation policymaking by asking how affordable transportation options are, for whom, and in what settings. The study was sponsored by CTS.

Fan and Huang defined transportation affordability as a household’s capacity to pay monetary and time-based transportation costs without incurring financial difficulties and time pressures. The researchers’ new framework differentiates population groups based on sociodemographics, the built environment, and the policy environment to determine transportation affordability.

To demonstrate the need for a context-sensitive framework, the researchers conducted a case study of the Twin Cities. Based on study results, Fan and Huang found a need for multimodal transportation solutions to improve affordability among all groups in all locations. As one short-term option, the researchers suggest providing financial subsidies for car access among disadvantaged populations to improve both transportation affordability and social welfare.
Managing traffic and improving operations

Technology keeps buses on time and between the lines

A driver-assist system (DAS) developed by the Intelligent Transportation Systems (ITS) Institute is helping local bus drivers safely navigate bus-only shoulder lanes, even in heavy traffic and poor weather conditions. The system uses a combination of highly accurate differential GPS and vehicle-mounted laser sensors to monitor a bus's position on the roadway and provides visual and tactile alerts to quickly deliver critical information to the driver. This is the first deployment of the system in passenger service.

With funding through the U.S. Department of Transportation's Urban Partnership Agreement and match from the Twin Cities Metropolitan Council, the ITS Institute's Intelligent Vehicles Laboratory (IV Lab) and HumanFIRST Program have collaborated with the Minnesota Valley Transit Authority (MVTA) and Schmitty and Sons Transportation to equip 10 MVTA buses with the system. The ITS Institute is a federal University Transportation Center that is a part of CTS.

Project leaders are Craig Shankwitz, director of the IV Lab; Mike Manser, director of the HumanFIRST Program; and Mike Abegg, MVTA transit planning manager. “It’s really been a great team,” Abegg says.

The DAS technology was installed in the MVTA buses in March 2010, and use of the buses was progressively increased through January 2011 as drivers were assigned and trained. The buses provide service on part of the Cedar Avenue bus rapid transit (BRT) corridor, which offers express commuter service on bus-only shoulders between downtown Minneapolis and Apple Valley. The 22-mile BRT corridor is part of an effort to improve traffic flow on I-35W.

SMART Signal improves traffic management in California and Minnesota

The SMART Signal system, developed by civil engineering associate professor Henry Liu to improve traffic management on urban arterials, was implemented in Pasadena, California—the first installation of the system outside of Minnesota.

A new start-up company—SMART Signal Technologies Inc.—has been formed to market the technology (see page 13).

SMART Signal (Systematic Monitoring of Arterial Road Traffic Signals) simultaneously collects event-based high-resolution traffic data from multiple intersections and generates real-time arterial performance measures, including queue length and travel time. System equipment is installed directly in signal controller cabinets.

Liu began work on the SMART Signal system in 2006, and it has been installed at 20 intersections on three major arterial corridors in Minnesota. MnDOT expects to equip additional intersections with the system.

Liu’s team has included graduate students Wenteng Ma, Xinkai Wu, Heng Hu, Jie Sun, Saif Jabari, and Jeff Zheng. Funding support has come from MnDOT, the ITS Institute, the Minnesota Local Road Research Board, and the National Cooperative Highway Research Program. Traffic engineering staff from MnDOT and Hennepin County worked closely with Liu to facilitate system testing and implementation.
Making travel safer

**Intersection warning system reduces roll-throughs**

An intersection warning system designed by Professor Taek Mu Kwon of the Department of Electrical and Computer Engineering at the University of Minnesota Duluth has been installed at a problem intersection just north of Duluth—and it’s getting results.

Kwon and his team—research associate Ryan Weidermann and St. Louis County traffic engineer Victor Lund—created the Advanced Light-Emitting Diode (LED) Warning System specifically for rural intersections with high speeds and limited sight distances. The two-year project was funded by the Minnesota Local Road Research Board.

In Minnesota, most intersection-related crashes occur at rural, two-way-stop intersections because drivers stopped on a minor road often cannot see traffic on the major road. Static warning signs are often ineffective.

Kwon’s wireless system, powered by solar panels, uses a combination of non-intrusive vehicle detectors and flashing LED warning signs to raise driver awareness about traffic entering or waiting to enter a through-stop intersection. Radar detectors aimed at both approaches of the minor road identify vehicles waiting to enter the main road. These detectors send a wireless signal to a “Cross Traffic When Flashing” sign installed on the sight-restricted approach of the main road. Similarly, passive infrared sensors detect incoming vehicles traveling on the main approach and trigger “Vehicle Approaching When Flashing” signs on both minor approaches.

According to Lund, the system has been “tremendously successful” at changing driver behavior. When the alert signs were flashing, westbound traffic on the major road was slowed by four miles per hour, drivers on the minor road waited longer before crossing, and roll-throughs were eliminated.

Before these systems could be widely used, Lund notes, fail-safe issues—such as what to do on sunless days or if solar panels malfunction—must be dealt with.

Researchers developed a low-cost warning system that provides information to drivers approaching an intersection.

Research is making travel safer for drivers, pedestrians, and cyclists.
Researchers at the Minnesota Traffic Observatory (MTO) are using newly developed traffic monitoring tools to investigate safety and accessibility issues affecting pedestrians and bicyclists at traffic roundabouts. The MTO is a joint effort of the ITS Institute and the Department of Civil Engineering.

Municipalities are increasingly interested in roundabouts in light of recent research showing they provide a variety of benefits over traditional signalized intersections, including reducing the number of automobile crashes and allowing traffic to flow in all directions with virtually no interruptions. The impact of roundabouts on the safety and mobility of pedestrians and bicyclists, however, remains poorly understood. Roundabout safety is a particularly important issue for pedestrians who are elderly or visually impaired.

MTO director John Hourdos, lab manager Ted Morris, civil engineering professor Gary Davis, and a group of nine undergraduate students worked with MnDOT to identify a pair of roundabouts for study—one in suburban Richfield and another in a residential area of Minneapolis. MnDOT is funding the research.

Observations at the research sites confirm that drivers often fail to yield to pedestrians, creating a significant safety risk. A preliminary analysis showed that drivers were less likely to yield at roundabout exits and more likely to yield to pedestrians in the center of the roundabout than to those on the sidewalk. As the project continues, the researchers will examine how other factors—including traffic volume, number of lanes, and general roundabout design—affect yielding behavior. The findings could help local agencies address pedestrian concerns through changes in design or signage, for example.

Roundabout safety is a particularly important issue for pedestrians who are elderly or visually impaired.
Maintaining our infrastructure

Monitoring bridges to extend bridge life

Researchers in the Department of Civil Engineering (CE) are monitoring the performance of the new I-35W bridge over the Mississippi River in Minneapolis. The structure is instrumented with 500 sophisticated sensors to measure stress, corrosion, expansion and contraction, and other effects over time. Professor Catherine French and co-investigators Carol Shield and Henryk Stolarski are studying the bridge over 40 months in work for MnDOT. The team will evaluate the data obtained from the instrumentation and provide a final report to MnDOT about the bridge's performance. The study will also evaluate the instrumentation technology for consideration in other bridge-monitoring applications in the state.

Another team of CE researchers—Professor Arturo Schultz, Assistant Professor Steven Wojtkiewicz, and graduate student Andrew Gastineau—designed a device that could be added to bridge components under stress. The stiffening device uses data from sensors to adapt how it responds to specific loads—adding more support for an overweight vehicle, for example. To test their design, the researchers used an existing computer model of the Cedar Avenue Bridge in Burnsville, Minnesota. Their results indicate that, combined with bridge health monitoring and advanced sensors, the device could extend bridge life by decades at a fraction of the cost of bridge replacement. The work was funded by CTS.
Software helps minimize road wear

During the spring thaw, transportation agencies post weight restrictions on low-volume roads. The restrictions prevent damage to weakened road structures but increase costs for truckers, who need to make more trips with lighter loads or use different routes. Researchers in the civil engineering department developed a new process that will help officials more accurately determine the need and timing for seasonal restrictions.

The researchers—Associate Professor Lev Khazanovich, associate program director Derek Tompkins, and graduate student Peter Bly—developed a more effective analysis process for falling weight deflectometer (FWD) data. (An FWD applies a simulated heavy axle load to an area of pavement and measures the resulting deformation.) The project, funded by the Minnesota Local Road Research Board, culminated in the creation of an MS-DOS-based computer program—TONN2010—that uses the data to assess a road’s load capacity. The program is expected to be widely used by MnDOT, county, and city engineers.

Other research conducted by Khazanovich and MnDOT is looking at the impacts of heavy vehicles (such as wind farm equipment) on paved surfaces. Road agencies in Minnesota and other states, as well as industries in Wisconsin, are using the findings to mitigate deterioration of rural low-volume roads and minimize the cost of road maintenance.

Infrastructure research crosses borders

Jia-Liang Le, a new assistant professor in the Department of Civil Engineering, is working in partnership with the National University of Singapore on bridge safety research. CTS provided seed funding for the project. The collaboration was initiated during a trip to Singapore by CTS director Laurie McGinnis, who was part of a delegation that traveled to Singapore in October 2010 to exchange ideas about land use, transportation policy, and pricing and to explore research collaboration opportunities. Other delegates represented the Humphrey School’s State and Local Policy Program, the U.S. Senate Committee on Environment and Public Works, and the Oregon Department of Transportation.

CE associate professor Mihai Marasteanu conducted a joint effort with Ecole Nationale des Travaux Publics de l’Etat, based in Lyon, France. The research, also supported with CTS seed funding, investigated solutions to low-temperature cracking in asphalt pavements in Minnesota.
Understanding travel patterns

Infrared sensors count bicyclists, pedestrians on Minneapolis trails

A team of researchers from the Humphrey School of Public Affairs is using infrared counters to study the use of bicycle and pedestrian trails in Minneapolis. The project is led by Greg Lindsey, professor and associate dean of the Humphrey School, and funded by the ITS Institute.

Lindsey and his team are using the data they collect to develop more sophisticated models for estimating nonmotorized traffic on Minneapolis streets, sidewalks, and trails. Their models are helping policymakers and planners make better decisions about how, when, and where to invest in nonmotorized infrastructure.

The team has installed seven infrared devices. When a passing cyclist or pedestrian breaks the infrared beam spanning a trail, the event is registered on an electronic counter. According to Lindsey, this is an unobtrusive way to measure how many people are using a given trail and at what times of the day traffic levels are highest. Data collection is planned to continue indefinitely.

The data collected by the sensors have already affected trail management, Lindsey says, citing traffic control changes on the Midtown Greenway as one example. When the trail was developed, cyclists had stop signs while drivers had the right-of-way. When traffic counts revealed that nonmotorized traffic on the trail exceeded auto traffic on the cross streets, trail users were given the right-of-way at certain intersections.

“Traffic counts are a basic building block for decision making,” Lindsey said. “They provide evidence to make transportation decisions rationally.”
E-shopping generates store shopping

Does online buying displace or reduce traditional shopping? How does it influence personal travel habits? Transportation and land-use planners want to know, because the answers have implications for freight transport, travel demand management, and congestion mitigation.

In a study sponsored by the ITS Institute, researchers in the Humphrey School of Public Affairs—Assistant Professor Xinyu (Jason) Cao; Frank Douma, associate director of the State and Local Policy Program; graduate student Zhiyi Xu; and former graduate student Fay Cleaveland (now with MnDOT)—looked into the issue. They surveyed Internet users from four urban, four suburban, and eight exurban neighborhoods in the Minneapolis–St. Paul metropolitan area about their shopping habits and opinions.

Results indicate that the use of the Internet for searching and shopping didn’t displace in-store shopping—it generated further shopping demand, both in-store and online, due to the availability of large amounts of product information online. The analysis also found that participants living in urban areas tended to shop online more frequently than residents of suburban and exurban neighborhoods. Other findings showed that older people were responsible for more in-store shopping trips, as were residents of suburban neighborhoods and those who considered themselves to be impulsive shoppers.
Paying for it all

Laying the groundwork for mileage-based user fees

While many researchers and policymakers believe fuel taxes are no longer a sustainable funding source for surface transportation, there is little public support for the main alternative—mileage-based user fees (MBUFs).

This is one finding from a study that examined the rationale, technology, and transitional issues involved in shifting from fuel taxes to MBUFs. According to the research team—David Coyle, a graduate student in the Department of Applied Economics, and senior research fellow Lee Munnich, assistant professor Zhirong (Jerry) Zhao, and research fellows Ferrol Robinson and Adeel Lari of the Humphrey School of Public Affairs—the study’s findings set the stage for a policy discussion on these issues and lay the groundwork for a public outreach effort. The study was sponsored by the ITS Institute.

The team reviewed eight different mileage-tracking technologies, several of which proved promising. The researchers also developed an action plan for the design and administration of MBUF systems that addresses pricing and revenue collection, revenue allocation, system cost and management strategy, and transitional issues. Education and outreach efforts are key to moving MBUFs forward, they note, to improve public understanding of the current funding system and the possibilities for MBUFs.

MnDOT is conducting a pilot MBUF study with 500 volunteers, and a state task force is examining the feasibility and implications of implementing an MBUF system.

University researchers are lending their expertise to state task forces investigating mileage-based user fees and public-private partnerships.

U of M inventions brought Minnesota nearly $390 million in revenue in the last five years.

—University of Minnesota economic impact study (http://impact.umn.edu)
Promoting public interest in public-private partnerships

Many states are exploring public-private partnerships (PPPs, or P3s) for infrastructure development. PPPs allow public agencies to access private financing and specialized expertise, resulting in projects that may use more innovative techniques, cost less, and be completed more quickly. However, confusion and controversy surrounding recent U.S. cases have led to public concern and legislative caution.

In a MnDOT-funded study, Zhirong (Jerry) Zhao, assistant professor in the Humphrey School of Public Affairs, and research fellow Emily Sanoi-Sandgren studied various types of PPPs. They analyzed public benefits, associated risks, and possible approaches to mitigate these risks. The researchers also examined related public concerns and potential strategies to address these concerns at different stages of PPP decisions.

One key strategy is to strengthen contract design by making costs and responsibilities more explicit. “In PPPs, the public’s goal is to get things done,” Zhao says. “The private sector’s goal is to make a profit. Although they have different goals, they can be connected by the careful design of a contractual relationship.”

A state PPP task force is using Zhao’s report as a framework for discussion. The Humphrey School of Public Affairs is leading the task force at MnDOT’s request.

Moving research to market

Commercialization agreements signed for SAFL Baffle, SMART Signal
The University of Minnesota finalized agreements with two startup companies to market devices invented by U of M researchers.

SMART Signal Technologies Inc. was formed to commercialize the SMART Signal traffic management system (see page 5). The system fills an information gap, as no current systems can accurately track congestion on roads with traffic signals. “Once you get off the freeway, people have no idea how long it takes to get through lights,” says Ken Shain, president and CEO of SMART Signal.

Upstream Technologies is marketing the SAFL Baffle, a cost-effective device for preventing harmful sediments in stormwater from reaching lakes and streams. It was developed at the St. Anthony Falls Laboratory (SAFL) with funding from MnDOT. Several Minnesota cities installed the SAFL Baffle in the spring of 2011. Co-inventors of the device are Professor John Gulliver, adjunct professor Omid Mohseni, and graduate student Adam Howard, all of the Department of Civil Engineering.

Patent granted for vehicle detection technology
Craig Shankwitz, director of the Intelligent Vehicles Laboratory (a part of the ITS Institute), was granted a patent titled “Vehicle Positioning System (VPS) Using Location Codes in Passive Tags.” The system employs passive electronic tags in or on roadways to locate vehicles for a number of ITS applications.
Students at a summer camp learn about traffic management using Gridlock Buster, an online educational game from the ITS Institute.

Because the transportation industry needs a skilled workforce.

www.cts.umn.edu/Education
Attracting future students

Online educational games

The ITS Institute continued to push the envelope in the development of "serious games," which engage learners through entertainment while providing training and education. Serious games can also introduce players to a field of study and reach an international audience at a low cost.

In FY11 the Institute developed *Distraction Dodger*, an online game designed to help teens and young adults understand the risks of distracted driving. Players get behind the wheel of a pizza delivery van and have to avoid obstacles and obey traffic laws. As they progress through the game's levels, they get feedback on their driving—and how it is affected by their level of distraction. Developed by Web Courseworks for the Institute, the game has already received international attention with an award at the 2011 International Serious Play Conference. Mike Manser and Chris Edwards of the ITS Institute's HumanFIRST program, along with consultant David Glick, contributed to the game's development.

*Distraction Dodger* builds on the success of *Gridlock Buster*, another online game from the ITS Institute. *Gridlock Buster* provides a fun way to teach students what is involved in traffic grid management and make transportation interesting and relevant. Since its original posting online, *Gridlock Buster* has received more than 3 million game plays and has garnered national interest. Locally, the game was used as a recruiting tool by several area high schools, as a featured activity at related University of Minnesota summer camps and by elementary school children at education events, and as a teaching tool for university undergraduates as part of their coursework.

Online games from the U of M are introducing teens and young adults worldwide to transportation issues and careers.

The U of M graduating class of 2010 will add $8.9 billion in future increased earnings for Minnesota.

—University of Minnesota economic impact study (http://impact.umn.edu)
<h2>Careers brochure and video</h2>

CTS produced a new brochure about careers in transportation. *Is a Career in Transportation for You?* is aimed at potential students and their parents. It gives a picture of common job titles, where graduates might work and what they might do, and the degrees offered at the University to help them prepare.

CTS also supported the ITS Institute in producing a 10-minute video designed to attract potential students to a future in transportation technology. *Intelligent Transportation Systems: Your Road to the Future* outlines related coursework and provides students with a glimpse of ITS Institute research projects, ITS deployments in Minnesota, and a snapshot of Minnesota professionals who use ITS in their jobs.

<h2>Camps and exhibits</h2>

CTS staffed exhibits and participated in numerous camps and classes to introduce K–12 students to transportation and transportation-related fields of study. For example, CTS participated in the CSE Exploring Careers in Engineering and Physical Science Summer Camp, hosted by the University’s College of Science and Engineering, and in Technology Day Camp, organized by the Center for Distributed Robotics and the Digital Technology Center.

CTS and the ITS Institute also exhibited for the fourth year in a row at TechFest, a one-day event focusing on engineering, held at The Works, a hands-on science and technology museum in Edina, Minnesota. “The benefits the ITS Institute provides The Works [are] great—hands-on activities, access to experts, and more,” says Kris Best, development director with The Works.

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*a new brochure gives a snapshot of jobs and degrees.*

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*Goldy Gopher plays Gridlock Buster at TechFest, one of several camps and events at which CTS introduced K-12 students to the transportation field.*
Educating tomorrow’s workforce

Career Expo

The 2011 Transportation Career Expo drew more than 100 university students pursuing degrees related to transportation. The March event featured a general-session panel discussion moderated by Shannon Tyree of the City of St. Paul; panelists were Jim Grube (director of transportation and county engineer, Hennepin County), John Dillingham (president, Alliant Engineering), Amy Vennewitz (deputy director of transportation, planning, and finance, Metropolitan Council), Don Lawrence (LTL operations manager, Koch Logistics), and Fay Cleveland (transportation planner, MnDOT).

Students were able to learn about transportation-related careers, receive job-searching tips, and network with potential employers. A record 22 exhibitors attended the expo to meet and recruit students. In addition, three professional organizations exhibited to recruit new members and build connections to students.

Learning tools

Several universities in the United States and China are using a suite of web-based simulation modules developed under the STREET program for their curriculum. STREET (Simulating Transportation for Realistic Engineering Education and Training) was sponsored by the National Science Foundation with matching funds from the ITS Institute. The modules communicate the basic concepts of highway design, traffic flow theory, and transportation/urban planning to college students. STREET modules have received favorable reviews from U of M students, who report that they gain a better understanding of core concepts and appreciate the hands-on experience.

A total of 145 undergraduate and graduate students participated in transportation research projects in FY11.
Supporting student achievement

Huber and Adams Excellence in Transportation Awards

CTS presents the Matthew J. Huber Award to students in engineering, science, and technology fields. Two students received awards in FY11:

• Hai Quang Dinh, master’s degree, electrical and computer engineering (Duluth campus). Research focus: tracking-based traffic performance measurement system for roundabouts and intersections. Advisor: Assistant Professor Hua Tang.

• Andy Erickson: doctoral candidate, civil engineering. Research focus: sand filtration system that protects water quality by treating stormwater runoff. Advisor: Professor John Gulliver.

The John S. Adams Award is given to students in policy and planning fields. Two students received awards:

• David Coyle, master’s candidate, applied economics. Research focus: potential of mileage-based user fees. Advisor: Associate Professor Gerard McCullough.

• Pavithra Parthasarathi, doctoral candidate, civil engineering. Research focus: statistical and econometric models to understand travel behavior and network growth. Advisor: David Levinson.

ITS Institute Student of the Year Award

The U.S. Department of Transportation’s Research and Innovative Technology Administration presents an outstanding student of the year award to each of its University Transportation Centers. The recipient of the 2010 award at the ITS Institute was Saif Jabari, a doctoral candidate in civil engineering advised by Associate Professor Henry Liu. Jabari’s doctoral work concentrates on the development of mathematical models for estimating and predicting traffic conditions along freeways and signalized arterials.
Interdisciplinary Transportation Student Organization

The Interdisciplinary Transportation Student Organization (ITSO) held its annual student paper conference in March. The six winners of the paper competition—Carlos Carrion Madera, Shaker Rabban, Minmao Liao, Avital Barnea, Heng Hu, and Arthur Huang—gave presentations covering topics such as structural science, transit operation, and signal operation. The conference concluded with a luncheon sponsored by the North Central chapter of the Institute of Transportation Engineers (NCITE) featuring a presentation by Steve Murphy, former chair of the Minnesota Senate Transportation Committee.

ITSO also presents an annual Kasia Winiarczyk Award to recognize excellence in transportation studies, professional potential, and commitment to the field. The 2010–2011 winners were Nicklaus Ollrich (undergraduate award) and Pavithra Parthasarathi (graduate award).

ITSO provides students with leadership roles and valuable opportunities to network with professionals. It is sponsored by CTS, the Department of Civil Engineering, and several professional organizations including WTS Minnesota, NCITE, ITS Minnesota, and the Minnesota Surveyors and Engineers Society. CE associate professors David Levinson and Henry Liu serve as faculty advisors.

CTS enriches the education experience for students of all ages—creating the skilled workforce needed to solve transportation challenges.

Travel awards

Twenty-four students were awarded travel funds from CTS and the ITS Institute in FY11 to attend transportation-related events across the country. Of these, 20 students attended the 2011 Transportation Research Board conference. Other conferences attended included the WTS International Conference; the Sixth International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design; the 2011 American Control Conference; the NSF Symposium on the Low Carbon Footprint Supply Chain; and the 2011 Institute for Operations Research and Management Science Conference. Travel scholarships give students the opportunity to network with professionals and enable them to improve their public speaking experience and practice communicating technical concepts.

Eno, NSF awards

Avital Barnea, a candidate in the Master of Urban and Regional Planning Program at the Humphrey School of Public Affairs, was selected by the Eno Transportation Foundation to participate in the 19th annual Eno Leadership Development Conference in Washington, D.C., in June 2011. CTS provided financial support for her participation at this event. Barnea was nominated by her advisor, Yingling Fan, assistant professor in the Humphrey School.

Andrew Gastineau, a doctoral candidate in civil engineering, was chosen as only 1 of 15 U.S. participants in the 2011 Asia–Pacific Summer School in Smart Structures Technology funded by the National Science Foundation. The NSF program was held at Tongji University in Shanghai, China. Gastineau’s doctoral research, supervised by Steve Wojtkiewicz and Arturo Schultz, concerns the development of a framework for the response modification of vulnerable bridges in order to increase their usable lifetime.
Strengthening professional skills

Seminar series

CTS provides a number of opportunities for professionals to hone their skills and secure professional development credits.

The CTS seminar series combines CTS Research Seminars and the ITS Institute’s Advanced Transportation Technologies Seminars. Each seminar qualifies for one professional development hour (PDH), and degree credit is available for the Institute seminars. Held every week during fall semester and periodically throughout the rest of the year, the seminars are broadcast live on the web and are available for later viewing. They may also be downloaded through the University’s iTunes U site. A range of topics were covered in FY11, such as:

- Performance of Pervious Concrete Pavement in a Cold Weather Climate
- Itasca County Area Transportation Study
- Economic Impact of Airports and Update of Economic Impact Calculator

Other events, such as the annual research conference, provide PDH credits. CTS is also a provider of maintenance credits for American Institute of Certified Planners certification.

Minnesota Local Technical Assistance Program

The Minnesota Local Technical Assistance Program (LTAP), housed at CTS, honored 10 students who acquired the necessary credits to complete the Roads Scholar Program in 2010. More than 1,800 students are enrolled in the Roads Scholar Program, a structured curriculum of training options targeted to maintenance workers who maintain city, county, and township roads and bridges.

A new LTAP workshop in FY11—Stormwater Maintenance Strategies—was based on research conducted by John Gulliver and Andrew Erickson of the Department of Civil Engineering. Transportation agencies are required by law to manage stormwater runoff, which may contain various pollutants as well as chloride from winter road salt. The workshop provides standardized assessment methods to measure the performance of stormwater treatment practices as well as techniques for selecting and scheduling appropriate maintenance.

Minnesota LTAP also partnered with the Federal Highway Administration (FHWA), MnDOT, and Dodge County to promote the Safety Edge, a sloped pavement edge that allows drivers to recover safely if they drift off the road. A demo of the technology, held in conjunction with a county road-paving project, illustrated how agencies and industry are collaborating to share this innovative and low-cost safety solution.
**Airport Technical Assistance Program**

The Minnesota Airport Technical Assistance Program (AirTAP), housed at CTS, continued to hold its fall forum and produce a newsletter for general aviation (GA) airport personnel. In addition, AirTAP held a special workshop in March to provide GA security training for Level 2 (medium) airports. Transportation Security Administration staff provided training on tactics such as establishing an airport watch program. AirTAP is a statewide program that helps Minnesota’s public- and private-sector airport professionals improve the safety, quality, and efficiency of airport operations.

*Minnesota AirTAP provided security training for medium airports.*

**Customized training**

CTS coordinated a number of events and customized training courses for MnDOT. One such event was the Cost Estimating and Cost Management Capacity Building Workshop, held in August 2010 in Minneapolis. The workshop was sponsored by the FHWA in cooperation with the American Association of State Highway and Transportation Officials (AASHTO) and MnDOT and was hosted by CTS. At the workshop, the third in a series dating back to November 2007, participants learned about best practices in risk management and risk assessment.

Other customized training topics during FY11 included context-sensitive solutions, public participation, and truck-weight compliance.

*James Cheatham of the FHWA and Tim Henkel of MnDOT were among the speakers at the Cost Estimating and Cost Management Capacity Building Workshop.*

CTS provides a range of training for professionals to build their skills and learn about best practices.
Outreach


Because sharing knowledge leads to informed decisions.

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Connecting people and sharing knowledge

World Symposium on Transport and Land Use Research

The inaugural meeting of the World Symposium on Transport and Land Use Research (WSTLUR) attracted more than 70 participants from countries across the globe and served as the launch pad for a new World Society on Transport and Land Use Research (www.wstlur.org). The meeting, held July 28–30, 2011, in Whistler, British Columbia, was the first time an organized group met with this focus.

The new society brings together multiple disciplines—including planning, engineering, and economics—to better understand the interactions of transport and land use and to provide a forum for debate and a mechanism for information dissemination.

CTS organized the symposium and served as a contributing partner with university centers and departments in Georgia, California, Connecticut, Vermont, and Colorado as well as Transport Canada. The organizing committee included Braun/CTS Chair David Levinson and Laurie McGinnis, Gina Baas, and Stephanie Malinoff of CTS. Three University of Minnesota researchers—Levinson, and Yingling Fan and Jason Cao of the Humphrey School—gave concurrent-session presentations.

The WSTLUR symposium followed on the Access to Destinations conferences (www.cts.umn.edu/access-study) sponsored by CTS in 2004 and 2007. Select papers from WSTLUR are being published in the Journal for Transportation and Land Use, a peer-reviewed journal launched following the 2007 conference and published by CTS.

Symposium on Mileage-Based User Fees

Professionals in the field of road user fees gathered in Colorado in June for the 2011 Symposium on Mileage-Based User Fees (MBUFs). The symposium was hosted by the University Transportation Center for Mobility at the Texas Transportation Institute, the Humphrey School of Public Affairs at the University of Minnesota, and CTS, with additional sponsorship from Move Colorado. A national commission created by Congress has recommended the nation shift from the gas tax to a mileage-based usage fee by 2020.

Lee Munnich, director of the State and Local Policy Program at the Humphrey School, was the symposium co-chair and also moderated two panels, one about public and political acceptance and the other on national initiatives related to MBUF. Ferrol Robinson, a research fellow with the Humphrey School, moderated a panel on user perspectives. They also served on the symposium planning committee with Gina Baas of CTS. Other panel discussions addressed specific topics such as legislative and policy issues, potential technology applications, and institutional issues.

Sharing expertise and collaborating across disciplines stimulates new thinking and brings more value to end users.
**Annual research conference**

The 22nd Annual CTS Transportation Research Conference, held in May 2011 in St. Paul, included more than 75 presentations by researchers and practitioners. The conference allows policymakers and practitioners to hear cutting-edge research findings.

The conference opened with a plenary presentation about public-private partnerships (P3s) by Adrian Moore, vice president of research with the Reason Foundation. He was followed by a reactor panel with four leaders involved in the future of P3s in Minnesota: Brad Larsen of MnDOT, state senator Scott Dibble, Lee Munnich of the Humphrey School, and Jay Lindgren of Dorsey & Whitney LLP and a legal expert in innovative finance.

Joe Cortright, president and principal economist with Impresa and senior adviser with CEOs for Cities, gave the conference luncheon presentation. He summarized findings from *Driven Apart: How Sprawl is Lengthening Our Commutes and Why Misleading Mobility Measures Are Making Things Worse*, a report prepared for CEOs for Cities and funded by the Rockefeller Foundation.

Prior to Cortright’s presentation, MnDOT commissioner Tom Sorel gave his annual update of department activities, this year focusing on MnDOT’s new enterprise risk management approach.

**Freight and logistics symposium**

Sustainable practices can have a positive impact on the environment and on freight and logistic providers’ bottom line, but they don’t come without specific challenges, according to speakers at the 14th Annual Freight and Logistics Symposium held in Minneapolis in December 2010. The symposium brings together the private sector and government to discuss current issues in the freight and logistics industry and hear about initiatives to strengthen the freight transportation system.

The event was sponsored by CTS in cooperation with MnDOT, the Minnesota Freight Advisory Committee, the Council of Supply Chain Management Professionals–Twin Cities Roundtable, the Metropolitan Council, the Transportation Club, and the Trucking Industry Mobility and Technology Coalition.

Kevin Jones (Walmart), Cheryl Bynum (U.S. EPA), Wayne Johnson (National Industrial Transportation League), Don Scott (National Biodiesel Board), and Dan Murray (American Transportation Research Institute) gave a range of perspectives at the Freight and Logistics Symposium.
### Outreach

#### Luncheons

CTS luncheons continued to bring speakers to Minnesota to share the latest national trends and issues in transportation.

**Fall Luncheon:** Daniel Sperling, professor of civil engineering and environmental science and policy and founding director of the Institute of Transportation Studies at the University of California, Davis, “Climate Change and the Transportation Community: Conflicts and Tensions”

**Winter Luncheon:** Susan Ferguson, president, Ferguson International LLC and previous senior vice president for research at the Insurance Institute for Highway Safety, “Driver Alcohol-Detection Systems: The End to Drunk Driving?”

#### Academic symposia

**Network reliability international symposium**

Researchers and professionals from around the world came to the Twin Cities campus in July 2010 to attend the Fourth International Symposium on Transportation Network Reliability. CTS hosted the event. David Levinson, the Braun/CTS Chair, and CE associate professor Henry Liu played key roles in bringing the event to Minneapolis and were members of the local organizing committee.

The scope of the symposium included all aspects of analysis and design to improve network reliability, such as public policy, travel behavior, and vehicle routing and scheduling. It was the second academic paper conference hosted by CTS in as many years, following the Fourth International Transport Economics Conference held in June 2009.

**Supply chain symposium**

The Symposium on the Low Carbon Footprint Supply Chain was held at National Science Foundation (NSF) headquarters in Virginia in October 2010. The symposium was sponsored by the NSF, the Industrial and Systems Engineering Program (ISyE) at the University of Minnesota, the Department of Industrial and Operations Engineering at the University of Michigan, and CTS. Saif Benjaafar, professor and ISyE director, was the symposium co-organizer and co-author of the symposium final report.

The symposium was designed to stimulate research into the impacts of supply-chain decisions on carbon emissions and begin building a community of researchers interested in the topic. It brought together researchers with backgrounds in various disciplines with representatives of government agencies, nonprofit organizations, and industry.

The number of participants at events convened by CTS grew by 32 percent in FY11—demonstrating the value of connecting even during tight economic times.
**Telling our story**

**Exhibits and tours**

**University Research Technology Transfer Day in Washington, D.C.**

Two ITS Institute projects were featured in poster presentations at University Research Technology Transfer Day, an exhibition of the U.S. Department of Transportation’s Research and Innovative Technology Administration. The projects were “Traffic Signal Performance Measurement Using High-Resolution Data: The SMART Signal System” and “Smartphone-Based Novice Teenage Driver Support System (TDSS).” The TDSS project was also selected for a podium presentation.

**International tours**

CTS and several University research laboratories hosted tours for European transportation organizations.

In September 2010, members of FEHRL and ECTRI visited campus as part of a scan tour of U.S. transportation research facilities. FEHRL, the Forum of European National Highway Research Laboratories, provides a coordinated structure for the interests of more than 30 national research and technical centers from Europe, together with associated institutes from around the world. ECTRI, the European Conference of Transport Research Institutes, is an international nonprofit organization whose members are 27 major transport research institutes or universities from 20 European countries.

The aim of the scan was twofold: to identify what’s missing in existing U.S. and European research facilities to meet current and emerging needs, and to recommend opportunities to use existing facilities and collaborate to develop new ones.

The participants toured several campus facilities: the HumanFIRST lab, a part of the ITS Institute; the MAST (Multi-Axial Subassemblage Testing) Laboratory; the Minnesota Traffic Observatory, another ITS Institute lab; and the St. Anthony Falls Laboratory. They also heard presentations about pavement research facilities and partnerships.

Also that September, a similar tour was given to representatives from the Swedish Transport Administration. Members also received a demonstration of a Teen Driver Support System under development in the Intelligent Vehicles Lab, another facility of the ITS Institute.

In August, a delegation from Russian transportation organizations visited campus for an information exchange and tours focusing on safety innovations.

*The Russian tour group with John Hourdos (far right)*
State Fair
People of all ages stopped by the CTS exhibit at the Minnesota State Fair. The main attraction was “Transportation Jeopardy,” hosted by emcees Michael Marti of SRF Consulting Group and Don Theisen of Washington County public works. Visitors also had the opportunity to check out Gridlock Buster (see page 15) and SafeRoadMaps.org, a crash-mapping tool from the Center for Excellence in Rural Safety.

Video production
CTS began producing short videos of selected research projects and posting them on the University’s YouTube Channel as well as on the CTS website. Staff also created a 10-minute video of CTS highlights from the past year for debut at the CTS annual meeting and awards ceremony in April (available for viewing at www.cts.umn.edu/About/History). In addition, CTS assisted with video production for MnDOT’s Minnesota GO initiative (see below).

Providing products and services

➦ MnDOT Long-Term Transportation Vision
The Minnesota Department of Transportation tapped University expertise to find out what Minnesotans expect in terms of quality of life, the economy, and the natural environment as it develops a long-term vision for transportation in the state. In its work for the initiative—dubbed “Minnesota GO”—CTS, along with Carissa Schively Slotterback from the Humphrey School of Public Affairs and Cindy Zerger from the College of Design, prepared a public participation and outreach plan that included a variety of workshops as well as outreach to groups traditionally underserved by planning processes. CTS also assisted in the production of videos for the Minnesota GO website that feature University experts discussing what’s ahead in the next 50 years.

➦ Other events and services
CTS partners with and provides administrative and management services for organizations offering transportation-related events. For example:
• Toward Zero Deaths (TZD) Conference, regional workshops, and stakeholder breakfasts
• Transportation Engineering and Road Research Alliance (TERRA) Pavement Conference and Innovation Series
• Center for Excellence in Rural Safety (CERS) Summer Institute and monthly webinars
• Minnesota Spring Maintenance Training Expo
Recognizing service and partnerships

CTS presented the following awards at its Annual Meeting and Awards Luncheon in April.

**Richard P. Braun Distinguished Service Award:** David Levinson (center), associate professor in the Department of Civil Engineering (CE) and the Braun/CTS Chair in Transportation Engineering, with CTS director Laurie McGinnis and Richard Braun

**Ray L. Lappegaard Distinguished Service Award:** Ann Johnson (center), faculty director of the University’s Construction Management degree program and the CE department’s outreach coordinator, with previous recipient Connie Kozlak and McGinnis

**Distinguished Public Leadership Award:** Peter Bell (center), chair of the Metropolitan Council from 2003–2011, with former recipient Curt Johnson and McGinnis

**William K. Smith Distinguished Service Award:** Kevin McCarthy (center), director of consulting services for C.H. Robinson, with former recipient Richard Murphy Jr. and McGinnis
CTS Research Partnership Award

Two teams received an award in FY11. In one project, “Bus 2.0 Driver-Assist System,” researchers at the ITS Institute developed a system to help drivers safely navigate bus-only shoulder lanes (see page 5).

Project Partners:
MVTA: Michael Abegg, Glenn Boden
Schmitt & Sons Transit: Connie Massengale, Jesse Borchowiec, Mary Blanchard
University of Minnesota: Max Donath, Michael Manser, Craig Shankwitz, Eddie Arpin, Pi-Ming Cheng, Peter Easterlund, Alec Gorjestani, Justin Graving, Erin Kurshoff, Arvind Menon, Bryan Newstrom

In the other project, “Assessment and Recommendation for Operation of Standard Sumps as Best Management Practices for Stormwater Treatment,” the St. Anthony Falls Laboratory (SAFL) developed the “SAFL Baffle” (see page 13).

Project Partners:
City of Bloomington: Scott Anderson
City of Prior Lake: Ross Bintner
Metropolitan Council: Jack Frost
MnDOT: Derek Beauduy, Barbara Loida, Beth Neuendorf, Lisa Sayler, Shirlee Sherkow
University of Minnesota: John Gulliver, Omid Mohseni, Adam Howard, Kurt McIntire

Three additional projects received special recognition in FY11:
“eWorkPlace: Telework in Action” (see page 3)
“Pavement Surface Characteristics (Rehab) MnROAD Studies”
“The Effects of Implements of Husbandry on Pavement Performance”

Bus 2.0 receives MPTA award
The Minnesota Public Transit Association (MPTA) awarded Intelligent Vehicles Lab director Craig Shankwitz and Minnesota Valley Transit Authority transit planning manager Mike Abegg its Management Innovation Award for their work on the Bus 2.0 driver-assist system (see page 5). The award is given for innovative work in the field of transit or creative new methods of addressing the transit-related concerns of transit users. It was presented at the MPTA annual conference in September 2010 in Rochester, Minnesota. “This [project] is a great example of a successful university–transit agency partnership that is deploying innovative technology to solve a problem,” says Max Donath, director of the ITS Institute.
Henry Liu and Chen-Fu Liao are educating tomorrow’s workforce as they conduct cutting-edge research.

Because great minds create breakthrough solutions.

www.cts.umn.edu/FacultyStaff
CTS Faculty and Research Scholars

CTS Faculty and Research Scholars have joint appointments at CTS and in their own departments.

2011 Faculty and Research Scholars

**Bridge Engineering**

- **Catherine French**
  Professor, Civil Engineering

- **Nikolaos Papanikolopoulos**
  Professor, Computer Science and Engineering

- **Gerard McCullough**
  Associate Professor, Applied Economics

- **Janet Creaser**
  Research Fellow, HumanFIRST Program, ITS Institute

- **Arturo Schultz**
  Professor, Civil Engineering

- **Shashi Shekhar**
  Professor, Computer Science and Engineering

- **Zhirong (Jerry) Zhao**
  Assistant Professor, Humphrey School of Public Affairs

- **Kathleen Harder**
  Director, Center for Design in Health, College of Design

- **Carol Shield**
  Professor, Civil Engineering

- **Saif Benjaafar**
  Professor, Industrial & Systems Engineering

- **David Biesboer**
  Professor, Plant Biology

- **Michael Manser**
  Director, HumanFIRST Program, ITS Institute

- **Steve Wojtkiewicz**
  Assistant Professor, Civil Engineering

- **Karen Donohue**
  Associate Professor, Operations and Management Sciences, Carlson School of Management

- **John Gulliver**
  Professor, Civil Engineering

- **Bojan Guzina**
  Shimizu Professor, Civil Engineering

**Economics and Management**

- **Taek Kwon**
  Professor, Electrical and Computer Engineering (Duluth)

- **Jerry Fruin**
  Associate Professor, Applied Economics

- **Julian Marshall**
  Assistant Marshall,
  Assistant Professor,
  Civil Engineering

- **Karen Donohue**
  Associate Professor, Operations and Management Sciences, Carlson School of Management

- **David Biesboer**
  Professor, Plant Biology

- **Michael Manser**
  Director, HumanFIRST Program, ITS Institute

- **Chen-Fu Liao**
  Educational Systems Manager, Minnesota Traffic Observatory, ITS Institute

- **Diwakar Gupta**
  Professor, Industrial & Systems Engineering

- **Bruce Wilson**
  Professor, Bioproducts and Biosystems Engineering

- **Vassilios Morellas**
  Director, Safety, Security, and Rescue Research Center, Computer Science and Engineering

- **Alfred Marcus**
  Professor, Carlson School of Management

- **John Bloomfield**
  Research Associate, Center for Design in Health, College of Design

**Environmental Impacts**

**Data Systems**

**Pavement Engineering**

**Human Factors**

In FY11, 76 faculty and research staff were involved in 151 transportation-related research projects.

Membership as of December 2011
New faces

Seven principal investigators are participating in the CTS research program for the first time: Stefano Garella, Jialiang Le, and Steven Wojtkiewicz (Civil Engineering); John Carlsson and Chris Edwards (Mechanical Engineering); and Carol Becker and Peter Kiedrowski (Humphrey School of Public Affairs).

In addition, James Oberstar, former congressman and chair of the U.S. House Transportation and Infrastructure Committee, joined the Humphrey School as a visiting scholar. He also chairs the board of the Center for Excellence in Rural Safety.
# Affiliated faculty and research staff

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<td>U of M researchers won $823 million in competitive research funding in 2010, up 36% from the previous year.</td>
<td>University of Minnesota economic impact study (<a href="http://impact.umn.edu">http://impact.umn.edu</a>)</td>
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Because our success depends on your participation.

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Colleen Landkamer  
State Director, USDA Rural Development

Bob McFarlin  
Member, District 3, Metropolitan Council

Adolph Ojard  
President, Murphy Warehouse Company

Khani Sahebjam  
Deputy Commissioner, Minnesota Department of Transportation

Charles Zelle  
CEO/President, Jefferson Lines

Michael R. Huber  
Cardiovascular Health Consultant, BlueCross BlueShield of Minnesota

Tom Sorel  
Commissioner, Minnesota Department of Transportation

Derrell Turner  
Minnesota Division Administrator, Federal Highway Administration

Douglas Weiszhaar  
Vice President for Special Projects, WSB & Associates, Inc.

Left during FY11:  
Mark Hoisser  
President, Dakota Area Resources and Transportation for Seniors

Colleen Landkamer  
State Director, USDA Rural Development

Bob McFarlin  
Member, District 3, Metropolitan Council

Adolph Ojard  
President, Murphy Warehouse Company

Khani Sahebjam  
Deputy Commissioner, Minnesota Department of Transportation

Charles Zelle  
CEO/President, Jefferson Lines

Mark Phillips  
Commissioner, Department of Employment and Economic Development
CTS Board of Advisors

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Bob Sands, Jacobs Engineering Group (retired)
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Cadie Wright Adhikary
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Christine Anderson
Editor

Gina Baas
Assistant Director, Education and Outreach

Joe Barbeau
Program Coordinator

Kate Bartelt
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