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NORTH DAKOTA STRATEGIC HIGHWAY SAFETY PLAN

Submitted by

CH2MHILL®

SEPTEMBER 2013

North Dakota

Strategic Highway Safety Plan

Prepared for

North Dakota Department of Transportation

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Acronyms

4Es	education, emergency medical services, enforcement, and engineering
AASHTO	American Association of State Highway and Transportation Officials
BAC	blood alcohol concentration
CHSP	Comprehensive Highway Safety Plan
DUI	driving under the influence
EMS	emergency medical services
FHWA	Federal Highway Administration
FY	fiscal year
GDL	graduated driver licensing
HSIP	Highway Safety Improvement Program
LEAD	Listen, Educate, Ask, Discuss
MAP-21	Moving Ahead for Progress in the 21st Century
MMUCC	Model Minimum Uniform Crash Criteria
NCHRP	National Cooperative Highway Research Program
NDDOT	North Dakota Department of Transportation
NDLTAP	North Dakota Local Technical Assistance Program
NHTSA	National Highway Traffic Safety Administration
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SHSP	Strategic Highway Safety Plan
SOAR	Statewide Online Ambulance Reporting
TraCS	Traffic and Criminal Software
TRCC	Traffic Records Coordination Committee
TSO	Traffic Safety Office
USC	United States Code
YIELDD	Young Individuals Establishing Logical Driving Decisions

1 Introduction and Background

1.1 North Dakota Strategic Highway Safety Planning and Implementation

The State of North Dakota, through the leadership of the North Dakota Department of Transportation (NDDOT), published its first Strategic Highway Safety Plan (SHSP) in 2006 using a process that built on the state's existing Comprehensive Highway Safety Plan (CHSP). With this revised SHSP, North Dakota is establishing a long-term goal to eliminate all traffic fatalities on North Dakota's public roads. This approach reflects a growing national trend that no life lost or serious injury is acceptable. This 2013 North Dakota SHSP update was prepared to align traffic safety efforts across the state with this mentality and encourage responsible agencies and organizations to work together in a coordinated effort.

1.1.1 2006 Edition of the North Dakota SHSP

The 2006 North Dakota SHSP focused on the following safety emphasis areas:

- Reduce Alcohol Impaired Driving
- Increase the Use of Safety Restraints for all Occupants
- Younger Driver/Older Driver Safety
- Curb Aggressive Driving
- Improvements to Address Lane Departure Crashes
- Enhancing Emergency Medical Capabilities to Increase Survivability
- Improve Intersection Safety

Strategies for each emphasis area were chosen and safety projects implemented were consistent with the SHSP. However, a review of North Dakota crash records revealed that despite these efforts, fatalities and incapacitating injuries have increased since 2008.

1.1.2 NDDOT's Highway Safety Program Highlights

The NDDOT manages federal safety funds directed towards driver-behavior and infrastructure programs. A summary of past investments for these areas is provided in this subsection.

Infrastructure Improvements through Highway Safety Improvement Program

The Highway Safety Improvement Program (HSIP) includes federal funds intended to address hazardous highway locations and hazardous railway-highway grade crossings. The HSIP program primarily addresses safety needs through infrastructure improvements. In fiscal years (FY) 2011 and 2012, approximately $5.75 million in FY 2011 and just over $8.8 million in FY 2012 were obligated for highway safety improvements.

The analysis process to select candidate locations for HSIP funds has historically used site-based analysis techniques, which focused largely on localized improvements identified through annual high-crash listings rather than the systemic deployment of strategies. The analysis technique used by the NDDOT weights crashes by severity to help address locations where severe crashes have occurred. More recently, the NDDOT has begun implementing statewide strategies for lane departure and intersection

improvements based on roadway and traffic criteria. These and other projects implemented through the HSIP in FY 2011-2012 are summarized as follows:

- The NDDOT has embarked on a program to address lane-departure crashes by widely deploying centerline, edge line, or shoulder rumble strips on rural state highways. This program invested $3.8 million to improve nearly 750 miles of road.
- Approximately $46,000 was invested to install enhanced pavement markings on 2.54 miles of road to address lane-departure crashes.
- A total of $55,000 was invested to install enhanced delineation at 10 sharp curves.
- Over $10.2 million was invested to improve 66 intersections with projects that included installation of turn lanes, increased sight distance, and improved geometry of pedestrian and bicycle facilities.

Behavioral Program Highlights of the NDDOT Traffic Safety Office

In collaboration with its safety partners, the NDDOT's Traffic Safety Office (TSO) annually invests approximately $4.5 million in new grant funds to accomplish its traffic safety performance goals. Programming highlights for the TSO include the following:

- Coordination of statewide impaired-driving enforcement through the Regional Driving Under the Influence (DUI) Task Force program. Regional DUI Task Forces include state, county, city, university, and tribal law enforcement agencies collaborating to provide high-visibility enforcement for impaired-driving through regular saturation patrols and sobriety checkpoints. Regional DUI Task Forces facilitate the arrest, prosecution, and adjudication of DUI offenders. Agencies participate in the national impaired-driving enforcement campaigns and conduct additional quarterly high-visibility enforcement during high-risk community events throughout the year. In addition, North Dakota has effectively used speed enforcement (enhanced by the purchase and use of radar/lidar units) as a trigger violation to enforce both impaired driving and seat belt violations.
- North Dakota's nationally recognized 24/7 Sobriety Program is a highly supervised, court monitoring program for DUI offenders to maintain sobriety 24 hours a day, 7 days a week through twice-daily alcohol testing or the use of an alcohol-monitoring ankle bracelet.
- To increase public awareness of the importance of seat belt use and its safety and enforcement consequences, the TSO conducts four annual *Click It or Ticket* events. Over 60 law-enforcement agencies across the state participate in the high-visibility campaign to increase public seat belt compliance. To help ensure the proper use and installation of child safety seats, North Dakota's comprehensive Child Passenger Safety program provides technical assistance, training, and resources to parents and caregivers; Child Passenger Safety technician certification; over 1,900 car seats given annually to the public; and Child Passenger Safety workshops and courses reaching approximately 400 participants annually across the state.
- The Tribal Outreach Program provides resources and technical assistance to North Dakota's tribes to establish and/or maintain a traffic safety outreach program that disseminates information on seat belt use, impaired driving, speeding, and distracted driving.
- The Parents LEAD (Listen, Educate, Ask, Discuss) program educates parents about the importance of their involvement and intervention to reduce underage alcohol consumption. A

featured component of the program is its website (www.parentslead.org), which offers a variety of prevention and communication resources and suggestions for parents.

- Effective, data-driven traffic safety programs are built on reliable and timely crash data. North Dakota continues to expand law enforcement agencies' conversion from paper crash reporting to electronic reporting using the NDDOT's Traffic and Criminal Software (TraCS). The state currently receives over 83 percent of all crash reports electronically. Each of the state's four tribes has expressed interest in implementing TraCS for crashes that occur on tribal lands.
- The TSO seeks to strengthen its understanding of the public's attitudes, perceptions, and behaviors regarding traffic safety. Traffic safety surveys (such as the DUI Offender Survey; annual statewide and county-level seat belt observation surveys; Behavioral Risk Factor Surveillance Survey; Youth Risk Behavior Survey; and 2012 Statewide Traffic Safety Survey) shape the TSO's traffic safety programs to strengthen North Dakota's traffic safety culture, reinforce motorists' safe driving behaviors, and reduce traffic fatalities and serious injuries.

1.2 SHSP Development Process

The North Dakota SHSP incorporates federal guidance and is structured to accomplish specific goals. These goals are as follows:

- Be consistent with Federal Highway Administration (FHWA) procedural guidance.
- Establish a mission, vision, and goal for all traffic safety partners in North Dakota.
- Address the frequency, rate, and primary factors contributing to fatalities and incapacitating injuries in North Dakota through a comprehensive (addresses the 4Es of safety [education, enforcement, engineering, and emergency medical services]) and data-driven process that considers all users on all roads.
- Incorporate input provided by safety partners representing national, state, tribal, and local agencies, and private safety advocacy groups.
- Guide future safety investments.

Figure 1-1 illustrates the process used to update the North Dakota SHSP, beginning with the crash analysis and concluding with the SHSP report.

FIGURE 1-1
North Dakota SHSP Update Development Process

Through the SHSP development process, a three-level prioritization of safety improvement projects takes place (Figure 1-2). First, key safety emphasis areas that represent the greatest opportunity to save lives and reduce injuries are identified (Chapter 2). Second, priority strategies are selected through stakeholder input and considering the ability to address crashes in the selected emphasis areas, the implementation cost and effectiveness (Chapter 3). Third, patterns in crash location, jurisdiction, and facility type to drive future implementation are identified (Chapter 4).

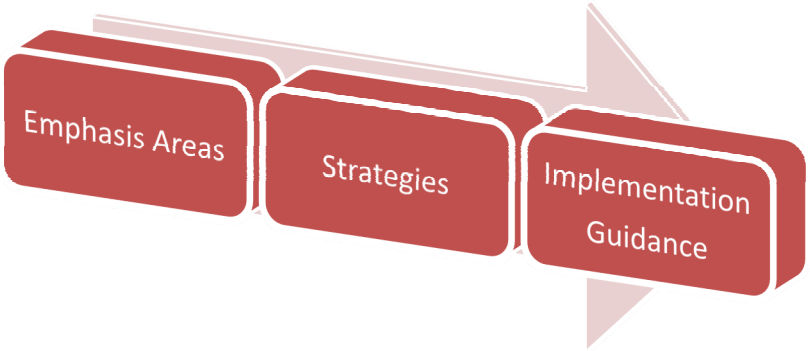


FIGURE 1-2
North Dakota SHSP Update Development Process

1.3 Traffic Safety Partners

The North Dakota SHSP was developed through coordination with stakeholders from public and private agencies. Invited participants (Table 1-1) represent a broad spectrum of agencies and organizations, allowing the North Dakota SHSP to be a truly comprehensive document. Participating stakeholders provided input on selecting an intermediate goal and helped identify priority strategies to address North Dakota's traffic safety issues. The participating stakeholders included many outside of the traditional safety planning process, including planning organizations, nonprofit agencies, universities, tribes, counties, and cities. Individuals representing the 4Es were also invited to participate in the SHSP process.

TABLE 1-1
Invited North Dakota Safety Partners

Participants Invited Based on MAP-21 Requirements	
Governor's Highway Safety Representative	Motor Carrier Safety Assistance Program Administrator
Metropolitan planning organizations	Motor vehicle services
Major modes of transportation	County transportation officials
State, tribal, and local law enforcement	Non-motorized transportation
Rail-grade crossing safety/Operation Lifesavers	Major federal, state, tribal, and local safety stakeholders
Additional Invited Participants	
Affected families	Traffic safety resource prosecutor
Insurance industry	NDDOT Safety and Engineering personnel
Emergency medical services	Safe Routes to School
Community coalitions (such as Safe Communities)	North Dakota State University Upper Great Plains Transportation Institute
North Dakota Association of Counties	Tribal transportation

1.4 National Context—Renewed Focus on Severe Crashes

Strategic safety planning, as performed today, first began when the American Association of State Highway and Transportation Officials (AASHTO) published a nationally focused SHSP in 1997, which was updated in 2004. In the document, AASHTO and FHWA noted that individual state efforts had not effectively lowered the number of fatal crashes in the past decade. Contributing to the lack of progress was that many state highway agencies were not coordinating efforts with their safety partners. In addition, states' efforts were typically not being focused on the primary causes of fatal crashes and implemented safety projects were not effective at reducing traffic fatalities and injuries.

In response to this lack of progress, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) legislation required states to prepare an SHSP for the first time. The recommended SHSP development process considered all roads, was comprehensive, involved stakeholders, was data driven, and focused on severe crashes. The current federal transportation legislation, Moving Ahead for Progress in the 21st Century (MAP-21), continues the emphases identified under SAFETEA-LU, including a focus on addressing the most severe crashes—those crashes resulting in fatal and/or incapacitating injuries. MAP-21 also specifies that the SHSP will be a guiding document for safety investments in the states, identifying priorities, strategies, and key facilities where severe crashes occurred. MAP-21 also places greater emphasis on states meeting the needs of older drivers/pedestrians, especially if fatalities and incapacitating injuries per capita for these users increased during the most recent 2-year period for which data are available.

2 Determining Safety Emphasis Areas

2.1 Crash Data Overview

2.1.1 National and State Context—Traffic Fatalities

Fatal and life-changing injury (severe) crashes are a major public health issue in the United States. In 2011, the latest estimates showed that 32,310 people were killed in traffic crashes nationally—nearly 90 people killed every day. From a peak of 54,589 fatalities in 1972, traffic-related fatalities in the U.S. have been significantly reduced, but with fluctuations from year to year . This trend was interrupted beginning in the early 1990s and continuing through the early 2000s as traffic fatalities began to increase. However, since 2005, traffic fatalities have decreased dramatically to the lowest number of fatalities in recent history—33,833 in 2010.

North Dakota's traffic fatality trend resembled the national trend through 2008, including traffic fatalities dropping in the state beginning in 2005. However, unlike the national trend, North Dakota's traffic fatalities have increased since 2008 (Figure 2-1). There are numerous possible reasons contributing to the difference between national and state trends, including, but not limited to:

- Shifts in the age of the driving population
- Steadily growing vehicle miles traveled in North Dakota, which is counter to the flat or decreasing national trend in travel
- Other states have a longer history using a systemic investment approach to focus on locations with risk factors
- The growing challenges of providing emergency medical response and quick access to advanced health care in rural areas

2.1.2 North Dakota Traffic Fatalities and Incapacitating Injuries by Safety Emphasis Area

The AASHTO SHSP focused on 22 specific highway safety challenges, or safety emphasis areas, that are divided into six parts or categories (Table 2-1). Disaggregating crash data by safety emphasis areas helps agencies and organizations identify safety priorities based on actual data. This step also reduces the universe of safety strategies considered to those associated with the most common types of severe crashes occurring on an agency's transportation system. Finally, crash data disaggregation and identification of key emphasis areas helps agencies select the most effective strategies for reducing crashes and determine where limited funds should be invested for the most positive impact. Table 2-2 shows the disaggregation of North Dakota's severe crashes.

FIGURE 2-1
Fatality Rate— National and North Dakota

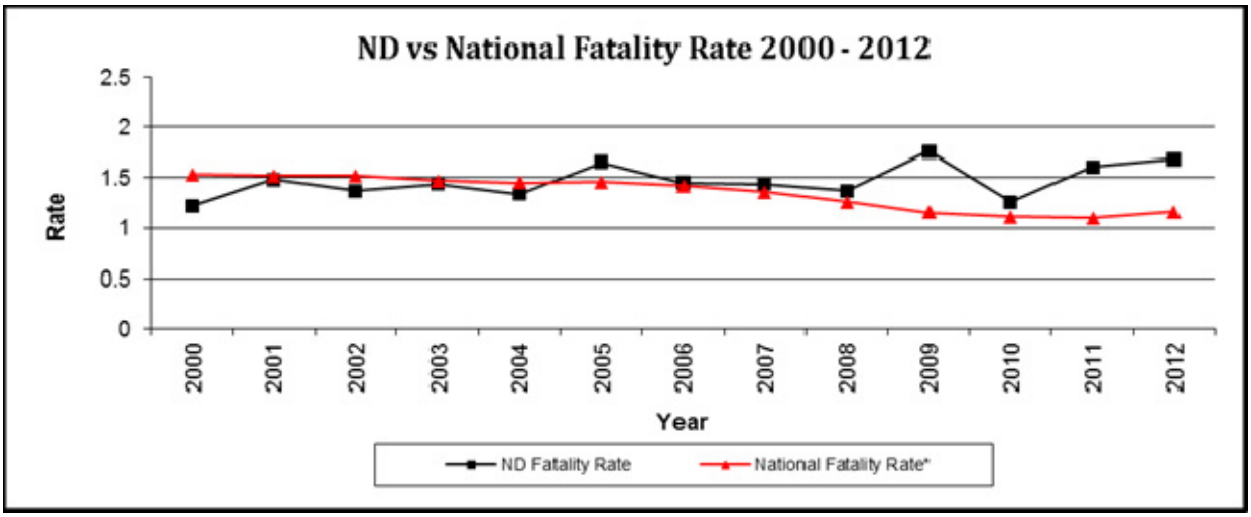


TABLE 2-1
22 Safety Emphasis Areas from the AASHTO State Highway Safety Plan

Part 1: Drivers 1. Instituting Graduated Licensing for Young Drivers 2. Ensuring Drivers are Licensed and Fully Competent 3. Sustaining Proficiency in Older Drivers 4. Curbing Aggressive Driving 5. Reducing Impaired Driving 6. Keeping Drivers Alert 7. Increasing Driver Safety Awareness 8. Increasing Seat Belt Usage and Improving Airbag Effectiveness	**Part 4: Highways** 14. Reducing Vehicle-Train Crashes 15. Keeping Vehicles on the Roadway 16. Minimizing the Consequences of Leaving the Road 17. Improving the Design and Operation of Highway Intersections 18. Reducing Head-On and Across-Median Crashes 19. Designing Safer Work Zones
Part 2: Special Users 9. Make Walking and Street Crossing Safe 10. Ensuring Safer Bicycle Travel	**Part 5: Emergency Medical Services (EMS)** 20. Enhancing Emergency Medical Capabilities to Increase Survivability
Part 3: Vehicles 11. Improving Motorcycle Safety and Increasing Motorcycle Awareness 12. Making Truck Travel Safer 13. Increasing Safety Enhancements in Vehicles	**Part 6: Management** 21. Improving Information and Decision Support Systems 22. Creating More Effective Processes and Safety Management Systems

Source: *AASHTO Strategic Highway Safety Plan*, American Association of State Highway and Transportation Officials, 1997 and 2004.

TABLE 2-2
North Dakota Fatal and Incapacitating Injury Crashes by AASHTO Safety Emphasis Area

Safety Emphasis Area		Statewide (All Roads)	
		Percent	Number
Drivers	**Involving Driver Under Age 21**	**25%**	**493**
	Unlicensed drivers	–	–
	Involving drivers over the age of 64	14%	272
	Excessive Speed or Aggressive Driving	**27%**	**553**
	Alcohol Related	**30%**	**607**
	Distracted, asleep, or fatigued drivers	11%	222
	Safety awareness	–	–
	Unbelted Vehicle Occupants	**48%**	**963**
Special Users	Pedestrians crashes	6%	119
	Bicycle crashes	2%	47
Vehicles	Motorcycles crashes	13%	255
	Heavy vehicle crashes	12%	243
	Safety enhancements	–	–
Highways	Train-vehicle collisions	0%	7
	Lane-Departure Crashes **Including both lane-departure (844 severe crashes) and head-on/ sideswipe-opposing crashes (131 severe crashes)**	**48%**	**975**
	Intersection Crashes	**23%**	**459**
	Work zone crashes	1%	25
EMS	Enhancing emergency capabilities	–	–
Management	Information and decision support systems	–	–
	More effective processes	–	–
Total Severe (Fatal and Incapacitating Injury) Crashes		**2,012**	

Notes:

North Dakota Crash Data Records, 2007 to 2011

Numbers in this table do not add up to the statewide crash numbers because one crash may be categorized into multiple emphasis areas. For example, one crash may involve a young driver at an intersection and therefore be included in both of these emphasis areas.

2.2 North Dakota Safety Emphasis Areas

Based on crash records, the following six safety emphasis areas had the most associated severe crashes and were selected for the North Dakota SHSP (Figure 2-2):

- Younger drivers
- Speeding or aggressive drivers
- Alcohol-related
- Unbelted vehicle occupants
- Lane departure
- Intersections

Of these safety emphasis areas, lane departure has the most crashes (975 severe crashes) and intersections have the fewest crashes (459 severe crashes). Following intersections, there is a noticeable drop to the next highest emphasis area: older drivers with 272 related severe crashes, suggesting there is a natural breakpoint after the top six safety emphasis areas (shown as red bars in Figure 2-2 and red lines in Figure 2-3). However, further investigation of severe crashes involving older drivers reveals that fatal and incapacitating injury crashes increased in the most recent 2-year period in which data are available (shown as green line in Figure 2-3). In response to MAP-21 guidance, crashes involving older drivers are included in the SHSP for further consideration in subsequent steps. As shown in Figure 2-3, severe crashes involving heavy vehicles (blue line with long dash) were observed to have a distinct upward trend during the study period. While not selected as a safety emphasis area for the SHSP, severe crashes involving heavy vehicles continue to be a part of the discussion during the Plan's development.

Fact sheets summarizing key information for each of the six selected safety emphasis areas were prepared during the SHSP development. These fact sheets are provided in Appendix A.

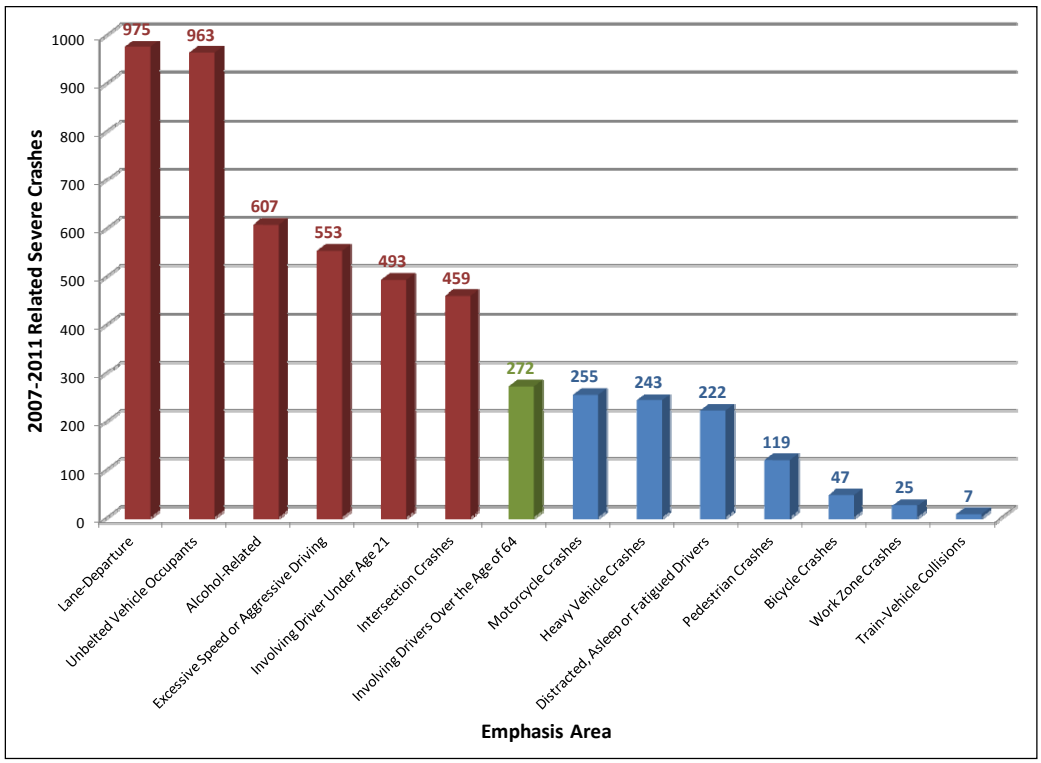


FIGURE 2-2
Safety Emphasis Areas Organized by North Dakota's Severe Crashes

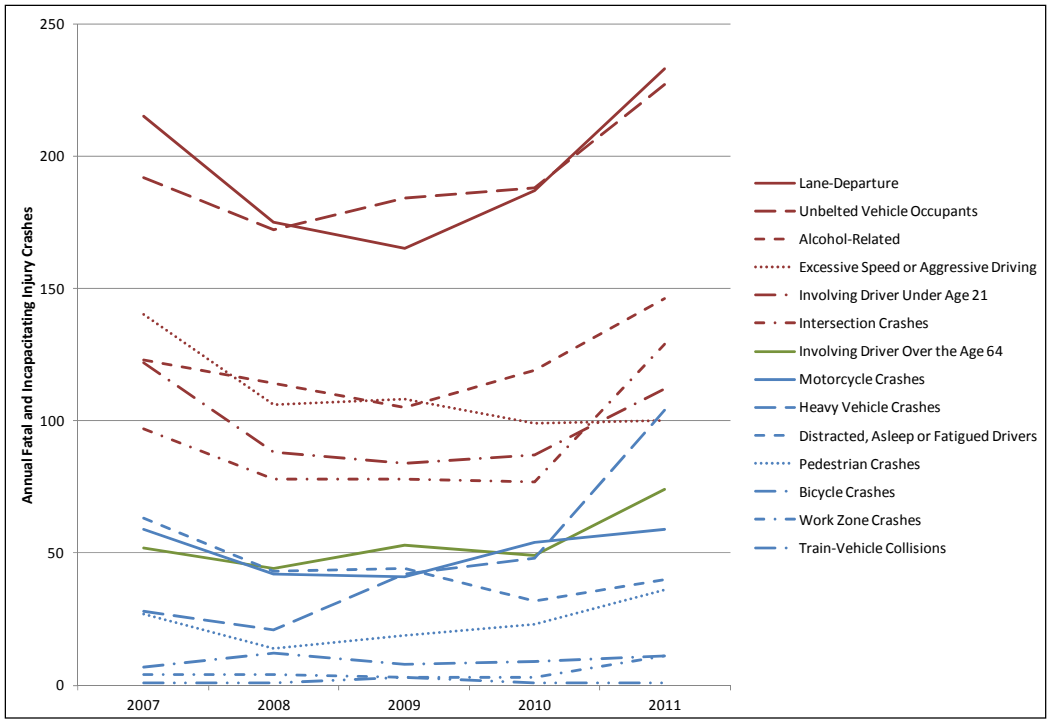


FIGURE 2-3
Annual Severe Crashes (Fatal and Incapacitating Injuries) by Safety Emphasis Area

2.3 North Dakota Safety Goal

As stated previously, North Dakota has established a long-term goal to eliminate all traffic fatalities on North Dakota's public roads. The state recognizes that this is a long-term vision, and achieving it will require many years and dramatic shifts in the safety culture for North Dakota residents. While it is widely recognized within the state that there is only one suitable long-term goal, it is also acknowledged that intermediate (short-term) goals are needed as benchmarks to measure progress. Intermediate goals also promote cooperation among agencies to accomplish these goals.

Discussions were held with safety stakeholders to begin the process of selecting an intermediate goal. Due to the upward trend of traffic fatalities, there was unanimous support for an aggressive intermediate goal to reduce traffic fatalities, and several options were discussed. After considering the stakeholders' input, the SHSP Steering Committee selected reducing the 3-year average of traffic fatalities to 100 or fewer by 2020.

3 Prioritizing Safety Strategies

3.1 Safety Strategies and Prioritization Workshop

Following the selection of the safety emphasis areas, potential safety strategies were identified for each emphasis area. The initial list of strategies was compiled using *Countermeasures That Work*[1] and the National Cooperative Highway Research Program (NCHRP) Report 500 series[2]. Both resources were developed to assist state and local agencies in implementing programs to reduce the number of fatalities and injuries in targeted emphasis areas. Additions and edits were made to the strategies to develop a comprehensive list that reflects North Dakota programs.

On August 16, 2012, the North Dakota Steering Committee conducted a workshop for safety stakeholders and partners to provide input on North Dakota's priority safety strategies. The workshop began with group presentations to create a common understanding of the traffic safety issues in the state. Afternoon breakout sessions provided focused discussions of strategies and the workshop ended with a group strategy-prioritization exercise. North Dakota's strategy tables with edits made during the workshop are provided in Appendix B.

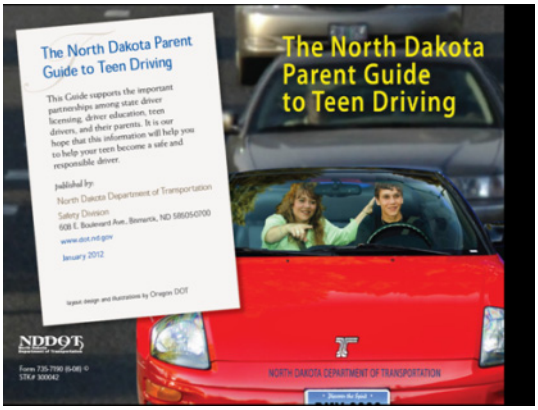
As the process of selecting priority strategies moved forward, the stakeholder input, along with information regarding effectiveness and cost, was used to determine the priority safety strategies for North Dakota's future safety investments.

3.2 Priority Safety Strategies for Safety Emphasis Areas

Organized by safety emphasis area, the priority safety strategies are intended to help focus their implementation. Widespread use of these strategies is expected to reverse North Dakota's growing trend in traffic fatalities and incapacitating injuries. The priority safety strategies are outlined in the following subsections. However, these are not intended to be an all-inclusive list of strategies. Other strategies intended to address the noted emphasis areas may also be deployed.

3.2.1 Young Drivers

- Strengthen current restricted teen driver licensing to meet graduated driver licensing (GDL) system requirements, including:
  - Require classroom education component. (*Consider parental education requirement. Current studies underway suggest parental engagement influences safe driving behaviors of their teen drivers.)*
  - Require 30 to 50 hours of supervised driving for drivers 16 to 17 years of age.



[1] *Countermeasures that Work*, 6th Edition. DOT HS 811 444. National Highway Traffic Safety Administration, Washington, D.C. February 2011.

[2] *National Cooperating Highway Research Program Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan*; Volumes 1-23. Transportation Research Board, Washington, D.C.

  - Implement passenger restrictions.
  - Implement minimum age of 17 to qualify for a full, unrestricted license. (*Research demonstrates safety benefits of delaying licensure to provide additional driving skill development and experience.)*

- Enact/support legislation requiring teen drivers subject to graduated driver licensing be identified via a vehicle decal to assist law officers in enforcing GDL provisions.
- Publicize and enforce teen driving license provisions.
- Publicize and enforce laws pertaining to underage drinking and driving.

3.2.2 Speeding or Aggressive Drivers

- Enact/support legislation to strengthen penalties such as increased fines for right-of-way and speed violations.
- Address the perception of widespread speeding by heavy vehicles by first conducting a statewide assessment of commercial vehicle speeds. In response to the assessment results, examine enforcement, safety education, and outreach safety strategies for priority regions or corridors identified as needing improvement.
- Strengthen speed detection and public perceived risk of being stopped and ticketed through sustained, well-publicized, highly visible speed enforcement campaigns.
- Install speed signing using variable message signs in school zones.

3.2.3 Alcohol-Related

- Conduct a comprehensive assessment of impaired driving laws to strengthen criminal penalties and administrative license sanctions against best practices and recommend impaired driving policy changes. Included in this assessment will be an examination of the following key elements:
  - Extend/strengthen administrative license suspension for DUI offenders, including first-time offenders.
  - Remove the option of blood alcohol content (BAC) test refusal. (Or at a minimum, establish stronger penalties for BAC test refusal than for test failure.)
  - Impose increased penalties for a 0.15 BAC and higher *(Research demonstrates a higher risk of recidivism beginning at 0.15 BAC and significant life-saving benefits of increased penalties at 0.15.)*.
  - Implement a mandatory ignition interlock program; require ignition interlocks as a condition for license reinstatement for first-time and high BAC offenders. *(Research demonstrates that approximately 60 percent of alcohol-related fatalities involve offenders with no prior DUI offense. Mandatory ignition interlocks for first-time offenders serve as an effective public deterrent to drinking and driving.)*

- Apply holistic or ecological approaches (via persons, families, cultures, communities, and policies) to educate the motoring public and create a cultural awareness of the risks associated with excessive alcohol use.
- Conduct highly publicized compliance checks and training for alcohol retailers and merchants to reduce sales to underage persons.
- Conduct public outreach on accessible safe-ride alternative transportation services.
- Strengthen impaired driving detection and public perceived risk of arrest through sustained, well-publicized, highly visible impaired-driving enforcement, including sobriety checkpoints.

3.2.4 Unbelted Vehicle Occupants

- Enact primary seat belt legislation that includes primary enforcement of belt use for all passengers in all seating positions.
- Strengthen penalties for lack of seat belt use.
- Strengthen detection and the public-perceived risk of being stopped and ticketed through sustained, well-publicized, highly visible seat belt enforcement campaigns.

3.2.5 Lane Departure

- Deploy centerline, shoulder, and edge line rumble strips to alert drivers when they are leaving their lane of travel.
- Use enhanced edge line markings (for example, 6-inch edge lines, wet-reflective material, or embedded pavement markings) where appropriate, such as sections with either unpaved or narrow paved shoulders among others.
- Provide enhanced shoulders, lighting, delineation (for example, Chevrons), or pavement markings for sharp horizontal curves.
- Improve roadway shoulders by eliminating drop-offs from paved road to unpaved shoulder.

3.2.6 Intersections

Signalized Intersections

- Supplement conventional enforcement of red-light running with confirmation lights; include a public information campaign to increase awareness and compliance.
- Provide countdown timers, advanced walk phase, and other low-cost pedestrian/bicycle facility improvements.

Unsignalized Intersections

- Improve visibility of intersections by providing appropriate street lighting.
- Channelize or close median openings to restrict or eliminate turning maneuvers.
- Construct roundabouts at appropriate locations.
- Improve visibility of intersections by providing enhanced signing, delineation, or pavement markings/messages.

- Install larger regulatory and warning signs at intersections, including the use of dynamic warning signs at appropriate intersections.
- At appropriate locations, provide or enhance (such as lengthen or offset) left-turn and right-turn lanes at intersections. These enhancements may include acceleration lanes on divided highway corridors or bypass lanes at T-intersections.

3.3 Other Priority Safety Strategies

Because of the increasing trend in severe crashes involving older drivers or heavy vehicles, the SHSP Steering Committee discussed key strategies that may be appropriate for these areas.

3.3.1 Older Drivers

Regarding infrastructure approaches to reduce these severe crashes, the strategies focus on improving signing, installing intersection lighting, and adding turn lanes; which are already priority strategies in the Lane Departure and Intersection safety emphasis areas. Furthermore, the NDDOT is already implementing these kinds of projects across the state. Policy and program strategies identified as a priority to address issues with older drivers include the following:

- Review license renewal policies for older drivers identified as an excessive risk through screening by motor vehicle personnel (such as restrict vs. rescind, age and interval schedule for license renewal, etc.). Continue to evaluate policies and relevant data in the future.
- Develop informational resources and conduct outreach for older driver safety screening for family, friends, physicians, and law enforcement to report at-risk drivers:
  - Establish a statewide "one-stop" resource to guide the public on addressing driving skill assessments, educational courses, licensing, and safe mobility choices.
  - Provide educational and training opportunities to the general older driver population to assess their driving capabilities and limitations, improve skills, and voluntarily limit their driving to safer driving conditions.
- Establish a broad-based coalition to plan for addressing older adults' transportation needs and strengthen transportation options.

3.3.2 Involving Heavy Vehicles

Many severe crashes involving heavy vehicles are either lane departure crashes, side-swipe crashes, or angle crashes at intersections. The infrastructure priority strategies identified in the respective areas are considered appropriate for crashes involving heavy vehicles. Potential changes to driver-behavior program and strategy implementation for crashes involving heavy vehicles would be influenced by the findings from the assessment identified in the Speeding and Aggressive Drivers safety emphasis area. Furthermore, when a heavy vehicle was involved in a severe crash with another vehicle, past crash records show that more drivers in the passenger vehicle were reported with contributing factor (http://www.ugpti.org/rtssc/briefs/downloads/2012_TrafficSafetyFacts.pdf). Therefore, the strategies to address driver behavior should also reduce severe crashes involving heavy vehicles.

4 Addressing Severe Crash Potential

Severe crashes on North Dakota's roadways tend to be dispersed across the state's network of roads. With severe crash "clusters" relatively rare, the challenge is distinguishing the locations that have a greater potential for a future severe crash from all other sites.

According to research, severe crash locations often change along a highway or roadway system. Therefore, improving specific locations simply because one or a small number of severe crashes could lead to a trend commonly called "chasing fatals." In other words, locations targeted because of a severe crash during the previous year(s), may have no severe crash the following year—even if the locations had not been the focus for a program or improvement. As a result, the investment could be an inefficient use of the state's resources. Instead, an approach addressing locations based on the risk or potential for a future severe crash, in combination with historic safety performance, will provide increased opportunity to prevent future crashes. This evolving approach to safety investment is known as the systemic safety process.

The challenge of a systemic safety process is understanding those elements of the transportation system that have an increased risk for a future crash. Individually, severe crashes often appear to be at random locations, but in aggregate there may be patterns based on the facility type (rural county roads, urban signalized intersections, etc.), the locations' characteristics (traffic volumes, speed limits, etc.), or persons involved (gender, age, vehicle type, etc.). The facility types and characteristics can be viewed as risk factors for crash potential, indicating which locations or individuals may have a greater potential for a severe crash in the future. This should not be interpreted to mean that the characteristic or risk factors "caused" the crash, but simply that the presence of the characteristics was noted at these locations. Risk factors combined with systemic strategies implementation – wide use of low-cost, effective strategies that address the predominant collision type – are evolving to create a new approach to location prioritization and safety investment.

All emphasis areas are prime candidates for systemic treatment because specific locations typically do not have multiple severe crashes year after year. While the systemic deployment of strategies is an evolving concept in infrastructure-based safety, it has been used for some time in driver-behavior programs. Driver-behavior safety programs often begin by identifying demographic, time, or location characteristics that are overrepresented in severe crashes. In response, education and enforcement campaigns are developed to target these overrepresented characteristics.

By understanding priority facility types and location risk factors, safety investment decisions can be guided to the appropriate locations. Directing programs to locations similar to where severe crashes occurred in the past or targeting drivers and passengers that tend to exhibit behavior that may contribute to severe crashes can be a much more effective way to invest safety funds.

4.1 Priority Facility Types for the Six Safety Emphasis Areas

Crash trees are a graphic tool that can help identify some patterns for severe crashes based on facility types. The North Dakota crash trees were developed using severe crashes in the 2007 through 2011 crash records system (Appendix C). (Severe crashes were defined as any crash where there were one or more fatalities or incapacitating injuries.) Some observations based on the data include the following:

- **Jurisdiction:** To accomplish the goal to eliminate all traffic fatalities on North Dakota's public roads, a safety program must be comprehensive: it must address all roads susceptible to severe

crashes, regardless of the agency that maintains and operates the facility. Based on the North Dakota crash records, local roads account for 56 percent of severe crashes. This suggests a balanced approach between local and state facilities is needed to reduce or eliminate severe crashes on North Dakota roads.

- **State Highways:** On state highways, severe crashes were found to be overwhelmingly rural (818 crashes, or 92 percent) in their location. The severe rural crashes predominately occurred on roadway segments, as opposed to occurring at intersections. The severe segment crashes were mostly lane-departure crashes (run-off-the-road, head-on, and sideswipe-opposite collisions). In addition, over 20 percent of the severe roadway segment crashes were reported in a curve. For severe rural intersection crashes, through-STOP-controlled was the most commonly reported intersection type when the traffic control was identified in the crash report.

- **Local Streets and Highways:** Severe crashes on local roads were split nearly equally between urban and rural locations during the study period, indicating that counties and cities are both important partners for a comprehensive safety program. Of the severe rural crashes, most occurred on county or township roads according to the crash records, but may have also occurred on federal roads (such as tribal roads). These crashes are roadway segment related (78 percent); and approximately 93 percent of the severe segment crashes are lane departure. On local facilities, approximately 26 percent of run-off-the-road crashes occurred within a curve, but curves were not a primary factor in across-centerline crashes. For severe rural intersection crashes, unsignalized was the most commonly reported intersection type when the traffic control was identified in the crash report.

  Of the 48 percent of local severe crashes in urban areas, most were on city streets, but may have also occurred on county facilities. Pedestrian and bicycle crashes represented a noticeable percentage (21 percent) of the severe urban local crashes—an important factor that will be considered when developing safety programs for local urban systems. The remaining severe crashes are split between roadway segment and intersections. For severe intersection crashes, the same proportion of severe crashes occurred at signalized and unsignalized intersections.

The crash trees and observed patterns included all severe crashes in North Dakota, regardless of crash type and contributing circumstances. However, the information in the fact sheets (Appendix A) has specific information regarding jurisdiction and location by the six safety emphasis areas. This information is detailed in the following bullets and summarized in Table 4-1:

- **Jurisdiction:** Following the overall trend for the state, severe crashes involving lane departure and unbelted vehicle occupants occurred nearly equally on state and local roads. The remaining emphasis areas, Young Drivers (67 percent), Alcohol-Related (62 percent), Speeding or Aggressive Drivers (62 percent), and Intersections (70 percent), demonstrate an increasing proportion of severe crashes on local roads. For these four emphasis areas, it is important to include and address severe crashes on local roads in future safety project implementation.

- **Location:** The lowest number (44 percent) of severe intersection crashes occurred at rural locations. By contrast, more than half (56 percent) of the severe intersection crashes occurred at urban locations. This percentage includes the 52 percent of all severe intersection crashes that

occurred at local urban intersections—which is a significantly higher number of crashes than occurred for the other safety emphasis areas. Other than urban intersections, most severe crashes occurred on rural roads; from 59 percent for Young Drivers to 81 percent for Unbelted Vehicle Occupants and 86 percent for Lane Departure.

TABLE 4-1
Distribution of Severe Crashes for the Six Safety Emphasis Areas by Jurisdiction and Location

Safety Emphasis Area	Distribution by Jurisdiction and Location				Distribution by Jurisdiction Only		Distribution by Location Only	
	State		Local					
	Rural	Urban	Rural	Urban	State	Local	Rural	Urban
Young Drivers	28%	5%	31%	36%	33%	67%	59%	41%
Speeding or Aggressive Drivers	33%	5%	40%	22%	38%	62%	73%	27%
Alcohol-Related	35%	3%	42%	20%	38%	62%	77%	23%
Unbelted Vehicle Occupants	44%	3%	37%	16%	47%	53%	81%	19%
Lane Departure	46%	3%	40%	11%	49%	51%	86%	14%
Intersections	26%	4%	18%	52%	30%	70%	44%	56%

4.2 Severe Crashes Involving Older Drivers and Heavy Vehicles

Unlike severe crashes in the six safety emphasis areas, severe crashes involving older drivers or heavy vehicles were more frequent on state maintained facilities (Table 4-2); with 57 percent of older driver involved crashes on state highways and 81 percent of the severe crashes involving heavy vehicles. Like the six safety emphasis areas, the crashes were also primarily located in rural areas, including 91 percent of severe crashes involving heavy vehicles. Rural state facilities were identified as particularly important since these represent over half of the severe crashes in either area (52 percent for older drivers and 79 percent for heavy vehicles.

TABLE 4-2
Distribution of Severe Crashes Involving Older Drivers or Heavy Vehicles

Severe Crashes Involving	Distribution by Jurisdiction and Location				Distribution by Jurisdiction Only		Distribution by Location Only	
	State		Local					
	Rural	Urban	Rural	Urban	State	Local	Rural	Urban
Older Drivers	52%	5%	13%	30%	57%	43%	65%	35%
Heavy Vehicles	79%	2%	12%	7%	81%	19%	91%	9%

4.3 Western North Dakota

The economic growth due to oil drilling predominantly in 17 western counties has had a noticeable influence on severe crashes in those counties (Figure 4-3). In 2007, 75 percent of severe crashes were in the 36 counties with little/no oil drilling, with 25 percent of the severe crashes in the 17 oil-producing counties. From 2008 to 2010, a smaller percentage of severe crashes occurred each year in the 36 counties. In 2011, severe crashes were equally split between the two regions. With the rapid economic growth and increase in severe crashes in the oil-producing counties, the state intends to focus its traffic safety programs within this region. However, this focus will be balanced with the rest of the state, since approximately half of the severe crashes occurred in counties with little or no oil drilling.

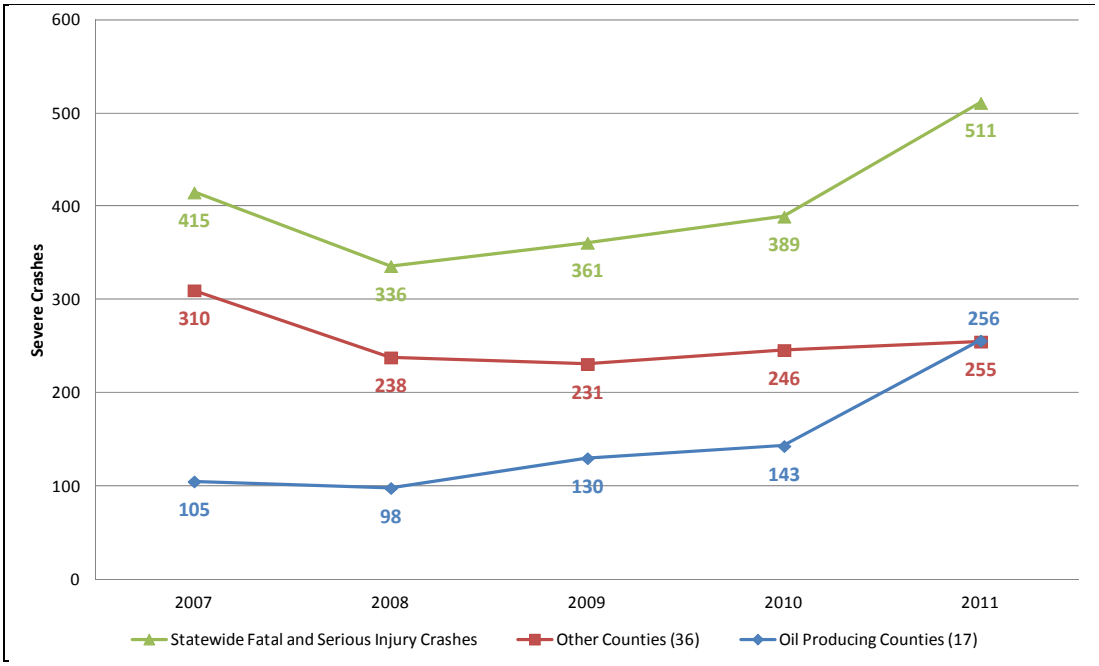


FIGURE 4-3
Severe Crashes by Counties

The economic growth in the oil-production areas was observed to coincide with the increase in severe heavy vehicle crashes. Severe heavy vehicle crashes increased each year in the oil-producing region, with 4 severe crashes in 2007 increasing to 81 severe crashes in 2011. Prior to 2010, more severe heavy vehicle crashes occurred annually in the 36 counties identified outside of the oil production area. In 2010, each region experienced 24 severe heavy vehicle crashes. In 2011, severe crashes involving heavy vehicles in the oil-producing counties increased to 81 crashes, while the area outside the oil production reported 23 severe crashes. In the oil-producing region, the increase observed in 2011 largely occurred on state highways, increasing from 20 severe crashes in 2010 to 64 severe crashes in 2011. In addition, severe crashes involving heavy vehicles on county and local roads increased from 4 crashes in 2010 to 17 crashes in 2011.

5 Local Road System Issues

5.1 Key Trends for Local Road Crashes

Chapter 4 established the importance of safety improvements for local roads to eliminate traffic fatalities, since these roads account for approximately half of the severe crashes in North Dakota. However, there are just over 99,000 miles of roads under the authority of county, city, township, tribal, or federal agencies and less than 7,400 miles operated by the state highway agency. This means that local roads represent over 93 percent of all roadway miles in North Dakota.

With a large roadway network, safety implementation has to be data driven and focused on the persons and locations with the greatest risk for involvement in a future severe collision. For example, over half of all severe intersection crashes in North Dakota were on the local, urban system, suggesting that intersection improvements need to be implemented in cooperation with municipalities. Severe crashes involving young drivers on local roads were nearly equally split between the urban and rural areas, inferring a balanced approach is best. Severe crashes in the remaining safety emphasis areas were more often reported on rural roads, which underscores the importance of safety improvements on local rural roads to eliminate traffic fatalities.

Of the 99,000 miles of local roads, nearly 97,600 miles are rural. Approximately 7 percent of these roads are paved with the remaining 93 percent being unpaved. Of the severe crashes on the rural local road system (Table 5-1), slightly more than half in each safety emphasis area occurred on unpaved roads. Of all severe crashes on local rural roads, 49 percent were on unpaved roads. Based on these percentages, safety improvements on both paved and unpaved local rural roads are necessary to reach the traffic safety goal. However, with only 7 percent of the system paved but approximately half of the severe crashes on the paved roads, the paved roads have a higher density of severe crashes (that is, severe crashes per mile per year) compared to the unpaved roads.

5.2 Local Road Safety Programs

Overall, the TSO's behavioral traffic safety program supports statewide implementation of safety strategies to reduce serious and fatal crashes on North Dakota roadways. The resource allocation and implementation of the TSO's statewide behavioral safety program include many components that support improved safety on both state and local roads, such as:

- Crash data improvement, problem identification, and crash analysis
- Law enforcement support (providing overtime enforcement grants/contracts, officer training, and recognition awards to law enforcement)
- High-visibility enforcement for unbelted occupants, impaired, aggressive, and distracted drivers
- Purchase of speed and DUI enforcement and surveillance equipment, as well as alcohol monitoring devices for offenders

- Technical assistance and resources for the prosecution and adjudication of DUI offenders
- Annual seat belt observation and public opinion surveys
- Public information outreach on seat belt use, impaired driving, speeding, and distracted driving
- Young driver outreach and education, and support toward school-based driver education programs
- Traffic safety program management and evaluation

In addition, when submitting its annual Highway Safety Plan outlining behavioral performance goals and supporting highway safety projects, the TSO includes certifications and assurances that the State of North Dakota complies with all applicable federal requirements. This compliance includes that at least 40 percent of all federal funds apportioned under 23 USC 402 will be expended by or for the benefit of the political subdivisions of the state to carry out local highway safety programs. Behavioral traffic safety programs that more directly target improving driver behavior on local and tribal roads include the following programs and services:

Local Agency Crash Data Support – The Upper Great Plains Transportation Institute develops crash data summaries for each law enforcement agency under contract with the TSO for overtime enforcement supporting impaired driving and seat belt enforcement campaigns. The crash data summaries demonstrate the priority crash factors and trends within each local agency's jurisdiction.

Rural Seat Belt Observational Survey – The TSO, in cooperation with Upper Great Plains Transportation Institute, conducts an annual statewide seat belt observation survey to evaluate the success of occupant protection programs and includes county-level observational seat belt surveys on rural roadways.

Regional DUI Task Forces – DUI enforcement saturation patrols, sobriety checkpoints, and other enforcement initiatives conducted through the Regional DUI Task Force Program increases the visibility of enforcement, particularly in rural areas, during coordinated regional enforcement periods. With the required engagement of county, city, and tribal law enforcement, in cooperation with the state Highway Patrol, traffic safety is enhanced on local roads. Nearly 80 percent of city and county law-enforcement agencies participate in a Regional DUI Task Force together with law enforcement from each of North Dakota's four reservations and the North Dakota Highway Patrol.

Tribal Traffic Safety Outreach – The TSO supports traffic safety outreach programs developed by four of North Dakota's Native American tribes (Standing Rock Sioux Tribe, Three Affiliated Tribes, Spirit Lake Nation, and Turtle Mountain Band of Chippewa) by providing resources and technical assistance to disseminate countermeasure strategy information to the reservations to increase seat belt use and deter impaired driving, distracted driving, and speeding.

County Outreach Program – The TSO, in cooperation with the North Dakota Association of Counties, launched its county-based Traffic Safety Outreach program to provide advocacy and community mobilization, media support, public outreach, and training to address seat belt use, impaired driving, speeding, and distracted driving at the county level. County participants include law enforcement, transportation engineering, social services, public health, businesses, nonprofit agencies, faith-based agencies, media, and other entities.

TABLE 5-1
Severe Crashes for the Six Safety Emphasis Areas by Jurisdiction, Location, and Road Surface Type

Safety Emphasis Area	State Jurisdiction				Local Jurisdiction				Overall Percent of Severe Crashes on Unpaved Roads	Local Rural Percent of Severe Crashes on Unpaved Roads
	Rural Roads		Urban Roads		Rural Roads		Urban Roads			
	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved		
Young Drivers	134	4	21	1	68	86	176	3	19%	56%
Speeding or Aggressive Drivers	179	3	24	1	99	124	117	6	24%	56%
Alcohol-Related	212	3	18	1	123	129	116	5	23%	51%
Unbelted Vehicle Occupants	422	3	25	2	170	184	153	4	20%	52%
Lane Departure	439	6	32	2	171	218	100	7	24%	56%
Intersections	117	2	19	0	60	23	236	2	6%	28%
Total	**805**	**13**	**70**	**2**	**294**	**285**	**533**	**10**	**15%**	**49%**

Regarding support given to local agencies in the areas of infrastructure, support is provided through either the HSIP or the North Dakota Local Technical Assistance Program (NDLTAP). Even though the HSIP process has been open to all agencies, local participation has been limited. One possible reason for few local agencies participating in North Dakota's safety program is a practice relating to the distribution of federal highway funds. In North Dakota, federal funds have been distributed to local agencies by formula, but if a local agency were successful in securing HSIP funds, then that amount would be deducted from their formula-derived total. Consequently, this may have contributed to a low level of engagement by local agencies. Beginning in FY 2013, this funding practice has changed. Local HSIP projects will not affect the local federal fund allocation. Another possible reason for low local participation in the HSIP is lack of resources and specific safety knowledge.

Assistance provided by NDLTAP to local agencies includes announcements of training opportunities, organizing local training and workshops, providing a Safety Circuit Rider that can advise local agencies, and conducting traffic safety evaluations for locations of concern. The NDLTAP also has access to crash records information for conducting safety analyses to support local agencies. Training available to counties of a safety nature include work zone safety and a web-based operator course for gravel road maintenance.

5.3 Actions to Strengthen Local Road Safety

The following actions are recommended to improve safety on North Dakota's local road system:

1. **Enhance Regional DUI Task Forces on local roads to include seat belt enforcement.** Nationally, 80 percent of impaired drivers killed are unbelted, while 82 percent of impaired drivers killed in North Dakota are unbelted. Expanding the enforcement and media outreach focus of the Regional DUI Task Forces to include unbelted occupants would strengthen belt use and improve safety on local roads.

2. **Target enforcement on local roads during higher risk driving periods.** Crash data analysis from 2007 through 2011 demonstrates that severe crashes occur more regularly on weekends (Friday through Sunday) and 33 percent of the fatal crashes occur from 3:00 p.m. to 9:00 p.m.

3. **Focus high visibility enforcement for rural counties with most fatal and serious injury crashes.** North Dakota's enforcement efforts have strong, locally based, earned media[3] components as well as paid statewide media for the core enforcement *Click It or Ticket* belt campaign and *Drive Sober or Get Pulled Over* impaired driving campaign. Focusing its high-visibility enforcement techniques (including multiple agency participation, signs, and vests, in addition to media outreach), on counties with the highest number of fatalities maximizes impact on local roads.

[3] Earned media (or free media) refers to favorable publicity gained through promotional efforts other than advertising, as opposed to paid media, which refers to publicity gained through advertising.

4. **Expand recognition of local enforcement agency participation during non-grant-funded enforcement.** Local agencies are typically reimbursed by the grants for their overtime enforcement hours. However, by providing an opportunity for local enforcement agencies to be recognized for traffic safety enforcement during non-grant-funded periods, agencies are encouraged to commit on-duty officers to traffic safety enforcement on local roads.

5. **Promote local ordinances and tribal law to enact primary seat belt enforcement on local roads.** To strengthen local support for primary seat belt enforcement and to provide a foundation for building statewide support for primary seat belt, provide communication tools and suggested language to local engineering, enforcement, public health, advocacy groups, and elected officials for the development of primary seat belt local ordinances and tribal laws.

6. **Initiate a County Road Safety Planning Process for local, urban intersections and lane departure crashes on local, rural roads.** Support the systemic implementation of low-cost, effective safety strategies on county roads, by first developing strategic safety plans for counties. In the urban areas, the process should conduct further analysis of local, urban severe intersection crashes to determine the most common issues (for example, right angle crashes at signalized intersections, pedestrian/bicycle crashes at signalized intersections, and right angle crashes at unsignalized intersections) and the most common roadway and traffic characteristics at locations where a severe crash was reported. With this information, develop a program to assist local agencies to widely implement low-cost and effective solutions at the intersections exhibiting the highest risk for a severe crash, reserving costly improvements for locations with the greatest need.

   For rural county roads, the planning process should focus on creating a program to systemically implement rumble strips (a low-cost and proven effective safety strategy) on paved rural roads. For locations that are identified in need of a safety investment but where rumble strips are not appropriate, other improvements (such as enhanced centerline and edge line markings, curve delineation, shoulder improvements, etc.) can be deployed. Given the inability to implement rumble strips and pavement markings on gravel roads, improvements would be focused on improved signing, especially Curve warning signs and Chevrons.

7. **Remove financial barriers preventing local agency participation.** Revise the safety project solicitation process to remove the barriers that limit local agency participation. This would include not reducing federal funds distributed by formula when a safety project is awarded.

8. **Provide training and data to local agencies**. Through the NDLTAP program, continue (or expand) services and outreach provided to local highway agencies. This may include information or training on how to develop systemic safety programs, funding for their implementation, and resources to conduct program evaluations. Incorporate any lessons learned from intersection and lane-departure safety programs into services provided through the Safety Circuit Rider or traffic safety evaluations. Also continue to offer operator training for gravel road maintenance, expanding participation and evaluating if courses can include in-the-field training. The NDDOT

will also support the development of safety tracks for conferences directed towards local agencies.

9. **Local community and political support.** Local community and political support is critical to sustaining traffic enforcement in counties and cities and may prove necessary to implement some infrastructure improvements, such as rumble strips. The public information and media outreach conducted on the local level are the primary strategies for gaining that support. In addition, the NDDOT may consider contracting with enforcement or engineering liaisons to present to local city council and county board meetings the importance of traffic safety, provide local crash statistics, recognize community partners for their work, and thank the council/board for their support.

6 Safety Investment Review

6.1 Introduction

Strategic highway safety plans are forward-looking documents. However, a number of states have found it instructive to look back at historic safety investments and make a qualitative assessment whether those investments were consistent with the priorities established in their previous SHSP. The following sections provide a summary of this look-back exercise relating to both driver-behavior- and infrastructure-related investments.

6.2 Driver-Behavior Program Investment

The NDDOT's TSO annually prepares a behavioral safety annual evaluation report—a look back on program results—for the previous federal fiscal year. This information, together with the identification of effective countermeasure strategies, serves to guide the annual Highway Safety Plan planning process and the resulting safety investments.

The TSO invests approximately $4.5 million annually in grant and procurement funds to accomplish its traffic safety performance goals (Table 6-1). The review of the 2011 program expenditures and the 2012 Highway Safety Plan resulted in the following observations about recent behavioral traffic safety investments to improve safety in North Dakota. Percent expenditures by program area may appear lower than actual due to some of the "Other" program areas providing additional activities within the areas listed (such as impaired driving, occupant protection, etc.). Additionally, the apportionment of federal funds through the National Highway Traffic Safety Administration (NHTSA) impacts the investment per safety emphasis area by providing excess funds in some areas (for example, Section 410 for impaired driving prevention) and limited funding in other areas (Section 402 funds for remaining emphasis areas).

TABLE 6-1
Historic North Dakota Driver-Behavior Investment

Investment Area	Annual Investment	Percent of Expenditure	Related Severe Crashes
Impaired Driving	$1.89 million	42%	30%
Occupant Protection	$0.72 million	16%	48%
Motorcycle Safety	$0.32 million	7%	13%
Speed Management	$0.13 million	3%	27%
Youth/Young Drivers	$0.05 million	1%	25%
Distracted Driving	$0.27 million	0.6% (or <1%)	11%
Other	$1.12 million	25%	N/A
Total	**$4.50 million**	**100%**	

6.2.1 Impaired Driving Prevention

The TSO spent approximately $1.8 million (42 percent of the annual budget) to reduce alcohol-related serious injury and fatal crashes, primarily on the following program initiatives:

- Overtime enforcement/high visibility enforcement – Regional DUI Task Forces
- Media and public information and education campaigns including *Drive Sober or Get Pulled Over* and *Buzzed Driving is Drunk Driving* national campaigns
- In-car video camera surveillance systems for state and local law enforcement use
- Alcohol-testing equipment including preliminary breath testing equipment, toxicology equipment, and Secure Continuous Remote Alcohol Monitoring (SCRAM) units

6.2.2 Vehicle Occupant Protection

The TSO spent approximately $0.68 million (16 percent of the annual budget) to reduce occupant protection related severe crashes, primarily on the following program initiatives:

- Sustained high visibility enforcement of North Dakota's occupant protection laws
- Sustained seat belt public outreach to the public through the placement of enforcement and non-enforcement (that is, social norms) messages throughout the year
- Conducting annual statewide seat belt observation and county-level observational seat belt surveys on rural roads to evaluate the success of occupant protection programs
- Administering the Child Passenger Safety program

6.2.3 Motorcycle Safety

To decrease motorcycle fatalities, the TSO invests approximately $0.29 million (7 percent of the annual budget) in the following:

- Statewide North Dakota Motorcycle Safety Program (NDMSP) for motorcycle rider training
- Conducting motorcycle safety public outreach and implementing *Share the Road* campaigns

6.2.4 Speed Management

The TSO spent approximately $0.12 million (3 percent of the annual budget) to provide resources to law enforcement to facilitate speed enforcement and reduce speed-related serious injury crashes, primarily on the following initiatives:

- Technical assistance, resources, and equipment such as radar and lidar units to support speed enforcement
- High-visibility speed enforcement including speed enforcement as a trigger violation to seat belt and impaired driving violations during *Click It or Ticket* and *Drive Sober or Get Pulled Over* enforcement campaigns

6.2.5 Youth/Young Drivers

To improve teen driver and occupant behaviors to reduce teen-involved serious injury crashes, the TSO invests approximately $0.04 million (1 percent of the annual budget) in the following:

- North Dakota Driver Risk Prevention Curriculum instructor technical assistance and resource support
- Teen peer-directed, traffic safety media, education, and outreach
- Young Individuals Establishing Logical Driving Decisions (YIELDD) for first-time juvenile offenders
- *Driving Skills for Life* program

6.2.6 Distracted Driving

The TSO invests approximately $0.26 million (11 percent of the annual budget) to promote distracted driving awareness through media outreach and informational materials.

6.2.7 Additional Safety Programs

The TSO invests approximately $1.25 million (25 percent of the annual budget) in other behavioral safety program initiatives, including:

- Planning and Administration – To provide program management to plan, develop, implement, monitor, and evaluate the annual statewide Highway Safety Program.
- Emergency Medical Services and Trauma – To support the management of the EMS system data including the North Dakota Trauma Registry and the Statewide Online Ambulance Reporting (SOAR) system.
- Police Traffic Services – To provide training, technical assistance, and resources to law enforcement to improve the enforcement, prosecution, and adjudication of traffic offenses.
- Community Traffic Safety Projects – To provide statewide outreach to influence driver's safety attitudes, perceptions, and behaviors primarily through media programs and outreach programs to counties and tribes.
- Traffic Records – To improve the accuracy, timeliness, completeness, uniformity, accessibility, and integration of traffic records data and systems' including producing North Dakota's Crash Summary; installing the software and training to convert law enforcement to electronic crash reporting (using TraCS); convening the Traffic Records Coordination Committee (TRCC); and advancing the Model Minimum Uniform Crash Criteria (MMUCC) data elements.

6.3 Infrastructure Investment

NDDOT's Office of Transportation Programs annually prepares a progress and evaluation report for the HSIP. A review of these reports for FY 2011 and FY 2012 indicates that NDDOT obligated nearly $6 million annually in HSIP funds for highway safety-improvement projects (Table 6-2). In addition, approximately 95 percent of the spending was for projects located in rural areas in North Dakota and 98 percent of the spending was for projects deployed along the state's system of highways. A further review of these annual reports results in the following observations about recent HSIP spending.

TABLE 6-2
Historic North Dakota Infrastructure Investment

Investment Area	Investment			Percent of Expenditure	Related Severe Crashes
	Fiscal Year 2011	Fiscal Year 2012	Total		
Intersections	$4.07 million	$5.90 million	$9.97 million	86%	23%
Turn Lanes, Sight Distance, etc.	*$3.02 million*	*$5.90 million*			
Pedestrian and Bicycle Improvements	*$1.05 million*				
Lane Departure	$1.41 million	$0.28 million	$1.69 million	14%	42%
Edge Improvements and Enhanced Curve Delineation	*$1.27 million*	*$0.06 million*			
Miscellaneous	*$0.14 million*	*$0.22 million*			
Total Obligational Authority Used	**$5.48 million**	**$6.18 million**	**$11.66 million**		

6.3.1 Intersections

As shown in Table 6-2, approximately $5 million of HSIP funds have been invested annually in intersection safety projects, including; turning lanes, sight distance and pedestrian/bicycle improvements. This level of investment represents approximately 86 percent of HSIP expenditures.

6.3.2 Lane Departure

As shown in Table 6-2, approximately $0.84 million of HSIP funds have been invested annually in lane-departure-related safety projects. These projects primarily involved edge line and centerline rumble strips, enhanced edge lines, and curve delineation along state highways. This level of investment represents approximately 14 percent of HSIP expenditures.

6.4 Conclusions

The review of historic safety investments for both driver behavior and infrastructure found that most of the spending was directed at the emphasis areas that are considered a priority for North Dakota. However, the level of investment in some specific areas appears to be out of balance with the distribution of severe crashes. For example, 1 percent of the driver-behavior-related investments were directed at young drivers but young drivers were involved in 25 percent of severe crashes. Similarly, 14 percent of HSIP investments were directed at lane-departure safety projects but lane-departure crashes accounted for 42 percent of all severe crashes. As a result, the NDDOT will review the safety programs related to driver behavior and infrastructure, identify what reasons may exist for the unbalance (such as, that the past HSIP process was primarily site-analysis driven, which directed projects to intersections where the strategies are inherently more expensive than lane departure strategies), and

investigate opportunities to bring safety spending more in line with the actual distribution of severe crashes.

Again, percent expenditures by program area may appear lower than actual because some of the "Other" program areas providing additional activities within the areas listed (such as impaired driving, occupant protection, etc.). Additionally, the apportionment of federal funds through the NHTSA impacts the investment per safety emphasis area by providing excess funds in some areas (for example, Section 410 for impaired driving prevention) and limited funding in other areas (Section 402 funds for the remaining safety emphasis areas).

7 Implementation

Since the publication of North Dakota's last Strategic Highway Safety Plan in 2006, the state made substantial efforts to reduce the number of fatal and severe injury crashes along the state's roadways. In the area of driver behavior, efforts have been primarily focused on high visibility enforcement relating to impaired driving, occupant protection, speeding, and improving the accuracy of the crash database. During this same period, the NDDOT obligated approximately 85 percent of the available HSIP funds to upgrading intersections and road edges along state highways in rural areas. It should also be noted that even though the application process for HSIP funds is open to all agencies in North Dakota, more than 95 percent of these funds supported implementation of projects along state highways.

However, a review of historic trends indicates that in spite of these efforts, the annual number of fatal plus severe injury crashes has increased. Further review of the data indicates that this overall upward trend is primarily due to a substantial increase in severe crashes in the 17 oil-producing counties.

Moving forward, North Dakota's goal is to eliminate all traffic fatalities on North Dakota's public roads with an intermediate goal of reducing the 3-year average of traffic fatalities to 100 or fewer by 2020 (a reduction of approximately 3 percent per year). North Dakota also acknowledges that the development of this data-driven SHSP and adopting crash reduction goals is only the first step—plans do not save lives, implementation does. To reverse the current trend and achieve the crash reduction goal, North Dakota commits to a comprehensive statewide highway safety program with implementation of high priority safety strategies along roadway systems and facilities defined to be at-risk. The basic components of this comprehensive program are implementing a driver-behavior program, implementing infrastructure improvements, improving emergency response, and improving reporting of crashes.

7.1 Driver-Behavior Program Implementation

The implementation of driver behavior-related priority safety strategies seeks to provide safety benefits across the state. However, with the increase in severe crashes in the 17 oil-producing counties, special consideration will be given to deploy priority safety strategies in these high-risk counties as well as rural communities across the state.

Unbelted Vehicle Occupants: Reducing unbelted severe injury crashes is North Dakota's greatest opportunity to strengthen road safety through improving driver behavior. With the increasing trend of severe unbelted crashes accounting for approximately 48 percent all severe crashes, and over 80 percent of these crashes occurring in rural areas of the state, coupled with a more recent decline in motorists observed seat belt use, the following are key safety commitments:

- Enact primary seat belt legislation that includes primary enforcement of belt use for all passengers in all seating positions.
- Strengthen penalties for lack of seat belt use.
- Shift resources to support highly visible seat belt enforcement campaigns particularly in rural areas. Consider combined enforcement programs where more than one safety emphasis area is enforced during a campaign period (for example, speeding, seat belt use, and impaired driving). Combined enforcement will stretch resources for overtime enforcement programs to allow enforcement of additional safety emphasis areas (such as speeding, youth/GDL, etc).

Alcohol-Related: The growing trend of alcohol-related severe crashes accounts for approximately 30 percent of all severe crashes in North Dakota—77 percent of these in rural communities and 62 percent on local roadways. In response to this trend, North Dakota has progressively increased its annual driver-behavioral investments to address alcohol-related severe injury crashes. With this increased investment of resources to combat impaired driving coupled with the increasing crash trend, North Dakota commits to examining new approaches through the following key safety commitments:

- Conduct a comprehensive assessment of impaired driving laws to strengthen administrative license sanctions and criminal penalties against best practices and recommend impaired driving policy changes. Included in this assessment will be an examination of the following key elements:
  - Extend/strengthen administrative license suspension for DUI offenders, including first-time offenders.
  - Expand and implement a mandatory ignition interlock program requiring ignition interlocks as a condition for license reinstatement.
  - Remove the option of BAC test refusal or establish stronger penalties for BAC test refusal than for test failure.
  - Impose increased penalties for a 0.15 BAC and higher
- Strengthen impaired driving detection and public perceived risk of arrest in rural communities and on local roads by expanding the use of sobriety checkpoints during high-visibility saturation patrols to combat impaired driving.
- Apply holistic or ecological approaches (via persons, families, cultures, communities, and policies) to create a cultural awareness of risk and to educate the motoring public during high-visibility enforcement campaigns.
- Conduct highly publicized compliance checks and training for alcohol retailers and merchants to reduce sales to underage persons.
- Conduct public outreach on accessible safe-ride alternative transportation services during high-visibility enforcement campaigns.

Speeding and Aggressive Driving: Speeding and aggressive driving continue to account for approximately 27 percent of all severe injury crashes in North Dakota with no significant crash trend improvements. In addition, 73 percent of speed-related serious injury crashes occur in rural areas and 62 percent on local roads. Commitments to combat this ongoing, culturally accepted, high-risk driving behavior include the following:

- Enact/support legislation to strengthen penalties such as increased fines for right-of-way and speeding violations.
- Address the perception of widespread speeding by heavy vehicles by first conducting a statewide assessment of commercial vehicle speeds. In response to the assessment results, examine enforcement, safety education, and public outreach safety strategies for priority regions or corridors identified as needing improvement.

- Strengthen speed detection and public perceived risk of being stopped and ticketed through sustained, well-publicized, highly visible speed enforcement campaigns focused in rural communities and on local roadways.
- Strengthen speed enforcement by leveraging impaired driving and unbelted enforcement and outreach resources, coupled with speed enforcement resources, to conduct dual-focused, high-visibility enforcement campaigns.
- Shift resources committed to media and public outreach programs during non-enforcement periods to support high-visibility speed enforcement campaigns—including tribal information outreach initiatives conducted independently from tribal enforcement campaigns.
- Investigate new strategies and the use of new technologies to address the number of speed-related and red-light running crashes.

Young Drivers: Although severe injury crashes involving young drivers have gradually declined, young drivers continue be to overrepresented in crashes, accounting for 25 percent of severe injury crashes statewide. Of these, 67 percent occur on local roads with nearly 60 percent in rural areas, where an increase in severe crashes involving young drivers has been reported. Strengthened commitments to further the progress made with younger driver safety include the following:

- Strengthen current restricted teen driver licensing to meet GDL system requirements, including:
  - Required classroom education component.
  - Required 30 to 50 hours of supervised driving for drivers 16 to 17 years of age.
  - Implement passenger restrictions.
  - Minimum age of 17 to qualify for a full, unrestricted license.
- Enact/support legislation requiring teen drivers subject to graduated driver licensing be identified via a vehicle decal to assist law officers in enforcing GDL provisions.
- Publicize and enforce teen driving license provisions focused in rural areas and on local roadways including peer-led information outreach about the enforcement.
- Publicize and enforce laws pertaining to underage drinking and driving.

7.2 Infrastructure Implementation

- The crash data indicates that the greatest opportunity to reduce infrastructure-related severe crashes continues to focus directing safety investments to North Dakota's emphasis areas – reducing lane-departure- and intersection-related crashes.
- The crash data indicates that the majority of severe crashes is rural (70 percent) and on local systems (56 percent), where densities of crashes are very low and the probability of finding locations with concentrations of crashes is virtually zero. Due to the inability to address a majority of severe crashes through high-crash locations, a systemic/proactive component will be added to the primarily site-analysis-based HSIP. In addition, the NDDOT will work at finding the right balance of distributing HSIP funds between the systemic and site-based components.

- The statewide Highway Safety Improvement Program will include all roads by increasing the level of engagement of local highway agencies in the HSIP. The specific steps that NDDOT will take to increase the level of participation by local agencies includes the following:
  - Prepare safety plans for local systems around the state.
  - Dedicate significantly more HSIP funds to improvements on local systems where the majority of fatal and injury crashes occur.
  - Investigate and identify future data needs to support on-going participation by local agencies in the HSIP (for example, traffic volumes, traffic-control device inventories, video logs, etc.).
  - Identify and then remove the barriers for local participation in the statewide HSIP, such as the current practice of deducting any HSIP award from the current formula driven distribution of federal aid.
  - Identify needs and then provide safety training to local agency staff.
- Focus investments from the HSIP on widely deploying high-priority, low-cost, and highly effective strategies at the identified at-risk locations around North Dakota. Examples of the high-priority strategies include enhanced road edge treatments (wider edge lines and edge line rumble strips); enhanced curve delineation (Chevrons); centerline rumble strips; street lighting and upgraded signs and markings at rural intersections; channelized medians along rural expressways.
- Partner with law enforcement agencies to implement the use of new technologies to address the number of speed related and red-light running crashes (confirmation lights).
- Set a focus on the 17 oil-producing counties by identifying the locations with the greatest need for deploying the high-priority safety strategies on state and local roads.

7.3 Emergency Response Improvement

- Reduce response times in rural areas and increase the ability of rural communities to maintain trained staff by allowing community paramedics or by establishing a paid-staff system, either of which could be supplemented through local volunteers.
- Research potential programs that are intended to decrease the time it takes for paramedics and hospitals to receive important medical information. The Illinois Yellow Dot Program (www.yellowdotillinois.org) uses a vehicle decal to inform paramedics that a completed medical card is in the vehicle glove compartment. CrashHelp (http://www.ruralsafety.umn.edu/research/crashhelp.html) is a Smartphone application that securely transfers images, video, audio recordings and patient information from the paramedics to the hospital.
- Support the increase in coverage by air ambulance.

7.4 Crash Data Improvements

- Support increased electronic crash reporting through TraCS, including assisting the state's tribes in using the software.

7.5 Performance Measurement

To monitor North Dakota's SHSP implementation and the progress toward achieving its goal to eliminate all traffic fatalities on North Dakota's public roads, the NDDOT will assess key measures on an annual basis. All fatality measures will be reported as three- or five-year moving averages to account for possible random fluctuations that may obscure crash trends.

Based on the results of its annual SHSP performance assessment, the examination of crash data, and emerging crash trends, the NDDOT will re-examine safety strategy investments for potential improvements.

APPENDIX A

Severe Crash Fact Sheets

Severe (K+A) Crashes Involving Young Drivers

AUGUST 16, 2012

How Significant is the Issue?

On North Dakota roadways, there were 493 severe crashes between 2007 and 2011 in which the crash involved a driver 20 and younger. This is an average of 99 severe crashes per year and accounted for nearly 25% of all severe crashes during the five year period.

What are the Contributing Factors?

The Driver

- There were 520 young drivers involved in the 493 severe crashes; 63% of those were identified as male.
- 41% of young drivers involved in severe crashes were between the ages of 18 and 20.

Age Group	Male	Female	Total
≤14	28 (5%)	9 (2%)	41* (8%)
15 or 16	50 (10%)	49 (9%)	99 (19%)
17 or 18	101 (19%)	68 (13%)	169 (32%)
18 - 20	148 (28%)	65 (13%)	213 (41%)

*Includes 2 drivers of unknown gender.

- The top contributing circumstances for young drivers involved in a severe crash were:

Top Contributing Factors	% of Young Drivers
Speed	16%
Failed to Yield	13%
Other	9%
Improper Evasive Action	3%

Road and Area Type

- Young driver severe crashes were primarily in rural areas (292 of 493; 59%).
- Combining rural and urban roadways, young driver severe crashes are mostly on the county / local jurisdictions (67%).

Jurisdiction	Rural	Urban
State Highways	138 (28%)	22 (4%)
County / Local Roads	154 (31%)	179 (36%)
Total by Area Type	292 (59%)	201 (41%)
Total	493 (100%)	

Crash Type

- Over half of young driver severe crashes involved a single vehicle (257 of 493; 52%).

Crash Type	Severe Crashes	Percentage
Single Vehicle	257	52%
Angle (Not Specific)	100	20%
Rear End	47	10%

- The top three first harmful events for a young driver severe single vehicle crash are:

Single Vehicle	Severe Crashes	Percentage
Overturn/Rollover	79	31%
Run Off Roadway	40	16%
Pedestrian	29	11%

Location

- 28% (140 of 493) of young driver severe crashes occurred at an intersection.
- The Top 5 counties represent 49% (239 of 493) of young driver severe crashes in North Dakota.

Top 5 Counties	Severe Crashes	Percentage
Cass	71	14%
Ward	53	11%
Grand Forks	44	9%
Williams	37	8%
Burleigh	34	7%

Time-of-Day

- Most young driver severe crashes occurred between 3:00 PM – 8:59 PM (182 of 493; 37%).

Time of Day	Severe Crashes	Percentage
Midnight to 5:59 AM	78	16%
6:00 AM to 8:59 AM	68	14%
9:00 AM to 11:59 AM	34	7%
Noon to 2:59 PM	67	14%
3:00 PM to 5:59 PM	108	22%
6:00 PM to 8:59 PM	74	15%
9:00 PM to Midnight	64	13%

Severe (K+A) Crashes Involving Aggressive/Speeding Drivers

AUGUST 16, 2012

How Significant is the Issue?

On North Dakota roadways, there were 553 severe crashes between 2007 and 2011 in which the crash involved an aggressive or speeding driver. This is an average of 111 severe crashes per year and accounted for nearly 27% of all severe crashes during the five year period.

What are the Contributing Factors?

The Driver

- There were 746 aggressive and speeding drivers involved in the 553 severe crashes. 551 (74%) of identified drivers were male.
- 40% of aggressive and speeding drivers were 25 or younger.

Age Group	Male	Female	Total
≤20	107 (14%)	55 (7%)	162 (22%)
21 – 25	106 (14%)	29 (4%)	135 (18%)
26 – 35	106 (14%)	22 (3%)	128 (17%)
36 – 45	83 (11%)	35 (5%)	118 (16%)
46 – 55	71 (10%)	30 (4%)	101 (14%)
56 – 65	52 (7%)	11 (1%)	63 (8%)
≥66	25 (3%)	10 (1%)	35 (5%)
Unknown	1 (<1%)	1 (<1%)	4* (1%)

*Includes 2 drivers of unknown age and gender.

Road and Area Type

- Aggressive and speeding-related severe crashes were primarily in rural areas (405 of 553; 73%).
- Combining rural and urban roadways, aggressive and speeding-related severe crashes are most prevalent on county / local roads (346 of 553; 63%).

Jurisdiction	Rural	Urban
State Highways	182 (33%)	25 (5%)
County / Local Roads	223 (40%)	123 (22%)
Total by Area Type	405 (73%)	148 (27%)
Total	553 (100%)	

Crash Type

- 69% of aggressive and speeding-related severe crashes involved a single vehicle (382 of 553).

Crash Type	Severe Crashes	Percentage
Single Vehicle	382	69%
Rear End	82	15%
Angle (Not Specific)	44	8%

- The top three most harmful events for aggressive and speeding-related severe single vehicle crashes are:

Single Vehicle	Severe Crashes	Percentage
Overturn/Rollover	157	41%
Run Off Roadway	73	19%
Ditch	43	11%

Location

- 13% (70 of 553) of aggressive and speeding-related severe crashes occurred at an intersection.
- The Top 5 counties represent 41% (226 of 553) of aggressive and speeding-related severe crashes in North Dakota.

Top 5 Counties	Severe Crashes	Percentage
Cass	76	14%
Ward	43	8%
Grand Forks	40	7%
Williams	36	7%
Stutsman	31	6%

Time-of-Day

- 27% of aggressive and speeding-related severe crashes occurred from midnight – 5:59 PM (147 of 553).

Time of Day	Severe Crashes	Percentage
Midnight to 5:59 AM	147	27%
6:00 AM to 8:59 AM	47	8%
9:00 AM to 11:59 AM	38	7%
Noon to 2:59 PM	61	11%
3:00 PM to 5:59 PM	100	18%
6:00 PM to 8:59 PM	87	16%
9:00 PM to Midnight	73	13%

Severe (K+A) Crashes Involving Alcohol

AUGUST 16, 2012

How Significant is the Issue?

On North Dakota roadways, there were 607 severe crashes between 2007 and 2011 in which the crash involved alcohol. This is an average of 121 severe crashes per year and accounted for nearly 30% of all severe crashes during the five year period.

What are the Contributing Factors?

The Driver

- There were 633 alcohol-related drivers involved in the 607 severe crashes. 67% of those alcohol-related drivers were identified as male.
- 47% of alcohol-related drivers were between the ages of 21 and 35.

Age Group	Male	Female	Total
≤20	54 (9%)	25 (4%)	79 (12%)
21 - 25	116 (18%)	24 (4%)	140 (22%)
26 – 35	27 (4%)	130 (21%)	157 (25%)
36 – 45	105 (17%)	28 (4%)	133 (21%)
46 – 55	68 (11%)	9 (1%)	77 (12%)
>55	38 (6%)	8 (1%)	46 (7%)
Unknown	0 (0%)	1 (<1%)	1 (<1%)

- The top officer reported contributing circumstances for impaired drivers involved in a severe crash were:

Top Contributing Circumstances	% of Drivers
Speed	23%
Drove Left of Center	6%
Improper Evasive Action	5%

Road and Area Type

- Alcohol-related severe crashes were primarily in rural areas (467 of 607; 77%).
- Combining rural and urban roadways, alcohol severe crashes are mostly on the county / local jurisdictions (62%).

Jurisdiction	Rural	Urban
State Highways	215 (35%)	19 (3%)
County / Local Roads	252 (42%)	121 (20%)
Total by Area Type	467 (77%)	140 (23%)
Total	607 (100%)	

Crash Type

- 76% of alcohol-related severe crashes involved a single vehicle (463 of 607).

Crash Type	Severe Crashes	Percentage
Single Vehicle	463	76%
Head On	41	7%
Angle	41	7%

- The top three most harmful events for an alcohol-related single vehicle, severe crash are:

Single Vehicle	Severe Crashes	Percentage
Overturn/Rollover	168	36%
Run Off Roadway	74	16%
Ditch	44	10%

Location

- 14% (84 of 607) of alcohol-related severe crashes occurred at an intersection.
- The Top 4 counties represent 29% (178 of 607) of alcohol-related severe crashes in North Dakota.

Top 4 Counties	Severe Crashes	Percentage
Cass	64	11%
Burleigh	43	7%
Williams	38	6%
Grand Forks	33	5%

Time-of-Day

- Most alcohol-related severe crashes occurred between 9:00 PM – 2:59 AM (312 of 607; 51%).

Time of Day	Severe Crashes	Percentage
Midnight to 2:59 AM	188	31%
3:00 AM to 5:59 AM	86	14%
6:00 AM to 8:59 AM	25	4%
9:00 AM to 11:59 AM	14	2%
Noon to 2:59 PM	21	3%
3:00 PM to 5:59 PM	48	8%
6:00 PM to 8:59 PM	101	17%
9:00 PM to 11:59 PM	124	20%

Severe (K+A) Crashes Involving Unrestrained Occupants

AUGUST 16, 2012

How Significant is the Issue?

On North Dakota roadways, there were 963 crashes between 2007 and 2011 in which the crash involved an unrestrained occupant severely or fatally injured. This is an average of 193 severe crashes per year and accounted for nearly 48% of all severe crashes during the five year period.

What are the Contributing Factors?

The Unrestrained Occupant

- There were 1,159 severely or fatally injured unbelted occupants involved in the 963 severe crashes. 70% of those unrestrained occupant were identified as male.
- 18% of unrestrained occupants were between the ages of 16 and 20.

Age Group	Male	Female	Total
≤15	39 (3%)	27 (2%)	66 (6%)
16 – 20	116 (10%)	91 (8%)	207 (18%)
21 – 25	151 (13%)	47 (4%)	198 (17%)
26 – 35	149 (13%)	52 (4%)	201 (17%)
36 – 45	126 (11%)	43 (4%)	169 (15%)
46 – 55	122 (11%)	40 (3%)	162 (14%)
56 – 65	67 (6%)	26 (2%)	93 (8%)
>65	36 (3%)	27 (2%)	63 (5%)
Total	806 (70%)	353 (30%)	1,159 (100%)

Road and Area Type

- Unrestrained occupant severe crashes were primarily in rural areas (779 of 963; 81%).
- Combining rural and urban roadways, unrestrained occupant severe crashes are mostly on the county / local jurisdiction (53%).

Jurisdiction	Rural	Urban
State Highways	425 (44%)	27 (3%)
County / Local Roads	354 (37%)	157 (16%)
Total by Area Type	779 (81%)	184 (19%)
Total	963 (100%)	

Crash Type

- 66% of unrestrained occupant severe crashes involved a single vehicle (637 of 963).

Crash Type	Severe Crashes	Percentage
Single Vehicle	637	66%
Angle (Not Specific)	111	12%
Head On	74	8%

- The top three most harmful events for a unrestrained occupant single vehicle, severe crash are:

Single Vehicle	Severe Crashes	Percentage
Overturn/Rollover	280	44%
Run Off Roadway	114	18%
Motor Vehicle in Transport	50	8%

Location

- 17% (166 of 963) of unrestrained occupant severe crashes occurred at an intersection.
- The Top 5 counties represent 33% (314 of 963) of unrestrained occupant related severe crashes.

Top 5 Counties	Severe Crashes	Percentage
Cass	76	8%
Ward	68	7%
Burleigh	58	6%
Williams	57	6%
Grand Forks	55	6%

Time-of-Day

- Most unrestrained occupants severe crashes occurred between 3:00 PM – 8:59 PM (301 of 963; 31%).

Time of Day	Severe Crashes	Percentage
Midnight to 2:59 AM	157	16%
3:00 AM to 5:59 AM	76	8%
6:00 AM to 8:59 AM	107	11%
9:00 AM to 11:59 AM	73	8%
Noon to 2:59 PM	110	11%
3:00 PM to 5:59 PM	144	15%
6:00 PM to 8:59 PM	157	16%
9:00 PM to 11:59 PM	139	14%

Severe (K+A) Lane Departure Crashes

AUGUST 16, 2012

How Significant is the Issue?

On North Dakota roadways, there were 975 severe roadway departure crashes between 2007 and 2011. This includes 844 severe run-off the road crashes and 131 severe head-on or sideswipe, opposite direction crashes. This is an average of 195 severe crashes per year and accounted for 48% of all severe crashes during the five year period.

What are the Contributing Factors?

The Driver

- There were 1,123 drivers involved in the 975 severe lane departure crashes. 75% of those were identified as male.
- 20% of drivers were between the age of 26 and 35.

Age Group	Male	Female	Total
<21	144 (13%)	72 (6%)	216 (19%)
21 to 25	146 (13%)	39 (3%)	185 (16%)
26 to 35	169 (15%)	54 (5%)	223 (20%)
36 to 45	134 (12%)	42 (4%)	176 (16%)
46 to 55	125 (11%)	30 (3%)	155 (14%)
56 or 65	81 (7%)	25 (2%)	106 (9%)
≥66	42 (4%)	17 (2%)	59 (5%)
Other	0 (0%)	1 (<1%)	3* (<1%)

*Includes 2 drivers of unknown age and gender.

Light and Weather Condition

- 45% of severe lane departure crashes occurred during dark driving conditions (436 of 975). Another 6% were reported during Dawn or Dusk (63 of 975).
- Severe lane departure crashes were predominantly reported on dry roads (717 of 975; 74%). 6% occurred on a wet road (61 of 975) while 18% occurred on a road with snow, ice, slush or frost surface conditions (179 of 975).

Crash Type

- The top two most harmful events for a severe lane departure crash are:

Harmful Event	Severe Crashes	Percentage
Overturn/Rollover	425	44%
Ditch	90	9 %

Road and Area Type

- Severe lane departure crashes were primarily in rural areas (834 of 975; 86%).
- Combining rural and urban, severe lane departure crashes are evenly distributed across jurisdictions.

Jurisdiction	Rural	Urban
State Highways	445 (46%)	34 (3%)
County / Local Roads	389 (40%)	107 (11%)
Total by Area Type	834 (86%)	141 (14%)
Total	975 (100%)	

Location

- 6% (55 of 975) of severe lane departure crashes occurred at an intersection.
- Severe lane departure crashes in a horizontal curve accounted for 27% (260 of 975).
- The Top 5 counties represent 32% (312 of 975) of severe lane departure crashes in North Dakota.

County	Severe Crashes	Percentage
Cass	77	8%
Williams	69	7%
McKenzie	60	6%
Ward	53	5%
Grand Forks	53	5%

Time-of-Day

- Most severe lane departure crashes occurred between midnight – 5:59 AM (263 of 975; 27%).

Time of Day	Severe Crashes	Percentage
Midnight to 5:59 AM	263	27%
6:00 AM to 8:59 AM	110	11%
9:00 AM to 11:59 AM	83	9%
Noon to 2:59 PM	109	11%
3:00 PM to 5:59 PM	146	15%
6:00 PM to 8:59 PM	146	15%
9:00 PM to Midnight	118	12%

Severe (K+A) Intersection Crashes

AUGUST 16, 2012

How Significant is the Issue?

On North Dakota roadways, there were 459 severe intersection crashes between 2007 and 2011. This is an average of 92 severe crashes per year and accounted for nearly 23% of all severe crashes during the five year period.

What are the Contributing Factors?

The Driver

- There were 858 drivers involved in the 459 severe intersection crashes. 66% of those were identified as male.
- 34% of drivers were between the ages of 36 and 55.

Age Group	Male	Female	Total
<21	91 (11%)	57 (7%)	148 (17%)
21 - 25	76 (9%)	44 (5%)	120 (14%)
26 - 35	79 (9%)	36 (4%)	115 (13%)
36 - 45	98 (11%)	34 (4%)	132 (15%)
46 – 55	115 (13%)	47 (5%)	162 (19%)
56 – 65	58 (7%)	23 (3%)	81 (9%)
>65	51 (6%)	47 (5%)	98 (11%)
Unknown	1 (<1%)	1 (<1%)	2 (<1%)

Light and Weather Condition

- 25% of severe roadway departure crashes occurred during dark driving conditions (117 of 459). Another 7% were reported during Dawn or Dusk (30 of 459).
- Severe roadway departure crashes were predominantly reported on dry roads (365 of 459; 80%). 8% occurred on a wet road (36 of 459) while 12% occurred on a road with snow, ice, slush or frost surface conditions (56 of 459).

Crash Type

- Nearly half of severe intersection crashes were angle (not specific) (220 of 459; 48%).

Crash Type	Severe Crashes	Percentage
Angle (Not Specific)	220	48%
Single Vehicle	113	25%
Right Angle	91	20%

Road and Area Type

- Severe intersection crashes were primarily in urban areas (257 of 459; 56%).
- Combining rural and urban roadways, county / local roads had the greatest number of severe intersection crashes (321 of 459; 70%).

Jurisdiction	Rural	Urban
State Highways	119 (26%)	19 (4%)
County / Local Roads	83 (18%)	238 (52%)
Total by Area Type	202 (44%)	257 (56%)
Total	459 (100%)	

Location

- The Top 3 counties represent 41% (186 of 459) of severe intersection crashes in North Dakota.

Counties	Severe Crashes	Percentage
Cass	88	19%
Burleigh	53	12%
Ward	45	10%

- Stop/Yield control was the location of 42% of the severe intersection crashes (191 of 459).

Intersection Control	Severe Crashes	Percentage
Stop/Yield	191	42%
None Reported	148	32%
Traffic Signal	107	23%
Other/Unknown	13	3%

Time-of-Day

- Most severe intersection crashes occurred between 3:00 PM – 5:59 PM (109 of 459; 24%).

Time of Day	Severe Crashes	Percentage
Midnight to 5:59 AM	52	11%
6:00 AM to 8:59 AM	49	11%
9:00 AM to 11:59 AM	55	12%
Noon to 2:59 PM	77	17%
3:00 PM to 5:59 PM	109	24%
6:00 PM to 8:59 PM	73	16%
9:00 PM to Midnight	44	10%

Severe (K+A) Crashes Involving Old Drivers

AUGUST 16, 2012

How Significant is the Issue?

On North Dakota roadways, there were 272 severe crashes between 2007 and 2011 in which the crash involved a driver 65 and older. This is an average of 54 severe crashes per year and accounted for nearly 14% of all severe crashes during the five year period.

What are the Contributing Factors?

The Driver

- There were 290 older drivers involved in the 272 severe crashes; 64% of those were identified as male.
- 30% of older drivers involved in severe crashes were 80 and older.

Age Group	Male	Female	Total
65 – 69	56 (19%)	26 (9%)	82 (28%)
70 – 74	41(14%)	19 (7%)	60 (21%)
75 – 79	36 (12%)	24 (8%)	60 (21%)
≥80	54 (19%)	34 (12%)	88 (30%)

- The top contributing circumstances for older drivers involved in a severe crash were:

Top Contributing Factors	% of Old Drivers
Failed to Yield	18%
Drove Left of Center	4%
Speed	4%

Road and Area Type

- Older driver severe crashes were primarily in rural areas (176 of 272; 65%).
- Combining rural and urban roadways, older driver severe crashes are mostly on the state jurisdictions (57%).

Jurisdiction	Rural	Urban
State Highways	142 (52%)	14 (5%)
County / Local Roads	34 (13%)	82 (30%)
Total by Area Type	176 (65%)	96 (35%)
Total	272 (100%)	

Crash Type

- Angle (Not Specific) represented the highest fraction of older driver severe crashes (79 of 272; 29%).

Crash Type	Severe Crashes	Percentage
Angle (Not Specific)	79	29%
Single Vehicle	77	28%
Rear End	37	14%

- The top three first harmful events for severe single vehicle crashes involving older drivers include:

Single Vehicle	Severe Crashes	Percentage
Overturn/Rollover	15	19%
Pedestrian	12	16%
Run Off Roadway	6	8

Location

- 35% (96 of 272) of old driver severe crashes occurred at an intersection.
- The Top 5 counties represent 39% (106 of 272) of old driver severe crashes in North Dakota.

Top 5 Counties	Severe Crashes	Percentage
Cass	30	11%
Ward	24	9%
Grand Forks	18	7%
Burleigh	18	7%
Morton	16	6%

Time-of-Day

- Most old driver severe crashes occurred between noon – 2:59 PM (78 of 272; 29%).

Time of Day	Severe Crashes	Percentage
Midnight to 5:59 AM	12	4%
6:00 AM to 8:59 AM	17	6%
9:00 AM to 11:59 AM	48	18%
Noon to 2:59 PM	78	29%
3:00 PM to 5:59 PM	59	22%
6:00 PM to 8:59 PM	36	13%
9:00 PM to Midnight	22	8%

APPENDIX B

Strategy Tables

TABLE B-1
Young Driver Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
A - Enhance Graduated Driver Licensing	A1 - Enact enhanced graduated drivers licensing system	Low	Proven
	A2 - Require the learner's permit to be held for a minimum period of 6 months of supervised driving	Low	Proven
	A3 - For licensed drivers, implement a nighttime driving restriction 10 p.m. to 5 a.m.	Low	Proven
	A4 - Enact minimum age of 15 for learner's permit	Low	Tried
	A5 - Require 30 to 50 hours of supervised driving for drivers 16 to 17 years of age	Low	Tried
	A6 - Implement passenger restrictions	Low	Tried
	A7 - Prohibit cell phone use by drivers with a GDL	Low	Tried
	A8 - Enact law requiring young drivers subject to GDL to be identified via a vehicle decal	Low	Tried
	A9 - Enact/support legislation requiring teen drivers subject to graduated driver licensing be identified via a vehicle decal to assist law officers in enforcing GDL provisions	Low	Tried
	A10 - Implement minimum age of 17 to qualify for a full, unrestricted license	Low	Tried
B - Publicize, enforce, and adjudicate laws pertaining to young drivers	B1 - Publicize and enforce teen driving license provisions	Moderate	Experimental
	B2 - Publicize and enforce laws pertaining to underage drinking and driving	Moderate to High	Proven
	B3 - Publicize and enforce helmet law for young motorcycle riders under 18	Low	Proven
C - Assist parents in monitoring their teens' driving	C1 - For learner's permit drivers, require parental certification of 30 to 50 hours of supervised driving	Low	Tried
	C2 - Require parent education as a driver education classroom component	Low	Experimental
	C3 - Publicize technology solutions to promote safe driving behaviors, reduce driver distraction and promote parental engagement	Moderate	Experimental
D - Improve young driver training	D1 - Improve content and delivery of driver education/training including vehicle recovery skills training	Moderate to High	Experimental
	D2 – Require classroom education		
	F2 - Provide adequate change + clearance intervals at signalized intersections	Low	Proven
	F3 - Install lighting at high-speed intersections (High Speed Only)	Moderate to High	Tried

TABLE B-2
Aggressive Driving & Speed-Related Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
A - Heighten driver awareness of aggressive driving/speed-related consequences	A1 - Strengthen speed detection and public perceived risk of being stopped and ticketed through sustained, well-publicized, highly visible speed enforcement campaigns	High	Tried
B - Improve efficiency and effectiveness of aggressive driving/speed enforcement efforts	B1 - Conduct highly visible, publicized and saturated enforcement campaigns at locations with higher incidence of aggressive driving/speed-related crashes	Moderate to High	Proven
	B2 - Enact/support legislation to strengthen penalties such as increased fines for right-of-way and speed violations	Low	Tried
	B3 - Strengthen the adjudication of speeding citations to enhance the deterrent effect of fines	Low	Tried
	B4 – Address the perception of widespread speeding by heavy vehicles by first conducting a statewide assessment of commercial vehicle speeds. In response to the assessment results, examine enforcement, safety education, and outreach safety strategies for priority regions or corridors identified as needing improvement	Moderate to High	Tried
C - Review crash data	C1 - Analyze data to clearly define aggressive driving and identify factors contributing to aggressive driving	Low	Tried
D - Set appropriate speed limits	D1 - Install speed signing using variable message signs in school zones	Low	Tried
E - Communicate appropriate speeds through use of traffic control devices	E1 - Implement active speed warning signs, including dynamic message boards at rural to urban transitions	Low	Tried
	E2 - Use in-pavement measures to communicate the need to reduce speeds	Moderate	Tried
F - Ensure that roadway design and traffic control elements support appropriate and safe speeds	F1 - Effect safe speed transitions through design elements and on approaches to lower speed areas	High	Tried

TABLE B-3
Impaired Driving Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
A - Reduce excessive drinking and underage drinking	A1 - Conduct highly publicized compliance checks and training for alcohol retailers and merchants to reduce sales to underage persons	Low	Tried
	A2 - Conduct public outreach on accessible safe-ride alternative transportation services	Moderate	Proven
	A3 - Employ screening and brief interventions in health care settings	Low	Tried
B - Strengthen enforcement to improve safety	B1 - Strengthen impaired driving detection and public perceived risk of arrest through sustained, well-publicized, highly visible impaired-driving enforcement, including sobriety checkpoints	Moderate-High	Proven
	B2 - Expand use of data driven DWI sobriety checkpoints and multijurisdictional enforcement task forces	Moderate-High	Proven
	B3 - Publicize and enforce zero tolerance laws for drivers under age 21	Moderate	Proven
	B4 - Conduct a comprehensive assessment of impaired driving laws to strengthen criminal penalties and administrative license sanctions against best practices and recommend impaired driving policy changes - Extend/strengthen administrative license suspension for DUI offenders, including first-time offenders - Remove the option for BAC test refusal - Impose increased penalties for BACs of 0.15 and higher	Low to Moderate	Proven
	B5 - Use Preliminary Breath Test Devices	Moderate	Proven
C - Prosecute, impose sanctions on, and treat DWI offenders	C1 - Implement mandatory ignition interlock program	medium	Proven
	C2 - Strengthen the use of in-squad cameras to more successfully prosecute DWI arrests	Moderate	Tried
D - Control high-BAC and repeat offenders	D1 - Require ignition interlocks as a condition for license reinstatement for first-time and high BAC offenders	Moderate	Proven
	D2 - Strengthen repeat DWI offender monitoring programs	Moderate-High	Proven
	D3 - Apply holistic or ecological approaches (via persons, families, cultures, communities, and policies) to educate the motoring public and create a cultural awareness of the risks associated with excessive alcohol use	High	Tried

TABLE B-4
Seat Belt Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
A - Maximize use of occupant restraints by all vehicle occupants	A1 - Conduct high visibility and highly publicized targeted enforcement campaigns to maximize belt and child restraint use, including nighttime enforcement	Moderate-High	Proven
	A2 - Provide enhanced enforcement and focused communication outreach to population groups with low belt use	Low	Proven
	A3 - Enact primary seat belt legislation that includes primary enforcement of belt use for all passengers in all seating positions	Low	Proven
	A4 - Strengthen penalties for lack of seat belt use	Low	Tried
	A5 - Conduct targeted and highly publicized enforcement for drivers under 18 at school locations	Moderate	Proven
B - Insure that restraints, especially child and infant restraints, are properly used	B1 - Strengthen child restraint/booster laws for children up to age 8 or 4'9"	Low	Tried
	B2 - Conduct high-profile “Child Passenger Safety" inspection clinics events at multiple community locations to educate on the proper use of restraint devices	Low	Proven
C - Provide use requirements through alternative sources	C1 - Use employer, insurance or workforce safety programs for non-compliance of belt use polices	Moderate	Tried

TABLE B-5
Road Departure Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
A - Keep vehicles from encroaching on the roadside	A1 - Install shoulder rumble strips	Low	Tried
	A2 - Install edge lines "profile marking", edge line rumble strips, modified shoulder rumble strips, 6-inch edge line, or embedded wet-reflective pavement markings on section with narrow or no paved shoulders	Low	Experimental
	A3 - Provide enhanced shoulders, lighting, delineation (for example, Chevrons), or pavement markings for sharp horizontal curves	Low	Tried / Proven
	A4 - Provide improved highway geometry for horizontal curves	Moderate	Proven
	A6 - Provide skid-resistance pavement surfaces	Moderate	Proven
	A7 - Apply shoulder treatments *Eliminate shoulder drop-offs from paved road to unpaved shoulder *Shoulder edge *Widen and/or pave shoulders	Low	Experimental Proven
B - Minimize the likelihood of crashing into an object or overturning if the vehicle travels off the shoulder	B1 - Design safer slopes and ditches to prevent rollovers	Moderate	Proven
	B2 - Remove/relocate objects in hazardous locations	Moderate to High	Proven
C - Reduce the severity of the crash	C1 - Improve design and application of barrier and attenuation systems	Moderate to High	Tried
D - Reduce the likelihood of a head on vehicles collision	D1 - Install centerline rumble strips for two-lane roads	Low	Proven
	D2 - Use alternating passing lanes or four-lane sections at key locations (T)	Moderate to High	Tried
	D3 - Install cable median barrier for narrow-width medians and multilane roads	Moderate to High	Proven

TABLE B-6
Signalized Intersection Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
A - Reduce frequency and severity of intersection conflicts through traffic control and operational improvements	A1 - Employ multiphase signal operation	Low	Tried / Proven
	A2 - Optimize clearance intervals	Low	Proven
	A3 - Restrict or eliminate turning maneuvers (including right turns on red)	Low	Tried
	A4 - Employ signal coordination along a corridor or route	Moderate	Proven
	A5 - Employ emergency vehicle preemption	Moderate	Proven
	A6 - Provide countdown timers, advanced walk phase, and other low-cost pedestrian/bicycle facility improvements	Low	Tried / Proven
	A7 - Remove unwarranted signal	Low	Proven
B - Reduce frequency and severity of intersection conflicts through geometric improvements	B1 - Provide/improve left-turn channelization	Moderate	Proven
	B2 - Provide/improve right-turn channelization	Moderate	Proven
	B3 - Improve geometry of pedestrian and bicycle facilities	Low	Tried / Proven
C - Improve sight distance at signalized intersections	C1 - Clear sight triangles	Low	Tried
	C2 - Redesign intersection approaches	High	Proven
D - Improve driver awareness of intersections and signal control	D1 - Improve visibility of signals (overhead indications, 12" lenses, background shields, LED's) and signs (mast arm mounted street names) at intersections	Low	Tried
E - Improve driver compliance with traffic control devices	E1 - Supplement conventional enforcement of red-light running with confirmation lights; include a public information campaign to increase awareness and compliance	Low	Tried
F - Improve access management near signalized intersections	F1 - Restrict access to properties using driveway closures or turn restrictions	Low	Tried
	F2 - Restrict cross-median access near intersections	Low	Tried
G - Improve safety through other infrastructure treatments	G1 - Restrict or eliminate parking on intersection approaches	Low	Proven

TABLE B-7
Unsignalized Intersection Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
A - Improve management of access near unsignalized intersections	A1 - Implement driveway closure/relocations	Moderate	Tried
	A2 - Implement driveway turn restrictions	Low	Tried
B - Reduce the frequency and severity of intersection conflicts through geometric design improvements	B1 - Provide left-turn lanes at intersections	Moderate	Proven
	B2 - Provide longer left-turn lanes at intersections	Moderate	Tried
	B3 - Provide offset left-turn lanes at intersections	Moderate to High	Tried
	B4 - Provide bypass lanes on shoulders at T-intersections	Low	Tried
	B5 - Provide acceleration lanes at divided highway intersections	Moderate	Tried
	B6 - Provide right-turn lanes at intersections	Moderate	Proven
	B7 - Provide offset right-turn lanes at intersections	Moderate to High	Tried
	B8 - Provide right-turn acceleration lanes at intersections	Moderate	Tried
	B9 - Channelize or close median openings to restrict or eliminate turning maneuvers	Low	Tried
	B10 - Close or relocate "high-risk" intersections	High	Tried
	B11 - Convert four-legged intersections to two T-intersections	High	Tried
	B12 - Realign intersection approaches to reduce or eliminate intersection skew	High	Proven
	B13 - Improve pedestrian and bicycle facilities to reduce conflicts between motorists and nonmotorists	Moderate	Varies
C - Improve sight distance at unsignalized intersections	C1 - Clear sight triangle on stop- or yield-controlled approaches to intersections, including snow removal	Low	Tried
	C2 - Clear sight triangles in the medians of divided highways near intersections, including snow removal	Low	Tried
	C3 - Change horizontal and/or vertical alignment of approaches to provide more sight distance	High	Tried
	C4 - Eliminate parking that restricts sight distance	Low	Tried

TABLE B-7
Unsignalized Intersection Strategies

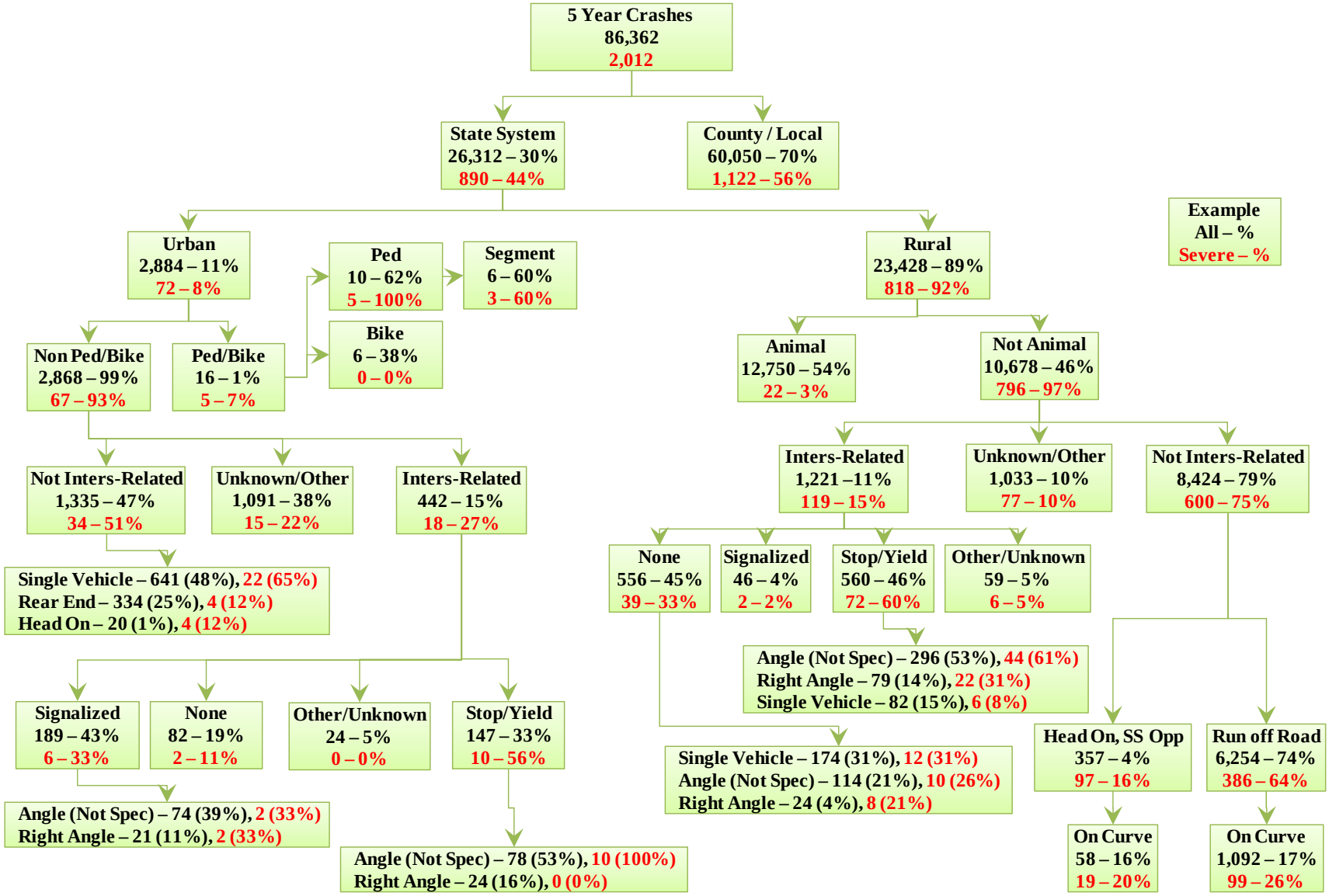
Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
D - Improve driver awareness of intersections as viewed from the intersection approach	D1 - Improve visibility of intersections by providing enhanced signing, delineation, or pavement markings/messages	Low	Tried
	D2 - Improve visibility of intersections by providing appropriate street lighting	Moderate to High	Proven
	D3 - Install larger regulatory and warning signs at intersections, including the use of dynamic warning signs at appropriate intersections	Low	Tried
	D4 - Call attention to the intersection by installing rumble strips on intersection approaches	Low	Tried
	D5 - Provide dashed markings (extended left edge lines) for-major-road continuity across the median opening at divided highway intersections	Low	Tried
F - Choose appropriate intersection traffic control to minimize crash frequency and severity	F1 - Construct roundabouts at appropriate locations	High	Proven

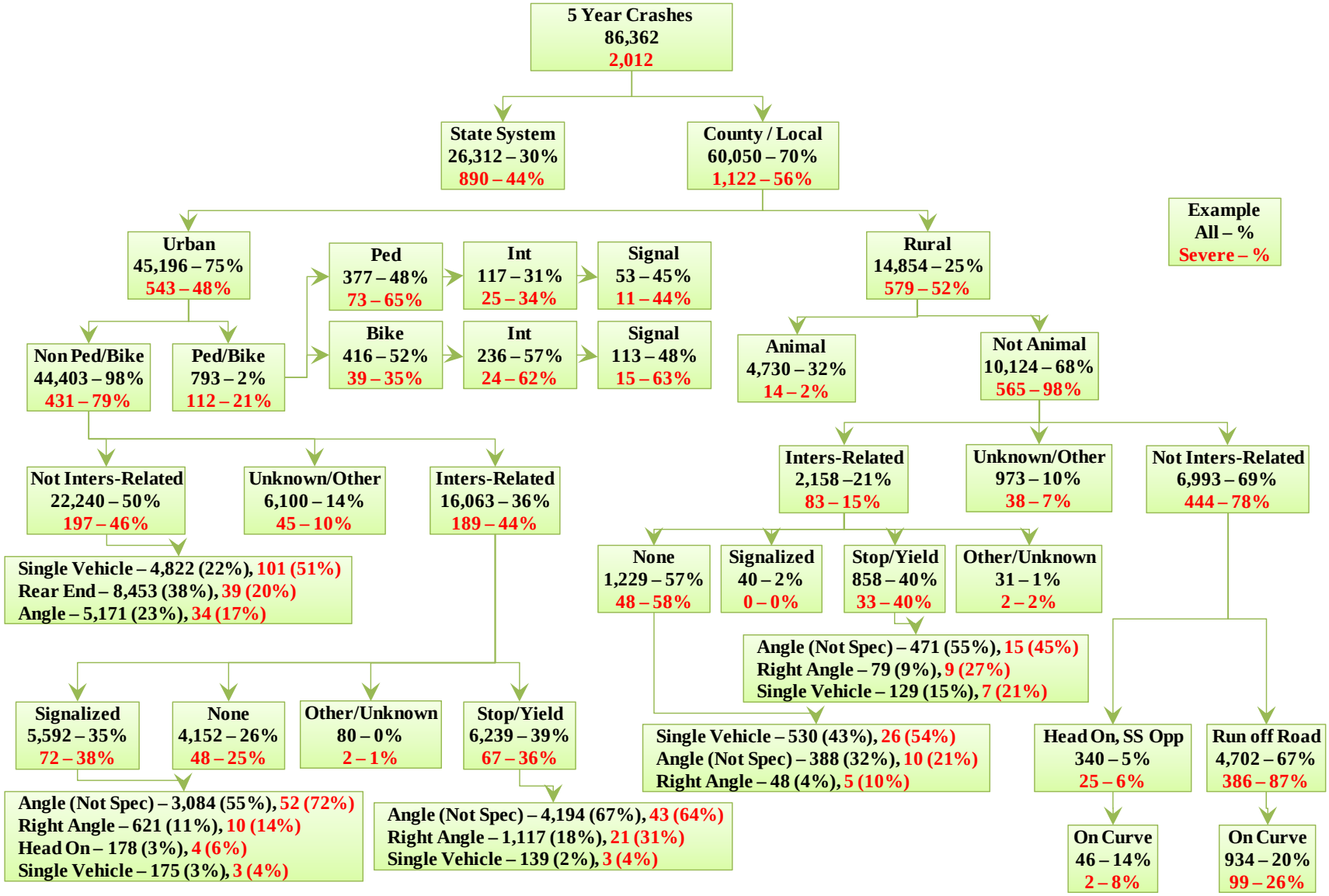
TABLE B-8
Older Driver Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness
A - Plan for an aging population	A1 - Establish a broad-based coalition to plan for addressing older adults' transportation needs and strengthen transportation options	Low	Tried
B - Identify older drivers at increased risk of crashing and intervene	B1 - Develop informational resources and conduct outreach for older driver safety screening for family, friends, physicians, and law enforcement to report at-risk drivers • Establish state-wide "one-stop" resource to guide the public on addressing driving skill assessments, educational courses, licensing, and safe mobility choices • Provide educational and training opportunities to the general older driver population to assess their driving capabilities and limitations, improve skills, and voluntarily limit their driving to safe driving conditions	Low to Moderate	Tried / Proven
	B2 - Review license renewal policies of older drivers' identified as an excessive risk through screening by motor vehicle personnel (i.e., restrict vs. rescind, age and interval schedule for license renewal, etc.). Continue to evaluate policies and relevant data.	Moderate	Tried
	B3 - Review screening protocol and training for DMV personnel to identify older drivers demonstrating a decline in physical or cognitive functioning	Low	Tried
C - Improve the roadway and driving environment to better accommodate older drivers' special needs	C1 - Provide advance guide signs and street name signs	Low	Tried
	C2 - Increase size and letter height of roadway signs	Low	Tried
	C3 - Provide all-red clearance intervals at signalized intersections	Low	Tried
	C4 - Provide more protected left-turn signal phases at high-volume intersections	Low	Tried
	C5 - Provide offset left-turn lanes at intersections	Moderate to High	Tried
	C6 - Improve lighting at intersections, horizontal curves, and railroad grade crossings	Moderate to High	Tried
	C7 - Improve roadway delineation	Low	Tried
	C8 - Reduce intersection skew angle	Moderate to High	Tried

APPENDIX C

North Dakota Crash Trees


5 Year Crashes
86,362
2,012
State System
26,312 – 30%
890 – 44%
County / Local
60,050 – 70%
1,122 – 56%
Example
All – %
Severe – %
Urban
2,884 – 11%
72 – 8%
Ped
10 – 62%
5 – 100%
Segment
6 – 60%
3 – 60%
Bike
6 – 38%
0 – 0%
Non Ped/Bike
2,868 – 99%
67 – 93%
Ped/Bike
16 – 1%
5 – 7%
Not Inters-Related
1,335 – 47%
34 – 51%
Unknown/Other
1,091 – 38%
15 – 22%
Inters-Related
442 – 15%
18 – 27%
Single Vehicle – 641 (48%), 22 (65%)
Rear End – 334 (25%), 4 (12%)
Head On – 20 (1%), 4 (12%)
Signalized
189 – 43%
6 – 33%
None
82 – 19%
2 – 11%
Other/Unknown
24 – 5%
0 – 0%
Stop/Yield
147 – 33%
10 – 56%
Angle (Not Spec) – 74 (39%), 2 (33%)
Right Angle – 21 (11%), 2 (33%)
Angle (Not Spec) – 78 (53%), 10 (100%)
Right Angle – 24 (16%), 0 (0%)
Rural
23,428 – 89%
818 – 92%
Animal
12,750 – 54%
22 – 3%
Not Animal
10,678 – 46%
796 – 97%
Inters-Related
1,221 –11%
119 – 15%
Unknown/Other
1,033 – 10%
77 – 10%
Not Inters-Related
8,424 – 79%
600 – 75%
None
556 – 45%
39 – 33%
Signalized
46 – 4%
2 – 2%
Stop/Yield
560 – 46%
72 – 60%
Other/Unknown
59 – 5%
6 – 5%
Angle (Not Spec) – 296 (53%), 44 (61%)
Right Angle – 79 (14%), 22 (31%)
Single Vehicle – 82 (15%), 6 (8%)
Single Vehicle – 174 (31%), 12 (31%)
Angle (Not Spec) – 114 (21%), 10 (26%)
Right Angle – 24 (4%), 8 (21%)
Head On, SS Opp
357 – 4%
97 – 16%
Run off Road
6,254 – 74%
386 – 64%
On Curve
58 – 16%
19 – 20%
On Curve
1,092 – 17%
99 – 26%


5 Year Crashes
86,362
2,012
State System
26,312 – 30%
890 – 44%
County / Local
60,050 – 70%
1,122 – 56%
Example
All – %
Severe – %
Urban
45,196 – 75%
543 – 48%
Ped
377 – 48%
73 – 65%
Int
117 – 31%
25 – 34%
Signal
53 – 45%
11 – 44%
Rural
14,854 – 25%
579 – 52%
Non Ped/Bike
44,403 – 98%
431 – 79%
Ped/Bike
793 – 2%
112 – 21%
Bike
416 – 52%
39 – 35%
Int
236 – 57%
24 – 62%
Signal
113 – 48%
15 – 63%
Animal
4,730 – 32%
14 – 2%
Not Animal
10,124 – 68%
565 – 98%
Not Inters-Related
22,240 – 50%
197 – 46%
Unknown/Other
6,100 – 14%
45 – 10%
Inters-Related
16,063 – 36%
189 – 44%
Inters-Related
2,158 –21%
83 – 15%
Unknown/Other
973 – 10%
38 – 7%
Not Inters-Related
6,993 – 69%
444 – 78%
Single Vehicle – 4,822 (22%), 101 (51%)
Rear End – 8,453 (38%), 39 (20%)
Angle – 5,171 (23%), 34 (17%)
None
1,229 – 57%
48 – 58%
Signalized
40 – 2%
0 – 0%
Stop/Yield
858 – 40%
33 – 40%
Other/Unknown
31 – 1%
2 – 2%
Angle (Not Spec) – 471 (55%), 15 (45%)
Right Angle – 79 (9%), 9 (27%)
Single Vehicle – 129 (15%), 7 (21%)
Signalized
5,592 – 35%
72 – 38%
None
4,152 – 26%
48 – 25%
Other/Unknown
80 – 0%
2 – 1%
Stop/Yield
6,239 – 39%
67 – 36%
Single Vehicle – 530 (43%), 26 (54%)
Angle (Not Spec) – 388 (32%), 10 (21%)
Right Angle – 48 (4%), 5 (10%)
Head On, SS Opp
340 – 5%
25 – 6%
Run off Road
4,702 – 67%
386 – 87%
Angle (Not Spec) – 3,084 (55%), 52 (72%)
Right Angle – 621 (11%), 10 (14%)
Head On – 178 (3%), 4 (6%)
Single Vehicle – 175 (3%), 3 (4%)
Angle (Not Spec) – 4,194 (67%), 43 (64%)
Right Angle – 1,117 (18%), 21 (31%)
Single Vehicle – 139 (2%), 3 (4%)
On Curve
46 – 14%
2 – 8%
On Curve
934 – 20%
99 – 26%