Actual Speeds on the Roads Compared to the Posted Limits

FINAL REPORT 551

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16. Abstract

The purpose of this report is to explore actual vehicle speeds on Arizona highways exceeding posted speed limits. This is done through a three-fold approach that includes a survey of state practices in setting and enforcing speed limits, a literature review, and an analysis of data from automatic traffic recording devices, which assesses whether speeding is a problem, where it is most prevalent, and if the incidence of speeding is on the rise.

The survey of state practices showed no significant increase in speed-related fatalities in states that have adjusted speed limits upward. No state has data that addresses the effectiveness of speeding sanctions and no speed reduction practice is seen as the "most effective." Fewer speed-related fatalities were seen in those states with commercial vehicle speed and/or lane restrictions. No factor used to establish speed limits was found to be predominant.

Review of the literature shows choice of speed is determined by factors based on unconscious actions with unrecognized repercussions. The impact of travel time, speed-related crashes, vehicle operating costs, and pollution on society warrant speed management for economic reasons. The connection between speed and incidence of crashes is unclear. Speed and severity is governed by the laws of physics, warranting speed management for safety purposes.

Data analysis shows the incidence of speeding on Arizona highways is widespread. The problem is worse on high volume roadways, primarily urban interstates. Reducing speeding on high-speed interstate highways, where the relationship between speed and severity of injury is clear, should be the target of enforcement efforts. Speed data from ATR sites should be used to identifying areas for targeted enforcement efforts.

The findings of this report support the premise that speed limits should be raised to the 85th percentile where roadway design, accident history, road type and surface, and traffic volume warrant an increase. Enforcement efforts should be targeted at urban interstate highways using traffic data for optimal use of limited resources.

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SI (MODERN METRIC) CONVERSION FACTORS*

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
	AREA			
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
	VOLUME			
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: Volumes greater than 1000L shall be shown in m^3.			
	MASS			
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000lb)	0.907	megagrams (or "metric ton")	mg (or "t")
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celsius temperature	°C
	ILLUMINATION			
fc	foot candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
	FORCE AND PRESSURE OR STRESS			
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
	AREA			
mm^2	Square millimeters	0.0016	square inches	in^2
m^2	Square meters	10.764	square feet	ft^2
m^2	Square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	Square kilometers	0.386	square miles	mi^2
	VOLUME			
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	Cubic meters	35.315	cubic feet	ft^3
m^3	Cubic meters	1.308	cubic yards	yd^3
	MASS			
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (or "metric ton")	1.102	short tons (2000lb)	T
	TEMPERATURE (exact)			
°C	Celsius temperature	1.8C + 32	Fahrenheit temperature	°F
	ILLUMINATION			
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
	FORCE AND PRESSURE OR STRESS			
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

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ACRONYMS

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ATR	Automatic Traffic Recorder
AzDOT	Arizona Department of Transportation
CARE	Corridor Accident Reduction Enforcement
CMV	Commercial Motor Vehicle
DOT	Department of Transportation
DPS	Department of Public Safety
DUI	Driving Under the Influence
DVMT	Daily Vehicle Miles Traveled
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FY	Fiscal Year
HEAT	Highway Enforcement of Aggressive Traffic
HPMS	Highway Performance Monitoring System
IACP	International Association of Chiefs of Police
IIHS-HLDI	Insurance Institute for Highway Safety, Highway Loss Data Institute
ITS	Intelligent Transportation System
KM/H	Kilometers per Hour
KTC	Kentucky Transportation Cabinet
MPH	Miles per Hour
NMSL	National Maximum Speed Limit
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
NTIS	National Technical Information Service
SAE	Society of Automotive Engineers
SMS	Safety Management System
STEP	Selective Traffic Enforcement Program
TEA	Transportation Equity Act
TRB	Transportation Research Board
TRIS	Transportation Research Information Service
USDOT	United States Department of Transportation
VMT	Vehicle Miles Traveled

EXECUTIVE SUMMARY

The Arizona Department of Transportation (AzDOT) is aware that a large number of motorists exceed the posted speed limits on Arizona highways. The extent of the problem is not clearly understood. Excessive speed increases the risk of accidents and presents a safety hazard to other drivers. Yet, the expeditious movement of people and goods throughout the state is important to the state's economy. The purpose of this project is to explore the issue of actual vehicle speeds on Arizona highways exceeding posted speed limits.

This report is comprised of three sections. The first section summarizes the results of a survey of state practices in the area of speed limits and speed enforcement. The second section is a review of literature on recent research and current practices in setting and enforcing speed limits. The third section of the report analyzes data from AzDOT's Transportation Planning Division automatic traffic recording (ATR) devices to assess whether or not speeding is a problem, where it is most prevalent, and if the incidence of speeding is on the rise. The principal findings of this report are listed below:

Survey of State Practices:

- There was no significant increase in speed-related fatalities in the 46% of states that adjusted speed limits upward as a result of vehicles exceeding posted limits.
- Of the following factors used to establish speed limits—roadway design, accident history, road type and surface, 85th percentile determination, and traffic volume—none was found to be predominant.
- There is limited use of automated methods of enforcement, possibly due to the lack of statutes authorizing the use of these practices.
- No state has data that directly addresses the effectiveness of speeding sanctions.
- Public education programs are the most common speed reduction practice in use, followed by speed feedback indicators and vehicle messaging systems.
- No speed reduction practice is seen as the "most effective," but visibility of mobile and stationary patrol units and targeted enforcement are seen as primary deterrents.
- Commercial vehicle speed and/or lane restrictions are in effect in half of the states queried. There were fewer speed-related fatalities in those states with restrictions.

Literature Review:

- Choice of speed is determined by a multitude of factors—age, gender, attitude, and the perceived risks of law enforcement encounter or crash—many of which are based on unconscious actions with unrecognized repercussions.
- Speed management is essential due to the significant risks that drivers can impose on others. The impact of travel time, speed-related crashes, vehicle operating costs, and pollution on society warrant speed management for economic reasons.

- There is no clear consensus on the impact that raising or lowering speed limits has on the number of crashes; however, studies seem to show crashes decrease when speed limits are lower and increase or remain unchanged when limits are raised.
- The relationship between speed and safety is two-fold involving both incidence and severity of crashes. The connection between speed and the incidence of crashes is unclear. The connection between speed and the severity of crashes is straightforward and governed by the laws of physics.
- Automated enforcement is underutilized in the U.S., but may be the method of choice in congested, high-accident, hard-to-enforce traffic zones.

Analysis of Speed Data:

- The incidence of speeding on Arizona highways is widespread with 46% to 69% of vehicles exceeding posted limits on those 55, 65, and 75 mph roadways examined.
- The number of vehicles exceeding the posted limit is higher on high volume roadways, primarily on the functional class of roadway identified as "urban principal arterial – interstate."
- Reducing excessive speeds on high-speed interstate highways, where the relationship between speed and severity of injury is clear, should be the target of enforcement efforts.
- Speed data from ATR sites are valuable in identifying areas and times for targeted enforcement efforts in order to make the most of limited resources.

The information gathered and data analyzed for this report make it clear that speeding is widespread. It is not clear whether speed limits are set too low or enforcement efforts are inadequate. There is no clear consensus on how speed limits should be set, but research supports the notion that the 85th percentile is the most commonly accepted practice. Traffic data analyzed on Arizona highways shows speed limits to be consistently set below the 85th percentile. Additionally, from the enforcement perspective, speed enforcement efforts have not kept up with population growth and increased highway usage.

Ultimately, the choice of enforcement methods will be dictated by the availability of traditionally scarce resources. This would seem to make automated methods particularly appealing. Although, most states favor mobile and stationary patrol units for enforcement, it may be time to consider other options. Mobile and stationary patrols are labor intensive and result in less than a 1.2% chance of receiving a speeding citation on Arizona highways. This report supports the premise that speed limits should be raised to the 85th percentile where roadway design, accident history, road type and surface, and traffic volume warrant an increase and enforcement efforts should be targeted at urban interstate highways. These efforts also should be guided by traffic data that targets when and where resources will be most effective. These alternatives may improve the situation without significant financial impact on the state budget.

1.0 INTRODUCTION

1.1 PURPOSE

The Arizona Department of Transportation (AzDOT) is aware that a large number of motorists exceed the posted speed limits on Arizona highways. The extent of the speeding problem is not clearly understood. The purpose of this project is to explore the issue of actual speeds on Arizona highways exceeding posted limits.

In addition to examining the current state of affairs, this report looks at how other states are handling speed limits and speed enforcement and explores options to help reduce the problem. This was done by means of a written survey sent to each of the fifty states. A review of the literature also was conducted to identify recent research, current trends, and best practices in the industry. The information that was gathered is summarized in this report. It is intended this report will be used by AzDOT to inform decision-makers regarding whether to increase speed enforcement efforts or raise speed limits to accommodate driver behavior on Arizona highways.

1.2 BACKGROUND

Three primary factors – safety, efficiency, and economics – influence the need for the effective setting and enforcement of speed limits on Arizona highways. There were 1,117 traffic fatalities in 2002. Four hundred and eight of these were speed related. The potential to prevent or reduce the severity of these accidents and the preservation of human life should be strong motivation to focus efforts on reducing excessive speeds on Arizona highways.

With respect to efficiency, there are approximately 8.3 million lane-miles of roadway in the United States. Arizona's 122,000 lane-miles of roadway comprise roughly 1.5 percent of the nation's total lane miles. Each of the fifty states is charged with the responsibility of maintaining its respective share of this network to ensure the effectiveness of the road system in promoting our economy, strengthening our defense, and facilitating the movement of people and goods. These activities are supported in part by Federal-Aid Highway Program funds derived from highway user taxes. These funds are apportioned back to the states based on statutory formulas, which seek to guarantee that each state receives at least 90.5 percent of its percentage share of contributions to the Highway Trust Fund.

One important way of ensuring that the highway system is functioning efficiently is to make sure that individual users are following safety and performance guidelines established by Federal, state, and local governments. Consequently, the monitoring and enforcement of speed limits are essential to ensuring the system's efficiency and effectiveness.

Lastly, the economic cost to citizens for speed-related accidents is considerable. In 2000, the estimated cost to Arizonans was $772 million. This included healthcare costs, vehicle operating costs, travel time, and the impact of pollution on our environment. These three important issues—safety, efficiency, and economics—make evaluating how well speed limits are set and how well motorists are complying with posted speed limits on Arizona highways a priority.

1.3 PROJECT OVERVIEW

This report is comprised of three sections—a review of existing literature on current practices in setting and enforcing speed limits, a survey of state practices, and an evaluation of actual versus posted speed on Arizona highways.

The first section summarizes the results of the "Survey of Speed Limits and Speed Enforcement Practices" sent to the fifty agencies responsible for speed monitoring. The surveys primarily went to state departments of public safety, highway patrol/state police, or office of highway safety. The responses were entered into a Microsoft ACCESS database and summarized for this report.

The second section contains information gathered through a review of books, journals, Internet websites, and interviews with traffic enforcement professionals.

The third section of the report analyzes the extent of the speeding problem on Arizona highways. Data from AzDOT Transportation Planning Division automatic traffic recording (ATR) sites were used to assess whether or not speeding is occurring, where it is most prevalent, and whether or not the incidence of speeding is on the rise.

2.0 SURVEY OF SPEED LIMITS AND SPEED ENFORCEMENT PRACTICES

2.1 PURPOSE

A large number of motorists exceed the posted speed limits on Arizona highways. Excessive speed increases the risk of accidents and presents a safety hazard to other drivers on the road. Yet, the expeditious movement of people and goods throughout the state is important to the state's economy. Arizona is confronted with the issue of how to address this dilemma. Should there be stricter enforcement? Should speed limits be raised? Should stiffer sanctions be imposed on those caught exceeding posted limits? Would stiffer sanctions act as a deterrent to speeding? The AzDOT Survey of Speed Limits and Speed Enforcement Practices was conducted to gather information regarding how other states deal with setting speed limits and speed enforcement. This information can be used in making decisions regarding how to address speeding on Arizona highways.

2.2 METHODOLOGY

A two-page survey was sent to each of the fifty states in April 2003. In most cases, the survey was sent to the primary traffic law enforcement agency in the state or the department of transportation. Prior to distribution of the survey each agency was contacted to identify an individual able to respond to the types of questions included on the survey. In some cases, there more than one person was identified in different areas of state government, as some of the questions require different areas of expertise. In several states, establishment of speed limits falls under the department of transportation whereas the enforcement of traffic laws falls under the jurisdiction of the state police or highway patrol. Consequently, some states received more than one survey. Participants were given three weeks to respond.

Forty-eight of the fifty states receiving the survey returned results—a 96% response rate. Mississippi and South Carolina did not respond. The data were entered in a Microsoft Access database and summarized for this report. Following review of the results, individuals responsible for completing the survey were contacted to obtain additional or missing information and to clarify ambiguous responses. A list of each agency and the fifty-two individuals participating in the survey is shown in Table 1.

Table 1. Survey Participants

Agency	Division	Contact
Alaska State Troopers		Lt. Ralph Reyes
Alabama Department of Public Safety	Administrative	Capt. Agatha Windsor
Arkansas Highway Safety Office		Charlie Marsh
Arizona Department of Transportation	ADOT Traffic Group	Reed Henry
California Office of Traffic Safety	California Highway Patrol	Capt. Chris Jenkins
Colorado Department of Transportation	Traffic Engineering	Bryan K. Allery

Table 1. Survey Participants		
Connecticut State Police	State Police	Sgt. J. Paul Vance
Delaware State Police		Lt. Timothy E. Winstead
Florida Highway Patrol		Chief Ken Howes
Georgia State Government	Governor's Office of Highway Safety	Ricky H. Rich
Hawaii Department of Transportation	Honolulu Police Department	Sgt. Robert Lung
Iowa Department of Public Safety	State Patrol	Lt. Robert Hansen
Idaho State Police	Operations	Maj. Glen Schwartz
Illinois State Police	Information and Technology Command	Aaron Schroeder
Indiana State Police		Sgt. Tom Bennett
Kansas Highway Patrol		MCI Sgt. Tony Stewart
Kentucky State Police	Governor's Highway Safety Program	Kent Scott
Louisiana State Police		Sgt. Jason G Jacob
Massachusetts Governor's Highway Safety Bureau		Brook Chipman
Maryland State Police	Office of Media Communications	Maj. Greg Shipley
Maryland State Highway Administration	Office of Traffic and Safety	Ron Lipps
Maine Department of Public Safety	Bureau of Highway Safety	Richard E. Perkins
Maine Department of Transportation	Traffic Engineering	Stephen Landry
Michigan State Police	Special Operations Division	Sgt Lance Cook
Minnesota Department of Public Safety	Office of Traffic Safety	Katherine Burke Moore
Missouri State Highway Patrol		Capt. Gregory Kindle
Mississippi Highway Safety Patrol		Warren Strain
Montana Highway Patrol		Sgt. Mitch Tuttle
State Highway Patrol		Sgt. RC Broadway
North Dakota Highway Patrol	Safety and Education	Capt. Mark Bethke
Nebraska State Patrol	Research & Planning	Lucinda Dowding
New Hampshire State Police	Field Operations	Capt. KG Hamilton
New Jersey State Police		Sgt F/C Paul Blanda
New Mexico State Police	Research & Development	Maj. Mark Weaver
Nevada Office of Traffic Safety	Planning Division	Charles Abbott
Nevada Department of Transportation	Planning	Michael Lawson
Nevada Public Safety	Highway Patrol Division	Lt. Paul H. Hinen
New York State Police		Sgt James Halvorsen
Ohio State Highway Patrol		Suzan Cogswell
Oklahoma Highway Safety Office		2nd Lt. JC Burris
Oregon Department of Transportation	Safety/Police Traffic Speed Control	Steve Vitolo
Pennsylvania State Police	Bureau of Patrol	Tpr. John V Spishock
Rhode Island State Police	Planning & Research	Sgt. Linda Bailey
South Carolina Highway Patrol		Maj. EC Johnson
South Dakota Highway Patrol		Col. Dan Mosteller
Tennessee Highway Patrol	THP/Safety	Trp. Tim Southerland
Texas Department of Public Safety		Maj. David Baker
Utah Highway Patrol		Lt. Ron Ostler
Virginia State Police	Department of State Police	Bud Cox

Table 1. Survey Participants		
Vermont State Police Headquarters		Lt. William O'Leary
Washington State Patrol		Lt. Mike DePalma
Wisconsin Department of Transportation		Sgt. William Harley
West Virginia State Police		F/Lt. DW Skeen
Wyoming Highway Patrol	Headquarters Patrol	Sgt. Stephen Townsend

2.3 SURVEY INSTRUMENT

The AzDOT Speed Limits and Speed Enforcement Practices Survey included twelve questions, eleven of which were multiple-choice. The questions are shown below. The complete survey is included as Appendix A.

1. How are speed limits established for highways in your state?
2. Have speed limits ever been adjusted upward as a result of vehicles exceeding posted limits?
3. What department of state government is ***MOST*** directly responsible for enforcement of speed limits on state highways?
4. How are speed limits enforced on state highways?
5. Do you have special speed and/or lane restrictions for commercial vehicles on state highways?
6. What practices have you implemented to help reduce speeding?
7. Which one of the practices checked in Question 6 has proven to be the ***MOST*** effective at reducing speeding?
8. What is the penalty for a first-time speeding offense?
9. Does your state law allow drivers to escape or reduce penalties by attending a defensive driving or traffic safety class?
10. Do you have any reports or data indicating whether the sanctions for exceeding the speed limit are effective in preventing speeding?
11. Is speeding on your state highways considered a significant safety hazard?
12. Has your state taken any special action to implement stricter enforcement of speed limits?

2.4 SURVEY RESULT

The results from the Speed Limits and Speed Enforcement Practices Survey are summarized in this section. In several parts of this section, data from *Highway Statistics 2001* published by the U.S. Department of Transportation (USDOT) are referenced. These statistics are derived from information reported by states via the Highway Performance Monitoring System (HPMS) and databases or business records maintained by many different state departments of transportation. The databases and record keeping systems of these governmental units are maintained to meet their individual business needs. Consequently, data quality and consistency are dependent upon "the programs, actions and maintenance of sound databases by numerous data collectors, manipulators and suppliers at the state, local and metropolitan area levels." This should be kept in mind when making interpretations and comparisons. [1]

Additionally, *Traffic Safety Facts 2001* published by the National Center for Statistics and Analysis is referenced [2]. Data reported in this publication are taken from the Fatality Analysis Reporting System and the General Estimates System. Similarly, data quality and consistency are dependent on the same factors and limitations.

For each question, the responses in each category are listed as a count and as a percentage of the total number responding to the question. Those states not responding to a question were eliminated from the total number of responses used in the percentage calculation.

2.4.1 Question 1

Of the forty-eight states returning survey results, all but one state responded to question 1. The question asked how speed limits are established on state highways. A summary of the responses is shown below in Table 2. Individual results reported by each state are listed in Appendix B.

Table 2. Establishing Speed Limits

State	Roadway Design Speed	Accident History	Road Type and Surface	85th Percentile	Traffic Volume	Traffic and Engineering Studies	Assigned Arbitrarily	Other
Total	35	32	31	30	29	6	4	10
Percent	74.5	68.1	66.0	63.8	61.7	12.8	8.5	21.3

The most frequently reported response was roadway design speed. This is not surprising as each class of highway is designed and constructed to accommodate a particular type of traffic flow ranging from freeways to two-lane rural roads. Prior to construction or reengineering of a roadway, a design plan is developed that addresses such elements as traffic characteristics, sight distance, horizontal and vertical alignment, and cross sectional elements to ensure user safety and operational efficiency at posted speed limits. The American Association of State Highway and Transportation Officials (AASHTO) has several publications addressing roadway design issues. These publications can be obtained on-line from the AASHTO Bookstore at http://transportation.org/aashto/home.nsf/FrontPage.

Following the selection of roadway design speed was accident history, road type and surface, traffic volume, and 85th percentile determination in decreasing order of frequency. The category "traffic and engineering studies," although included in the summary was not listed as a choice on the survey. Traffic and engineering studies, which include assessments of accident history, road type and surface, traffic volume, and speeds, are typically conducted when changes to posted speed limits are being considered. Six states wrote this response under the "Other" category so it was added to the summary of results.

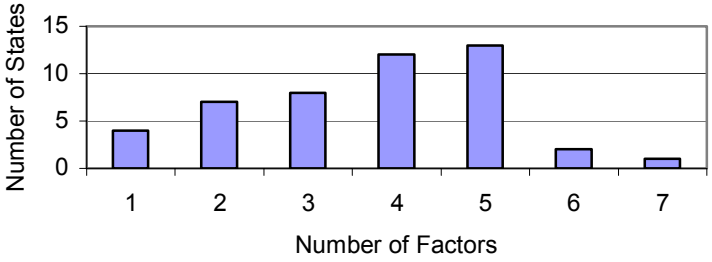
Four states reported that some speed limits are set arbitrarily. In one case, the National Maximum Speed Limit established by Congress [23 CFR 1260, Section 205(d)] and later repealed in 1995 was cited as the example of setting speed limits arbitrarily. One state checking this response stated that some small municipalities set them arbitrarily. Setting speed limits arbitrarily was never reported as the sole method used by any of the four states marking this response.

Of the five factors involved in setting speed limits that were included on the survey, the use of 85th percentile determinations was reported by only 30 of 47 respondents (63.8%). Two of those states reported 85th percentile determinations as the only method used to set speed limits. Use of an 85th percentile determination is the principle of setting speed limits as near as practicable to the speed at or below which 85 percent of the drivers are traveling. Speeds may then be adjusted downward to accommodate engineering considerations such as accident experience, roadway design, surrounding development, etc. These factors are typically part of the information gathered in "traffic and engineering studies," the response written in the "other" category by six states. The lack of use of the 85th percentile determinations seems to indicate limited accommodation of driver behavior into the equation used to set speed limits.

It is interesting to note that the survey results show a change in attitude from the 1985 survey conducted by M. R. Parker Jr. as part of FHWA/RD-85/096 that showed the 85th percentile speed to be the primary factor considered in engineering studies for setting speed limits. [3]

In looking at the number of factors reported by each state, more than half of those responding marked that either four or five different factors are involved in establishing speed limits. Seventy-seven percent take a minimum of three different traffic and engineering parameters into account to ensure speeds are set at safe and prudent limits. Figure 1 below shows the distribution of the number of factors used by each state to set speed limits.

Figure 1. Factors Involved in Setting Speed Limits



Speed limits throughout the United States vary from 55 miles per hour (mph) and 75 mph on rural and urban interstate highways. The Insurance Institute for Highway Safety, Highway Loss Data Institute, publishes a listing of established speed limits for various types of roads in the United States. The listing as of June 2003 is shown in Table 3 on the following page.

Table 3. National Speed Limits

State	Rural Interstates	Urban Interstates	Other Limited Access Roads	Other Roads	Effective Date of Limits on		Effective Date of Limits on	
	Cars (mph)	Cars (mph)	Cars (mph)	Cars (mph)	Rural Interstates	Urban Interstates	Other Limited Access Roads	Other Roads
Alabama	70	70	65	65	5/21/1996	5/21/1996	5/21/1996	5/21/1996
Alaska	65	55	65	55	1/15/1988	no action	8/25/1999	no action
Arizona	75	55	55	55	12/8/1995	no action	no action	no action
Arkansas	70 trucks: 65	55	60	55	8/19/1996	no action	8/19/1996	no action
California	70 trucks: 55	65	70	65	1/8/1996	1/8/1996	1/8/1996	no action
Colorado	75	65	65	65	6/24/1996	6/24/1996	6/24/1996	no action
Connecticut	65	55	65	55	10/1/1998	no action	10/1/1998	no action
Delaware	65	55	65	55	1/17/1996	no action	1/17/1996	no action
Florida	70	65	70	65	4/8/1996	4/8/1996	4/8/1996	4/8/1996
Georgia	70	65	65	65	7/1/1996	7/1/1996	7/1/1996	7/1/1996
Hawaii	60	50	45	45	1974	no action	no action	no action
Idaho	75 trucks: 65	75	65	65	5/1/1996	5/1/1996	5/1/1996	5/1/1996
Illinois	65 trucks: 55	55	65	55	1/25/1996	no action	1/25/1996	no action
Indiana	65 trucks: 60	55	55	55	6/1/1987	no action	no action	no action
Iowa	65	55	65	55	5/12/1987	no action	6/6/1996	no action
Kansas	70	70	70	65	3/7/1996	3/7/1996	3/7/1996	3/7/1996
Kentucky	65	65	65	55	6/8/1987	no action	no action	no action
Louisiana	70	70	70	65	8/15/1997	8/15/1997	8/15/1997	8/15/1997
Maine	65	65	65	60	6/12/1987	6/12/1987	6/12/1987	6/12/1997
Maryland	65	65	65	55	7/1/1995	8/1/1996	8/1/1996	no action
Massachusetts	65	65	65	55	1/5/1992	1/29/1996	1/29/1996	no action
Michigan	70 trucks: 55	65	70	55	8/1/1996	8/1/1996	8/1/1996	no action
Minnesota	70	65	65	55	7/1/1997	7/1/1997	7/1/1997	no action
Mississippi	70	70	70	65	2/29/1996	2/29/1996	2/29/1996	2/29/1996
Missouri	70	60	70	65	3/13/1996	3/13/1996	3/13/1996	3/13/1996
Montana	75 trucks: 65	65	day: 70 night: 65	day: 70 night: 65	5/28/1999	5/28/1999	5/28/1999	5/28/1999
Nebraska	75	65	65	60	9/1/1996	9/1/1996	9/1/1996	9/1/1996
Nevada	75	65	70	70	12/8/1995	12/8/1995	12/8/1995	12/8/1995

State	Rural Interstates	Urban Interstates	Other Limited Access Roads	Other Roads	Effective Date of Limits on		Effective Date of Limits on	
	Cars (mph)	Cars (mph)	Cars (mph)	Cars (mph)	Rural Interstates	Urban Interstates	Other Limited Access Roads	Other Roads
New Hampshire	65	65	55	55	4/16/1987	5/29/1996	no action	no action
New Jersey	65	55	65	55	1/19/1998	no action	1/19/1998	no action
New Mexico	75	75	65	55	5/15/1996	no action	5/15/1996	no action
New York	65	65	65	55	8/1/1995	7/16/1996	7/16/1996	no action
North Carolina	70	70	70	55	8/5/1996	8/5/1996	10/1/1996	no action
North Dakota	75	75	70	65	8/1/2003	8/1/2003	8/1/2003	8/1/2003
Ohio	65 trucks: 55	65	55	55	7/15/1987	7/28/1996	no action	no action
Oklahoma	75	70	70	70	8/29/1996	8/29/1996	8/29/1996	8/29/1996
Oregon	65 trucks: 55	55	55	55	6/27/1987	no action	no action	no action
Pennsylvania	65	55	65	55	7/13/1995	no action	5/10/1996	no action
Rhode Island	65	55	55	55	5/12/1996	no action	no action	no action
South Carolina	70	70	60	55	4/30/1999	4/30/1999	4/30/1999	no action
South Dakota	75	75	65	65	4/1/1996	4/1/1996	4/1/1996	4/1/1996
Tennessee	70	70	70	65	3/25/1998	5/15/2001	5/15/2001	5/15/2001
Texas	day: 75 night: 65 trucks: 65	day: 70 night: 65	day: 75 night: 65 trucks: 65	day: 60 night: 55	9/1/1999	9/1/1999	9/1/1999	9/1/1999
Utah	75	65	75	65	5/1/1996	5/1/1996	5/1/1996	5/1/1996
Vermont	65	55	50	50	4/21/1987	no action	no action	no action
Virginia	65	65	65	55	7/1/1988	7/1/2001	2/13/1996	no action
Washington	70 trucks: 60	60	60	60	3/15/1996	3/15/1996	3/15/1996	3/15/1996
West Virginia	70	55	65	55	8/25/1997	no action	8/25/1997	no action
Wisconsin	65	65	65	55	6/17/1987	8/1/1996	8/1/1996	no action
Wyoming	75	60	65	65	12/8/1995	12/8/1995	12/8/1995	12/8/1995

Source: Insurance Institute for Highway Safety, Highway Loss Data Institute, June 2003.

Note: "Limited access highways are multiple-lane roads with restricted access using exit and entrance ramps rather than intersections. Interstate highways are part of the national system of limited access highways that connect the nation's principal metropolitan areas and industrial centers. The interstate system is divided into urban and rural sections. The distinction between urban and rural areas is based on population density figures from the U.S. Census Bureau and adjusted by state and local government to reflect planning and other issues. Urban sections are within a census area with an urban population of 5,000 to 49,999 or within a designated urbanized area with a population of 50,000 or greater. Speed limits for commercial use trucks, if different, are specified." [4]

2.4.2 Question 2

The second survey question asked whether speed limits on state highways have been adjusted upward as a result of vehicles exceeding posted limits. Forty-six of the forty-eight states returning results responded to the question. A summary of the responses is shown in Table 4 on the following page. Individual results reported by each state are listed in Appendix B.

Table 4. Speed Limits Adjusted Upward

State	Yes, speeds adjusted up	No, speeds not adjusted up
Total	20	26
Percent	43.5	56.5

Of the forty-six states responding to this question, the majority (56.5%) indicated they have not adjusted speeds upward as a result of vehicles exceeding posted limits. Twenty states report they have adjusted speed limits upward. You might expect that raising the limits would result in higher speed-related accidents in those states adjusting speed limits upward. This does not seem to be the case.

If the number of speed-related fatalities expressed as a percentage of total traffic fatalities is examined for each state, there appears to be no higher accident rate in those states adjusting the speed limits upward. These rates were calculated from statistics in *Traffic Safety Facts 2001* published by the National Center for Statistics and Analysis in Washington, D.C. [1] Figure 2 on the following page shows the distribution of speed-related fatalities as a percentage of total traffic fatalities. The white bars are states where the speed has been adjusted upward. The black bars represent those states not adjusting speed limits upward. Striped bars indicate states that did not respond to the question. When the average percentage of speed-related fatalities is calculated, the percentage for states where the speed limit has been adjusted as a result of vehicles exceeding posted limits, 33.4%, is similar to those states where it has not, 31.7%.

In a similar comparison, the number of speed-related fatalities expressed as a percentage of daily vehicle miles traveled (DVMT) was calculated. DVMT is a measure of the total traffic on roadways. It is the product of the average daily traffic count and the length of the road. The average percentages in 2001 were 0.390% for states that adjusted their speed limits and 0.272% for those that made no adjustment. However, if the values for North Dakota are eliminated as outliers, the average percentage for those states that have raised speed limits as a result of vehicles exceeding posted limits is 0.263%. The data seem to indicate there is no significant difference in speed-related fatalities between the two groups in 2001. Figure 3 shows the distribution of results.

Figure 2. Speed-Related Fatalities as a Percentage of Total Traffic Fatalities

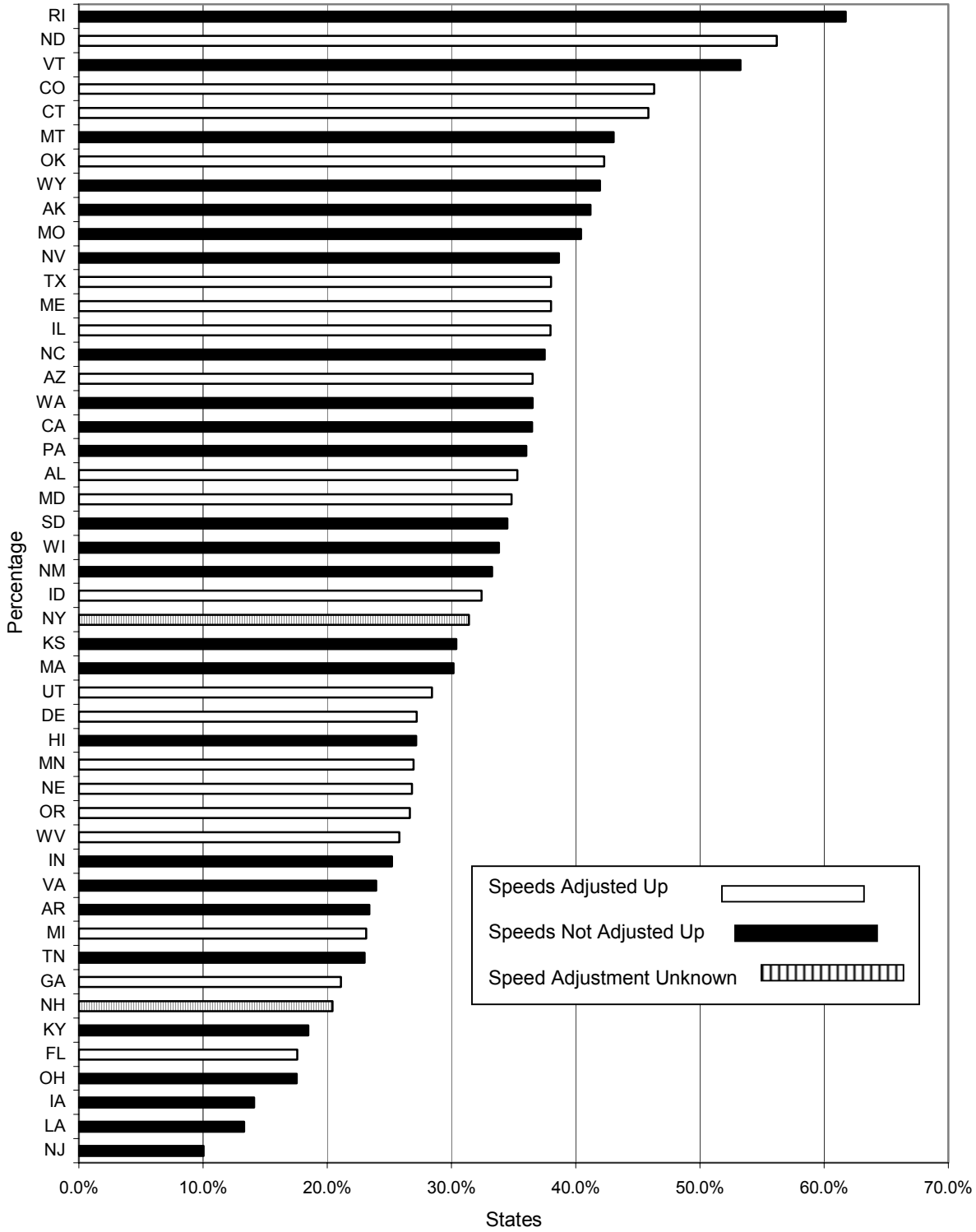
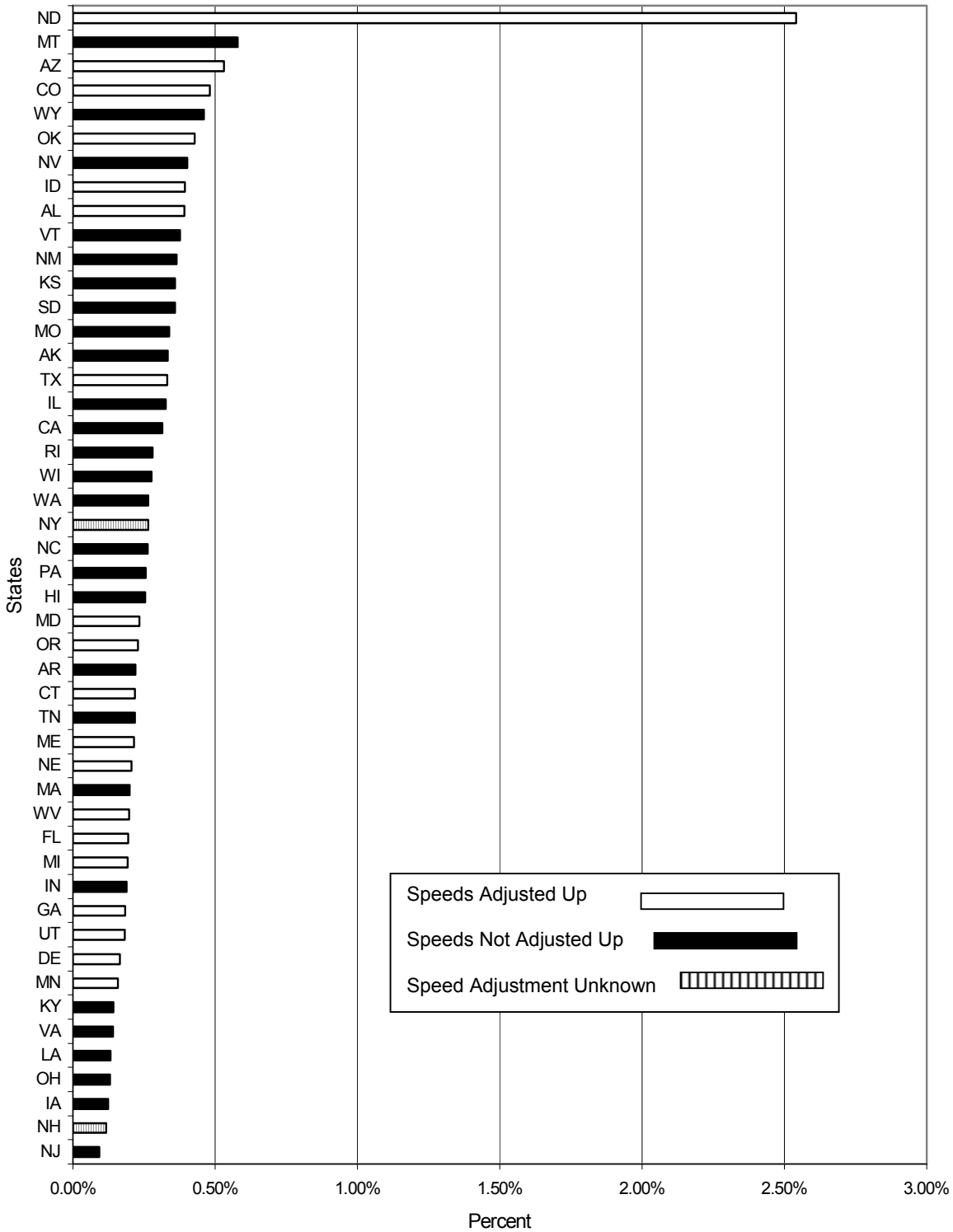


Figure 3. Speed-Related Fatalities as a Percentage of Daily Vehicle Miles Traveled



2.4.3 Question 3

The third survey question asked what department of state government is most directly responsible for enforcement of speed limits on state highways. All forty-eight states returning results responded to this multiple-choice question. A summary of all responses is shown in Table 5 below. Individual results reported by each state are shown in Appendix B.

Table 5. Speed Enforcement Agency

State	DPS	DOT	State Police falls under DPS	State Police or Highway Patrol	Other
Total	9	1	5	31	2
Percent	18.8	2.1	10.4	64.6	4.2

Sixty-five percent of the respondents indicated the state police is the agency primarily responsible for speed enforcement. Several states checked "other" and wrote in highway patrol or state patrol. These responses were grouped together for purposes of summarizing these results and will be collectively referred to as State Police. An additional nine states indicated the department of public safety as responsible and five states reported that the state police falls under the umbrella of the department of public safety.

Only one state, Wisconsin, reported that speed enforcement is the responsibility of the Wisconsin Department of Transportation. The Wisconsin State Patrol enforces speed limits; however, it is a division of the Department of Transportation. Two states checked the "Other" category—one indicating "municipal police" and the second reporting "those agencies with jurisdiction for the roadway—state, county, or local."

2.4.4 Question 4

The fourth survey question asked participants what methods they use to enforce speed limits. Forty-seven of the forty-eight states returning results responded to this question. A summary of the responses is shown in Table 6 below. Individual responses reported by each state are listed in Appendix B.

Table 6. Methods of Enforcement

State	Mobile Patrol Units	Stationary Patrol Units	Aerial Surveillance	Unmarked Patrol Units	Automated Enforcement	Other
Total	47	44	35	35	6	2
Percent	100.0	93.6	74.5	74.5	12.8	4.2

As might be expected, the most frequently reported response was mobile patrol units. All forty-seven participants who answered question 4 gave this response. Mobile units are the mainstay of every traffic enforcement agency. This response was followed in frequency by stationary patrol units with 44 responses and aerial surveillance and unmarked patrol units each with 35 responses. Several participants reporting they use aerial surveillance indicated they seldom use this method anymore due to the expense involved. The two "other" responses were motorcycle patrols and vehicle-mounted radar.

Automated speed enforcement was reported by only six states—Indiana, Minnesota, North Dakota, Ohio, Oregon, and Rhode Island. Use of automated methods for enforcement purposes typically refers to the use of technology to enforce traffic laws. For the most part, this practice is being directed toward identifying red light runners. Automated speed management is less prevalent but functions in a similar fashion. Speed enforcement systems are triggered when a vehicle exceeds the posted speed limit by a predetermined amount. Radar or laser speed detection devices record the speed and a still or video camera provides vehicle identification while recording the time, date, and location. Sanctions vary by state. "A few states treat automated enforcement citations just like parking tickets in that the registered owner is liable. Similarly, just as parking tickets do not result in points and are not recorded on a driver's record, many states do not assess points or make a record of automated enforcement citations." [4]

The limited use of automated enforcement may be due to the absence of well-drafted state statutes authorizing use of this practice. The Federal Highway Administration (FHWA) identifies fifteen states with statutes addressing automated enforcement on its website at http://safety.fhwa.dot.gov under the section *Guidance for Using Red Light Cameras.* It is surprising that only one of the six states reporting the use of automated speed enforcement is listed below as having state statutes.

State Statutes:

1. California Vehicle Code- California Vehicle Code §§ 210, 21455.5, 21455.6, 40518, 40520 (2003).

2. Colorado Revised Statutes - Colorado Revised Statutes. § 42-4-110.5 (2002).

3. Delaware Code Annotated - Delaware Code. Ann. title 21 § 4101(d) (2002).

4. Official Code of Georgia Annotated - Georgia Code. Ann. § 40-6-20 (2002).

5. Illinois Compiled Statutes Annotated - 625 Illinois Comp. Stat. Ann. 5/1-105.5, 5/11-306 (2002).

6. Annotated Code of Maryland - Maryland Code Annotated Transportation § 21-202.1 (2002).

7. Nevada Revised Statutes Annotated - Nevada Revised Statutes Ann. § 484.910 (2002).

8. New Jersey Annotated Statutes – New Jersey Stat. Ann. § 39:4-103.1 (2002).

9. New York Consolidated Laws Service – New York Vehicle & Traffic Law § 1111-a (2002).

10. General Statutes of North Carolina – North Carolina Gen. Stat. § 160A-300.1 (2002).

11. Oregon Revised Statutes - Oregon Rev. Stat. §§ 810.434 -36, 438 - 439 (2001).

12. Pennsylvania Consolidated Statutes - 75 Pennsylvania C.S. §§ 102, 3116 (2002).

13. Utah Code Annotated -Utah Code Ann. § 41-6-52.5 (2002).

14. Code of Virginia - Virginia Code. Ann. §§ 46.2-819.1, 833.01 (2002).

15. Wisconsin Statutes - Wisconsin Stat. § 349.02 (2002).

The website also provides a link to National Committee on Uniform Traffic Laws and Ordinances. "The National Committee on Uniform Traffic Laws and Ordinances is a private, non-profit membership organization dedicated to providing uniformity of traffic laws and regulations through the timely dissemination of information and model legislation on traffic safety issues." The Automated Traffic Law Enforcement Model Law can be found at www.ncutlo.org/autoenforce622.htm. The National Committee on Uniform Traffic Laws and Ordinances can be contacted at 107 S. West Street, #110, Alexandria, Virginia, 22314 or by E-mail at: ncutloceo@rica.net. Any state considering the use of automated enforcement may want to investigate this resource.

2.4.5 Question 5

Question five asked if there are special speed and/or lane restrictions for commercial vehicles? All forty-eight participants responded to this question. A summary of the responses is shown in Table 7 below. Individual responses reported by each state are listed in Appendix B.

Table 7. Commercial Vehicle Speed and/or Lane Restrictions

State	Yes Restrictions	No Restrictions
Total	25	23
Percent	52.1	47.9

Twenty-five of the forty-eight participants reported having speed and/or lane restrictions for commercial vehicles. Only twenty-three states provided a description of the type of restrictions that are in effect. Table 8 shows the responses of those states indicating they have speed and/or lane restrictions.

Table 8. Commercial Vehicle Restrictions

State	If yes, what are the restrictions?
AR	No more than 65 mph at all times on state highways.
AZ	Two locations where there are restrictions due to road grades.
CA	May not exceed 55 mph on a highway (see attachment).
CO	Restrictions on some steep grades.
FL	Lane restrictions for commercial vehicles on Interstate 75.
GA	Metro area multi-lane highways - trucks must only use right two lanes.
ID	Maximum speed of 65 mph on vehicles with 5 axles or more at 26,000 lbs gross.
IL	55 mph.
IN	3rd lane violation on the interstate.
MA	Left lane prohibition when indicated.
MD	Lower truck speed limits at only a few locations. Trucks prohibited from HOV lanes and certain other (left most or two left most) lanes.
MI	55 mph for trucks on 65-70 mph freeways, restricted to right two lanes on multi-lane freeways except to pass.
MT	60 mph on primary and secondary.
NC	Three axle trucks restricted from the left lane.
NJ	Trucks not allowed in the left lane of travel.
OH	Trucks 55 mph, cars 65 mph.
OR	Must be in slow lane except when passing.
RI	Cannot operate in high-speed lanes.
TN	There are lane restrictions only when posted in designated areas; commercial vehicles must "stay in the right lane."
UT	Some areas posted for no commercial vehicles in left lane.
VA	Lane restrictions.
WA	Reduced speed 60 mph in a 70 mph zone. No 10,000+ lb vehicles in the left
WV	Lane restrictions on grades, speed restriction on turnpike.

The commercial vehicle restrictions reported above fall into three different categories—a general reduction in speed limit, restrictions from operating in the left most lane(s), and restrictions in speed and/or lanes of travel due to road grades. The goal of all of these restrictions is to improve traffic safety conditions on state highways. Table 9 on the following page shows the number of large trucks involved in fatal crashes by state for 1996 through 2001. The percent changes from 1996 to 2001 and 2000 to 2001 also are shown. Those states indicating they have speed and/or lane restrictions for commercial vehicles are identified in the column marked CMV Restrictions.[5]

Table 9. Large Trucks Involved in Fatal Crashes

State	1996	1997	1998	1999	2000	2001	Carrier/Motor Vehicle (CMV) Restrictions	Percent Change 1996 to 2001	Percent Change 2000 to 2001
AK	7	7	1	5	4	10		43%	150%
AL	141	167	149	144	153	144		2%	-6%
AR	98	113	105	92	109	102	X	4%	-6%
AZ	79	72	98	108	100	79	X	0%	-21%
CA	366	369	365	319	362	365	X	0%	1%
CO	55	75	52	60	65	85	X	55%	31%
CT	32	23	29	22	36	27		-16%	-25%
DE	16	16	18	10	21	11		-31%	-48%
FL	279	284	313	327	302	335	X	20%	11%
GA	211	218	197	220	208	228	X	8%	10%
HI	11	3	4	3	2	7		-36%	250%
IA	86	75	81	99	84	76		-12%	-10%
ID	39	30	23	25	26	32	X	-18%	23%
IL	147	166	186	193	163	180	X	22%	10%
IN	160	160	180	191	167	133	X	-17%	-20%
KS	62	81	78	82	79	78		26%	-1%
KY	92	108	99	94	97	95		3%	-2%
LA	89	124	142	120	113	126		42%	12%
MA	34	38	38	35	46	28	X	-18%	-39%
MD	66	88	66	57	67	76	X	15%	13%
ME	13	21	21	25	24	27	X	108%	13%
MI	159	127	146	132	147	123	X	-23%	-16%
MN	65	88	79	86	77	60		-8%	-22%
MO	150	139	155	155	165	129		-14%	-22%
MS	88	99	108	111	118	85		-3%	-28%
MT	19	24	18	15	24	27	X	42%	13%
NC	166	195	232	190	173	186	X	12%	8%
ND	10	12	8	18	11	11		10%	0%
NE	48	46	40	58	52	61		27%	17%
NH	12	12	10	9	10	14		17%	40%
NJ	82	80	71	59	88	71	X	-13%	-19%
NM	53	51	44	48	45	48		-9%	7%
NV	40	27	34	41	36	43		8%	19%
NY	150	144	130	159	153	133		-11%	-13%
OH	205	203	187	201	189	161	X	-21%	-15%
OK	89	97	105	82	107	83		-7%	-22%
OR	58	77	67	48	59	52	X	-10%	-12%
PA	184	193	178	207	177	167	X	-9%	-6%
RI	6	2	3	9	1	5	X	-17%	400%
SC	98	89	118	124	120	106		8%	-12%
SD	18	15	14	18	22	22		22%	0%

State	1996	1997	1998	1999	2000	2001	Carrier/Motor Vehicle (CMV) Restrictions	Percent Change 1996 to 2001	Percent Change 2000 to 2001
TN	165	130	133	168	157	129	X	-22%	-18%
TX	411	411	425	385	447	459		12%	3%
UT	33	47	49	41	39	33	X	0%	-15%
VA	118	120	115	107	112	112	X	-5%	0%
VT	9	15	10	8	8	6		-33%	-25%
WA	69	77	70	59	64	56	X	-19%	-13%
WI	94	80	90	74	98	95		1%	-3%
WV	58	52	40	50	48	48	X	-17%	0%
WY	11	24	30	25	18	23		109%	28%
Total	4,755	4,917	4,955	4,920	4,995	4,793	26		

Source: Federal Motor Carrier Safety Administration, October 2002. [5]

In looking at the number of large trucks involved in fatal crashes, it appears there are fewer crashes in those states with speed and/or lane restrictions compared to those without. In 2001, when the number of trucks involved in accidents is taken as a percentage to the daily vehicle miles traveled for each state, the average percent for those with restrictions is 0.0015% as compared to 0.0044% for those without restrictions.

2.4.6 Question 6

Question six asked participants what speed reduction practices they have implemented to help reduce speeding. All forty-eight states returning results responded to this question. A summary of the responses is shown in Table 10 below. Individual responses reported by each state are listed in Appendix B.

Table 10. Speed Reduction Practices

State	Public Education Programs	Speed Feedback Indicators	Vehicle Messaging Systems	Pavement Markings	Decoy Radar	Other, specify
Total	48	33	22	18	10	21
Percent	100.0	68.8	45.8	37.5	20.8	43.8

"Public education programs" was reported by all forty-eight states responding to the survey. This was followed in decreasing frequency by speed feedback indictors, vehicle messaging systems, pavement markings, and decoy/drone radar. There were a surprisingly large number of participants (43.8%) that reported responses in the "other" category. The responses are shown in Table 11 on the following page.

Table 11. "Other" Speed Reduction Practices

State	Speed Reduction Practices
AK	Traffic enforcement
AR	Enforcement
AZ	Transverse rumble strips; unmanned police vehicles parked within right of way; enforcement
CA	In view patrol and vehicle mounted radar
CO	Enforcement
IL	Tactical Enforcement Program
MD	Speed cameras – warnings only
ME	Traffic calming
MI	Extra patrols
MN	Targeted enforcement
NC	Enforcement contacts
NE	Selective enforcement
NH	Enforcement, public service announcements
NJ	Laser
OH	Text messaging over highways, visible presence of patrol car on road as deterrent
PA	Special speed enforcement programs
TN	Active patrol and visibility
VT	Special enforcement teams
WA	Enforcement
WV	Enhanced enforcement patrols
WY	Speed limit signs

Active enforcement was reported by seventeen of the twenty-one states reporting "other" responses. The intent of the question was to discover the practices being used to supplement routine patrol efforts and identify which are most effective. Consequently, neither routine nor targeted enforcement efforts were listed as multiple-choice responses for this question. It was assumed that all states are involved in some form of active enforcement. The fact that such a large number participants wrote this response on the survey highlights the importance of active, visible enforcement patrols to these states.

2.4.7 Question 7

Question 7 follows up on the responses to question 6 in that participants are asked to indicate which of the practices they use to help reduce speeding is the most effective. Forty-four of the forty-eight states returning results responded to the question. Although asked to report only one response, six states gave two "most effective" practices so the number of responses is more than forty-four as would be expected. A summary of the responses is shown in Table 12 on the following page. Individual responses reported by each state are listed in Appendix B.

Table 12. Most Effective Enforcement Practices

State	Public Education	Speed Feedback Indicators	Vehicle Messaging System	Pavement Markings	Decoy Radar	Unknown	Other
Total	10	6	4	1	0	5	23
Percent	22.7	13.6	9.1	2.3	0.0	11.4	52.3

It should be kept in mind that the question of which of these practices is "the *MOST* effective" is very subjective. In the majority of cases, the response to this question was not based on actual data and may not be the viewpoint of the agency queried but rather is the opinion of the individual completing the survey.

Public education proved to be the most popular multiple-choice response but was reported by only ten states (22.7%) followed by speed feedback indicators (13.6%), and vehicle messaging systems (9.1%). As with question 6, the prevalent response was "other," reported by twenty-three states. Of the twenty-three responses, some form of enforcement contact was reported by twenty states. There were many different variations on the idea of enforcement with the main focus on visibility and concentrated or targeted enforcement programs. Table 13 below shows the individual responses.

Table 13. Most Effective Enforcement Practices - Detail

State	Most Effective Enforcement Practices Other Responses and Comments
AK	Traffic enforcement
AR	Enforcement
AZ	Enforcement
CA	In-view patrol and vehicle mounted radar
CO	Enforcement
DE	Police enforcement
IA	None, speed continues to increase
IL	Tactical Enforcement Program
LA	Enforcement
MA	Targeted/wave enforcement
ME	Traffic calming, but speeding continues to be a problem
MI	Extra patrols
MN	Targeted enforcement
NC	Enforcement contacts
NJ	Laser
NV	High visibility enforcement
OH	Visibility, presence of patrol vehicle on highway
PA	Speed enforcement programs
TN	Active patrol and visibility
VT	Special enforcement teams
WA	Enforcement
WI	Special emphasis concentrated enforcement patrols
WV	Enhanced enforcement patrols
WY	Speed limit signs

2.4.8 Question 8

The eighth survey question dealt with penalties imposed for speeding. States were asked to give the fine, points, jail time, and licensing action associated with a first-time speeding offense. The second part of the question asked whether speeding penalties vary based on the number of miles per hour over the limit. Forty-seven of the forty-eight states responded to the question. A summary of the responses is shown in Table 14 below. Individual responses reported by each state are listed in Appendix B.

Table 14. Type of Sanctions Imposed

State	Fines	Points	Jail
Total	43	37	7
Percent	91.5	78.7	14.9

Forty-three of the states responding to question 8 indicated that fines are imposed for speeding and gave information on the nature of the fine. Four states responded that information on fines was unknown to the person completing the survey but they were able to provide information on points and/or jail time. Comments reported by participates indicate there are many variables involved in assigning the value of the fine. Some of the variables involved are the speed of the violator, speed limit in effect, jurisdiction where the offense occurred, court discretion as well as additional administrative and/or court fees and head injury surcharges. The question asked for fines to be expressed as "not more than____" however, the manner in which some states calculate fines does not allow for an upper limit without more specific information.

The variability in fines also is validated by the responses to the second part of the question. All forty-eight states returning results responded to this part of question 8. Table 15 on the following page shows that ninety-eight percent of participants report that penalties vary based on the number of miles per hour over the limit. Consequently, the question should have specified the number of miles per hour over the limit and the particular speed zone in order to standardize the responses.

Table 15. Variable Speeding Penalties

State	Penalty Varies Yes	Penalty Varies No
Total	46	2
Percent	97.9	4.2

Figure 4 shows the distribution of speeding fines for those reporting specific values. The average and median fines are "not more than" $222 and $192, respectively.

Figure 4. Speeding Fines

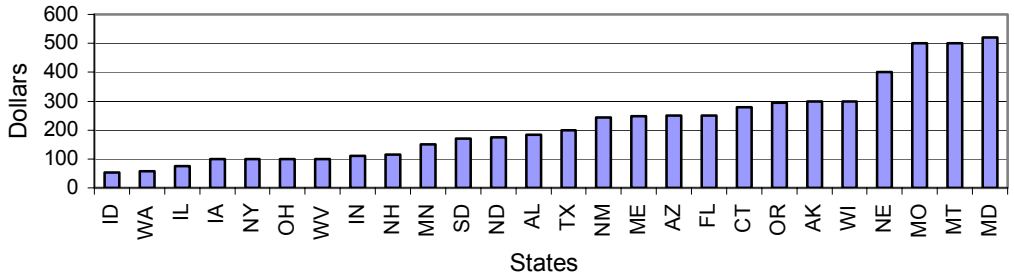
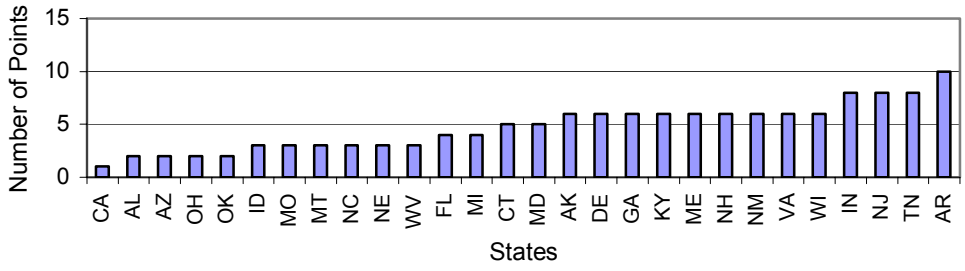


Figure 5 below shows the distribution of points given for speeding. Points are typically given to drivers as a mechanism for identifying high-risk drivers. The number of points assigned should relate to the severity of the infraction. Once a threshold number of points is reached, an individuals driving privileges can be either suspended or revoked. It is difficult to know if the states that left the points section blank meant that no points are assigned for a first-time speeding offense or if the information was unknown to the person completing the survey. As shown below, the average and median number of points assigned for those reporting a value other than zero are "not more than" 4.8 and 5.0, respectively. Eleven states—Hawaii, Iowa, Kansas, Louisiana, Massachusetts, Minnesota, Oregon, Rhode Island, Texas, Washington, Wyoming—do not have an overall point system in effect.

Figure 5. Points Given for Speeding



Only seven of the forty-seven states providing results for question 8 reported that jail time may be given for a first-time speeding offense. The responses are shown below.

Table 16. Jail Time

State	Number of Days
AR	variable
MO	15
MT	2
NM	90
OH	3
OK	30
SD	30

In reviewing the results for question 8, it is interesting to examine the speed-related accident rates for those states reporting the stiffest sanctions. If sanctions are intended to act as a deterrent to speeding, the speed-related accident rates for those states with the highest penalties should be lower. The results from this survey do not support this theory. Maryland, Montana, Missouri, and Nebraska all have maximum fines of greater than $300. Looking back at Figure 2, three of these four states have higher than the median (33.3%) speed-related fatalities as a percentage of total traffic fatalities rates. Similarly, for speed-related fatalities as a percentage of daily vehicle miles traveled (Figure 3), three of the states are at or above the median value of 0.23%. The limited data sample and not knowing when the sanctions were imposed make it difficult to draw conclusions. This leads one to the question, "Were the fines instituted because of the high crash rates; or do the high crash rates occur in spite of the high fines?"

Lastly, only seven states—California, Kentucky, Maryland, North Carolina, North Dakota, New Mexico, and Tennessee—reported that license suspension is a possibility for a first-time speeding offense. The length of suspension varied from six to 365 days. Only two states—California and Maryland—reported that a driver's license revocation is an option. The lengths of time reported were "variable" or 6 days, respectively. It is apparent that suspension or revocation are unlikely unless that speeding offense is extreme.

2.4.9 Question 9

Question nine asked whether drivers are allowed to escape or reduce penalties for exceeding the posted speed limit by attending a defensive driving or traffic safety class. Forty-seven of the forty-eight states returning results responded to this question. A summary of the responses is shown in Table 17 below. Individual responses reported by each state are shown in Appendix B.

Table 17. Reduction in Speeding Sanctions

State	Escape Penalty Yes	Escape Penalty No
Total	30	17
Percent	63.8	36.2

The goal of a defensive driving or traffic safety class is to decrease the likelihood of the participant repeating the offense for which the points were received. Thirty of the forty-seven states (63.8%) responding to this question offer the incentive of escaping or reducing penalties for attending the these classes.

2.4.10 Question 10

The goal of the tenth survey question was to identify information showing the effectiveness of sanctions imposed for speeding. Forty-six of the forty-eight states returning results gave a response for this question. A summary of the responses is shown in Table 18 below. Individual responses reported by each state are in Appendix B.

Table 18. Effectiveness of Speeding Sanctions

State	Yes, Data Available	No, Data Not Available
Total	3	43
Percent	6.5	93.5

Unfortunately, only three states—Kentucky, Tennessee, Washington—indicate they have reports or data demonstrating whether or not the sanctions for exceeding the speed limit are effective.

The Kentucky Transportation Center (KTC), a part of the University of Kentucky School of Engineering, serves as the focal point in the state for interdisciplinary transportation research. In 1998, KTC conducted a study whose primary objectives were to: a) summarize the characteristics of drivers in Kentucky involved in traffic crashes and b) evaluate and recommend improvements to Kentucky's driver license point system. Similar to most other states, a point system is used to identify high-risk drivers. In order to do this effectively, the number of points assigned to each violation should be associated with the relative severity of the violation. By assigning points to all moving violations, of which speeding is the most common, interventions can be directed toward those who are high-risk drivers. The effectiveness of the point system at reducing speeding is related to the subsequent intervention with those identified as high-risk. Dramatic reductions in violations and crashes were noted after various interventions. So, although the point system did not directly act as a deterrent, the resulting intervention required of individuals reaching a threshold was effective in reducing speeding. [6]

Tennessee Highway Patrol reported having data showing the effectiveness of sanctions but did not have information available at this time as they are in the process of updating their databases.

The Washington State Patrol also reported "Yes" to question 10 and referred to the Washington Department of Transportation's Speed Enforcement Report. The report is published quarterly showing the speed data collected by the Automated Data Collection Section at the Transportation Data Office. The entire report is available at

www.wsdot.wa.gov/mapsdata/tdo. Although the report does not deal directly with sanctions for speeding, it shows the ever-increasing volume of vehicles exceeding posted speed limits. Based on the first quarter 2003 sample, anywhere from 61% to 65% of vehicles observed on 60 and 70 mph highways are exceeding the posted speed. The numbers have continued to increase over the past three years. This would seem to indicate that current sanctions have had minimal effective in reducing speeding.

2.4.11 Question 11

The eleventh survey question asked participants whether speeding is considered a significant safety hazard. Forty-seven of the forty-eight states returning results responded to this question. A summary of the responses is shown in Table 19 below. Individual responses reported by each state are shown in Appendix B.

Table 19. Safety Hazard

State	Yes, Speeding is a Safety Hazard	No, Speeding is not a Safety Hazard	Other
Total	42	4	1
Percent	89.4	8.5	2.1

As with question 7, it should be kept in mind that the question of whether or not speeding is considered a significant safety hazard is very subjective. In majority of cases, the response to this question was not based on actual data and may not be the viewpoint of the agency queried but rather may be the opinion of the individual completing the survey.

Four states—Alaska, Colorado, Michigan, and New Hampshire—reported they do not consider speeding a safety hazard. Michigan indicated that speeding was not a safety hazard in and of itself, but it is when combined with other driving behaviors. Speed-related fatalities as a percentage of total traffic fatalities for these states are 41.2%, 46.3%, 23.1%, and 20.4%, respectively. The median value for all the states is 33.3%. The total number of speeding-related traffic fatalities in each of these states in 2001 was Alaska - 35, Colorado - 341, Michigan - 307, and New Hampshire - 29.

One state—Utah—reported "Other" for this question. The notation was made that speed contributes to the severity, not frequency of the crashes. Utah had 83 speed-related fatalities in 2001 for a speed-related fatality per total traffic fatalities rate of 28.4%. This is below the median value for all the states, which is 33.3%.

2.4.12 Question 12

The last question on the survey asked participants if any special action has been taken to implement stricter enforcement of speed limits. All forty-eight states that reported results responded to this question. A summary of the responses is shown in

Table 20 on the following page. Individual responses reported by each state are shown in Appendix B.

Table 20. Stricter Enforcement

State	Action Taken Yes	Action Taken No
Total	35	13
Percent	72.9	27.1

The majority of respondents (72.9%) reported that special action has been taken for stricter enforcement. The actions taken by those 35 states are shown in Table 21 below.

Table 21. Action Taken for Stricter Enforcement

State	Actions Taken for Stricter Enforcement
AK	Yes, but no explanation provided.
AR	Selective traffic enforcement projects
AZ	Special enforcement areas publicized, additional overtime for patrol units
CA	The California Highway Patrol places continual emphasis on enforcing speed limits involving special task forces and weekly road share days. Road share days involve all personnel at certain commercial inspection facilities teaming up to curb CMV violations
CO	Media coverage, visible enforcement
CT	Non-traditional police vehicles for enforcement
DE	Yes, but no explanation provided.
FL	Periodic selective enforcement details
GA	HEAT Team (see brochure) special speed enforcement grants
ID	In the past have fielded STEP (selective traffic enforcement program) teams, but not currently
IL	Hire-back programs. Funding is through the Illinois Department of Transportation.
KS	Special traffic enforcement, selective enforcements
KY	Federal funding provides for additional overtime enforcement efforts
LA	Enhanced enforcement by increased patrols through federal funds
MA	Rational Speed Demonstration Project; Speedwatch
MD	Legislation has been passed, but not signed into law, that would allow, upon local authorization, speed cameras in residential areas and school zones. Numerous public education/enforcement campaigns.
ME	Yes, new law went into effect significantly increasing fines.
MN	We have conducted a statewide speed enforcement campaign entitled *Slow Down. Or Pay the Price.* During this time, billboards, radio, and TV ads were aired and there was speed enforcement statewide for nearly two weeks.
MT	We assign officers to crash prevention units. They enforce speed laws on a stretch of highway for 4-5 days, usually 4-5 officers at a time
NC	Speeding in a highway work zone is $250 and $100 court cost. However, courts reduce most speeds and judges are reluctant to assess such a large fine.
ND	Construction Zone Enforcement Program (overtime hours for trooper to work in
NH	Highway safety grants (enforcement)
NJ	Use of laser, increased patrols during the holidays
NM	In problem segments only

State	Actions Taken for Stricter Enforcement
NV	We conduct special enforcement details for speed in high accident areas where we have identified speed as a contributing factor. We have demonstrated that an increased presence and enforcement of “Hazardous Moving” violations has greatly reduced our accidents.
OH	Holiday weekend enforcement blitzes
OK	Education, media, brochures, saturation patrol, grant to local police
SD	Public education, road signs
TN	Our state troopers participate in a STEP (selective traffic enforcement program) federally funded by the National Highway Traffic Safety Administration)
TX	Federally-funded selective traffic enforcement programs (STEP) grants to pay troopers overtime to work
VA	Legislation passed in 2003 allows for the establishment of safe highway corridors. Designated highways/segments can carry higher fines for speed violations.
VT	Yes, but no explanation provided
WA	Constant statistical analysis of Washington State DOT speed report and collision causation - data driven enforcement
WI	Increased penalty for speeding in work/safety zones
WY	Public information awareness via radio, television

Approximately half of the states responding implemented stricter enforcement by means of targeted enforcement programs on designated highway segments and during holiday weekends. As indicated by several states, funding for extra patrols often comes through federal grants. The Section 402 Program of the Transportation Equity Act for the 21st Century (TEA-21) provides funds to all states for performance-based highway safety programs. Funding of $932.5 million is provided over a 6 year period, 1998 to 2003. The federal grants support planning to identify highway safety problems, set goals and performance measures for highway safety improvements, provide start-up money for new programs, give new direction and support to existing safety programs, and fund analyses to determine progress in improving safety. At least 40 percent of these funds are to be used by states and communities to address local traffic safety problems. A state becomes eligible for these formula grants by submitting a Performance Plan, which establishes goals and performance measures to improve highway safety in the state, and a Highway Safety Plan, which describes activities to achieve those goals. [7]

Several states reported utilizing federal funding to implement a Selective Traffic Enforcement Program (STEP). The STEP model employs publicized and intensified traffic enforcement at specific locations. Selection of the locations and the types of traffic offenses is based on an above-average number of crashes with contributing factors that are the result of particular types of offenses. This model has proven effective in addressing different areas of highway safety, for example, driving under the influence (DUI), speeding, occupant restraints. [7]

The effectiveness of the STEP model was seen with Milwaukee’s *Aggression Suppression* Program. In 1998, the U.S. Department of Transportation awarded the first federally-funded Aggressive Driving Demonstration Project grant to the Milwaukee Police Department. The National Highway Traffic Safety Administration (NHTSA) defines aggressive driving as "the operation of a motor vehicle in a manner that

endangers or is likely to endanger persons or property." Speeding is considered aggressive driving. Results of the program "demonstrated the effects of targeted enforcement. More citations were issued for aggressive driving types of violations (that is, not just speeding tickets were issued); motorist behavior changed at targeted intersections; and crash reduction was demonstrated citywide, with greater reductions on corridors with targeted enforcement. Future programs of this type would be enhanced if they could generate more visible and more focused media attention." [8]

Details on how to implement an Aggressive Driving Enforcement Program to help reduce speeding can be found at http://www.nhtsa.dot.gov/people/injury/enforce/**.**

Some states identified specific enforcement campaigns and provided samples of the printed materials circulated to the public. Georgia's *H.E.A.T.* (Highway Enforcement of Aggressive Traffic) program is an enforcement and education program sponsored by the Governor's Office of Highway Safety. Three officers from each of six counties have come together to form a task force to target speeding and impaired driving in the metropolitan Atlanta area.

Massachusetts' enforcement project is called *Speedwatch,* which is a community-based speed management program. In 2002, twenty Massachusetts communities received Governor's Highway Safety Bureau grants to participate in the program. The community is provided with a sample news release describing the program and providing safety related facts. This project is part of the Rational Speed Demonstration Project funded through the U.S. Department of Transportation.

Minnesota's Office of Traffic Safety implemented a statewide speed enforcement campaign called *SLOW DOWN. OR PAY THE PRICE*. A powerful ad campaign was launched in 2002 addressing traffic safety issues. The campaign included television and radio commercials, as well as outdoor ads, focusing on the consequences of not wearing seat belts, driving impaired, and driving aggressively. The campaign was supported with paid media and pro bono public service advertising.

Figure 6. Minnesota Ad Campaign

The last program mentioned was Vermont's Corridor Accident Reduction Enforcement (C.A.R.E.) Team. The C.A.R.E. Team, consisting of a minimum of twenty troopers spread statewide, dedicates their time and skills to addressing safety issues as well as individual station identified problems and enforcement issues. Their mission is to: 1) reduce automobile crashes and fatalities using high visibility, education, and strong enforcement efforts; 2) combat drug trafficking and other criminal activity; and 3) increase enforcement aimed at commercial truck traffic. Clearly, this program is needed as Vermont ranks 10th, out of the forty-eight states responding to the survey, in speed-related fatalities as a percentage of daily vehicle miles traveled. [9]

2.5 CONCLUSIONS

Fifty-two individuals, representing forty-eight states, participated in the Speed Limits and Speed Enforcement Practices Survey. The results show there is no clear consensus on how speed limits are established; however, enforcement practices were found to be consistent throughout most areas of the country. The summary of results shows the following practices to be common among the majority of states:

- Three or more different factors are used to determine speed limits on state highways.
- Of the following factors: roadway design, accident history, road type and surface, 85th percentile determination, and traffic volume, none was found to be predominant.
- Forty-four percent of states have adjusted speed limits upward as a result of vehicles exceeding posted speed limits. These states showed no significant increase in speed-related fatalities in 2001.
- The state police/highway patrol is the primary traffic law enforcement agency on all freeways and state highways in rural areas in seventy-five percent of the states.
- Mobile and stationary patrol units are the main method of enforcing speed limits. Automated methods of enforcement are used by only 13% of states, possibly due to the lack of statutes authorizing the use of these practices.
- Commercial vehicle speed and/or lane restrictions are in effect in half of the states queried. During 2001, there were fewer speed-related fatalities in those states with restrictions.
- Public education programs, reported by 100% of the states, are the most common speed reduction practices in use. This was followed in frequency by speed feedback indicators (69%) and vehicle messaging systems (46%).
- No single speed reduction practice is considered the "most effective" means of reducing speeding; however, enforcement with a focus on visibility and concentrated or targeted enforcement is seen as a primary deterrent.

- Greater than 75% percent of states give fines and points for exceeding posted speed limits. The average fine is "not more than" $222. The average number of points given is "not more than" 4.8.

- Jail time, license suspension, and/or revocation are rare for a first-time speeding offense.

- No state has data available that directly addresses the effectiveness of speeding sanctions.

- The majority of states (89%) consider speeding a safety hazard but only 73% have taken action for stricter enforcement. The most frequently reported action taken is targeted enforcement on designated highway segments and targeted enforcement on holiday weekends.

Areas for further inquiry, identified by this survey, include developing a more widely accepted method for setting speed limits to ensure *consistently* safe and efficient use of our nation's highways. From the enforcement perspective, information needs to be gathered to determine the effectiveness of different enforcement practices. Additionally, the application of sanctions for exceeding posted limits will act *effectively* as a deterrent to speeding and will support enforcement efforts. Knowing what *works* is essential to making the most of limited budget dollars.

3.0 LITERATURE REVIEW

3.1 PURPOSE

The purpose of this literature review is to examine current practices in setting and enforcing speed limits. "Managing speeds through speed limits requires a system of speed laws and a process for establishing reasonable speed limits as well as enforcement, sanctions, and public education, ideally all working together." [10] As such, the main areas of focus for this review include factors influencing speeding, safety implications of higher speed limits, techniques used to establish speed limits, new developments in speed enforcement, and the economic impact that speeding has on society. The review targets information that would assist in the decision-making process regarding the efficacy of raising speed limits and/or increasing enforcement efforts on Arizona highways.

3.2 METHODS

This review includes an examination of websites of those state agencies involved with setting and enforcing speed limits. The goal was to identify innovative new practices in use by any of the fifty states. This was followed by an extensive examination of books and journal articles as well as websites associated with the transportation industry. The most productive searches were of databases administered by the National Technical Information Service (NTIS), the Transportation Research Board (TRB), and the Transportation Research Information Service (TRIS). A glossary of terms prepared by the National Highway Traffic Safety Administration is included as Appendix C to serve as a reference to the reader when reviewing literature cited in this report.

3.3 STATE DEPARTMENTS OF TRANSPORTATION

Each of the 50 state departments of transportation websites were canvassed for documentation on the state's traffic safety enforcement practices as they relate to speeding. As the response, "public education programs" was the most frequently reported practice implemented to help reduce speeding it seemed reasonable to expect that state websites would be a good place to find information of speeding and speed enforcement practices. This is particularly true as the state has primary responsibility for enforcement of speed limits on state highways.

This reviewer found that the majority of states are not taking advantage of their Internet websites to disseminate information on speeding and speed enforcement practices. There are a few states—Iowa, Minnesota, Utah, Wisconsin—that have very informational sites and/or reports, capable of being downloaded from the website, that deal with traffic safety, speed limits, and speeding. Unfortunately, for most states this information tends to be spread across several websites, most commonly the department of

transportation, department of public safety/state police and/or the governor's highway safety association. This makes getting a clear, concise picture of the state's traffic safety efforts difficult. Surprisingly, several state departments of transportation websites were lacking simple search engines to facilitate locating information on their sites. This results in a hit-or-miss approach to finding desired information. In only a few cases, where the information was scattered among several websites, were their hyperlinks between sites that made it easier for users to quickly access all available information.

The more comprehensive sites include information dealing with the following subjects: 1) rationale for setting speed limits, 2) frequently asked questions, 3) maps of state roads and their posted speed limits, 4) legislation, 5) accident statistics, and 6) news releases dealing with current projects and enforcement efforts. Minnesota Department of Transportation was one of the best examples at www.dot.state.mn.us/speed/index.html, having the majority of information accessible from a single page on the website. Wisconsin Department of Transportation is another well-organized site www.dot.wisconsin.gov/safety/index.htm also having the majority of information accessible from a single web page. Utah disseminates similar traffic information in a thorough but less organized manner through both the Department of Transportation www.udot.utah.gov/ops/traff_saf/traff_saf.htm and Department of Public Safety http://highwaysafety.utah.gov/.

The Iowa Highway Safety Management System (SMS), a partnership of the Iowa Department of Transportation and the Governor's Traffic Safety Bureau, handles information on speed limits and speed enforcement in a different manner. Iowa's Safety Management System hosts the Speed Limit Task Force that produces a comprehensive report entitled *Update Report on Speed Limits in Iowa.* The report summarizes the subjects listed above in a single report that can be obtained at www.iowasms.org/speedlimittaskforce/speed2002_full.pdf.

In reviewing the many websites, no innovative new practices in the areas of speed limit setting or speed enforcement were identified. Additionally, the amount of information available on traffic safety practices ranged from none to an extensive amount of information that can be used to assist in highway design, planning, and traffic law enforcement. This does not necessarily mean the information is not available from the state. Rather, the information is not readily accessible from their Internet websites using routine search techniques.

3.4 RELATED RESEARCH

This literature review was targeted at speed and speed management practices as they relate to the state highway system. Although a number of studies on this subject were found, two documents standout as exceptional and comprehensive reviews on the subject. Both reports published in 1998 are likely the result of renewed interest in speed management sparked by repeal of the National Maximum Speed Limit by Congress in

December 1995. This action allowed states the right to set speed limits without the threat of losing federal highway funds.

The first of the two reports is FHWA-RD-98-154, *Synthesis of Safety Research Related to Speed and Speed Management*, prepared by Jack Stuster, Zail Coffman, and Davey Warren. This report is available at www.tfhrc.gov/safety/speed/spdtoc.htm. [11] The second document is TRB Special Report 254, *Managing Speed – Review of Current Practice For Setting and Enforcing Speed Limits*, prepared by the Committee for Guidance on Setting and Enforcing Speed Limits. This document can be downloaded at http://gulliver.trb.org/publications/sr/sr254.pdf. [10] The following review summarizes pertinent information from these two sources along with various other articles and publications.

3.4.1 Are Speed Limits Necessary?

There has been much debate on the issue of speed limits. According to *Managing Speed*, the primary reason for regulating individual choices is the significant risks drivers can impose on others. A driver with a higher tolerance for risk may decide to drive faster, accepting a higher probability of a crash, injury, or even death in exchange for a shorter trip time. The imposition of risks on others by their choices almost certainly increases the risk of death and injury for other road users. This imposition of risks by others is the primary reason for government intervention in many areas besides traffic safety, such as environmental protection and product safety. [10]

Another reason for regulating speed derives from the inability of some drivers to judge correctly the capabilities of their vehicles (e.g., stopping, handling) and to anticipate roadway geometry and roadside conditions sufficiently to determine appropriate driving speeds. The inability to determine the appropriate driving speed may result from being unfamiliar with a particular roadway or other factors such as fatigue. Lastly, the need to regulate speed relates to information adequacy and judgment. There is a tendency for some drivers to underestimate or misjudge the effects of speed on crash probability and severity. Young and inexperienced drivers often manifest this problem. The consequences to other drivers can be substantial. [10]

3.4.2 Choice of Speed

There are many factors that influence a driver's choice of speed, some conscious and others unconscious. These factors include age, gender, attitude, and the perceived risks of a law enforcement encounter or crash to name a few. In addition, there are situational factors such as weather, road or vehicle characteristics, speed zoning, speed adaptation, impairment or simply "running late." [11]

As might be expected, of all drivers involved in fatal crashes, young, male drivers are mostly likely to have speed as a collision factor. According to the National Highway Traffic Safety Administration, in 1995, nearly 40 percent of the fatal crashes involving young male drivers 15 to 20 years old were speed related. This statistic has remained

relatively unchanged at 39 percent in 2002. Fildes *et al*. unobtrusively monitored the speed of vehicles on rural and urban roads in Australia. They found that young drivers, drivers without passengers, drivers of newer cars, drivers traveling for business purposes, and high mileage drivers were more likely to driver faster than average and exceed the speed limit. [11]

Mustyn and Sheppard [12] found that 75 percent of drivers claim they drive at a speed that traffic and road conditions permit, regardless of the posted speed limit. Although the motorists who were interviewed tended to consider speeding to be one of the primary causes of crashes, they did not consider driving 10 mi/h (16 km/h) over the limit to be particularly wrong. However, most of those interviewed considered driving 20 mi/h (32 km/h) over the limit to be a serious offense. [11]

Road characteristics and weather conditions are also discussed as factors affecting the rate of speed at which drivers travel. There are differing opinions on which characteristics have the most significant impact on a driver's choice of speed. Curvature, grade, length of grade, number of lanes, surface condition, sight distance, lateral clearance, number of intersections, and built-up areas near the roadway are all cited as influential factors. Environmental factors tended to lower speeds, but not significantly unless the conditions were extreme such as fog or heavy rain. These conditions lead to reduced speeds but also results in greater variations in speeds, which creates a risk in and of itself. [11]

3.4.3 Relationship Between Speed and Safety

The relationship between speed and safety is a complex one. *Synthesis of Safety Research Related to Speed and Speed Management*, an update of a similar synthesis prepared in 1982, attempts to dissect the issue by breaking the subject into three parts. The three major areas addressed in the report are: 1) the relationships between vehicle speed and safety; 2) factors influencing speed; 3) the effects on speed and crashes of speed limits, speed enforcement, traffic calming and other engineering measures to manage speed. The authors relate vehicle speed to safety in two ways: 1) the greater a vehicle's velocity the less time there is to react to a hazard; and 2) the physical relationship of mass and speed to energy. The first relationship equates to the incidence of crashes, the second to severity of the crashes at different speeds. Numerous studies are cited that look at these relationships. [11]

Solomon [13] showed that "low speed drivers are more likely to be involved in accidents than relatively high speed drivers." Cirillo [14] supported these findings in a similar study of 2,000 vehicles. Figure 7 on the following page diagrammatically expresses the relationship as a U-shaped curve plotting the number of crashed against the relative deviation from average speed expressed in miles per hour. Two concerns were noted with the data. First, the speeds in these studies were obtained from police reports, driver's reports, or third party estimates calling into question the reliability of the accuracy of the recorded speeds. Second, the risk of vehicles traveling at lower speeds may be attributable to accidents involving vehicles stopping or slowing to turn or just

entering the roadway as opposed to those traveling on sections of the roadway representative of average speeds. [11]

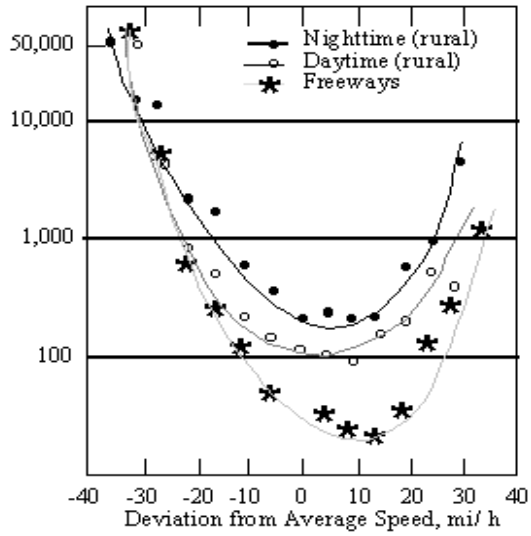


Figure 7. Crash Involvement Rate by Deviation from Average Travel Speed from Solomon [13] and Cirillo [14].

West and Dunn [15] reported on findings of the Research Triangle Institute that further examined the relationship of speed and incidence of crashes. A system of automated continuous speed monitoring stations was used to evaluate speed. Unlike the previous studies, in the data analysis they accounted for vehicles moving slow in the flow of traffic or slowing to turn. The results showed crash risk was greatest for vehicles traveling more than two standard deviations above the mean speed. With turning accidents excluded, the crash risk was six times greater for vehicles traveling much faster or slower than the average rate. [11]

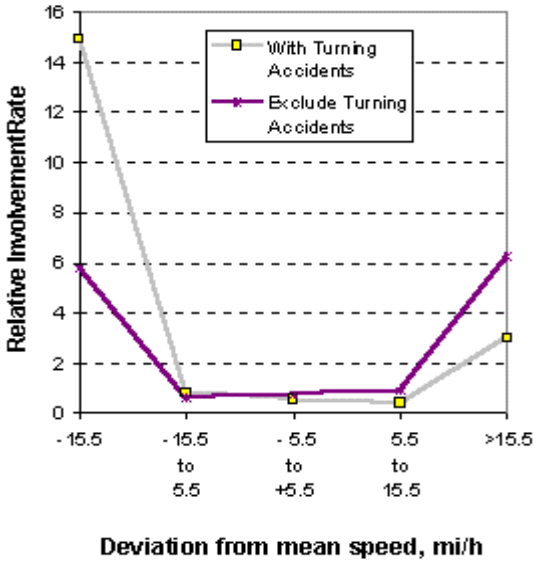


Figure 8. Relationship Between Speed and Crash Involvement from West and Dunn [15].

Little research was done on the relationship between speed and crash involvement during the 1970s and 1980s. Lave [16] revived the issue suggesting that raising the speed limit would result in fewer crashes in situations where variance was reduced by the higher limit. Lave concluded that "speed limits designed to reduce the fatality rate should concentrate on reducing variance. This means that taking action against slow drivers as well as fast ones." Similarly, Garber and Gadiraju [17] reported that crash rates increased with increasing variance on all types of roadways and that speeds were higher on roads with higher design speeds, irrespective of posted speed limits. In further support of this relationship, Harkley, Robertson, and Davis [18] replicated the U-shape relationship between speed and crashes on urban roads. The data collection was on sections of non-55 mi/h (89 km/h) roads in mostly built-up areas of Colorado and North Carolina using police-estimated travel speeds. [11]

The second relationship between vehicle speed and safety deals with the link between speed and the severity of the crashes. Stuster described this relationship as "unequivocal and based on the laws of physics." The kinetic energy of a moving vehicle is a function of its mass and velocity squared. Kinetic energy is dissipated in a collision by friction, heat, and the deformation of mass. Generally the more kinetic energy to be dissipated in a collision, the greater the potential for injury to vehicle occupants. [11]

The relationship of speed and the severity of the crashes has been examined by several researchers. Joksch [19] found that the risk of a car driver being killed in a crash increases with the change in speed to the fourth power as shown in Figure 9 below. The probability of death from an impact speed of 50 mi/h (80 km/h) is 15 times the probability of death from an impact speed of 25 mi/h (40 km/h). The fatality risk curve from an earlier study by O'Day and Flora [20] is also shown for comparison. The shift in

the curve to the right is likely due to the improvement in crash safety features—vehicle crashworthiness, seat-belt use, and emergency medical care—during the two time periods. [11]

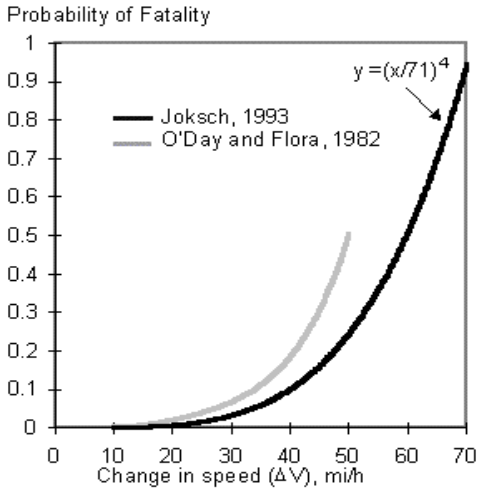


Figure 9. Effect of Change in Speed at Impact on Fatality Risk.

3.4.4 Establishing Speed Limits

Establishing appropriate speed limits is typically the responsibility of "state and local legislatures and traffic engineers, often with input from law enforcement officials and community groups." [10] The goal is to establish realistic speed limits appropriate for different road classes that promote the safe and efficient movement of people and goods.

However, according to the Society of Automotive Engineers, drivers travel at a speed that they find appropriate to the road, regardless of the posted speed limit. Some states use the "85th-percentile" average speed in setting their speed limits. Yet, according to a Federal Highway Administration report "…the majority of speed limits are posted below the average speed of traffic." When drivers encounter speeds they find unreasonably low, some will travel at the lower speed. But, if most stay at higher speeds, faster moving cars are constantly overtaking and passing the slower-moving ones. This increases danger to both vehicles, since danger increases as the speed difference between vehicles increases. [21]

In a survey of speed zoning practices, Parker [3] identified primary factors considered in setting speed limits. These factor are listed below in order of identified importance:

- 85th percentile determination.
- Type and amount of roadside development.
- Accident experience.

- Adjacent limits.
- 10 mi/h pace (i.e., speed range containing the largest percentage of vehicles.)
- Horizontal and vertical alignment.
- Design speed.
- Average test run speed.
- Pedestrians.

Canada [22] and Australia [23] were found to have similar criteria and procedures for setting appropriate speed limits. [11]

Considering that highways are planned with a particular function and speed in mind, it would seem that design speed would have ranked higher in importance than it did. According to American Association of State Highway and Transportation Officials (AASHTO)-recommended design criteria, the highest-level roads—new freeways and expressways designed to expedite through traffic—should be designed for vehicular speeds of 68 to 75 mi/h (110 to 120 km/h) where environmental conditions are good and traffic volumes are light [24]. Since a large portion of the nation's highways may have been built before these specific design criteria were established, it becomes necessary to reevaluate posted speed limits. This is particularly true where there have been changes in highway usage, population shifts, and new roadside construction.

Stuster's *Synthesis of Safety Research* also examines the relationship between vehicle speeds and safety by looking at the incidence and severity of crashes when speed limits are raised or lowered. Table 22 below summarizes the results of studies of this type conducted in several countries.

Table 22. Summary of Literature on Effects of Raising or Lowering Speed Limits

Speed Limit Increases			
Reference	Country	Change	Results
NHTSA (1989)	USA	55 to 65 mi/h (89 to105 km/h)	Fatal crashes increased by 21%
McKnight, Klein and Tippetts [25]	USA	55 to 65 mi/h (89 to105 km/h)	Fatal crashes increased by 22% Speeding increased by 48%
Garber and Graham [26]	USA 40 states	55 to 65 mi/h (89 to 105 km/h)	Fatalities increased by 15% Decrease or no effect in12 states
Streff and Schultz [27]	USA (MI)	55 to 65 mi/h (89 to 105 km/h)	Fatal and injury crashes increased significantly on rural freeways
Pant, Adhami and Niehaus [28]	USA (OH)	55 to 65 mi/h (89 to 105 km/h)	Injury and property damage crashes increased but not fatal crashes
Parker [29]	USA (22 states)	5 to 15 mi/h (8 to 24 km/h)	No significant changes
Sliogeris [30]	Australia	100 to 110 km/h (62 to 68 mi/h)	Injury crashes increased by 25%
Lave and Elias [31]	USA (40 states)	55 to 65 mi/h (89 to 105 km/h)	Statewide fatality rates decreased 3-5% (Significant in 14 of 40 states)
Iowa Safety Task Force (1996)	USA (IA)	55 to 65 mi/h (89 to 105 km/h)	Fatal crashes increased by 36%
Newstead and Mullan [32]	Australia (Victoria)	5-20 km/h increases (3-12 mi/h increases)	Crashes increased overall by 8% 35% decline in zones raised from 60-80

Speed Limit Decreases			
Nilsson [33]	Sweden	110 to 90 km/h (68 to 56 mi/h)	Speeds declined by 14 km/h Fatal crashes declined by 21%
Engel [34]	Denmark	60 to 50 km/h (37 to 31 mi/h)	Fatal crashes declined by 24% Injury crashes declined by 9%
Peltola [35]	UK	100 to 80 km/h (62 to 50 mi/h)	Speeds declined by 4 km/h Crashes declined by 14%
Sliogeris [30]	Australia	110 to 100 km/h (68 to 62 mi/h)	Injury crashes declined by 19%
Parker [29]	USA (22 states)	5 to 20 mi/h decreases (8 to 32 km/h decreases)	No significant changes
Finch *et al*. [36]	Switzerland	130 to 120 km/h (81 to 75 mi/h)	Speeds declined by 5 km/h Fatal crashes declined by 12%
Scharping [37]	Germany	60 to 50 km/h (37 to 31 mi/h)	Crashes declined by 20%
Newstead and Mullan [32]	Australia	5 to 20 km/h decreases (3 to 12 mi/h decreases)	No significant change (4% increase relative to sites not changed)

Source: Stuster et al., 1998 [11]; Parker, 1992 [29].

Studies conducted on the effect of raising speed limits generally show an increase in speeds when speed limits are raised. Changes in mean speeds ranging from 1 to 4 mi/h were observed when the speed limits in the United States were increased from 55 mi/h (89 km/h) to 65 mi/h (105 km/h) as shown in Table 23 below.

Table 23. Mean Speed Increases Observed from Raising Speed Limits from 55 to 65 mi/h

	mi/h	km/h
Brown *et al*. (1990)	2.4	3.9
Freedman and Esterlitz (1990)	2.8	4.5
Mace and Heckard (1991)	3.5	5.6
Pfefer, Stenzel, and Lee (1991)	4-5	6-8
Parker (1992)	0.2-2.3	0.3-3.7

Source: Stuster et al., 1998 [11]

"Finch *et al*. [36] analyzed the changes in speeds from raising and lowering speed limits reported in a number of international studies and found that the change in mean traffic speed is roughly one-fourth of the change in the posted limit. Knowles *et al*. [22] reported similar findings from observational before and after studies in Canada." [11]

A unique example of the effect of speed limits on driver behavior and fatal accidents rates can be seen in Montana when speed limits were instituted in a previously "no daytime speed limits" environment. No daytime speed limits existed on Montana highways from the end of 1995 through mid-1999. Fatality rates were at a modern low and Montana roads were "never safer" when speed limits were re-introduced. Dornsife conjectures that sound engineering practices were ignored and speed limits established due to "Montana's politicians succumbing to unfound conjecture." Regardless of the reason why these limits were instituted, the data in Table 24 below show the effect on the

traffic fatality rate. Dornsife refers to the situation in Montana as the "Montana Paradox"—the desired safety effect from posting speed limits was achieved by removing them. [38]

Table 24. Fatal Accidents Summary: Source Montana DOT

Year	Interstate	Primary	Total
1994	41	70	111
1995	33	72	105
1996	39	75	114
1997	51	91	142
1998	31	82	113
1999	30	72	102
Last 12 months with no speed limits	27	74	101 Low
2000	56	87	143 High

Source: Dornsife, 2001 [38].

Note: The last 12-month period of no daytime speed limits ended in May of 1999 with the lowest number of fatal accidents despite an estimated 12-18% increase in traffic volumes during the 6-year period. In 2000, the USDOT recorded the first modern reduction in miles traveled and Montana with its first true speed limits recorded its highest number of fatal accidents in modern time on its interstates.

3.4.5 Enforcement

Enforcement involves disciplinary actions that encourage compliance with traffic laws and ordinances. In the last section of Stuster's *Synthesis of Safety Research Related to Speed and Speed Management*, he addresses enforcement and engineering measures directed at controlling vehicle speeds. Standard enforcement procedures including mobile and stationary patrols, aerial enforcement, radar and laser speed monitoring equipment, automated enforcement, drone radar, speed feedback indicators, public information and education, and traffic enforcement notification signs are discussed. Stuster notes that in most cases, there is limited scientific research to validate the effectiveness of these methods of enforcement. However, he cites numerous "quasi-experiments." Table 25 below provides a listing of literature on different enforcement techniques.

Table 25. Summary of Literature on Effectiveness of Enforcement Techniques

Reference	Country	Findings
Mobile Patrol Vehicles		
Raub [39]	USA (IL)	Vehicles without roof-mounted lights were 25% more productive in speed enforcement and, were involved in 65% fewer crashes.
Shinar and Stiebel [38]	USA	Found compliance with speed limits to be greatest in the vicinity of police vehicles and diminish with increasing distance.
Benekohal *et al*. [39]	USA	In a highway construction zone, demonstrated the presence of a marked patrol car reduced average car and truck speeds as compared to an unpatrolled control condition.
Vaa [40]	Norway	Found intensive enforcement (an average of 9 hours per day) resulted in reductions in vehicle speed that lasted up to 8 weeks.
Stationary Patrol Vehicles		
Hauer *et al*. [41]	USA	Detected a pronounced decrease in average traffic speed to the posted speed limit at the location of the patrol vehicle.
Armour [42]	USA	Presence of a patrol vehicle was associated with a 2/3 drop in vehicles violating the speed limit and a measurable decrease in speed at the enforcement site.
Stuster [43]	USA	Found significant declines in unobtrusive measures of vehicle speed and speed-related crashes in the special enforcement zones having 8 hours of officer time each week.
Aerial Enforcement		
Saunders [44]	Australia	Compared changing levels of aerial enforcement. Removal of surveillance increased percentage of cars and trucks violating speed limits by ~6%.
Kearns and Webster [45]	Australia	Aerial surveillance program resulted in a vehicle crash reduction of 22 percent.
Blackburn, Moran and Glaus [46]	USA (NY)	Aerial surveillance found to be more effective than radar in apprehending drivers who used radar detectors and CB radios to avoid being caught speeding.
Radar and Laser Speed Monitoring Equipment		
Teed and Lund [47]	USA	Found that laser guns were more effective in identifying speeding motorists and that speeders identified under laser enforcement were 4 times more likely to have radar detectors than those ticketed under the radar condition.
Automated Enforcement		
Rogerson *et al*. [48]	Australia	Looked at the effect of a speed camera program and found the percent of vehicles exceeding the speed limit by >15km/h decreased and remained at a lower level in 60 and 70 km/h zones.
Maekinen and Oei [49]	Netherlands	Reviewed the effects of automatic enforcement on speeding, red-light violations, and crashes.
Elvik [50]	Norway	Found a 26% reduction in injury crashes at high accident sites after the introduction of photo-radar.

Drone Radar		
Freedman, Teed and Migletz [51]	USA	Noted to have a slight reduction in average vehicle speeds in a construction zone. The proportion of vehicles exceeding the limit by more that 10 mi/h was reduced by 30% to 50%.
Streff *et al*. [52]	USA	Did not find that drone radar with police patrols can be an effective deterrent at locations where high-speed trucks are a problem.
Speed Feedback Indicators		
Dart and Hunter [53]	USA	Found the speed feedback indicators had no significant effect on traffic speeds.
Casey and Lund [54]	USA	Found the indicators reduced speeds at a placement site and for a short distance past the site. No speed reduction was noted after the indicator was removed.
Hamalainen and Hassel [55]	Finland	Reduced speeds were indicated while the indicator was present, and the speed halo effect lasted for 10 km after the location of the display.
Perrillo [56]	USA (TX)	Noted speed reductions of 2-3 mi/h near the indicator site when they were in place on residential streets but speeds returned to previous levels when indicators were removed.

Stuster et al. also discuss traffic calming measures and their effect on slowing traffic; however, this information is not included in this report. The focus of this review is on speed management techniques on state and local highways rather than low-speed municipal roadways.

Bloch [57] published a comparative report looking at automated speed enforcement through the use of speed display boards and photo-radar. The photo-radar system used in this instance involved a narrow-beam, low-power radar speed detector, a motor-driven camera, a flash unit, and a computer. The report looks at three issues: 1) which of the devices is more effective in lowering speeds, 2) whether supplementing display boards with police enforcement makes them more effective, and 3) which device is more cost-effective. “Results show that both devices significantly reduce vehicle speeds 7-8 km/h, and particularly reduce the number of vehicles traveling 16 km/h (10 mi/h) or more over the posted limit. Supplementing the display board with intermittent enforcement significantly increased its effectiveness.” Only display boards demonstrated carryover effects. Enforced display board produced substantial short-term carryover but not long-term carryover. The display board alone demonstrated long-term but not short-term carryover, but only at the roadside location. Cost-effectiveness, in decreasing order, was the display board only, display board plus enforcement, followed by photo-radar.

Although photo-radar may be the least cost-effective method of automated enforcement, the Insurance Institute for Highway Safety reports that speed cameras are the most widely used form of automated enforcement in the world. They are in Australia, Austria, Israel, the Netherlands, Norway, and the United Kingdom. The cameras are not functioning as an adjunct to traditional police enforcement but rather are generating the majority of all speeding tickets in some countries. For example, in the United Kingdom

almost half of all speeding tickets result from automated enforcement. In contrast, photo-radar has never been used extensively in the United States. [4]

In support of the accurate speed monitoring practices, The International Association of Chiefs of Police (The IACP) has tested and certifies that certain speed measuring instruments meet all requirements of the radar speed-measuring device model minimum performance specifications, as published by the National Highway Traffic Safety Administration of the US Department of Transportation and adopted by the Highway Safety Committee of the International Association of Chiefs of Police. A listing of these devices in alphabetic order by manufacturer is included in Appendix D.

3.4.6 Economic Impact

The speed limits established by each state economically impact our society. According to the National Highway Traffic Safety Administration, the estimated cost of all speed-related crashes in the United States in 2000 was $40 billion. In Arizona, the estimated cost was $772 million. These economic costs include productivity losses, property damage, medical costs, rehabilitation costs, travel delay, legal and court costs, emergency service costs, insurance administration costs, premature funeral costs, and costs to employers. (www.nhtsa.dot.gov/stsi/)

The Australian government in its Working Paper 59, Road Speed Limits – Economic Effects of Allowing More Flexibility, examines this issue. The speed that drivers choose affects their "crash costs, vehicle operating costs, and travel time." The report estimates the changes in crash cost that results from changes in speed. The authors used valuations of travel time for different vehicle types published by Austroads, the association of Australian and New Zealand road transport and traffic authorities whose purpose is to contribute to the achievement of improved Australian and New Zealand transport related outcomes. Based on these valuations, the assumption is made that a 6 mi/h (10 km/h) change in average speed produces a 30% change in crash costs. On hypothetical roads with average and low crash rate, the speeds that produce the lowest total of travel time cost, vehicle operating cost and crash cost are between 56 to 62 mi/h (90 and 100 km/h) and between 68 and 75 mi/h (110 and 120 km/h), respectively. With fewer trucks in either of these mixes the "best" speeds would be higher. Consequently, Australia has undertaken a review of maximum speed limits and a broad assessment of the best locations to use intelligent transportation system (ITS) technology to optimize economic efficiency associated with transport of people and goods. It was recognized that optimal efficiency could be accomplished through use of Australia's current ITS technology to achieve different speed regimes—variable message signs, variable speed limits, and integrated traffic signal systems. [58]

Vehicle operating costs also have a direct relationship to the speed at which motorists choose to travel. The primary motivation for implementing the National Maximum Speed Limit was energy conservation. A fuel efficiency study by West et al. (1997) showed a clear relationship between fuel efficiency and the speed of travel. Under steady-state, cruise-type driving conditions, fuel economy peaks at about 55 mi/h

(89 km/h) and then declines at higher speeds. The decline at higher speeds is associated with aerodynamic drag on the vehicle. Fuel efficiency also varies based on the type of vehicle with sport utility vehicles, minivans, and pickup trucks having poorer fuel economy, which is of concern due to their increasing popularity as passenger vehicles. [10]

Travel time is likely the only factor that a driver consciously considers when choosing speed. This is one instance where lower speed limits actually increase travel time costs. This is particularly true for commercial vehicle drivers and business travelers who typically drive more miles than the average motorist. The economic cost of increased travel time and lost productivity associated with speed reduction measures can be substantial for these users. [10]

Additionally, speed is closely linked to vehicle emissions. At high speeds, the increased power demand on the engine increases carbon monoxide and volatile organic compound emissions. It is not documented at exactly what speeds the increase in emissions begins or the rate of increase. But, it is well known that these pollutants degrade metropolitan air and are the largest source of carbon dioxide emissions that are associated with global warming. [10]

Although the economic costs associated with speed-related crashes, vehicle operating costs, and pollution factor little in the speed at which individuals choose to drive, these factors must be considered when setting and maintaining speeds.

3.5 FUTURE PROJECTS

Several research projects currently in progress but not yet completed include the following:

National Cooperative Highway Research Program, Project 3-59, "Assessment of Variable Speed Limit Implementation Issues," Effective Date: November 2000, Completion Date: July 2004.

National Cooperative Highway Research Program, Project 3-67, "Expert System for Recommending Speed Limits in Speed Zones," Effective Date: September 2003, Completion Date: September 2005.

Oregon Department of Transportation, Research Problem statement: Measuring the Impacts of Speed Reduction Technologies on Highway Safety," FY 2003.

These projects may provide new insights into the areas of establishing, implementing, and managing speed limits. It will be important to track the progress of these three projects.

3.6 CONCLUSIONS

After review of the numerous articles and journals cited above, it is difficult to summarize in a few paragraphs how speeds should be established, managed, and enforced. Where human behavior is involved, nothing is clear-cut. Listed below are a few universal observations extracted from the literature review compiled for this report.

- The reasons for managing speed revolve around the significant risks that drivers can impose on others by their choice of speed.

- Choice of speed is determined by a multitude of factors—age, gender, attitude, and the perceived risks of law enforcement encounter or crash—many of which are based on unconscious actions with unrecognized repercussions.

- The relationship between speed and safety is two-fold involving both incidence and severity of crashes. The connection between speed and the incidence of crashes is unclear. The connection between speed and the severity of crashes is straightforward and governed by the laws of physics.

- Variations in speed among drivers, as seen with the higher accident rates observed for those going slower or faster than the mean or average speed, should be minimized.

- While there is no clear consensus on the impact that raising or lowering speed limits has on the number of crashes; studies seem to show number of crashes decreases when speed limits are lower and the number of crashes increases or remains unchanged when speed limits are raised.

- Many factors are used to determine appropriate speed limits. According to the literature cited, 85^{th} percentile determinations, design speed, roadside development, and accident experience may be the most significant.

- There is no clear-cut evidence in the literature that one method of enforcement is better than another. However, one thing is certain, "… if drivers believe that a speed limit is unreasonable, enforcement will be difficult and expensive [10]."

- Automated enforcement is underutilized in the U.S. but may be the method of choice in congested, high-accident, hard-to-enforce traffic zones [10]. Ultimately, the choice of enforcement methods will be dictated by the availability of traditionally scarce resources.

Anyone wishing to delve further into the subject of setting and enforcing speed limits should obtain the two comprehensive references mentioned earlier in this review. The first report is FHWA-RD-98-154, *Synthesis of Safety Research Related to Speed and Speed Management*, prepared by Jack Stuster, Zail Coffman, and Davey Warren. The second document is TRB Special Report 254, *Managing Speed – Review of Current Practice For Setting and Enforcing Speed Limits*, prepared by the Committee for Guidance on Setting and Enforcing Speed Limits.

4.0 EXAMINATION OF EXISTING DATA ON ACTUAL SPEEDS ON ARIZONA HIGHWAYS

4.1 PURPOSE

It is known that a large number of motorists exceed the posted speed limits on Arizona highways. The disparity between posted speed limits and actual speeds increases the risk of crashes. In order to assess the extent of the disparity, speed data collected from automatic traffic recording devices were examined. These data are collected at intervals throughout the year and provide a representative sampling of traffic volumes on highways throughout the state. It is anticipated the information gathered from analysis of these data will inform decision makers regarding the extent of the problem, where speeding is most prevalent, and whether or not the incidence of speeding is on the rise. This information also can be used to target enforcement efforts at those areas were speeding is the most prevalent.

4.2 METHODS

Speed data collected at automatic traffic recording (ATR) devices situated throughout the state were utilized. The ATR data are routinely gathered for purposes of meeting highway performance monitoring system (HPMS) data reporting requirements. Data from the years 2000, 2001, and 2002 were available for analysis.

Ideally, raw counts would have been used for the analysis. Actual speeds could then be compared directly to the posted speed limits. In addition, actual speeds could be used to calculate average and 85^{th} percentile speeds in order to assess the difference between the 85^{th} percentile determination and posted limits. Unfortunately, only binned data were available so actual speeds are given in 5 mph ranges. The binned data were used to evaluate the extent of the speeding problem by estimating the percentage of motorists that exceed posted limits. This information was then used to estimate whether posted speed limits are set close the 85^{th} percentile speed at which motorists are traveling.

4.3 DATA COLLECTION

There are fifty-six functional ATR sites that collected speed data for one or more of the three years being examined. The sites are spread throughout the state in a configuration that provides a representative sampling state roadways belonging to the National Highway System (NHS). A list of the data collection sites, including roadway functional class, location, and speed limit at the ATR site are shown as Table 26 on the following pages.

Table 26. Permanent ATR Data Collection Sites

Roadway	Milepost	Station Name	Functional Class	County	Speed Limit mph
U 180	240.9	Kendrick	Rural Major Collector	Coconino	55
S 082	4.93	Nogales	Rural Major Collector	Santa Cruz	55
S 082	30.9	Patagonia	Rural Major Collector	Santa Cruz	55
S 286	44	Three Points	Rural Major Collector	Pima	55
S 072	35	Utting	Rural Major Collector	La Paz	55
S 087	355	Homolovi	Rural Major Collector	Navajo	65
S 277	330	Papermill	Rural Major Collector	Navajo	65
U 191	47.2	Pearce	Rural Major Collector	Cochise	65
S 095	147.1	Parker	Rural Minor Arterial	La Paz	45
U 191	322	Coronado	Rural Minor Arterial	Apache	55
S 260	388.7	Eagar	Rural Minor Arterial	Apache	55
S 064	213.85	Valle	Rural Minor Arterial	Coconino	55
S 085	52.5	Why	Rural Minor Arterial	Pima	55
U 060	82.57	Aguila	Rural Minor Arterial	Maricopa	65
S 089	359	Ash Fork	Rural Minor Arterial	Yavapai	65
S 069	263.1	Cordes Junction	Rural Minor Arterial	Yavapai	65
S 264	438.03	Ganado	Rural Minor Arterial	Apache	65
S 068	14.5	Golden Valley	Rural Minor Arterial	Mohave	65
S 377	30	Holbrook	Rural Minor Arterial	Navajo	65
S 079	94.02	Oracle	Rural Minor Arterial	Pinal	65
S 087	248.7	Payson	Rural Minor Arterial	Gila	65
S 086	148.28	Robles Junction	Rural Minor Arterial	Pima	65
U 180	411.02	Springerville	Rural Minor Arterial	Apache	65
S 080	304.85	St. David	Rural Minor Arterial	Cochise	65
S 099	54.55	Leupp	Rural Minor Collector	Coconino	55
S 083	29.38	Sonoita	Rural Minor Collector	Santa Cruz	55
SA089	320.9	Prescott Valley	Rural Principal Arterial - Interstate	Yavapai	55
I 017	279.4	Cherry	Rural Principal Arterial - Interstate	Yavapai	65
I 010	2.48	Ehrenberg	Rural Principal Arterial - Interstate	La Paz	65
I 019	29.4	Amado	Rural Principal Arterial - Interstate	Santa Cruz	75
I 010	177.5	Bapchule	Rural Principal Arterial - Interstate	Pinal	75
I 017	288.2	Camp Verde	Rural Principal Arterial - Interstate	Yavapai	75
I 010	330	Cochise	Rural Principal Arterial - Interstate	Cochise	75
I 008	112.8	Gila Bend	Rural Principal Arterial - Interstate	Maricopa	75
I 017	232.5	New River	Rural Principal Arterial - Interstate	Maricopa	75
I 040	122.8	Seligman	Rural Principal Arterial - Interstate	Yavapai	75
I 010	94.75	Tonopah	Rural Principal Arterial - Interstate	Maricopa	75
I 008	37	Welton	Rural Principal Arterial - Interstate	Yuma	75
I 040	215.02	Winona	Rural Principal Arterial - Interstate	Coconino	75
I 040	259.95	Winslow	Rural Principal Arterial - Interstate	Navajo	75
S 260	309	Overgaard	Rural Principal Arterial - Other	Yavapai	45
U 089	422	Elden	Rural Principal Arterial - Other	Coconino	55
SA089	367.64	Sedona	Rural Principal Arterial - Other	Yavapai	55
U 060	337.2	Show Low	Rural Principal Arterial - Other	Navajo	55

Roadway	Milepost	Station Name	Functional Class	County	Speed Limit mph
U 093	194.11	Wickenburg	Rural Principal Arterial - Other	Maricopa	55
S 077	370.55	Snowflake	Rural Principal Arterial - Other	Navajo	65
U 160	326.95	Tuba City	Rural Principal Arterial - Other	Coconino	65
U 093	57.1	Kingman	Rural Principal Arterial - Other	Mohave	65
SB008	0.1	Yuma Crossing	Urban Minor Arterial	Yuma	35
I 010	256.45	Grant Road	Urban Principal Arterial - Interstate	Pima	55
I 019	62.45	Tucson/Ajo Way	Urban Principal Arterial - Interstate	Pima	55
I 008	1.71	Yuma	Urban Principal Arterial - Interstate	Yuma	65
U 060	156.68	Glendale	Urban Principal Arterial - Other	Maricopa	45
U 060	251.95	Globe	Urban Principal Arterial - Other	Gila	45
U 070	337.23	Safford	Urban Principal Arterial - Other	Graham	45
S 080	359.45	Douglas	Urban Principal Arterial - Other	Cochise	65

Each roadway is given a functional class designation for purposes of the Federal Highway Administration's (FHWA) Highway Performance Monitoring System reporting requirements. Functional class is a means of categorizing a roadway in terms of its location (rural or urban), use (e.g., local, arterial, collector), size (minor or major), and federal status as part of the National Highway System. There are 12 different roadway classifications. According to the classification scheme, *urban* includes all areas of a state inside of the FHWA approved adjusted census boundaries of small urban and urbanized areas. *Rural* is used to designate all areas of a state outside of the FHWA approved adjusted census boundaries of small urban and urbanized areas.

Relative to highway usage, *arterial* designates roadways that provide the highest level of service at the greatest speed for the longest uninterrupted distance, with some degree of access control. *Collector* roadways provide a less highly developed level of service at a lower speed for shorter distances by collecting traffic from local roads and connecting them with arterials. *Local* consists of all roads not defined as arterials or collectors; primarily providing access to land with little of no through movement. A map of Arizona showing the state's roadways that are part of the National Highway System can be viewed at http://www.fhwa.dot.gov/hep10/nhs/maps/az/az_arizona.pdf.

This FHWA system of classification also provides a framework for establishing speed limits that promote the safe and efficient movement of traffic throughout the state. However, the system is only effective if it accurately reflects the current functionality of the roadway system. One of the most important factors to keep in mind when establishing speed limits based on location and usage is the need to "reevaluate a locality's functional classification system on a relatively frequent and regular basis to ensure that the functional classification of any particular route accurately reflects the traffic function of the route ***now*** and in the foreseeable ***future***." A change in functional class can necessitate the need to adjust speed limits upward or downward based on population density and roadway usage. [60]

Data is collected from the permanent inductive loop ATR sites daily and the speed data are stored and processed in both monthly and annual cycles. The fluctuations

in these data are used to adjust raw counts taken on other highway segments. [61] Although speed data are no longer part of HPMS reporting requirements, the information is essential for monitoring actual speeds on state roadways to ensure safety and efficient travel for motorist.

As previously noted, the speed data are collected in bins. The binning scheme used by AzDOT Transportation Planning Division is as follows:

Bin 1 = 0.0 – 40 mph	Bin 5 = 55.1 – 60	Bin 9 = 75.1 – 80
Bin 2 = 40.1 – 45	Bin 6 = 60.1 – 65	Bin 10 = 80.1 – 85
Bin 3 = 45.1 – 50	Bin 7 = 65.1 – 70	Bin 11 = Above 85
Bin 4 = 50.1 – 55	Bin 8 = 70.1 – 75	

The binned speed data were then compiled in an ACCESS database and summarized for purposes of preparing this report.

4.4 DATA ANALYSIS

Traffic data from the permanent ATR sites listed in Table 26 were summarized by year, recording site, type of roadway, and posted speed limit. The percentage of vehicles traveling in each speed range was calculated. The information was then divided into separate tables based on posted speed limit. The speed limits listed for each roadway were taken from a May 2003 Microsoft ACCESS file provided by Ms. Shan Chen of AzDOT Transportation Planning Division. In a few instances, opposite lanes of a highway are assigned different speed limits. To simplify the analysis, the higher of the two limits was used as the "posted limit."

Additionally, from the ACCESS file it appears that in a few instances some of the speed limits may have changed during the course of the three years that were examined. The places where this may have occurred are on interstate highways where it is likely the speed limit was raised. This was not taken into account in the analysis, as there was no clear documentation on exactly when and how the speed limit changed. The speed limits used for the analysis were those in effect in May 2003. If a higher speed limit than what was posted were used in the analysis, the incidence of speeding documented in this report would be underestimated. As such, this factor should be kept in mind when interpreting the result of this report.

Table 27 on the following page shows data from the eighteen sites with a posted speed limit of 55 mph. The types of highways are identified with the following letter designations: S = state route, I = Interstate, U = US highway, SA = state route alternate (Alternate). The three-year average percent of vehicles exceeding the posted speed limit and the annual average daily traffic (AADT) for each site are given in the far right columns. The sites are arranged from the lowest to the highest three-year average percent of traffic traveling exceeding the posted limit. In some cases, the AADT values calculated from permanent ATR sites were not available so values calculated from

temporary counting sites in close proximity to the permanent ATR sites were used. Those AADT counts taken from temporary reporting sites are preceded by an *asterisk*.

Table 27. Percentage of Vehicles Exceeding 55 mph Posted Speed Limit

ATR Site	Type	Speed Limit	2000	2001	2002	Average	2002 AADT
Sedona	SA	55	40.5	17.5	-	29.0	* 11,351
Valle	S	55	46.7	44.1	41.5	44.1	4,333
Nogales	S	55	44.3	43.9	44.8	44.3	3,108
Sonoita	S	55	49.3	44.2	48.8	47.4	1,115
Why	S	55	-	54.6	55.8	55.2	8,981
Eagar	S	55	57.8	56.6	61.8	58.7	10,401
Leupp	S	55	55.9	59.3	62.4	59.2	624
Elden	U	55	-	60.4	63.1	61.8	15,242
Three Points	S	55	61.6	62.8	-	62.2	1,213
Wickenburg	U	55	70.4	72.0	68.2	70.2	* 9,146
Grant Road	I	55	83.2	80.8	79.8	81.3	130,576
Patagonia	S	55	84.4	83.9	84.5	84.3	2,245
Show Low	U	55	87.3	83.2	87.9	86.1	2,466
Coronado	U	55	-	87.3	88.1	87.7	561
Tucson/Ajo Way	I	55	91.8	91.9	90.6	91.4	69,841
Prescott Valley	SA	55	-	-	91.7	91.7	13,498
Kendrick	U	55	91.7	94.3	94.9	93.6	1,696
Utting	S	55	96.5	96.7	96.8	96.7	2,286
Average			***68.7***	***66.7***	***72.5***	***69.2***	

The average percentage of vehicles exceeding the posted limit for 2000, 2001, and 2002 are 68.7, 66.7, and 72.5 percent, respectively. The overall average for all 55 mph sites over the three-year period studied is 69.2 percent. If the posted limit were near the 85th percentile, the percentage of vehicles exceeding the limit should be only fifteen percent. This is not the case for any of the 55 mph sites.

Table 28 below shows the twenty-one recording sites with a speed limit of 65 mph. The average percentage of vehicles exceeding the posted limit for 2000, 2001, and 2002 are 51.2, 53.7, and 57.2 percent, respectively. The three-year average for all 65 mph sites is 53.9 percent. The ten mph increase in speed limit shows roughly a fifteen percent decrease in the number of vehicles exceeding the posted limit. Only one site's speed, Golden Valley at 65 mph, approximates the 85th percentile speed.

Table 28. Percentage of Vehicles Exceeding 65 mph Posted Speed Limit

ATR Site	Type	Speed Limit	2000	2001	2002	Average	2002 AADT
Golden Valley	S	65	22.3	11.1	-	16.7	* 9,297
Robles Junction	S	65	27.8	26.7	29.3	27.9	2,849
Cordes Junction	S	65	41.1	29.7	34.8	35.2	12,377
St David	S	65	32.8	40.1	40.1	37.7	3,826
Springerville	U	65	37.9	39.1	39.3	38.8	1,344
Ganado	S	65	44.1	35.0	38.3	39.1	1,966
Yuma	I	65	43.1	44.3	48.9	45.4	19,686
Pearce	U	65	-	47.2	46.1	46.7	1,207
Payson	S	65	41.4	50.3	53.8	48.5	10,776
Papermill	S	65	43.9	66.0	45.9	51.9	1,133
Oracle	S	65	55.0	58.2	56.9	56.7	3,054
Douglas	S	65	62.0	58.6	62.1	60.9	* 4,712
Ehrenberg	I	65	61.8	60.0	65.3	62.4	* 19,456
Homolovi	S	65	61.9	63.8	65.5	63.7	1,639
Aguila	U	65	63.2	65.2	63.5	64.0	1,414
Tuba City	U	65	62.3	65.7	69.3	65.8	3,825
Ash Fork	S	65	61.9	64.5	71.7	66.0	2,748
Snowflake	S	65	64.8	66.9	68.6	66.8	2,965
Holbrook	S	65	66.5	65.8	70.6	67.6	1,475
Kingman	U	65	79.7	84.3	87.0	83.7	7,868
Cherry	I	65	-	84.2	86.7	85.5	26,074
Average			***51.2***	***53.7***	***57.2***	***53.9***	

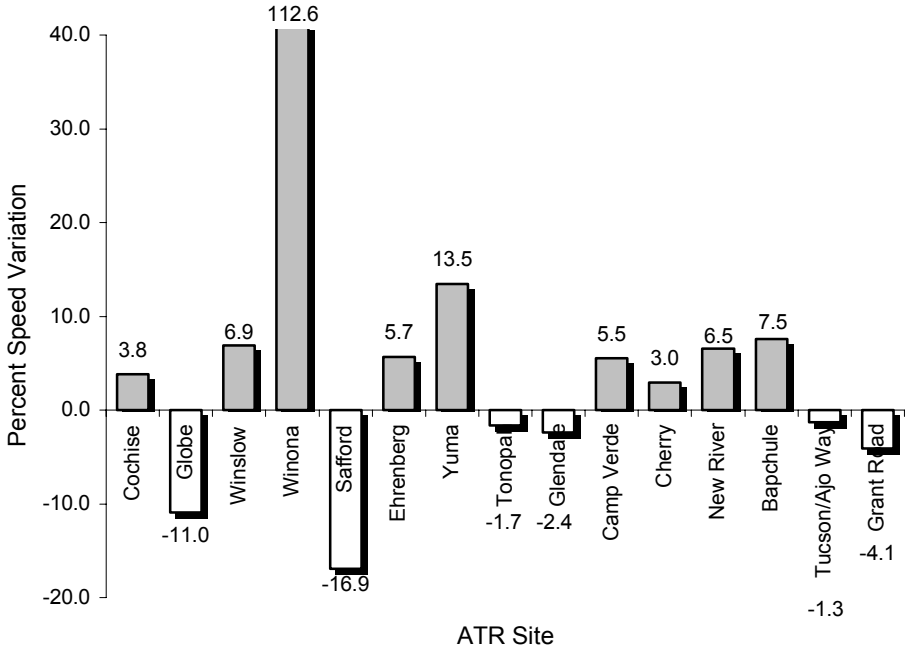
Table 29 below shows the eleven recording sites with a speed limit of 75 mph, all of which are interstate highways. The average percentage of vehicles exceeding the posted limit for 2000, 2001, and 2002 are 43.8, 44.5, and 48.9 percent, respectively. In this case, the ten mile-per-hour increase in speed limit shows roughly a seven percent decrease in the number of vehicles exceeding the posted limit. As with the 55 mph ATR sites, none of the 75 mph sites show statistics that approximate the 85th percentile. Instead, these sites are more than double the expected 15% of vehicles exceeding the posted limits.

Table 29. Percentage of Vehicles Exceeding 75 mph Posted Speed Limit

ATR Site	Type	Speed Limit	2000	2001	2002	Average	2002 AADT
Camp Verde	I	75	-	32.7	34.5	33.6	24,934
Winona	I	75	20.6	41.6	43.8	35.3	17,134
Seligman	I	75	-	40.8	40.4	40.6	12,072
Cochise	I	75	41.9	38.5	43.5	41.3	15,248
Amado	I	75	-	42.7	44.0	43.4	10,443
Winslow	I	75	47.8	34.8	51.1	44.6	16,272
Tonopah	I	75	-	48.2	47.4	47.8	* 21,833
Gila Bend	I	75	49.9	-	57.0	53.5	* 8,957
Welton	I	75	49.7	54.6	59.2	54.5	9,146
Bapchule	I	75	53.0	54.1	57.0	54.7	* 48,313
New River	I	75	-	56.7	60.4	58.6	31,410
Average			***43.8***	***44.5***	***48.9***	***46.2***	

It is interesting to note that the percentage of vehicles speeding at each of the sites has remained fairly consistent across the three years examined. Of the fifty-four sites with data reported for two or more years, thirty-eight showed absolute value changes of less than 5%. The remaining 16 sites had absolute value changes that ranged from 5.2 to 23.2%. Looking at all sites, thirty-nine showed increases in the number of vehicles exceeding the speed limit and only fifteen showed decreases. According to these statistics, the incidence of speeding appears to be on the increase. Figure 10 below shows the percent change in speed over the three years of data examined for the top fifteen AADT volume sites. The sites are shown with the lowest volume site on the left and the highest volume site on the far right of the graph.

Figure 10. Variation in the Percentage of Vehicles Exceeding Posted Speed Limits During the Past Three Years



In the instances such as Winona, Safford, and Yuma where the numbers appear to be extreme, the data were examined for outliers but none were noted. However, there are two factors that might account for large variation from one year to the next. The first is that the speed limit used for the analysis may be higher than was in existence when the data were collected. The second factor is roadway construction. Vehicles would be going much slower than the posted limit so the number of speeding vehicles would be reduced. In both instances, the percent of vehicles exceeding the posted limit would be artificially low making the percent change between years appear greater than it actually is.

To look more closely at the extent of the speeding problem on Arizona highways, the ten sites with the highest AADT were examined. Table 30 on the following page shows these high volume sites along with the three-year average percentage of vehicles exceeding posted limits and their ranking among the fifty-six sites, with the number one (1) designating the site with the highest percentage of vehicles speeding and fifty-six (56) the lowest percentage of speeding vehicles.

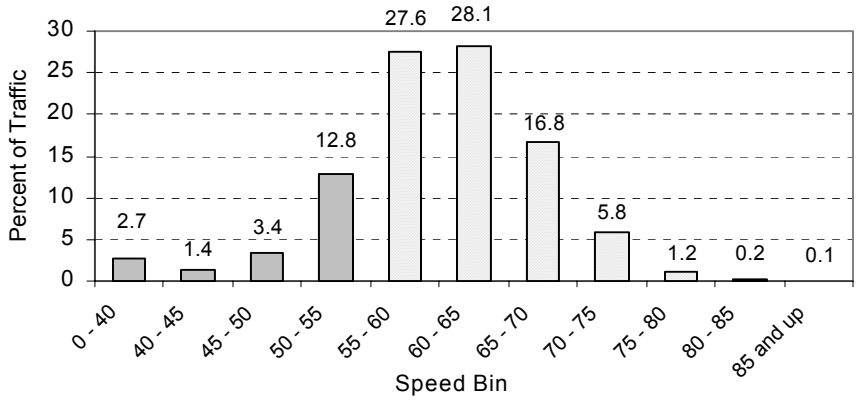
Table 30. Top Ten Sites with the Highest Average Annual Daily Traffic

Roadway	Station Name	Functional Class	Speed Limit	Average	Rank	2002 AADT
I 010	Grant Road	Urban Principal Arterial - Interstate	55	81.3	12	130,576
I 019	Tucson/Ajo Way	Urban Principal Arterial - Interstate	55	91.4	5	69,841
I 010	Bapchule	Rural Principal Arterial - Interstate	75	54.7	30	48,313
I 017	New River	Rural Principal Arterial - Interstate	75	58.6	27	31,410
I 017	Cherry	Rural Principal Arterial - Interstate	65	85.5	9	26,074
I 017	Camp Verde	Rural Principal Arterial - Interstate	75	33.6	51	24,934
U 060	Glendale	Urban Principal Arterial - Other	45	90.1	6	23,147
I 010	Tonopah	Rural Principal Arterial - Interstate	75	47.8	35	21,833
I 008	Yuma	Urban Principal Arterial - Interstate	65	45.4	38	19,686
I 010	Ehrenberg	Rural Principal Arterial - Interstate	65	62.4	21	19,456

One of the primary goals of speed enforcement efforts is to make the most of the potentially limited resources available. Consequently, those sites with the highest volume of traffic and percentage of vehicles exceeding posted limits should be targeted for enforcement efforts. Ideally, accident history also would be taken into account when identifying enforcement areas. For purposes of this report, only traffic volume and incidence of speeding are considered. With this in mind, several of the top ten sites were investigated more closely.

Grant Road and Tucson/Ajo Way ATR sites are both classified as urban principal arterial interstate highways, have speed limits of 55 mph, and are located in the Tucson metropolitan area. Figure 10 on the following page shows the 2002 traffic distribution at the Grant Road ATR on Interstate 10. The dark bars represent those vehicles driving at or below the speed limit. The light bars represent those exceeding the posted limit. The Grant Road statistics shown below are based on 41,877,998 vehicles observed over course of 325 days.

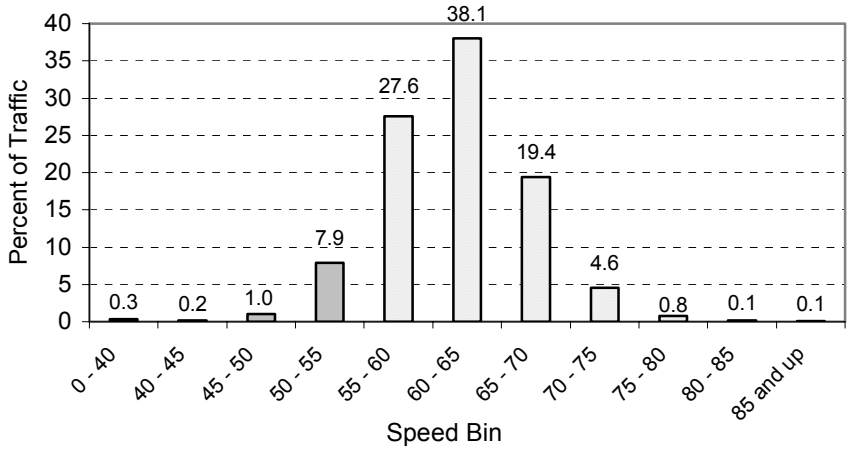
Figure 11. 2002 Speed Distribution on I-10 at Grant Road ATR



Based on the 2002 data, the speed limit at the Grant Road ATR would need to be raised to between 65 and 70 mph to approximate the 85th percentile speed. The number of vehicles exceeding the posted speed limit (81.3%), equates to a minimum of 34,046,812 vehicles speeding on I-10 at milepost 256.45 over the course of one year. If the speed limit were raised to 60 mph, 52.1% of the vehicles would be exceeding the posted limit and at 65 mph, 24.0% of the vehicles would be exceeding the posted limit. This equates to a minimum of 10,050,719 vehicles exceeding the posted limit in a year or a daily average of 27,536 vehicles speeding even at this higher speed limit. It also should be noted that although there are only 0.1% of the vehicles traveling 85 mph and up, this amounts to 441,878 vehicles a year or an average of 114 per day.

Figure 12 below shows the distribution of traffic at the Tucson/Ajo Way ATR site on Interstate 19 for the year 2002. Again, the dark bars represent those vehicles driving within the 55 mph speed limit. The light bars represent those vehicles that are exceeding the posted limit. The Tucson/Ajo Way statistics shown below are based on 5,745,531 vehicles observed over the course of 82 days.

Figure 12. 2002 Speed Distribution on I-19 at Tucson/Ajo Way ATR

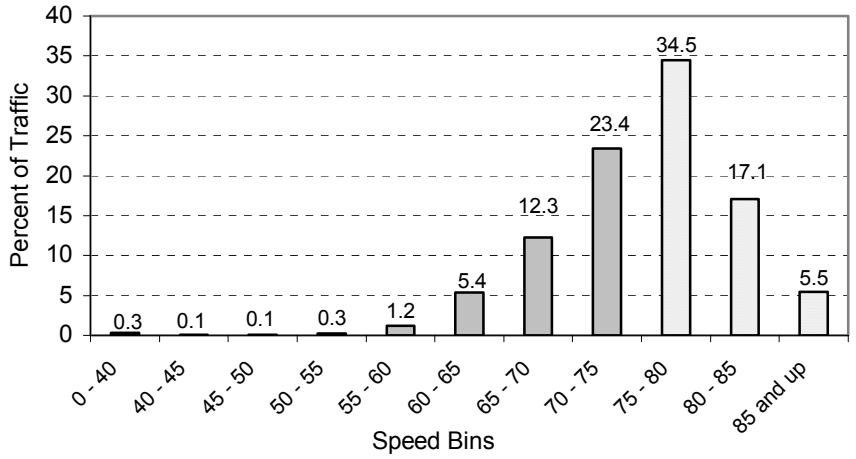


If 91.4% of the vehicles are exceeding the posted speed limit, over the course of one year, roughly 23,375,203 vehicles are speeding. If the speed limit were raised to 60 mph, 63.1% of the vehicle would be exceeding the posted limit and at 65 mph, roughly 25.0% of vehicles would be exceeding the posted limit. This equates to a minimum of 5,843,800 vehicles in a year or a daily average of 16,000 vehicles. As in the previous case, the 85th percentile speed falls in the 65-70 mph range. Both of these high volume ATR sites are in urban areas where raising the speed limit could have significant consequences to driver safety.

The next two high volume traffic sites from Table 26 are examined. These two sites, Bapchule and New River, are both classified as rural principal arterial – interstate. Both sites have posted speed limits of 75 mph. Figure 13 below shows the 2002 speed distribution for Bapchule, located on I-10 twenty-five miles south of Phoenix. The statistics are based on 10,034,504 vehicles observed over 239 days. As Figure 13 shows,

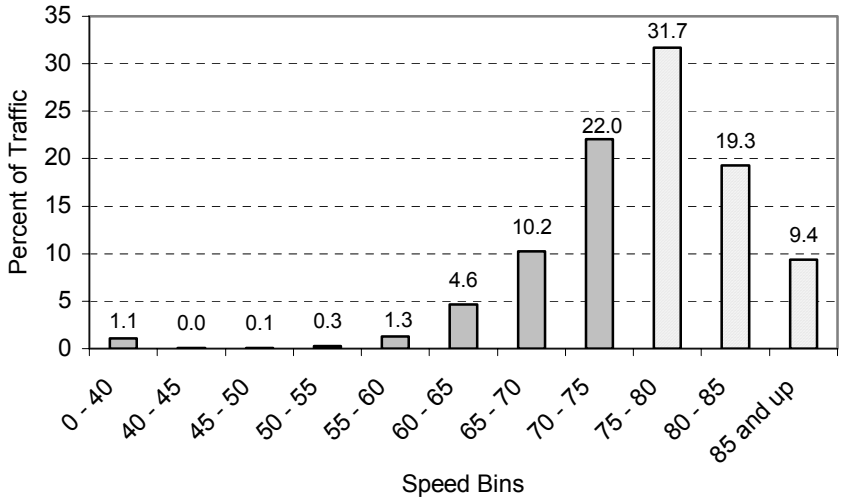
57.1% of the vehicles observed are going over the 75 mph posted speed limit. The 85th percentile speed would fall between 80 and 85 mph.

Figure 13. 2002 Speed Distribution on I-10 at Bapchule ATR



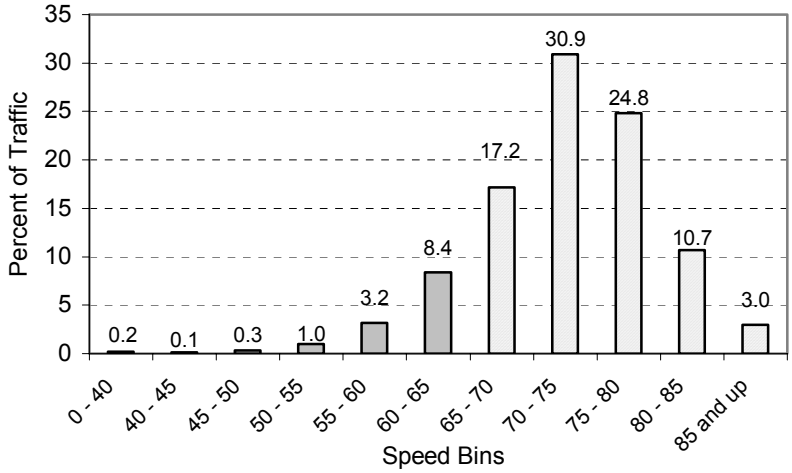
A similar situation is seen at the New River ATR site, which is located on I-17 approximately thirty-five miles north of Phoenix. Figure 14 on the following page shows the 2002 speed distribution for the New River site. In this instance, 60.4% of vehicles are traveling more than one mph above the speed limit. The New River statistics are based on 2,609,230 vehicles observed over the course of 137 days. Based on these statistics, the 85th percentile speed would fall within the 80 to 85 mph range.

Figure 14. 2002 Speed Distribution on I-17 at New River ATR



Lastly, the Cherry ATR site with a speed limit of 65 mph and AADT of 26,074 was examined. The site is located on a highway classified as a "rural principal arterial – interstate." It is located approximately ninety miles north of Phoenix on I-17. The Cherry ATR statistics shown on the following page are based on 7,473,359 vehicles observed over the course of 284 days.

Figure 15. 2002 Speed Distribution I-17 at Cherry ATR



As seen with the previous four ATR sites, Figure 14 shows the flow of traffic at the Cherry ATR is falling well over the posted speed limit of 65 mph with the 85th percentile in the 76-80 mph range.

Although only five ATR sites are shown in detail, a similar situation is seen throughout the state as evidenced by the statistics shown in Tables 27, 28, and 29. The data also were sorted by county, population density, functional class of roadway, and patrol division, without any of these factors showing an increased prevalence of vehicles exceeding the posted speed limits.

These findings are not surprising. They are consistent with the Federal Highway Administration report indicating that the majority of speed limits are below the average speed of traffic. If the Society of Automotive Engineers is correct in their statement that drivers travel at a speed at which they believe is safe, then the 85th percentile speed should be consistent with the posted speed limit. The ATR data examined indicate speed limits are set well below the 85th percentile speed and are lower than what 85% of drivers believe is a safe rate of speed to travel on Arizona highways.

This disparity creates a problem as some drivers are compelled to obey the posted speed limits while others follow their own presumption of what is a safe speed at which to drive. If the danger increases as the speed difference between vehicles increases, having speed limits set below the 85th percentile may be contributing to Arizona's ranking of 16th out of the 50 states in speeding related fatalities as a percentage of total traffic fatalities. Additionally, as the TRB indicates, "…if drivers believe that a speed limit is unreasonable, enforcement will be difficult and expensive [10]."

4.5 ARIZONA DEPARTMENT OF PUBLIC SAFETY

The Arizona Department of Public Safety (DPS) is responsible for enforcement of traffic laws on Arizona highways. This responsibility falls primarily with the Highway Patrol Division. The Highway Patrol Division "investigates traffic collisions, controls motor-vehicle traffic, conducts collision-reduction details, assists other law enforcement agencies, promotes traffic safety through public awareness programs, and provides specialized training to other criminal justice agencies." [62]

For traffic enforcement purposes, the Highway Patrol Division is split into three main patrol bureaus – North, Central, and Southern – based on geographic coverage of the state's highway system. In addition, there is a Commercial Vehicle Services Bureau and Aviation Section. The bureaus are further subdivided into ten districts as shown in Table 31 below and in Figure 16.

Table 31. Arizona Highway Patrol Enforcement Bureaus and Districts

Northern Bureau	
District 1 Headquarters – Kingman 2319 East Andy Devine Kingman, AZ 86401	District 11 Headquarters – Globe 1902 Hwy 60/77 Globe, AZ 85501
District 2 Headquarters – Flagstaff 1100 West Kaibab Lane Flagstaff, AZ 86001	District 12 Headquarters – Prescott 1216 East Sheldon Street Prescott, AZ 86302
District 3 Headquarters – Holbrook 2411 East Navajo Boulevard Holbrook, AZ 86025	
Southern Bureau	
District 4 Headquarters – Yuma 2111 East Gila Ridge Road Yuma, AZ 85365	District 8 Headquarters – Tucson 6401 South Tucson Blvd. Tucson, Arizona 85706
District 6 Headquarters – Casa Grande 410 West Centennial Casa Grande, AZ 85222	District 9 Headquarters – Sierra Vista 2599 East Tacoma Sierra Vista, Arizona 85635

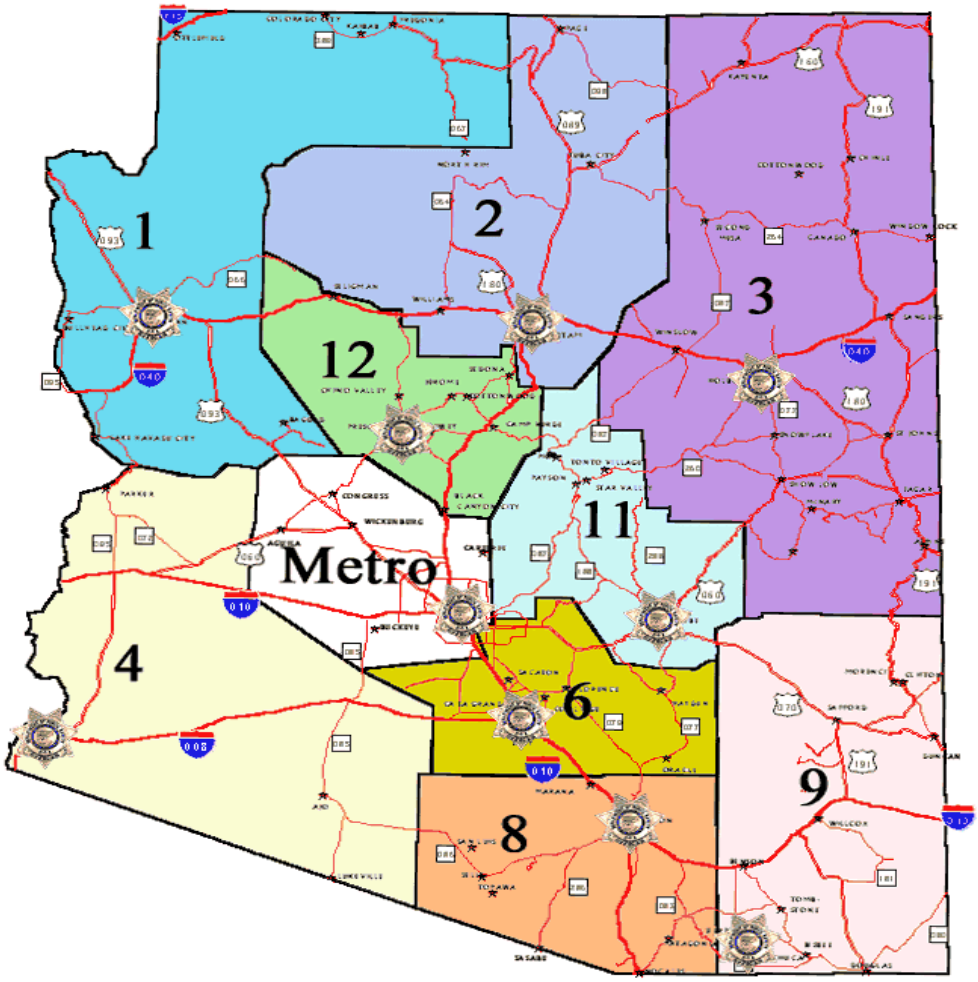
Central Bureau

Metro East –
East Valley District Office
Knudsen Station
2610 South 16th Street, PO Box 6638
Phoenix, AZ 85005-6638

Metro Central –
North Valley District Office
2501 W. Behrend Ste 57, PO Box 6638
Phoenix, AZ 85005-6638

Metro Central –North Valley District Office
2501 W. Behrend Ste 57, PO Box 6638
Phoenix, AZ 85005-6638

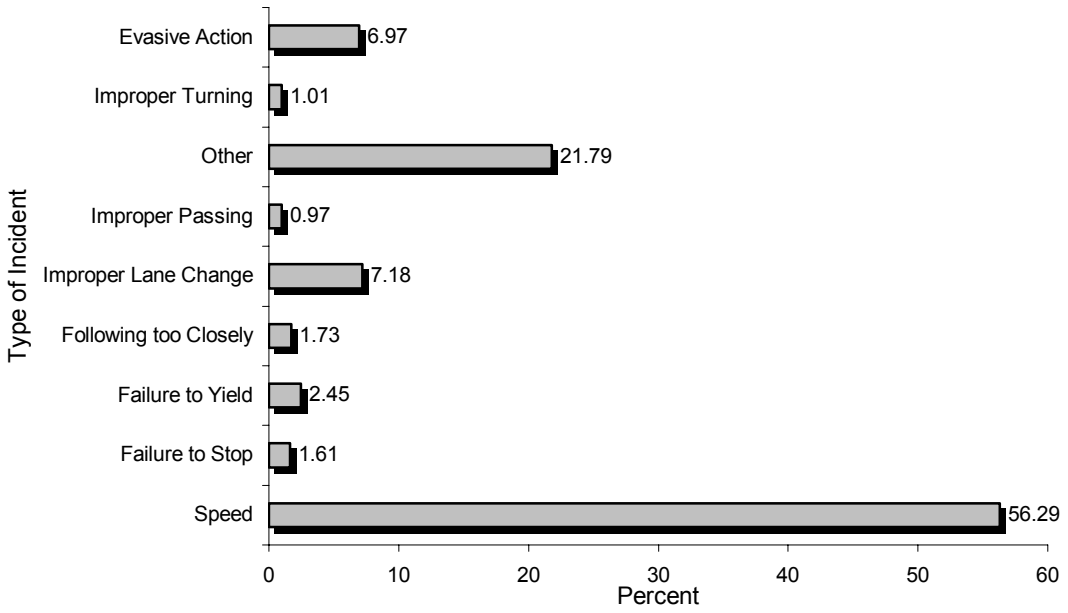
Figure 16. Map of Arizona Highway Patrol Districts



4.6 SPEED ENFORCEMENT EFFORTS

In 2003, there were 657 sworn patrol officers in the Arizona Department of Public Safety (DPS) Highway Patrol Division. During 2003, officers patrolled 18,440,005 miles of roadway issuing 131,979 traffic citations for speeding throughout the state. This averages to roughly 362 speeding citations per day. The division has 1,008 fully marked patrol vehicles, which includes motorcycles, and 212 unmarked vehicles for use in traffic enforcement. As Figure 17 below shows, speeding incidents comprise over half of all investigative actions handled by DPS. [62]

Figure 17. Major Causes of DPS Investigative Actions (2003)



Source: AZ DPS, 2004

To estimate the chances of a motorist receiving a speeding traffic citation, one needs to look at the number of vehicles exceeding the posted speed limits and the number of citations issued in a given year. Looking at 2002, there were approximately 162,706,490 vehicles exceeding the posted speed limit on the sections of highway that were examined. During this same year, there were 200,077 speeding citations issued throughout the entire state. Since the number of vehicles speeding throughout the entire state must far exceed the number from just these few monitored sites, the risk of receiving a citation for speeding must be far less than 1%. It is not surprising that so many drivers exceed the posted limit. This leads one to conclude that either speed limits are set too low or that speed enforcement efforts are not adequate.

The lack of enforcement efforts may be contributing to the increasing number of traffic fatalities. Table 32 on the following page summarizes the number of traffic fatalities throughout the state.

Table 32. Number of Fatalities by County

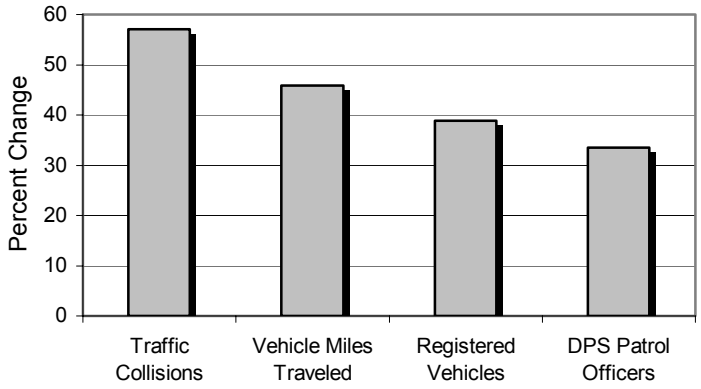
County	2000 Population	# Fatalities 2001	# Fatalities 2002	Percent Change 2001-2002	Percent Change 1994-2002
Apache	69,423	51	34	-33.3	5.6
Cochise	117,755	43	30	-30.2	25
Coconino	116,320	66	55	-16.7	-17.9
Gila	51,335	16	22	37.5	-26.7
Graham	33,489	10	7	-30.0	16.7
Greenlee	8,547	0	2	-----	-33.3
La Paz	19,715	23	26	13.0	44.4
Maricopa	3,072,149	492	489	-0.6	30.4
Mohave	155,032	44	61	38.6	29.8
Navajo	97,470	46	44	-4.3	7.3
Pima	843,746	118	166	40.7	39.5
Pinal	179,727	63	78	23.8	9.9
Santa Cruz	38,381	4	4	0.0	-55.6
Yavapai	167,517	53	57	7.5	46.2
Yuma	160,026	22	40	81.8	110.5
Total	5,130,632	1051	1117	6.3	23.6

Between 2001 and 2002, there was an overall 6.3% increase in the number of traffic fatalities throughout the state. These numbers were taken from the Fatality Analysis Reporting System (FARS) administered by the National Highway Traffic Safety Administration. The long-term increase from 1994 to 2002 is 23.6%. The table shows the biggest traffic fatality problems to exist in Yuma, Yavapai, Pima, Maricopa, and Mohave counties—all with increases of over 29% during the nine years examined.

One important point to keep in mind is that Arizona has seen considerable population growth during the past ten years. The 39.98% population increase from 1990 to 2000 ranks Arizona second highest in the nation for population growth during the ten-year period examined. Consequently, the increase in the number of traffic fatalities is not unexpected. It would be expected that growth in the Highway Patrol Division would have increased at a rate consistent with highway usage by the growing number of people. This is not the case.

Figure 18 on the following page shows the rate of growth in the number of officers relative to the number of traffic collisions, vehicle miles traveled, and number of registered vehicles from 1996 to 2003. The number of vehicle miles traveled (VMT) can be used to assess the extent of motor vehicle operation for a given set of roadways over a given time period. As the data shows, the number of DPS patrol officers has not kept up with the increase in roadway usage.

Figure 18. Highway Traffic Facts Percent Change FY 1996 versus FY 2003



What is the motivation for increasing enforcement efforts? It would seem that the fact that fatalities are increasing faster than vehicle miles of travel would make the effective enforcement of speed limits a higher priority for state government. *Traffic Safety Facts 2001* published by the National Center for Statistics and Analysis showed that in Arizona 36.5% of traffic fatalities were speed related. If this percentage is applied to the number of fatalities in 2002, then roughly 408 of the fatalities were speed related and might have been prevented or severity lessened if there were greater enforcement of speed limits on Arizona roadways.

4.6 CONCLUSIONS

Analysis of the traffic data collected at automatic traffic recorders maintained by the AzDOT Transportation Planning Division show that the incidence of speeding is extensive throughout the state and that it is on the increase when looking at data from the years 2000, 2001, and 2002. The three-year average percentages of vehicles exceeding the posted speed limits on 55, 65, and 75 mph roadways are 69.2, 53.9, and 46.2 percent, respectively. The data clearly show there is a significant problem that needs to be addressed. The use of targeted enforcement and the increased use of automated methods of enforcement will help reduce the financial impact on the state and the effectiveness of the effort. Some points to be considered are as follows:

- The speeding problem is worse on high volume roadways, primarily on the functional class of roadway identified as “urban principal arterial – interstate.”

- Since there is no clear relationship between speed and the incidence of crashes, the focus should be on reducing speeding on high-speed interstate highways where the relationship between speed and severity of injury is clear.

- Speed data from ATR sites should be analyzed routinely to allow for targeted enforcement efforts to make the most of limited resources. Problem areas can be identified relative to ATR site, the time of day, day of the week, and time of year.

- Aside from the economic impact speeding has on society, enforcement should be addressed for safety reasons. Many of these traffic fatalities might have been prevented or their severity lessened with better enforcement.

- Since inappropriate posted limits can create problems, the limits should be reviewed periodically as traffic and land use changes affect the roadway. Adjustments to raise or lower the speed limit should be made to fit the new conditions.

The statistics in this report support the notion that not enough is being done to reduce speeding on Arizona roadways. When analyzing traffic data it is not clear whether speed limits are set too low or enforcement efforts are not adequate. A more concerted effort to address this problem is clearly warranted.

BIBLIOGRAPHY

55 – Judge For Yourself, US Department of Transportation, Washington, DC, June 1979.

"Are Truck Lane Restrictions the Answer?" Texas Transportation Institute, Texas Transportation Research, Volume 38, Number 1, 2002.

"Automated Speed Enforcement Pilot Project for the Capital Beltway: Feasibility of Photo-Radar," Virginia Transportation Research Council, Charlottesville, VA, November 1992.

"Speed Kills," *Maclean's*. Volume 110, Issue 42, October 1997.

"Survey Investigates the Relationships Among Design Speeds, Operating Speeds, and Posted Speed Limits," *Road Injury Prevention & Litigation Journal*, TranSafety Inc., November 1997.

Babcock, M., "JTRF Focuses on Transportation Safety," *Transportation Quarterly*, Volume 56, Issue 4, Fall 2002.

Blake, K., "Speed Saves," *Consumers' Research Magazine*, Volume 80. Issue 11, November 1997.

Belsie, L., "Air Quality Diminishes as More Drivers Speed," *Christian Science Monitor*, Volume 90, Issue 138, June 12, 1998.

Bryant, A., "In the Debate Over Speed, There are Few Facts, No Limits," *New York Times*, Volume 148, Issue 51317, October 21, 1998.

Bryce, R., "What's the Speed Limit? What Would You Like It To Be?" *New York Times*, Volume 149, Issue 51391, May 17, 2000.

Dewey-Kollen, J., "Organize to Cut Residential Speeding," *Traffic Safety*, Volume 2, Number 5, September/October 2002.

Field, K., "Life in the Not-So-Fast Lane," *Design News*, Volume 56, Issue 8, April 23, 2001.

Fisher, P., and Nice, D., "Utilizing Increased Discretion: Explaining State Speed Limits," *Transportation Quarterly*, Volume 52, Issue 2, Spring 1998.

Frere, P., "Speed Doesn't Kill; Bad Drivers Do," *Road & Track*, Volume 49, Issue 10, June 1998.

Garber, N., and Patel, S., "Control of Vehicle Speed in Temporary Traffic Control Zones (Work Zones) Using Changeable Message Signs with Radar," *Transportation Research Record 1509*, National Academy Press, Washington, DC, 1995.

Harkey, D., and Mera, R. "Safety Impacts of Different Speed Limits on Cars and Trucks: Final Report," *Publication No. FHWA-RD-93-161*, US Department of Transportation, Federal Highway Administration, Turner-Fairbank Research Center, May 1994.

Holstein, W., Tharp, M., and Sieder, J. "The American Autobahn," *U.S. News and World Report*, Volume 124, Issue 21, June 1998.

Joscelyn, K., Jones, R., and Rushman, P., *Police Enforcement Procedures for Unsafe Driving Actions*. University of Michigan Highway Safety Research Institute. National Highway Traffic Safety Administration, Washington, DC, 1980.

Krugten, P., and Hoogenboom, M., "Know Your Limits: Enforcing Dynamic Speed Regulation," *Advanced Traffic Management Magazine*, Traffic Technology International, 2000.

Lloyd, J., "In Colorado, Police Ask Slow Drivers to Speed Up," *Christian Science Monitor*, Volume 91, Issue 222, October 13, 1999.

Lundegaard, K., "Cameras Slow Speeding by Cars, But Accelerate the Opposition," *Wall Street Journal – Eastern Edition*, Volume 239, Issue 86, May 2, 2002.

Moore, S., *Speed Doesn't Kill: The Repeal of the 55 MPH Speed Limit.* CATO Institute, Washington, DC, May, 1999.

Naijar, Y., Russell, E., Stokes, R., and Abu-Lebden, G., "New Speed Limits on Kansas Highways: Impact on Crashes and Fatalities," *Transportation Quarterly*, Volume 56, Issue 4, Fall 2002.

Richer, E., and Berman, T., "Speed, Air Pollution, and Health: A Neglected Issue," *Archives of Environmental Health*, Volume 56, Issue 4, July/August 2001.

Uchitelle, L. "Accelerate to 65 M.P.H. Now Empty Your Pockets," *New York Times*, Volume 151, Issue 52172, July 7, 2002.

Verhoef, E., and Rouwendal, J. "Congestion Caused By Speed Differences," *Journal of Urban Economics*, Volume 45, Issue 3, May 1999.

Waller, P. "Speed Limits: How Should They Be Determined?" *Transportation Quarterly*, Volume 56, Number 3, Summer 2002.

REFERENCES

1. "Highway Statistics 2001," US Department of Transportation, Federal Highway Administration, Government Printing Office, Washington, DC, 2001.

2. *Traffic Safety Facts 2001*. National Highway Traffic Safety Administration, National Center for Statistics and Analysis, Washington, DC, December 2001.

3. Parker, M., "Synthesis of Speed Zoning Practices," Report No. FHWA/RD-85/096, Federal Highway Administration, Washington, DC, 1985.

4. Insurance Institute for Highway Safety, Highway Loss Data Institute, Arlington, Virginia, June 2003.

5. United States Department of Transportation, Federal Motor Carrier Safety Administration, Washington, DC, October 2002.

6. Pigman, J., Kentucky Transportation Cabinet, University of Kentucky, School of Engineering, 1998.

7. United States Department of Transportation, National Highway Traffic Safety Administration, 2003.

8. McCartt, A.T., Leaf, W.A., Witkowski, T.L., and Solomon, M.G., "Evaluation of the Aggression Suppression Program, Milwaukee, Wisconsin," US Department of Transportation, National Highway Traffic Safety Administration, Washington, DC, May 2001.

9. Vermont Department of Public Safety website, 2003. (http://www.dps.state.vt.us)

10. "Managing Speed – Review of Current Practice for Setting and Enforcing Speed Limits," *Transportation Research Board Special Report 254*, National Research Council, National Academy of Sciences, Washington, DC, 1998.

11. Stuster, J.W., Coffman, Z., and Warren, D., "Synthesis of Safety Research Related to Speed and Speed Management," *Publication No. FHWA-RD-98-154*, US Department of Transportation, Federal Highway Administration, Turner-Fairbank Highway Research Center, July 1998.

12. Mustyn, B. and Sheppard, D., "A National Survey of Driver' Attitudes and Knowledge About Speed Limits," *SR 548*, Transport and Road Research Laboratory, Crowthorne, England, 1980.

13. Solomon, D., "Accidents on Main Rural Highways Related to Speed, Driver, and Vehicle," Federal Highway Administration, Washington, DC, July 1964 (Reprinted 1974).

14. Cirillo, J., "Interstate System Accident Research Study II, Interim Report II," Public Roads, Vol. 35, No. 3, August 1968.

15. West, Jr., L. and Dunn, J., "Accidents, Speed Deviation and Speed Limits," Traffic Engineering, Vol. 41, No. 10, July 1971.

16. Lave, C., "Speeding, Coordination, and the 55 MPH Limit," American Economic Review, Vol. 75, No. 5, 1985.

17. Garber, N. and Gadiraju, R., "Speed Variance and its Influence on Accidents," AAA Foundation for Traffic Safety, Washington, DC, July 1988.

18. Harkey, D., Robertson, H., and Davis, S., "Assessment of Current Speed Zoning Criteria," Transportation Research Record 1281, Transportation Research Board, Washington, D.C. 1990.

19. Joksch, H., "Velocity Change and Fatality Risk in a Crash-A Rule of Thumb," Accident Analysis and Prevention, Vol. 25, No. 1, 1993.

20. O'Day, J. and Flora, J., "Alternative Measures of Restraint System Effectiveness: Interaction with Crash Severity Factors," SAE Technical Paper 820798 Society of Automotive Engineers, Warrendale, PA, 1982.

21. Libertiny, G., "The Effects of Posted Speed Limits on Accident Rates: Should the Speed Limits Be Increased on the Interstate Highways?" Society of Automotive Engineers, Warrendale, PA, February 1996.

22. Knowles, V., Persaud, B., Parker, Jr., M., Wilde, G., "Safety, Speed & Speed Management," Transport Canada, Ottawa, Ontario, March 1997.

23. Fildes, B. and Lee, S., "The Speed Review: Road Environment, Behavior, Speed Limits, Enforcement and Crashes," *Report No. CR 127*, Federal Office of Road Safety, Canberra, Australia, September 1993.

24. American Association of State Highway Traffic Officials (AASHTO), Washington, D.C., 2003.

25. McKnight, A.J. and Klein, T.M., "Relationship of 65-mph Limit to Speeds and Fatal Accidents," *Transportation Research Record 1281*, Transportation Research Board, Washington, DC, 1990.

26. Garber, S. and Graham, J.D., "The Effects of the New 65 Mile Per Hour Speed Limit on Rural Highway Fatalities: A State by State Analysis," Accident Analysis and Prevention, Vol. 22, No. 2, 1990.

27. Streff, F.M. and Schultz, R.H., "65-MPH Speed Limit in Michigan: A Second Year Analysis of Effects on Crashes and Crash Casualties," *Report No. UMTRI-90-37*, University of Michigan Transportation Research Institute, Ann Arbor, 1990.

28. Pant, P.D., Adhami, J.A. and Niehaus, J.C., "Effects of the 65-mph Speed Limit on Traffic Accidents in Ohio," *Transportation Research Record 1375*, Transportation Research Board, 1992.

29. Parker, M., "Effects of Raising and Lowering Speed Limits," *Publication No. FHWA-RD-92-084*, Federal Highway Administration, U.S. Department of Transportation, Turner-Fairbank Highway Research Center, October 1992.

30. Sliogeris, J., "110 Kilometre Per Hour Speed Limit – Evaluation of Road Safety Effects," Report No. GR 92-8, VicRoads, Australia, 1992.

31. Lave, C. and Elias, P., "Did the 65 mph Speed Limit Save Lives," Accident Analysis and Prevention, Vol. 26, No. 1, 1994.

32. Newstead, S. and Mullan, N., "Evaluation of the Crash Effects of the Changes in Speed Zones in Victoria During 1993-1994," VicRoads, Australia, June 1996.

33. Nilsson, G., "Reduction of the 110 km/h Speed Limit to 90 km/h During Summer 1989. Effects on Personal Injury Accidents, Injured and Speeds," *Report No. VTI-358*, National Swedish Road & Traffic Research Institute, Linkoeping, Sweden, 1990.

34. Engel, U., "The Effects of Implementation of 50 Km/H in Urban Areas," presented at Living and Moving in Cities, Paris, 1990.

35. Peltola, H., "Seasonally Changing Speed Limits," presented at PTRC European Transport, Highways and Planning 19th Summer Annual Meeting, University of Sussex, Proceedings of Seminal K, Volume P350, 1991.

36. Finch, D.J., Kompfner, P., Lockwood, C.R., and Maycock, G. "Speed, Speed Limits, and Accidents." *Project Report 58, S211G/RB.* Transport and Road Research Laboratory, Crowthorne, Berkshire, England, 1994.

37. Scharping, F.K., "Experience Report: 30 Km/H Speed Limited Zones in Hamburg. Speed Reduction Measures On Major Inner City Roads," Transportation Research Institute, Technion-Israel Institute, Haifa, Israel, 1994.

38. Dornsife, C., “Fatal Accidents Double on Montana’s Interstates.” National Motorists Association, Waunakee, Wisconsin, May 2001.

39. Shinar, D and Stiebel, J., “Effectiveness of Stationary Versus Moving Police Vehicles on Compliance with Speed Limits,” Human Factors, Vol. 28, 1986.

40. Benekohal, R., Resende, P.T.V., and Orloski, R.L., “The Effects of Police Presence on Speed in a Highway Work Zone: Circulating Marked Police Car Experiment,” *Report No. FHWA/IL/UI-240*, Federal Highway Administration, Washington, DC, 1992.

41. Vaa, T. “Increased Police Enforcement Effects on Speed,” Accident Analysis and Prevention, Vol. 29, 1997.

42. Hauer, E., Ahlin, F.J. and Bowser, J.S., “Speed Enforcement and Speed Choice,” Accident Analysis and Prevention, Vol. 14, No. 4, 1982.

43. Armour, M., “The Effect of Police Presence on Urban Driving Speeds,” ITE Journal, Vol. 56, No. 2, 1986.

44. Stuster, J.W., “Experimental Evaluation of Municipal Speed Enforcement Programs,” *Report No. DOT HS 808 325*, National Highway Traffic Safety Administration, Washington DC, 1995.

45. Saunders, S.M., “The Effect the Aerial Patrol Has on Vehicle Speeds,” *Report No. 11*, Western Australia Traffic Authority, Perth, 1979.

46. Kearns, I.B. and Webster, K.A., “The Effect of Aerial Speed Enforcement on Traffic Crashes,” *Research Note RN 4*, Traffic Authority of New South Wales, 1988.

47. Blackburn, R.R., Moran, R. and Glauz, W.D., “Update of Enforcement Technology and Speed Enforcement Devices,” *Report No. DOT-HS-807 584*, National Highway Traffic Safety Administration, Washington, DC, 1989.

48. Teed, N., Lund, A.K., “Effect of Laser Speed Measuring Devices on Speed Limit Law Enforcement in Charleston, SC,” Insurance Institute for Highway Safety, Arlington, VA, 1991.

49. Rogerson, P.A., Newstead, S.V. and Cameron, M.H., “Evaluation of the Speed Camera Program in Victoria 1990-1991, Phase 3: Localized Effects on Casualty Crashes and Crash Severity, Phase 4: General Effects on Speed,” *Report No. 54*, Monash University Accident Research Centre, Victoria, Australia, 1994.

50. Maekinen, T. and Oei, H.L., "Automatic Enforcement of Speed and Red Light Violations: Applications, Experiences and Developments," *Report No. R 92 58*, SWOV Institute For Road Safety Research, Leidschendam, 1992.

51. Elvik, R., "Effects on Accidents of Automatic Speed Enforcement in Norway," *Transportation Research Record 1595*, Transportation Research Board, Washington, DC, 1997.

52. Freedman, M., Teed, N. and Miglets, J., "The Effect of Radar Drone Operations on Speeds at High Crash Risk Locations," Insurance Institute for Highway Safety, Arlington, VA, 1993.

53. Streff, F.M., Kostyniuk, L.P. and Christoff, C., "Effects of Drone Radar and Police Enforcement on Travel Speeds: Test on a 65 MPH Freeway and 55 MPH Construction," *Report No. UMTRI-95-22*, University of Michigan Transportation Research Institute, Ann Arbor, MI, 1995.

54. Dart, O.K. and Hunter, W.W., "Evaluation of the Halo Effect in Speed Detection and Enforcement," *Transportation Research Record 609*, Transportation Research Board, Washington, DC, 1997.

55. Casey, S.M. and Lund, A.K., "The Effects of Mobile Roadside Speedometers on Traffic Speeds," Insurance Institute for Highway Safety, Arlington, VA, 1990.

56. Hamalainen, V. and Hassel, S.O., "The Giant Speed-Indicating Display in Police Traffic Control," *Report No. HS-040 655*, Central Organization for Traffic Safety, Helsinki, 1990.

57. Perrillo, K.V., "Effectiveness of Speed Trailer on Low-Speed Urban Roadway," Master Thesis, Texas A&M University, College Station, TX, December 1997.

58. Bloch, S., and DeYoung, D., "Traffic Safety Impact of 1995-1996 Increases In California's Speed Limits." Automotive Club of Southern California, Costa Mesa, CA, March 2000.

59. Reynolds, Q. "Road Speed Limits Economic Effects of Allowing More Flexibility – Working Paper 59." Australian Government, Department of Transport and Regional Services, Bureau of Transport and Regional Economics, 2003.

60. *Flexibility in Highway Design*, Chapter 3, US Department of Transportation, Federal Highway Administration, Office of Human Environment, Washington, DC, 2003.

61. Arizona Department of Transportation website, Transportation Planning Division, 2004.

62. Arizona Department of Public Safety website, Highway Patrol Division, Highway Patrol, 2004.

APPENDIX A: SURVEY INSTRUMENT

Arizona Department of Transportation
Survey of Speed Limits and Speed Enforcement Practices

The *Arizona Department of Transportation* (AzDOT) is examining the issue of motorists exceeding posted speed limits on highways. As part of this process, we are interested in learning more about the experiences of other states and their speed enforcement practices.

1. How are speed limits established for highways in your state? (*check **ALL** that apply*)

   - ❑ Roadway design speed
   - ❑ 85th percentile determination
   - ❑ Accident history
   - ❑ Traffic volume
   - ❑ Road type and surface
   - ❑ Speed limits are assigned arbitrarily
   - ❑ Other, please specify: _____

2. Have speed limits ever been adjusted upward as a result of vehicles exceeding posted limits?

   - ❑ Yes
   - ❑ No

3. What department of state government is ***MOST*** directly responsible for enforcement of speed limits on state highways? (*check only **ONE***)

   - ❑ Department of Public Safety
   - ❑ Department of Transportation
   - ❑ State Police
   - ❑ Other, please specify: _____

4. How are speed limits enforced on state highways? (*check **ALL** that apply*)

   - ❑ Mobile patrol units
   - ❑ Stationary patrol units
   - ❑ Aerial surveillance units
   - ❑ Unmarked patrol units
   - ❑ Automated enforcement via radar/laser with camera or video identification
   - ❑ Other, please specify: _____

5. Do you have special speed and/or lane restrictions for commercial vehicles on state highways?

   - ❑ Yes
   - ❑ No

   If ***yes***, what are the restrictions? _____

6. What practices have you implemented to help reduce speeding? (*check **ALL** that apply*)
   - ❑ Pavement markings
   - ❑ Roadside vehicle messaging systems
   - ❑ Public education programs

- ❑ Roadside speed feedback indicators
- ❑ Decoy/Drone radar
- ❑ Other, please specify: _____

7. Which one of the practices checked in Question 6 has proven to be the ***MOST*** effective at reducing speeding? (*check only* ***ONE***)

   - ❑ Pavement markings
   - ❑ Roadside vehicle messaging systems
   - ❑ Public education programs
   - ❑ Roadside speed feedback indicators
   - ❑ Decoy/Drone radar
   - ❑ Other, please specify: _____

8. What is the penalty for a first-time speeding offense?

   - ❑ Fine (not more than) $ _____
   - ❑ Points (not more than) _____ of the _____ total points that trigger license suspension
   - ❑ Jail (not more than) _____ Days
   - ❑ Licensing Action

     Suspension (not more than) _____ Days

     Revocation (not more than) _____ Months

   Does the penalty vary based on the number of miles per hour over the speed limit?

   - ❑ Yes
   - ❑ No

9. Does your state law allow drivers to escape or reduce penalties by attending a defensive driving or traffic safety class?

   - ❑ Yes
   - ❑ No

10. Do you have any reports or data indicating whether the sanctions for exceeding the speed limit are effective in preventing speeding?

    - ❑ Yes
    - ❑ No

    If ***yes***, how may we obtain a copy?_____

11. Is speeding on your state highways considered a significant safety hazard?

    - ❑ Yes
    - ❑ No

12. Has your state taken any special action to implement stricter enforcement of speed limits?

    - ❑ No
    - ❑ Yes

If ***yes***, can you briefly describe (or forward any report, brochure or memo covering) the action?

APPENDIX B: SURVEY RESULTS

Question 1. How are speed limits established for highways in your state? (check ***ALL*** that apply)

Table B1. Establishing Speed Limits

state	Roadway Design Speed	85th Percentile	Accident History	Traffic Volume	Road Type and Surface	Traffic and Engineering Studies	Assigned Arbitrarily	No Response	Other	Total
AK	X				X					2
AL				X	X					2
AR	X	X		X	X					4
AZ		X	X	X		X				4
CA		X	X			X				3
CO	X	X	X						X	4
CT	X		X	X	X				X	5
DE		X								1
FL	X	X	X	X	X					5
GA	X	X	X	X	X					5
HI	X	X			X				X	4
IA	X								X	2
ID	X	X	X		X		X			5
IL		X							X	2
IN	X			X	X	X				4
KS	X		X							2
KY	X		X		X					3
LA		X								1
MA		X								1
MD	X	X	X	X	X		X		X	7
ME	X	X	X		X				X	5
MI	X	X	X	X	X		X			6
MN	X	X	X	X	X					5
MO	X	X	X	X	X					5
MS										
MT	X		X	X	X					4
NC	X	X			X					3
ND	X	X	X							3
NE	X	X			X					3
NH								X		
NJ	X			X					X	3
NM	X		X	X	X					4
NV	X	X	X	X	X	X				6
NY		X	X	X	X		X			5
OH		X	X	X	X	X				5
OK	X	X	X	X	X					5
OR	X	X	X	X	X					5
PA			X	X		X				3

state	Roadway Design Speed	85th Percentile	Accident History	Traffic Volume	Road Type and Surface	Traffic and Engineering Studies	Assigned Arbitrarily	No Response	Other	Total
RI	X		X	X	X					4
SC										
SD	X		X	X	X					4
TN		X	X	X						4
TX		X	X	X	X					4
UT	X	X	X	X	X					5
VA	X		X	X						3
VT	X		X	X	X				X	5
WA	X	X	X	X	X					5
WI	X		X	X	X					4
WV	X	X								2
WY	X								X	2
Total	35	30	32	29	31	6	4	1	10	

Table B2. Other Mechanisms for Setting Speed Limits

state	Other Comments
CO	Motor Vehicle Traffic Control Division
CT	State traffic commission
HI	Hawaii Department of Transportation sets the standards
IA	State legislature
IL	Legal requirements for residential areas, school zones, and federal highway mandates.
MD	Assigned by statute
ME	Pace, geometrics, number of access points
MI	All are used, 85th percentile carries the most weight; some are arbitrary, i.e., state maximum of 55 is left over from the energy crisis and national 55 mph speed limit
NJ	New Jersey Statute (39:4-98)
NY	A few small municipalities set them arbitrarily
VT	Most state highways are at 50 mph unless otherwise posted
WY	Interstates max=75 mph, primary/secondary max=65 mph

Question 2. Have speed limits ever been adjusted upward as a result of vehicles exceeding posted limits?

Table B3. Speeds Adjusted over 85th Percentile

State	Yes, speeds adjusted up	No, speeds not adjusted up	No response
AK		X	
AL	X		
AR		X	
AZ	X		
CA		X	

State	Yes, speeds adjusted up	No, speeds not adjusted up	No response
CO	X		
CT	X		
DE	X		
FL	X		
GA	X		
HI		X	
IA		X	
ID	X		
IL	X		
IN		X	
KS		X	
KY		X	
LA		X	
MA		X	
MD	X		
ME	X		
MI	X		
MN	X		
MO		X	
MS			
MT		X	
NC		X	
ND	X		
NE	X		
NH			X
NJ		X	
NM		X	
NV		X	
NY			X
OH		X	
OK	X		
OR	X		
PA		X	
RI		X	
SC			
SD		X	
TN		X	
TX	X		
UT	X		
VA		X	
VT		X	
WA		X	
WI		X	
WV	X		
WY		X	
Total	20	26	2

Question 3. What department of state government is ***MOST*** directly responsible for enforcement of speed limits on state highways? (check only ***ONE***)

Table B4. Enforcement Agency

State	DPS	DOT	State Police or Highway Patrol	Other, specify
AK	X			
AL	X			
AR			X	
AZ	X			
CA			X	
CO			X	
CT			X	
DE			X	
FL			X	
GA	X		X	
HI				Municipal police
IA	X			
ID			X	
IL			X	
IN			X	
KS			X	
KY			X	
LA			X	
MA			X	
MD			X	
ME	X		X	
MI			X	
MN	X			Minnesota State Police
MO			X	
MS				
MT			X	
NC			X	
ND			X	
NE			X	
NH	X		X	
NJ			X	
NM	X		X	
NV	X			
NY			X	
OH			X	
OK				those agencies with jurisdiction for the roadway - state, county, or local
OR			X	
PA			X	
RI			X	

State	DPS	DOT	State Police or Highway Patrol	Other, specify
SC				
SD	X		X	
TN	X			
TX	X			
UT	X			
VA			X	
VT			X	
WA			X	
WI		X		
WV			X	
WY			X	
Total	14	1	36	

Question 4. How are speed limits enforced on State Highways? (check ***ALL*** that apply)

Table B5. Methods of Enforcement

State	Mobile Patrol Units	Stationary Patrol Units	Aerial Surveillance	Unmarked Patrol Units	Automated Enforcement	No Response	Other	Comments
AK	X	X		X				
AL	X			X				
AR	X	X	X	X				
AZ	X			X				
CA	X	X	X				X	vehicle mounted radar
CO	X	X	X	X				
CT	X	X	X	X				
DE						X		
FL	X	X	X	X				
GA	X	X	X					
HI	X	X						
IA	X	X	X	X				
ID	X	X						
IL	X	X	X	X				
IN	X	X	X	X	X			
KS	X	X	X					
KY	X	X		X				
LA	X	X	X					
MA	X	X	X	X				
MD	X	X	X	X				
ME	X	X	X	X				
MI	X	X	X	X				flights rare (funding), semi-marked units
MN	X	X	X	X	X			
MO	X	X	X	X				
MS								

State	Mobile Patrol Units	Stationary Patrol Units	Aerial Surveillance	Unmarked Patrol Units	Automated Enforcement	No Response	Other	Comments
MT	X	X	X	X				
NC	X	X	X	X				
ND	X	X	X		X			
NE	X	X	X					
NH	X	X	X					
NJ	X	X		X				
NM	X	X	X					aerial rarely if ever used
NV	X	X	X	X				
NY	X	X	X	X				
OH	X		X		X			
OK	X	X	X	X				
OR	X	X	X	X	X			
PA	X	X	X	X			X	motorcycle patrols
RI	X	X		X	X			
SC								
SD	X	X	X	X				
TN	X	X		X				
TX	X	X		X				
UT	X	X	X	X				
VA	X	X	X	X				
VT	X	X		X				
WA	X	X	X	X				
WI	X	X	X	X				
WV	X	X	X	X				
WY	X	X						
Total	47	44	35	35	6	1	2	

Question 5. Do you have special speed and/or lane restrictions for commercal vehicles on State Highways?

Table B6. Commercial Vehicle Speed/Lane Restrictions

State	Yes Restrictions	No Restrictions	If yes, what are the restrictions?
AK		X	
AL		X	
AR	X		No more than 65 mph at all times on state highways
AZ	X		Two locations where there are restrictions due to road grades
CA	X		May not exceed 55 mph on a highway (see attachment)
CO	X		Restrictions on some steep grades
CT		X	
DE		X	
FL	X		Lane restrictions for CMVs on I-75
GA	X		Metro area multi-lane hig hways - trucks must only use right two lanes

State	Yes Restrictions	No Restrictions	If yes, what are the restrictions?
HI		X	
IA		X	
ID	X		Max speed of 65 mph on vehicles w/5 axles or more at 26,000 lbs gross
IL	X		55 mph
IN	X		3rd lane violation on the interstate
KS		X	
KY		X	
LA		X	
MA	X		Left lane prohibition when indicated
MD	X		Lower truck speed limits at only a few locations. Trucks prohibited from HOV and certain other (left most or two left most) lanes.
ME	X		Lower speed limit for trucks around dangerous curves
MI	X		55 mph for trucks on 65-70 mph freeways, restricted to right two lanes on multi-lane freeways except to pass
MN		X	
MO		X	
MS			
MT	X		60 mph on primary and secondary
NC	X		Three axle trucks restricted from the left lane
ND		X	
NE		X	
NH		X	
NJ	X		Trucks not allowed in the left lane of travel
NM		X	Not specifically on CMV, but left lane minimum speed regulations are posed in rare interstate locations, where significant hills/upgrades occur and postings mostly due to CV slowing on grade
NV		X	
NY		X	
OH	X		Trucks 55 mph, cars 65 mph
OK		X	
OR	X		Must be in slow lane except when passing
PA	X		
RI	X		Cannot operate in high speed lanes
SC			
SD		X	
TN	X		There are lane restrictions only when posted in designated areas, a CMV must "stay in the right lane"
TX		X	
UT	X		Some areas posted for no commercial vehicles in left lane
VA	X		Lane restrictions
VT		X	
WA	X		Reduced speed 60 mph in a 70 mph zone. No 10,000+ pound vehicles in the left lane
WI		X	
WV	X		Lane restrictions on grades, speed restriction on turnpike
WY		X	
Total	25	23	

Question 6. What practices have you implemented to help reduce speeding? (check **ALL** that apply)

Table B7. Speed Reduction Practices

State	Pavement Markings	Vehicle Messaging Systems	Public Education Programs	Speed Feedback Indicators	Decoy Radar	Other	Other, specify
AK			X			X	Traffic enforcement
AL	X		X				
AR		X	X	X	X	X	Enforcement
AZ	X	X	X	X		X	Traverse rumble strips; unmanned police vehicles parked within right of way, enforcement
CA	X	X	X	X		X	In view patrol and vehicle mounted radar
CO			X			X	Enforcement
CT		X	X	X	X		
DE		X	X	X			
FL		X	X				
GA			X	X			
HI			X	X			
IA			X	X			
ID		X	X	X			
IL	X	X	X	X	X	X	Tactical Enforcement Program
IN	X		X				
KS			X				
KY	X	X	X	X			
LA		X	X	X			
MA	X		X	X			
MD	X	X	X	X		X	Speed cameras – warnings only
ME	X		X	X	X	X	Traffic calming
MI			X	X		X	Extra patrols
MN			X	X		X	Targeted enforcement
MO		X	X	X			
MS							
MT			X				
NC			X	X	X	X	Enforcement contacts
ND		X	X	X			
NE			X			X	Selective enforcement
NH			X			X	Enforcement, public service announcements
NJ			X			X	Laser
NM		X	X	X			
NV	X		X	X			
NY		X	X	X	X		
OH		X	X	X		X	Text messaging over highways, visible presence of patrol car on road as deterrent
OK	X	X	X	X			
OR	X	X	X	X			
PA			X		X	X	Special speed enforcement programs

State	Pavement Markings	Vehicle Messaging Systems	Public Education Programs	Speed Feedback Indicators	Decoy Radar	Other	Other, specify
RI		X	X	X			
SC							
SD	X		X	X	X		
TN			X	X		X	Active patrol and visibility
TX			X				
UT	X	X	X	X			
VA	X	X	X	X	X		
VT			X			X	Special enforcement teams
WA	X	X	X	X	X	X	Enforcement
WI	X		X	X			
WV	X		X			X	Enhanced enforcement patrols
WY			X			X	Speed limit signs
Total	18	22	47	33	10	21	

Question 7. Which one of the practices checked in Question 6 has proven to be the **MOST** effective at reducing speeding? (check only ***ONE)***

Table B8. Most Effective Speed Reduction Practice

State	Pavement Markings	Vehicle Messaging System	Public Education	Speed Feedback Indicators	Decoy Radar	No Response	Other	Other, Specify
AK							X	Traffic enforcement
AL						X		
AR							X	Enforcement
AZ			X				X	Enforcement
CA							X	In-view patrol and vehicle mounted radar
CO							X	Enforcement
CT		X						
DE							X	Police enforcement
FL						X		Unknown, no data
GA				X				
HI			X	X				
IA							X	None, speed continues to increase
ID						X		
IL							X	Tactical Enforcement Program
IN	X		X					
KS			X					
KY				X				
LA				X			X	Enforcement
MA			X				X	Targeted/wave enforcement
MD		X				X		Relative effectiveness unknown

State	Pavement Markings	Vehicle Messaging System	Public Education	Speed Feedback Indicators	Decoy Radar	No Response	Other	Other, Specify
ME							X	Traffic calming, but speeding continues to be a problem
MI							X	Extra patrols
MN							X	Targeted enforcement
MO				X				
MS								
MT			X					
NC							X	Enforcement contacts
ND			X					
NE						X		No data available to support one or the other
NH						X		
NJ							X	Laser
NM				X				
NV							X	High visibility enforcement
NY						X		Unknown
OH							X	Visibility, presence of patrol vehicle on highway
OK			X					
OR						X		Don't know yet
PA							X	Speed enforcement programs
RI		X						
SC								
SD			X					
TN							X	Active patrol and visibility
TX						X		
UT			X					
VA		X						
VT							X	Special enforcement teams
WA							X	Enforcement
WI							X	Special emphasis Concentrated Enforcement Patrols
WV							X	Enhanced enforcement patrols
WY							X	Speed limit signs
Total	1	4	10	6	0	9	23	

Question 8a. What is the penalty for a first-time speeding offense?

Table B9. Speeding Penalties – Fines, Points, Jail

State	Fine	Cost of Fine ($)	Points	Number of Points	Total Points	Jail	Days in Jail	No Response	Comments
AK	X	$300	X	6	12	X	0		3 - 9 mph = 2 pts, 10-19 mph = 4 pts, >20 mph = 6 pts
AL	X	$123-183	X	2	12	X	0		
AR	X	variable, determined by the court	X	10	14	X	variable		more than 12 points in a year can trigger suspension
AZ	X	$250	X	2	8				number of points triggering suspension varies depending on violation
CA	X	Varies depending on speed, speed limit, and violator's driving record	X	1		X	0		Fines unknown
CO			X	?	12				
CT	X	$279	X	5	10	X	0		
DE	X	varies according to speed	X	6	8				
FL	X	$250	X	4	12				
GA	X	fines vary from county to county	X	6	15				
HI	X	$5 per mile over the limit + admin cost of $20 + other fees	NPS						
IA	X	$100	NPS						traffic speed is an infraction
ID	X	$53	X	3	12	X	0		
IL	X	$75	X	variable					Bureau of Motor Vehicle Function (317) 233-6000
IN	X	$110 varies in counties	X	8					
KS	X	$180 + $15 per mph over 3 mph over speed limit + $59 court cost	NPS						
KY	X	$100 + court costs	X	6	12				
LA	X	varies depending on jurisdiction under which the ticket is received	NPS						
MA	X	< 10 mph is $50 + $25 head injury surcharge	NPS						Over 10 mph: $50 + $25 surcharge + $10 for each mph over the limit
MD	X	$60-$520	X	5	8				1-5 point range
ME	X	1-9 mph = 109 10-14 mph = 126 15-19 mph = 172 20-24 mph = 201 25-29 mph = 247	X	6	12				

State	Fine	Cost of Fine ($)	Points	Number of Points	Total Points	Jail	Days in Jail	No Response	Comments
MI	X	varies	X	2 min, 4 max	9				9 points may trigger an interview and review of driver record - no automatic suspension
MN	X	$150	NPS						
MO	X	$500	X	3	12	X	15		
MT	X	$500	X	3	8	X	2		
NC	X	depends on courts judgement	X	3	12				
ND	X	$175, depends on speed limit	X	see chart*					
NE	X	$400	X	3	12				
NH	X	$115.20	X	6	12				Fines unknown
NJ			X	8	12				
NM	X	$243, fines graduate from $54 up to $243 depending on mph over limit	X	6	12	X	90		Penalties are based upon what the particular court of jurisdiction assesses.
NV	X	In outlying areas, typically $10 per mile over the limit + admin fees. In other areas, a flat rate fee based on speed.	X	?	12				
NY	X	$100	X	?	11				Points only for violations over 5 mph
OH	X	$100	X	2	12	X	3		
OK	X	determined by the speed of violator	X	2	10	X	30		
OR	X	1-10 mph = $77 11-20 mph = $109 21-30 mph = $175 31 mph and over = $295	NPS						
PA	X	$35 base fine + $2 for each mph over 5 mph of posted speed limit	X	2, + 1 for every 4 mph increase in speed	11				Fines unknown
RI			NPS						
SD	X	$171	X	?	15	X	30		
TN	X	$50 + arrest fees + court cost, class C misdemeanor	X	8	12				
TX	X	$200	NPS						
UT	X	varies according to the court	X	88	?				Fines unknown
VA			X	6	18				
VT	X	fines are based on speed above limit	X	points are based on speed above limit	10				
WA	X	$57 speed limit above 40 mph	NPS						

State	Fine	Cost of Fine ($)	Points	Number of Points	Total Points	Jail	Days in Jail	No Response	Comments
WI	X	$300, based on mph over the limit	X	6	12				
WV	X	$100	X	3	12				
WY			NPS						Fines unknown

NPS = No Point System

Table B10. Speeding Penalties - Licensing Action

State	Suspension	Revocation	No Response	Comments
AK	0	0		
AL	0	0		
AR			X	
AZ			X	Unknown
CA	varies with the violation	varies with the violation		
CO			X	Unknown
CT	0	0		
DE			X	Varies according to speed
FL			X	
GA			X	
HI			X	
IA			X	
ID			X	
IL				Three moving violations in the period of one year results in the suspension of a driver's license up to one year.
IN			X	
KS			X	
KY	90 if in excess of 25 mph	0		
LA			X	
MA			X	
MD	30	6		If points reach: 8 pts = suspension or 5 pts at one time, 12 pts = revocation pts
ME			X	
MI			X	
MN			X	
MO			X	
MS				
MT			X	
NC	60			
ND	28			
NE			X	
NH			X	
NJ			X	
NM	365	0		
NV			X	
NY			X	
OH				Suspension or Revocation depend on points on license and occurs when violator does not pay or appear
OK			X	
OR	0	0		
PA			X	
RI			X	

State	Suspension	Revocation	No Response	Comments
SC				
SD				
TN	12-Jun	0	X	*Only if points exceed 12
TX			X	
UT			X	Varies according to the court
VA			X	
VT			X	
WA			X	
WI			X	Penalty is based on mph over the limit
WV			X	
WY			X	

Question 8b. Does the penalty vary based on the number of miles per hour over the speed limit?

Table B11. Penalty Based on MPH Over the Limit

State	Penalty Varies Yes	Penalty Varies No	Other
AK	X		$4 per mile over the limit
AL	X		
AR	X		
AZ	X		
CA	X		
CO	X		
CT	X		
DE	X		
FL	X		
GA	X		
HI	X		
IA	X		
ID	X		
IL	X		
IN	X		
KS	X		
KY	X		
LA	X		
MA	X		
MD	X		
ME	X		
MI	X		
MN	X		
MO	X		
MS			

State	Penalty Varies Yes	Penalty Varies No	Other
MT	X		
NC	X		
ND	X		
NE	X		
NH	X		
NJ	X		
NM	X		
NV	X		
NY	X		
OH	X		
OK	X		
OR	X		
PA	X		
RI	X		
SC			
SD	X		
TN	X		
TX	X		
UT		X	Fine varies according to the court
VA	X		
VT	X		
WA	X		
WI	X		
WV		X	Magistrate determines fine, some use x miles = x times $
WY	X		
Total	46	2	

Question 9. Does your state law allow drivers to escape or reduce penalties by attending a defensive driving or traffic safety class?

Table B12. Reduction of Speeding Sanctions

State	Escape Penalty Yes	Escape Penalty No	No Response	Comments
AK	X			2 point reduction for each defensive driving class per year
AL		X		
AR	X			
AZ	X			
CA	X			
CO			X	
CT	X			
DE	X			Reduction in points only
FL	X			

State	Escape Penalty Yes	Escape Penalty No	No Response	Comments
GA		X		
HI		X		
IA		X		
ID	X			
IL	X			
IN	X			"Safe Driver Diversion"
KS	X			Diversion may include the programs mentioned, decision is up to the district attorney
KY	X			
LA	X			
MA		X		
MD		X		Point threshold for suspension/revocation increased if person required to drive on the job
ME	X			3 point reduction given for completing a course
MI		X		School may be ordered by the court in addition to fines, some judges may reduce penalties, but such reductions are in violations of state guidelines
MN		X		
MO	X			
MS				
MT	X			
NC	X			
ND	X			
NE	X			
NH		X		
NJ	X			
NM		X		
NV		X		
NY	X			
OH	X			
OK	X			Determined by court authority
OR	X			Yes, but at court authorization
PA		X		
RI		X		
SC				
SD		X		
TN	X			
TX	X			
UT	X			
VA	X			
VT		X		
WA	X			
WI		X		
WV	X			
WY		X		
Total	30	17	1	

Question 10. Do you have any reports or data indicating whether the sanctions for exceeding the speed limit are effective in preventing speeding?

Table B13. Data Available on Effectiveness of Sanctions

State	Yes, Data Available	No Data Available	No Response	Other, specify
AK		X		
AL		X		
AR		X		
AZ		X		
CA		X		
CO		X		
CT		X		
DE		X		
FL		X		
GA		X		
HI		X		
IA		X		
ID		X		
IL	X			Illinois Department of Transportation 217-782-4972
IN		X		
KS			X	Unknown
KY	X			
LA		X		
MA		X		
MD		X		
ME		X		
MI		X		
MN		X		
MO		X		
MS				
MT		X		
NC		X		
ND		X		
NE		X		
NH		X		
NJ		X		
NM		X		
NV		X		
NY		X		
OH		X		
OK		X		
OR		X		
PA		X		
RI		X		
SC				
SD		X		

State	Yes, Data Available	No Data Available	No Response	Other, specify
TN	X			Our databases are currently being updated
TX		X		
UT			X	
VA		X		
VT		X		
WA	X			WSDOT Speed Enforcement Report
WI		X		
WV		X		
WY		X		
Total	4	42	2	

Question 11. Is speeding on your state highways considered a significant safety hazard?

Table B14. Safety Hazard

State	Yes, Safety Hazard	No, Safety Hazard	No Response	Comments
AK		X		
AL	X			
AR	X			
AZ	X			
CA	X			
CO		X		
CT	X			
DE	X			
FL	X			
GA	X			
HI	X			
IA	X			
ID	X			
IL	X			
IN	X			
KS	X			
KY	X			
LA	X			
MA	X			
MD	X			Excessive speed
ME	X			
MI		X		Not in and of itself, but in combination with other driving behaviors
MN	X			
MO	X			
MS				
MT	X			
NC	X			

State	Yes, Safety Hazard	No, Safety Hazard	No Response	Comments
ND	X			
NE	X			
NH		X		
NJ	X			
NM	X			
NV	X			
NY	X			Considered a safety hazard by New York State Police
OH	X			
OK	X			
OR	X			Speeding is the #1 relating factor in crashes
PA	X			
RI	X			
SC				
SD	X			
TN	X			
TX	X			
UT			X	Speed contributes to the severity, not frequency of the crashes
VA	X			
VT	X			
WA	X			
WI	X			
WV	X			
WY	X			
Total	42	4	1	

Question 12. Has your state taken any special action to implement stricter enforcement of speed limits?

Table B15. Stricter Enforcement Practices

State	Action Taken Yes	Action Taken No
AK	X	
AL		X
AR	X	
AZ	X	
CA	X	
CO	X	
CT	X	
DE	X	
FL	X	
GA	X	
HI		X
IA		X
ID	X	
IL	X	

State	Action Taken Yes	Action Taken No
IN		X
KS	X	
KY	X	
LA	X	
MA	X	
MD	X	
ME	X	
MI		X
MN	X	
MO		X
MS		
MT	X	
NC	X	
ND	X	
NE		X
NH	X	
NJ	X	
NM	X	
NV	X	
NY		X
OH	X	
OK	X	
OR		X
PA		X
RI		X
SC		
SD	X	
TN	X	
TX	X	
UT		X
VA	X	
VT	X	
WA	X	
WI	X	
WV		X
WY	X	
Total	35	13

Table B16. Action Taken Toward Stricter Enforcement

State	Action Taken for Stricter Enforcement
AK	Yes, but no explanation provided. (follow-up for attachment)
AR	Selective traffic enforcement projects
AZ	Special enforcement areas publicized, additional overtime for patrol units
CA	The CHP places continual emphasis on enforcing speed limits involving special task forces and weekly road share days. Road share days involve all personnel at certain commercial inspection facilities teaming up to curb CMV violations
CO	Media coverage, visible enforcement
CT	Non-traditional police vehicles for enforcement
DE	Yes, but no explanation provided.
FL	Periodic selective enforcement details
GA	HEAT Team (see brochure) special speed enforcement grants
ID	In the past have fielded STEP(selective traffic enforcement program) teams, but not currently
IL	Hireback programs. Funding is through the Illinois Department of Transportation.
KS	Special traffic enforcement, selective enforcements
KY	Federal funding provides for additional overtime enforcement efforts
LA	Enhanced enforcement by increased patrols through federal funds
MA	Rational Speed Demo Project; Speedwatch
MD	Legislation has been passed, but not signed into law, that would allow, upon local authorization, speed cameras in residential areas and school zones. Numerous public education/enforcement campaigns
ME	Yes, new law went into effect significantly increasing fines.
MN	We have conducted a statewide speed enforcement campaign entitled, *Slow Down. Or Pay the Price.* During this time, billboards, radio, and TV ads were aired and there was speed enforcement statewide for nearly two weeks.
MS	
MT	We assign officers to crash prevention units. They enforce speed laws on a stretch of highway for 4-5 days, usually 4-5 officers at a time
NC	Speeding in a highway work zone is $250 and $100 court cost. However, courts reduce most speeds and judges are reluctant to assess such a large fine.
ND	Construction Zone Enforcement Program (overtime hours for trooper to work in construction zones)
NH	Highway safety grants (enforcement)
NJ	Use of laser, increased patrols during the holidays
NM	In problem segments only
NV	We conduct special enforcement details for speed in high accident areas where we have identified speed as a contributing factor. We have demonstrated that an increased presence and enforcement of “Hazardous Moving” violations has greatly reduced our accidents.
OH	Holiday weekend enforcement blitzes
OK	Education, media, brochures, saturation patrol, grant to L.P.
SC	
SD	Public education, road signs
TN	Our state troopers participate in a STEP (selective traffic enforcement program) federally funded by the National Highway Traffic Safety Administration)
TX	Federally funded selective traffic enforcement programs (STEP) grants to pay troopers overtime to work
VA	Legislation passed in 2003 allows for the establishment of safe highway corridors. Designated highways/segments can carry higher fines for speed violations.

State	Action Taken for Stricter Enforcement
VT	Yes, but no explanation provided
WA	Constant statistical analysis of WSDOT speed report and collision causation - data driven enforcement
WI	Increased penalty for speeding in work/safety zones
WY	Public information awareness via radio, television

APPENDIX C: GLOSSARY OF TERMS

Aerial Speed Enforcement

A method of speed enforcement using pre-measured distance markers, visible from the air, to determine the speed of vehicles on the ground. A pilot and spotter, in fixed-wing or rotary aircraft, 'clock' vehicles and radio a description of the offender's vehicle to officers on the ground that intercept the vehicle and issue a citation.

Automated Speed Enforcement Devices (ASED)

A variety of high-tech devices, e.g., Radar and Lidar-based photographic systems that monitor the speed of vehicles and create a record of infractions. These devices can operate with or without personnel.

Drone Radar

A device that activates radar detectors, creating the perception that a roadway is being patrolled. Use of drone radar must conform to National Highway Traffic Safety Administration guidelines established in compliance with the Federal Communications Commission's Regulations and Policy.

Enforcement

Disciplinary actions that encourage compliance with traffic laws and ordinances. These actions include: vehicle stops, verbal or written warnings, citations, and arrest.

Instant-On Radar

Speed radar, with a standby mode, which only transmits a signal when activated by an officer.

Light Detection and Ranging (LIDAR)

Technology that uses light pulses to measure the speed of a vehicle. These devices are more precise than radar in selecting a target vehicle in dense traffic. They obtain readings in less than a third of a second (radar requires about three to five seconds) and are less vulnerable to atmospheric interference. LIDAR distinguishes between approaching and departing target vehicles and is useful for conducting traffic speed surveys.

Photo-Radar

A system that photographs vehicles exceeding a preset speed threshold. The system imprints the date, time, and location on the picture, which may include the vehicle, license plate, and the driver. Units can be operated with or without personnel, depending on the type of equipment used and other local circumstance. Some units can simultaneously track multiple vehicles in several lanes. This method of speed enforcement has been used in several European countries for over twenty years.

RADAR (Radio Detection and Ranging)

A speed measurement device that uses microwaves to measure the speed of approaching or departing vehicles. It is effective when used across or down a road.

Radar Detector

A device that senses the presence of microwave signals emitted by active police radar. Depending on the type of device, they can detect X, K, and Ka band radar, photo radar, and Lidar. Some detectors are effective up to a mile away. These devices are illegal in commercial motor vehicles that are subject to Federal motor carrier regulations. They are also illegal in all vehicles in Virginia and the District of Columbia.

Radar Detector-Detector

A device used by traffic enforcement agencies to identify drivers illegally using radar detectors. This device senses the faint microwave transmission emitted by active radar detectors.

Selective Enforcement

Officers are assigned to a specific location to impact a particular traffic safety problem. Selection of enforcement sites is based on the location, time, and day of the week violations most often occur. Resources are allocated to maximize arrests, deterrence, and visible patrol.

Selective Traffic Enforcement Programs (STEP)

Periodic, highly publicized, enforcement efforts supported by community-initiated public education activities. These programs are used for enforcement of speed limit and impaired driving violations, non-compliance with safety belt usage laws, commercial vehicle regulation, and other areas of traffic safety. The program components are problem identification, enforcement activities, public information and education, data collection, and program evaluation.

Special Traffic Enforcement Programs (sTEP)

An enhanced enforcement effort designed to increase public awareness of a specific traffic problem, such as speeding, impaired driving, and safety belts, intensify related enforcement efforts, and make sure the public is aware of the intensified enforcement.

Speed Enforcement Blitz

Programs that concentrate police resources for short periods (usually two to three weeks at a time) to apprehend speeders. To maintain their effect, blitzes must be conducted at least every three or four months. Informing the public of the blitz through increased multimedia public information and education is an important part of the program. Media support maintains awareness of the blitz and increases the perceived risk of apprehension.

Speed Variance

A measure of the distribution of actual vehicle travel speeds above and below the average travel speed. As the variance increases, traffic fails to move smoothly as faster traffic groups behind slower traffic. Statistical analyses show that crash rates increase as the variance increases.

Visibility Patrol (Speed)

Patrol vehicles driving or parked near the roadway to discourage speeding. Visibility enforcement has a deterrent effect, which causes motorists to slow down.

Visible Display Radar and Signing Unit

Billboard-style devices that use radar to generate a display showing a motorist's actual speed or indicating that a motorist's speed is over a specific limit. The former use is often employed to allow the public to "check their speedometers for accuracy." These devices tend to make the public more aware of speed issues.

Visual Average Speed Computer and Recorder (VASCAR)

A speed measurement unit which has both distance and time input capability, allowing it to rapidly calculate and display the speed of any vehicle an officer may be tracking.

Zoning

Speed zoning is the establishment of reasonable and safe speed limits based on an engineering study.

Source: U.S. Department of Transportation, National Highway Traffic Safety Administration.

APPENDIX D: UNITS APPROVED AND CURRENTLY IN PRODUCTION

MANUFACTURER	MODEL	BAND	Mode (S/M)	HAND HELD	SAME DIRECTION	FASTEST TARGET	DISCRIMINATE DIRECTION
Applied Concepts	Stalker	Ka	S/M	●		●	
Applied Concepts	Stalker Basic	K	S/M	●			
Applied Concepts	Stalker Dual	K, Ka	S/M			●	
Applied Concepts	Stalker Dual SL	K, Ka	S/M		●	●	
Applied Concepts	Stalker Dual DSR	Ka	S/M		●	●	● (Not Tested)
Applied Concepts	Stalker DSR 2X	Ka	S/M		●	●	●
Decatur Electronics	Genesis I	X, K, Ka	S/M				
Decatur Electronics	Genesis I Remote Display	K	S/M				
Decatur Electronics	Genesis GHS	K	S	●			
Decatur Electronics	Genesis II	K, Ka	S/M		●	●	
Decatur Electronics	Genesis II Select	K, Ka	S/M		●	●	
Decatur Electronics	Genesis II Select Directional	K, Ka	S/M		●	●	●
Decatur Electronics	Genesis-VP	K	S	●		●	
Decatur Electronics	Genesis-VP Directional	K	S	●		●	● (Not Tested)
Decatur Electronics	Harley-Davidson Genesis VP Directional	K	S	●		●	● (Not Tested)
Kustom Signals	Eagle	X, K, Ka	S/M				
Kustom Signals	Eagle Plus	X, K, Ka	S/M			●	
Kustom Signals	Silver Eagle	X, K, Ka	S/M			●	
Kustom Signals	Golden Eagle	X, K, Ka	S/M		●	●	
Kustom Signals	Golden Eagle Plus	Ka	S/M		●	●	●
Kustom Signals	Directional Golden Eagle	Ka	S/M		●	●	●
Kustom Signals	Falcon	K	S	●			
Kustom Signals	HR-12	K	S/M	●			
Kustom Signals	KR-10SP	K	S/M				
Kustom Signals	Pro-1000(DS)	K	S/M				
Kustom Signals	Talon	Ka	S/M	●	●	●	
Kustom Signals	Trooper	K	S/M				
McCoy's LAW LINE	SpeedTrak Elite Ka	Ka	S/M		●	●	
McCoy's LAW LINE	SpeedTrak Elite K	K	S/M		●	●	
McCoy's LAW LINE	SpeedTrak Elite KD	K	S/M		●	●	●
MPH Industries	BEE III	K, Ka	S/M	●	●	●	● (Not Tested)
MPH Industries	K-55	X, K	S/M				
MPH Industries	Python Series II	X, K, Ka	S/M		● (Ka Only)	● (Ka Only)	
MPH Industries	Speedgun	K	S/M	●	●	●	
MPH Industries	Z-15	K	S	●			
MPH Industries	Z-25	K	S	●		●	
MPH Industries	Z-35	K	S	●		●	

MANUFACTURER	MODEL	BAND	Mode (S/M)	HAND HELD	SAME DIRECTION	FASTEST TARGET	DISCRIMINATE DIRECTION
MPH Industries	Enforcer	K, Ka	S/M	●	●	●	
Municipal Electronics	TS3	K	S	●			
Progressive Electronics	TOMCAT	K	S	●			
Tribar Industries	Muni Quip KGP	K	S	●			
Tribar Industries	Muni Quip MDR	X, K	S/M		●		
U. S. Radar	Phantom	K	S	●			
Vindicator	VH-1	K	S	●			