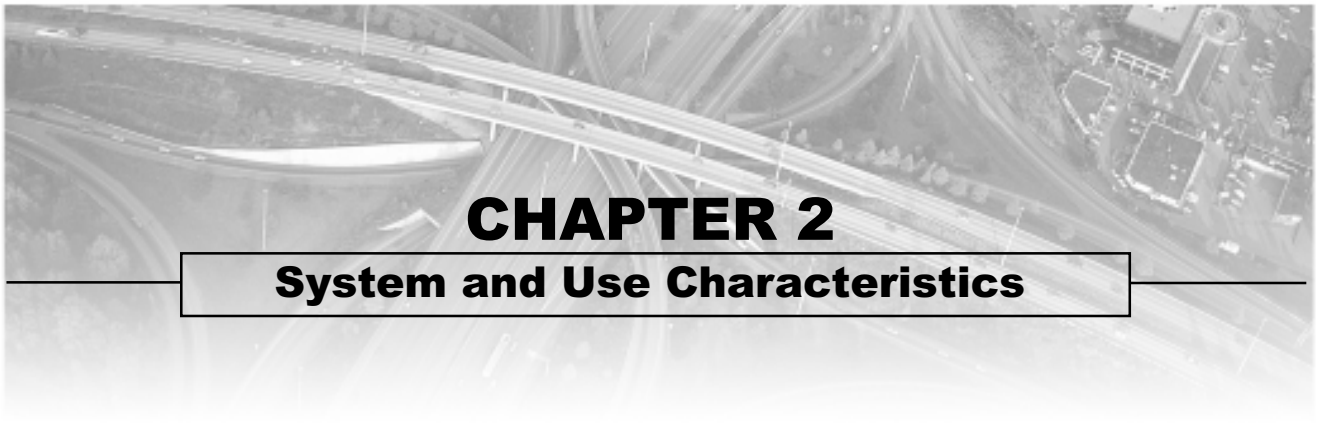


CHAPTER 2
System and Use Characteristics

Introduction

This chapter describes system and use characteristics for most elements of the American surface transportation system. This network includes roads, bridges, and public transit infrastructure. As such, it provides the backbone for an economy that is increasingly hemispheric and dependent on the rapid, integrated movement of people and goods.

The chapter begins with a summary of the key points that are addressed in greater detail later in the chapter. This section includes a summary table comparing key highway and transit statistics with the values shown in the last report. This combined summary is followed by separate sections on highways, bridges, and transit characteristics and system usage.

Both vehicle miles and passenger miles of travel are distributed across functional systems, and travel by passenger vehicles, single-unit trucks, and combination trucks is shown by major highway category.

The transit section of this chapter begins with an overview of transit system operations, followed by information on the transit fleet and infrastructure. A discussion follows of transit route miles (the number of miles covered by a transit route), capacity, passenger miles of travel, and transit vehicle occupancy.

Summary

Exhibit 2-1 compares the system and use characteristics data in this report with the values shown in the 1997 C&P report. The first column shows the values from the 1997 C&P report, which were based on 1995 data. Some of the 1995 data have subsequently been revised, and this is reflected in the second column as applicable. The third column contains comparable values, based on 1997 data.

Exhibit 2-1

Comparison of System and Use Characteristics with Those in the 1997 C&P Report

Statistic	1995 data		1997 data
	1997 report	Revised	
Percentage of Total Highway Miles Controlled by Local Governments	75.1%	---	75.3%
Percentage of Total Highway Miles Controlled by State Governments	20.5%	---	20.4%
Percentage of Total Highway Miles Controlled by the Federal Government	4.4%	---	4.3%
Local Public Transit Operators in Urbanized Areas	537	---	542
Rural and Specialized Transit Services Providers	5,010	---	4,920
Total Rural Highway Miles (Population < 5,000)	3.09 million	3.10 million	3.11 million
Total Urban Highway Miles (Population >= 5,000)	0.82 million	0.82 million	0.84 million
Total Highway Miles	3.91 million	3.93 million	3.95 million
Transit Route Miles (Rail)	8,206	8,206	8,602
Transit Route Miles (Non-Rail)	158,078	158,076	156,733
Total Transit Route Miles	166,284	166,282	165,355
Total Rural Highway Lane Miles (Population < 5,000)	6.32 million	6.33 million	6.37 million
Total Urban Highway Lane Miles (Population >= 5,000)	1.84 million	1.85 million	1.89 million
Total Highway Lane Miles	8.16 million	8.19 million	8.26 million
Urban Transit Capacity-Equivalent Miles (Rail)	1.65 million	---	1.72 million
Urban Transit Capacity-Equivalent Miles (Non-Rail)	1.69 million	---	1.72 million
Urban Transit Capacity-Equivalent Miles (Total)	3.34 million	---	3.54 million
Vehicle Miles Traveled on Rural Highways (Population < 5,000)	0.93 trillion	0.94 trillion	1.00 trillion
Vehicle Miles Traveled on Urban Highways (Population >= 5,000)	1.49 trillion	1.50 trillion	1.56 trillion
Vehicle Miles Traveled on All Highways	2.42 trillion	2.44 trillion	2.57 trillion
Transit Passenger Miles (Rail)	19.7 billion	---	21.1 billion
Transit Passenger Miles (Non-Rail)	18.3 billion	---	19.0 billion
Transit Passenger Miles (Total)	38.0 billion	---	40.2 billion

Public road length as distinguished from lane-miles reached 3.95 million miles in 1997. This mileage is overwhelmingly *rural* and *local* (i.e., under local government jurisdiction). About 3.11 million miles were in rural areas in 1997, or 78.7 percent of total length on all American roads. At the same time, 2.97 million miles were under local jurisdiction in 1997, about 75.3 percent of the national road system. However, the percentage of roads owned by local governments has steadily increased since 1987, by an average of 0.4 percent annually, while the share of rural miles consistently decreased, by about 0.2 percent annually. (As defined in this report, rural areas include only those with a population under 5,000. Some areas that were formerly rural have been reclassified as urban, as their population has grown.)

Transit route miles represent the number of miles covered by a transit route. Transit route mileage fell slightly between 1995 and 1997 due to a decline in non-rail transit mileage. This largely reflects a shift from fixed route systems (such as scheduled buses) to non-fixed route modes (such as demand response and vanpools).

Total highway lane-mileage was 8.3 million in 1997, as described by Exhibit 2-7. Lane-mileage increased by an average of 0.3 percent annually between 1987 and 1997, most of which was on urban highways. Urban highway lane-miles grew by an average of 2.1 percent annually. Transit capacity-equivalent miles increased by an average of 1.8 percent annually over this 10-year period. Rail capacity-equivalent miles grew by an average of 2.0 percent annually, while non-rail capacity-equivalent miles grew by an average of 1.6 percent annually.

The number of vehicle-miles traveled (VMT) between 1987 and 1997 has actually been comparable among rural and urban communities. This is shown in Exhibit 2-11. The VMT increased annually by an average of 2.6 percent each year on rural highways and by 3.2 percent annually on urban roads. Traffic has increased in metropolitan areas, but it has also grown in rural areas where there is increased truck traffic and growing tourist travel in recreation areas.

Urban transit passenger miles grew at an average annual rate of 1.0 percent from 1987 to 1997. Passenger travel grew on rail modes more than three times faster than on non-rail modes (1.5 percent versus 0.4 percent annually). Passenger mile growth was especially pronounced between 1995 and 1997, as rail modes grew by 7.4 percent and non-rail modes by 4.1 percent. It should be noted that over 80 percent of the growth in rail PMT came from the heavy rail system of the New York City Transit Authority, which instituted a new fare structure during this period.

Highway and Bridge System and Use Characteristics

Ownership and Extent

Highways are essential to our way of life. They provide access to where we live, work, and shop. They provide a way to travel to distant places, for business or pleasure. And they provide the means for much of the goods and services we consume to be within our grasp. This chapter contains information on the ownership and extent of the highway systems that play such a large role in our lives.

Roads are commonly classified in one of two ways: *by ownership* or *by purpose*. This section describes highway and bridge system characteristics with this distinction. Jurisdictional responsibility refers to ownership of a particular road, while functional classification identifies the road by the level of service it provides. For example, arterial highways generally serve long trips; collectors disperse traffic between the arterials and lower level roads; and local roads connect neighborhoods and businesses at the most elementary level. Although this chapter presents highway miles by jurisdiction, system and use characteristics are examined by Highway Functional Classification.

Q. What constitutes highway jurisdiction?

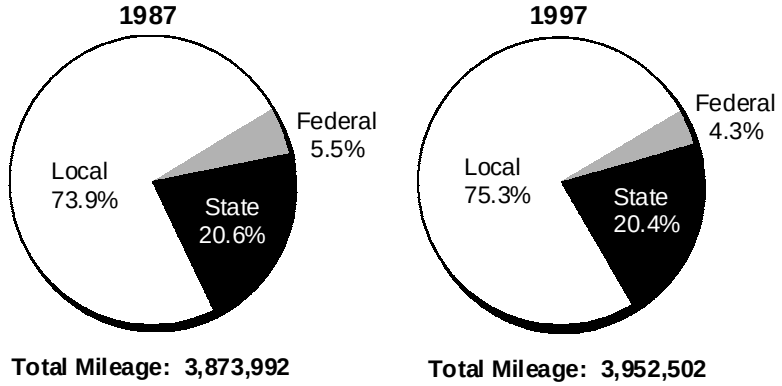
A. Jurisdiction refers to governmental ownership, not necessarily responsibility. For example, some roads owned by the Federal Government are maintained by State highway authorities. Additionally, the designation of a public road as a Federal-aid highway does not alter its ownership or jurisdiction as a State or local road–only that its service value and importance have made that road eligible for Federal-aid construction and rehabilitation funds.

Ownership is divided among the Federal, State, and local governments. States own over 20 percent of the national road network. The Federal Government has responsibility for about 5 percent, primarily in national parks, forests, and Indian reservations. Over 75 percent of the road system is locally controlled, although some intergovernmental agreements may authorize States to construct and maintain locally controlled highways.

As Exhibit 2-2 demonstrates, the share of locally owned routes has grown steadily over the past decade. Public road mileage controlled by local governments increased by 1.4 percent between 1987 and 1997, or an average annual change of 0.2 percent. At the same time, State ownership of public road mileage declined slightly, by 0.2 percent annually, while miles of Federally owned roads declined by about 2.3 percent annually. The decline in Federal ownership of public roads is largely a result of Federal agencies reclassification of some of their mileage from public road to non-public road status.

Exhibit 2-2

Highway Mileage by Owner, 1987 and 1997



Total Mileage: 3,873,992 **Total Mileage: 3,952,502**

Exhibit 2-3

Highway Mileage by Owner, Selected Years 1987-1997

	1987	1989	1991	1993	1995	1997	Annual Change 1987-97
Rural Miles (population < 5000)							
Federal	211,202	177,575	176,771	179,604	170,568	167,368	-2.3%
State	703,753	707,161	702,600	690,853	692,866	694,713	-0.1%
Local	2,248,872	2,238,330	2,254,687	2,228,877	2,236,865	2,246,801	0.0%
Subtotal Rural	3,163,827	3,123,066	3,134,058	3,099,334	3,100,299	3,108,882	-0.2%
Urban Miles (population >= 5000)							
Federal	1,045	1,027	1,030	1,268	1,509	1,462	3.4%
State	95,414	96,872	95,836	109,260	113,090	113,565	1.8%
Local	613,706	655,900	652,996	695,349	711,820	728,593	1.7%
Subtotal Urban	710,165	753,799	749,862	805,877	826,419	843,620	1.7%
Total Highway Miles							
Federal	212,247	178,602	177,801	180,872	172,077	168,830	-2.3%
State	799,167	804,033	798,436	800,113	805,956	808,278	0.1%
Local	2,862,578	2,894,230	2,907,683	2,924,226	2,948,685	2,975,394	0.4%
Total	3,873,992	3,876,865	3,883,920	3,905,211	3,926,718	3,952,502	0.2%
Percent of Total Highway Miles							
Federal	5.5%	4.6%	4.6%	4.6%	4.4%	4.3%	-2.5%
State	20.6%	20.7%	20.6%	20.5%	20.5%	20.4%	-0.1%
Local	73.9%	74.7%	74.9%	74.9%	75.1%	75.3%	0.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

Source: Highway Statistics Summary to 1995; June 1999 HPMS.

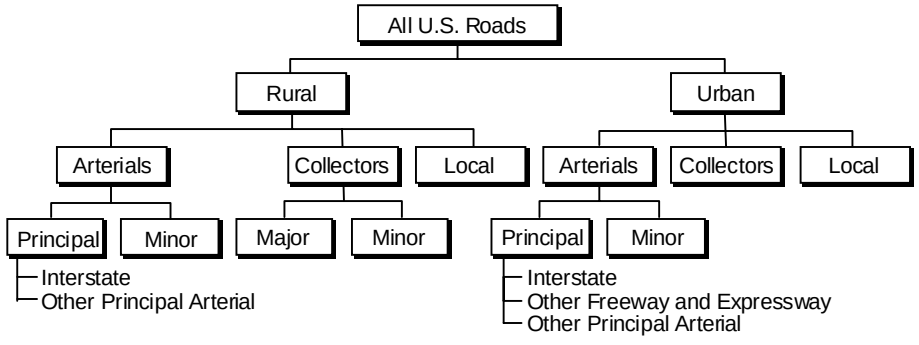
Another noticeable trend is the increase in urban highway miles. As urban areas grow throughout the United States, FHWA has expanded Federal-aid urban and urbanized area boundaries. This has led to a sharp decrease in rural miles, which dropped by an average of 0.2 percent annually between 1987 and 1997. During that same period, urban highway miles grew by an average of 1.7 percent each year.

Functional Classification

Another useful means of classifying roads is by the Highway Functional Classification System, which distinguishes among public roads by the service they provide. This is the basic organization used for the majority of this report. Exhibit 2-4 describes the hierarchy of the Highway Functional Classification System (HFCS).

Exhibit 2-4

Highway Functional Classification System



Arterials provide the highest level of mobility, at the highest speed, for long, uninterrupted travel.

The Interstate Highway System is an arterial network. Arterials generally have higher design standards than other roads, often with multiple lanes and some degree of access control.

The rural arterial network provides interstate and intercounty service so that all developed areas are within a reasonable distance of an arterial highway. This network is broken down into principal and minor routes. The rural principal arterial network is more significant. It serves virtually all urban areas with populations greater than 50,000 people. Additionally, most urban areas larger than 25,000 people are served by rural principal arterial highways. Rural principal arterial highways provide an integrated network without stub connections except where needed because of unusual geographic or traffic conditions (for example, connections to international borders, coastal cities, waterports and airports). The rural principal arterial network is divided into two subsystems, Interstate highways and other principal arterials.

In 1997, the rural principal arterial system accounted for about 3.3 percent of total miles in the United States. This small portion of highways carried 46.8 percent of rural traffic and 18.3 percent of total travel in the United States. The other element of the rural arterial system, minor arterials, represented 3.5 percent of total U.S. miles, carrying 16.5 percent of rural traffic and 6.4 percent of total travel in the United States.

Similarly, in urban areas, the arterial system is divided into principal and minor arterials. The urban principal arterial system is the most important group; it includes Interstate highways, other freeways and expressways, and other principal arterials. The urban principal arterial system serves major metropolitan centers, corridors with the highest traffic volume, and those with the longest trip lengths. It carries most trips entering and leaving urban areas, and it provides continuity for all rural arterials that intercept urban boundaries. In 1997, the urban principal arterial system accounted for 1.9 percent of total miles in the United States. However, this network carried 57.8 percent of urban traffic and 35.5 percent of total travel in the United States.

Urban minor arterial roads provide service for trips of moderate length and at a lower level of mobility. They connect with urban principal arterial roads and rural collector routes. In 1997, the urban minor arterial network represented 2.3 percent of total U.S. mileage. This system carried 19.5 percent of urban traffic and 12.0 percent of total travel in the United States.

Collectors provide a lower degree of mobility than arterials. They are designed for travel at lower speeds and for shorter distances. Collectors are typically two-lane roads that collect and distribute traffic from the arterial system.

The rural collector system is stratified into two subsystems: major and minor collectors. Major collectors provide service to any county seat not on an arterial route. They also serve larger towns not accessed by higher order roads, and important industrial or agricultural centers that generate significant traffic (but are avoided by arterials). Rural major collectors accounted for 10.9 percent of total U.S. miles in 1997. They carried 20.2 percent of rural traffic and 7.9 percent of total travel in the United States.

Rural minor collectors are spaced at intervals, consistent with population density, to collect traffic from local roads and to insure that all urbanized areas are within a reasonable distance of a collector road. The rural minor collector system accounted for 6.9 percent of total U.S. mileage in 1997. These roads carried 5.3 percent of rural traffic and 2.1 percent of total travel in the United States.

In urban areas, the collector system provides traffic circulation within residential neighborhoods and commercial and industrial areas. Unlike arterials, collector roads may penetrate residential communities, distributing traffic from the arterials to the ultimate destination for many motorists. Urban collectors also channel traffic from local streets onto the arterial system. In 1997, the urban collector network accounted for 2.2 percent of U.S. road mileage. It carried 8.04 percent of urban traffic and 4.9 percent of total U.S. travel.

Local roads represent the largest element in the American public road network in terms of mileage. For rural and urban areas, all public road mileage below the collector system is considered local. Local roads provide basic access between residential and commercial properties, connecting with higher order highways. In 1997, rural local roads represented 54.1 percent of total U.S. road mileage. Local roads carried only 11.5 percent of rural traffic and 4.5 percent of total travel in the United States. Urban local roads, meanwhile, accounted for 14.9 percent of total U.S. road mileage, 14.3 percent of urban traffic, and 8.7 percent of total U.S. travel.

Exhibit 2-5 summarizes the *percentage* of highway miles by functional classification. Like the jurisdictional information in Exhibit 2-2, Exhibit 2-6 shows a decrease in the percentage of miles in rural areas. However, the proportion of VMT on rural highways increased slightly between 1995 and 1997, from 38.5 percent to 39.1 percent. Accordingly, the percentage of urban highway VMT dropped slightly from 61.5 percent to 60.9 percent. Despite this slight decrease, the overwhelming majority of travel is still on urban highways in metropolitan communities.

In 1997, total public road length in the United States reached over 3.9 million route miles. About 78.7 percent of this was in rural areas, or approximately 3.1 million route miles. The remaining 21.3 percent of route mileage, or about 844,000 miles, was in urban communities. Overall route miles

Exhibit 2-5

Percentage of Highway Miles, Lane-Miles, and Vehicle-Miles Traveled by Functional System, 1997

Functional System	Miles	Lane-Miles	Vehicle-Miles Traveled
Rural Highways			
Interstate	0.8%	1.6%	9.4%
Other Principal Arterials	2.5%	3.0%	8.9%
Minor Arterial	3.5%	3.5%	6.4%
Major Collector	10.9%	10.6%	7.9%
Minor Collector	6.9%	6.6%	2.1%
Local	54.1%	51.8%	4.5%
Subtotal Rural	78.7%	77.1%	39.1%
Urban Highways			
Interstate	0.3%	0.9%	14.2%
Other Freeway & Expressway	0.2%	0.5%	6.3%
Other Principal Arterial	1.4%	2.2%	15.1%
Minor Arterial	2.3%	2.8%	11.6%
Collector	2.2%	2.3%	4.9%
Local	14.9%	14.3%	8.7%
Subtotal Urban	21.3%	22.9%	60.9%
Total Highway	100.0%	100.0%	100.0%

Source: June 1999 HPMS.

increased by an average annual rate of 0.2 percent between 1987 and 1997, decreasing by 0.1 percent in rural communities and increasing nearly 1.7 percent annually in urban areas. These statistics are described in Exhibit 2-6.

Exhibit 2-7 describes the number of highway lane-miles by functional system. Total highway lane-mileage was 8.3 million in 1997. Lane-mileage increased by an average of 0.3 percent annually

Exhibit 2-6

Highway Route Miles by Functional System, Selected Years 1987-1997

Functional System	1987	1989	1991	1993	1995	1997	Annual Rate of Change 1987-97
Rural Highway Route-Miles (population < 5000)							
Interstate	33,107	33,378	33,677	32,631	32,680	32,919	-0.1%
Other Principal Arterial	80,722	80,951	86,747	96,770	98,046	98,358	2.0%
Minor Arterial	147,252	147,327	141,795	137,577	137,444	137,791	-0.7%
Major Collector	435,409	436,184	436,746	432,222	432,482	433,500	0.0%
Minor Collector	294,793	294,424	293,511	282,182	274,764	273,042	-0.8%
Local	2,172,544	2,130,802	2,141,582	2,117,952	2,124,885	2,141,111	-0.1%
Subtotal Rural	3,163,827	3,123,066	3,134,058	3,099,334	3,100,301	3,116,721	-0.1%
Urban Highway Route-Miles (population >= 5000)							
Interstate	11,211	11,471	11,602	12,877	13,307	13,395	1.8%
Other Freeway & Expressway	7,390	7,582	7,709	8,841	9,022	9,116	2.1%
Other Principal Arterial	50,470	51,493	52,515	52,708	53,044	53,469	0.6%
Minor Arterial	74,984	74,746	74,795	86,821	89,013	89,684	1.8%
Collector	76,863	78,473	77,102	84,854	87,918	88,650	1.4%
Local	489,247	530,034	526,139	559,776	574,119	589,463	1.9%
Subtotal Urban	710,165	753,799	749,862	805,877	826,423	843,777	1.7%
Total Highway Route-Miles	**3,873,992**	**3,876,865**	**3,883,920**	**3,905,211**	**3,926,724**	**3,960,498**	**0.2%**

Source: Highway Statistics 1985-1995, Highway Statistics, 1997.

Exhibit 2-7

Highway Lane-Miles by Functional System, Selected Years 1987-1997

Functional System	1987	1989	1991	1993	1995	1997	Annual Rate of Change 1987-97
Rural Highway Lane-Miles (population < 5000)							
Interstate	133,452	134,960	136,503	132,138	132,344	133,574	0.1%
Other Principal Arterial	203,535	205,654	220,796	240,574	245,095	248,921	2.1%
Minor Arterial	308,939	308,308	297,017	285,332	286,433	288,742	-0.6%
Major Collector	878,187	880,182	880,539	870,109	870,855	874,969	0.0%
Minor Collector	589,586	588,848	587,022	564,364	549,528	546,084	-0.8%
Local	4,345,088	4,261,604	4,283,164	4,235,904	4,249,770	4,282,222	-0.2%
Subtotal Rural	6,458,787	6,379,556	6,405,041	6,328,421	6,334,025	6,374,512	-0.1%
Urban Highway Lane-Miles (population >= 5000)							
Interstate	59,835	61,786	62,826	69,184	72,078	72,967	2.4%
Other Freeway & Expressway	32,546	33,460	34,736	39,588	40,533	41,402	2.7%
Other Principal Arterial	166,762	170,423	176,536	176,261	180,637	184,203	1.5%
Minor Arterial	190,230	189,113	191,088	219,537	226,737	229,631	2.4%
Collector	164,361	168,546	165,288	179,653	186,317	189,476	1.6%
Local	978,494	1,060,068	1,052,278	1,119,552	1,148,234	1,178,926	2.2%
Subtotal Urban	1,592,228	1,683,396	1,682,752	1,803,775	1,854,536	1,896,605	2.1%
Total Highway Lane-Miles	8,051,015	8,062,952	8,087,793	8,132,196	8,188,561	8,271,117	0.3%

Source: Highway Statistics 1985-1995, updated as of 10/97. June 1999 HPMS.

between 1987 and 1997, most of which was on urban highways. Urban highway lane-miles grew by an average of 2.1 percent annually, while rural highway lane-miles dropped by about 0.1 percent each year.

Bridges

Exhibit 2-8 describes bridges by jurisdiction. The number of privately-owned bridges and those in rural communities declined from 1996 to 1998, but there was an increase in bridges on Federal and state property. Exhibit 2-9 relates bridge data by functional classification. The number of urban bridges—and those on arterial systems—increased between 1996 and 1998. This resulted from more aggressive reporting efforts for the National Bridge Inventory (NBI). It also occurred because many roads that included bridges were reclassified from rural to urban. Exhibit 2-10 illustrates the functional system data presented in Exhibit 2-9.

Exhibit 2-8

Bridges by Owner, 1996 and 1998

Owner	Number of Bridges 1996	1998
Federal	6,171	7,448
State	273,198	273,897
Local	299,078	298,222
Private	2,378	2,278
Unknown/Unclassified	1,037	1,131
	581,862	582,976

Source: National Bridge Inventory, 1999.

Exhibit 2-9

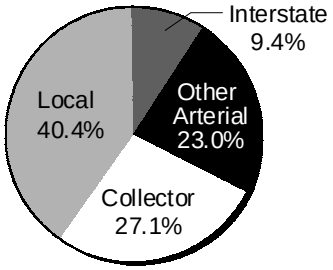
Bridges by Functional System, 1996 and 1998

Functional System	Number of Bridges 1996	1998
Rural Bridge		
Interstate	28,638	27,530
Other Arterial	72,970	73,324
Collector	144,246	143,140
Local	211,059	210,670
Subtotal Rural	456,913	454,664
Urban Bridge		
Interstate	26,596	27,480
Other Arterial	59,064	60,901
Collector	14,848	14,962
Local	24,441	24,969
Subtotal Urban	124,949	128,312
Bridge Total	581,862	582,976

Source: National Bridge Inventory, 1999.

Exhibit 2-10

Distribution of Bridges by Function, 1998



Use Characteristics

This section describes highway infrastructure use. Highway use is defined by VMT. Total highway VMT grew to 2.6 trillion in 1997. While Exhibit 2-11 shows increases for both urban and rural systems, perhaps the most interesting change is the growth in VMT on rural highways. Rural highway VMT climbed from 937 billion in 1995 to over 1.0 trillion in 1997, a 7.2 percent increase. During this time, urban highway vehicle-miles increased by 4.1 percent, from 1.50 trillion to about 1.56 trillion.

Exhibits 2-12 and 2-13 describe highway travel by functional classification and vehicle type, expanding on the information in Exhibit 2-11. In these exhibits there are three types of vehicles. Passenger vehicles (PV) include buses and 2-axle, 4-tire vehicles; single unit trucks (SU) have 6 or more tires; and combination trucks (Combo) include trailers and semi-trailers.

As Exhibits 2-12 and 2-13 show, travel grew the fastest on rural and urban interstates, particularly among combination trucks. For example, the average annual growth rate between 1987 and 1997 was 4.4 percent for combination trucks on rural interstates and 3.9 percent on urban interstates. Overall,

passenger vehicle travel grew by an average of 2.8 percent annually between 1987 and 1997. Single unit truck travel grew by about 3.4 percent each year, and combination truck travel increased by an average of 3.8 percent annually.

Exhibit 2-11

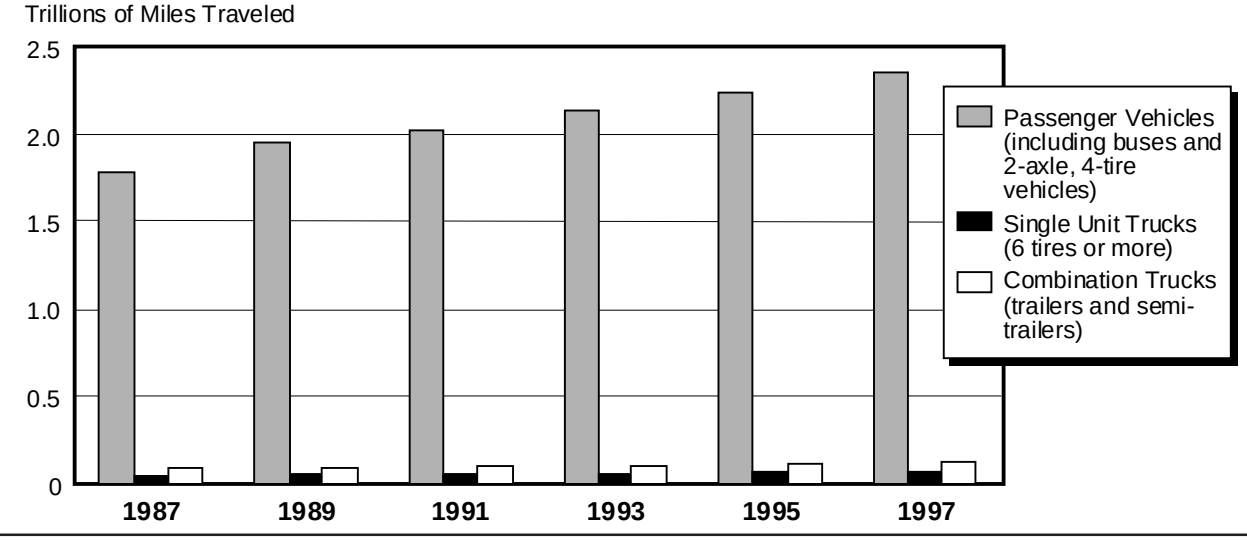
Highway Vehicle (VMT) and Passenger Miles of Travel (PMT), 1987-1997 (Millions of Miles)

Functional System	1987	1989	1993	1995	1997	Annual Rate of Change 1987-97
Rural Highway Vehicle-Miles (population < 5000)						
Interstate	170,493	191,085	208,308	224,435	241,451	3.5%
Other Principal Arterial	155,446	165,859	203,113	215,941	229,133	4.0%
Minor Arterial	146,543	156,646	146,454	153,824	163,999	1.1%
Major Collector	174,301	187,195	178,170	186,904	201,926	1.5%
Minor Collector	44,535	48,714	48,126	50,389	53,076	1.8%
Local	89,132	97,726	102,535	105,826	115,058	2.6%
Subtotal Rural	780,450	847,225	886,706	937,319	1,004,643	2.6%
Urban Highway Vehicle-Miles (population >= 5000)						
Interstate	244,836	270,735	317,399	344,602	364,769	4.1%
Other Freeway & Expressway	109,961	122,024	142,063	152,377	160,482	3.9%
Other Principal Arterial	304,684	327,173	354,976	372,995	387,808	2.4%
Minor Arterial	224,144	234,769	276,939	295,355	298,954	2.9%
Collector	95,970	101,871	117,887	128,362	126,718	2.8%
Local	161,159	192,690	200,408	207,361	223,584	3.3%
Subtotal Urban	1,140,754	1,249,262	1,409,672	1,501,052	1,562,315	3.2%
Total Highway Vehicle Miles	**1,921,204**	**2,096,487**	**2,296,378**	**2,438,371**	**2,566,958**	**2.9%**
Total Highway Passenger Miles	**3,088,227**	**3,231,369**	**3,825,052**	**4,017,442**	**4,087,217**	**2.8%**

Source: Highway Statistics, Summary to 1995, Tables VM-202 and VM-201, June 1997 HPMS. June 1999 HPMS.

Exhibit 2-12

Highway Travel by Vehicle Type, 1987-1997



Source: Highway Statistics, Summary to 1995, Table VM-201; Highway Statistics, 1997, Table VM-1.

Exhibit 2-13

Highway Travel by System and Vehicle Type, 1987-1997
(Millions of Vehicle-Miles Traveled)

Functional System / Vehicle Type	1987	1989	1991	1993	1995	1997	Rate of Change 1987-97
Rural Interstate							
PV	138,323	156,503	168,361	169,500	180,031	188,969	3.2%
SU	5,060	5,485	5,822	5,982	6,708	7,667	4.2%
Combo	27,110	29,097	30,829	32,826	36,644	41,642	4.4%
Other Arterials							
PV	272,816	291,874	302,889	314,469	331,539	349,555	2.5%
SU	10,078	10,549	10,866	11,374	12,980	13,668	3.1%
Combo	19,095	20,082	21,000	23,724	24,076	25,467	2.9%
Other Rural							
PV	287,100	311,532	320,913	304,389	315,687	338,590	1.7%
SU	11,154	11,690	11,960	12,505	12,948	13,671	2.1%
Combo	9,714	10,413	10,914	11,936	12,676	12,447	2.5%
Total Rural							
PV	698,239	759,909	792,163	788,358	827,257	877,114	2.3%
SU	26,292	27,724	28,648	29,861	32,636	35,006	2.9%
Combo	55,919	59,592	62,743	68,486	73,396	79,556	3.6%
Urban Interstate							
PV	225,307	249,144	262,400	294,703	315,888	330,668	3.9%
SU	5,395	5,970	6,384	6,513	7,148	7,906	3.9%
Combo	14,135	15,622	16,540	16,183	18,492	20,641	3.9%
Other Urban							
PV	864,141	944,685	967,945	1,053,429	1,101,516	1,144,334	2.8%
SU	16,335	17,176	17,866	20,398	22,923	23,933	3.9%
Combo	15,442	16,665	17,361	18,446	23,567	24,303	4.6%
Total Urban							
PV	1,089,448	1,193,829	1,230,345	1,348,132	1,417,404	1,475,002	3.1%
SU	21,730	23,146	24,250	26,911	30,071	31,839	3.9%
Combo	29,577	32,287	33,901	34,629	42,059	44,944	4.3%
Total							
PV	1,787,687	1,953,738	2,022,508	2,136,490	2,244,661	2,352,116	2.8%
SU	48,022	50,870	52,898	56,772	62,707	66,845	3.4%
Combo	85,496	91,879	96,644	103,115	115,455	124,500	3.8%

PV=Passenger Vehicles (including buses and 2-axle, 4-tire vehicles),
SU=Single Unit Trucks (6 tires or more),
Combo=Combination Trucks (trailers and semi-trailers).

Source: Highway Statistics, Summary to 1995, Table VM-201; Highway Statistics, 1997, Table VM-1.

The Role of Mass Transit

Public transit in the United States performs several services for transit passengers and local taxpayers. These can be summarized by three public policy functions:

- Transit provides *basic mobility* for those who cannot operate a motor vehicle because of low income, disability, youth, old age, or other reasons. These users benefit from a transit system that provides regular access to multiple destinations at a low cost.
- Transit encourages household *location efficiency.* A well-developed transit system encourages dense, multiple-purpose, pedestrian-oriented urban development in the vicinity of transit corridors and stations. This pattern of development allows households to reduce their ownership and use of motor vehicles while continuing to enjoy the benefits of accessibility to activity destinations.
- Transit assists in *congestion relief.* If transit service consistently provides door-to-door travel times that are competitive with those of private automobile trips, then transit will provide a meaningful substitute for autos as the travel mode of choice. In doing so, transit can effectively reduce roadway congestion. This function is especially important for commuting trips, which are often made during times of peak-period congestion on the urban road system. This function is best served by transit modes with a separate right-of-way and grade from the highway system, such as bus rapid transit and heavy rail systems.

These three public policy functions, while distinct in purpose, will obviously overlap with and support each other. For example, a transit vehicle may primarily serve as a congestion relief tool during peak travel periods while supporting basic mobility in off-peak hours. An individual may choose a housing location near a transit station in order to both avoid rush-hour congestion and to access diverse shopping and entertainment activities in the evening. For illustration purposes, however, it is often useful to assign transit trips to a particular functional category. Exhibit 2-14 describes such a classification system for transit trips in the 1995 Nationwide Passenger Transportation Survey.

Exhibit 2-14

Classification of Transit Trips by Public Policy Function

	Poverty	Vehicle Ownership	Age
Basic Mobility	Below	None or More	Not 16 - 74
Location Efficiency	Above	No Autos Owned	16 to 74
Congestion Relief	Above	One or More	16 to 74

Source: 1995 NPTS.

Using these definitions, Exhibit 2-15 indicates that basic mobility accounted for 40.1 percent of total transit passengers in 1995. Location efficiency accounted for 25.3 percent of total patronage, while congestion relief represented 34.7 percent of transit patronage.

Exhibit 2-15

Passenger Trips by Public Policy Function

	Percent
Basic Mobility	40.1%
Location Efficiency	25.3%
Congestion Relief	34.7%
Total	100.0%

Source: 1995 NPTS.

Exhibit 2-16 illustrates the distinct market niche that each of the three policy functions serves. Only 20 percent of the transit trips made by the basic mobility group were for work

Exhibit 2-16

Trip Characteristics of Transit's Primary Market Niches

	Percent Work Trips	Average Trip Distance (miles)	Percent by Bus
Basic Mobility	20.0%	10.2	82.9%
Location Efficiency	38.8%	6.9	60.1%
Congestion Relief	58.6%	21.0	57.3%

Source: 1995 NPTS.

trips, compared with 38.8 percent of the trips made by the location efficient group and 58.6 percent for the congestion relief group. For basic mobility, transit serves a wide variety of purposes, as users in this niche depend on transit for most of their mobility needs. Transit usage in the location efficiency niche serves fewer mobility purposes, as more of these purposes are served by neighborhood walking trips. Work trips dominate for congestion relief, when non-discretionary travel needs during peak congestion periods make rapid transit an appealing alternative to the private automobile.

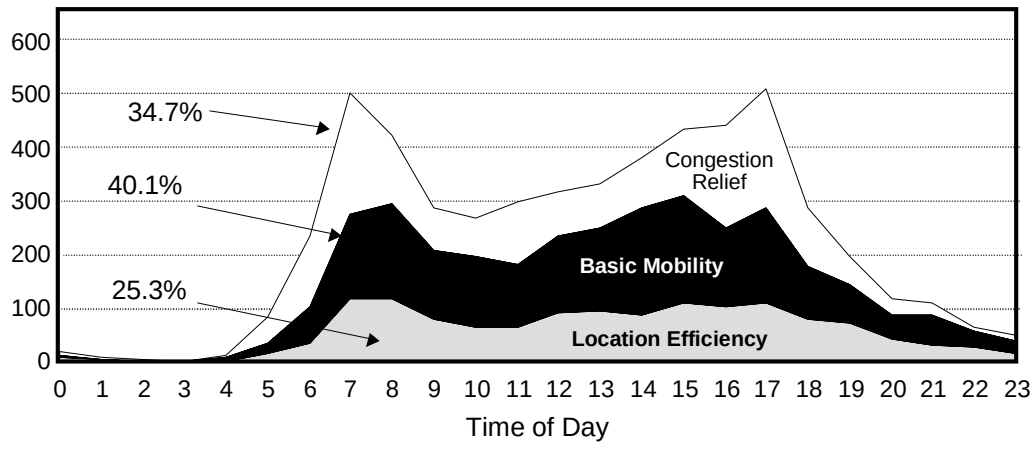
The average trip distance for basic mobility, 10.2 miles, is similar to the average automobile trip distance in the United States. The average trip distance for those wishing to bypass congestion is twice as long, reflecting the particular appeal of rapid transit for lengthy, congested work trips. Transit trips are shortest for those interested in location efficiency, reflecting transit's role in distributing passengers across central neighborhoods and commercial centers.

The relatively high share of basic mobility trips (82.9 percent) on buses as compared to location efficiency and congestion relief (60.1 and 57.3 percent, respectively) reflects two important characteristics of mass transit and its ridership. First, it reflects the preference of transit users in these two latter niches (who generally have higher incomes than those of basic mobility users) for faster modes of transportation, such as rail transit. Second, the greater dependence of the basic mobility group on bus transit also reflects the greater coverage provided by bus routes relative to rail routes, an especially important feature to individuals with limited mobility, such as the elderly and disabled.

Exhibit 2-17 shows how transit usage by the three market niches varies by time of day. Trips made by the location efficient group, *above-poverty households without cars*, tend to be evenly distributed throughout the day, with a very mild peaking in the morning and afternoon. Trips made by people from below poverty households tend to be slightly more peaked during the commuting hours. Transit use by above poverty households with cars contributes the most to the peaking of travel demand.

Exhibit 2-17

Transit Trips by Function and Time of Day, 1995



System Operations and Infrastructure

While State and Federal governments provide much of the funding for public transit in the United States, actual operations remain primarily a local responsibility. As local governments come to realize the regional nature of transportation problems, metropolitan planning organizations are playing an increasing role in formulating transit policy. Regional planning allows local officials to consider the effects of the transportation system on other characteristics of the urban environment as well, including land use, employment creation and location, and accessibility.

While most mass transit usage continues to occur in major metropolitan areas, it is becoming increasingly important in small urban areas and rural areas. In 1997 there were 556 local public transit operators serving 319 urbanized areas. There were also 1,260 operators providing service in rural areas, and 3,660 providers of specialized service to the elderly and disabled.

The urban transit system continues to grow in the United States. In 1997, transit systems in the U.S. operated 149,468 vehicles (Exhibit 2-18). Rail operators controlled over 9,922 miles of track and served 2,681 stations. There were also 1,179 maintenance facilities for transit vehicles in use. Between 1995 and 1997, the number of vehicles increased by 10.3 percent, track mileage grew by 3.6 percent, the number of stations increased by 2.3 percent, and the number of maintenance facilities grew by 1.2 percent.

Route Miles

Another indicator of the extent of transit service is route mileage. This represents the mileage covered by a transit route, independent of the number of vehicles that serve that route. The routes may be along fixed guideways (as in the case of rail modes) or may share city streets with other vehicles (as for most bus routes). When routes overlap, the mileage is counted separately for each route. Route miles are also called directional route miles, meaning that they are counted for vehicles traveling in a particular direction. This accounts for such transit route features as one-way loops.

Exhibit 2-19 shows transit route mileage from 1987 to 1997. In 1997, there were 8,602 rail route miles and 156,733 non-rail route miles operated by mass transit systems. While overall mileage increased at an annual rate of 1.1 percent during that period, it actually fell slightly between 1995 and 1997. This was due to a decline in non-rail transit mileage, reflecting a shift from fixed route systems (such as scheduled buses) to non-fixed route modes (such as demand response and vanpools). While rail systems continue to represent only 5.0 percent of transit route mileage, they are growing significantly. Rail route miles have increased at an annual rate of 3.7 percent since 1987, reflecting the new-start rail systems and extensions that have come online during that period.

System Capacity

Transit service capacity is measured by vehicle revenue miles (VRM), which incorporate the distance traveled by a transit vehicle (e.g., a bus or train car) in passenger-carrying revenue service. Vehicle revenue miles can be adjusted to reflect differences in the carrying capacity of different kinds of transit vehicles, using the typical bus as the reference point. The resulting measure, Transit Capacity-Equivalent Miles, is shown in Exhibit 2-20.

In 1997, transit operators supplied 3.44 billion capacity-equivalent miles of service in the United States. Of this total, 1.72 billion capacity-equivalent miles came from rail modes, a 2.0 percent annual increase since 1987, and 1.72 billion came from non-rail modes, representing an annual rate of increase of 1.6 percent over the same time period.

Exhibit 2-18

Urban Mass Transit Active Fleet and Infrastructure, 1997

	Urbanized Areas over 1 million	Urbanized Areas under 1 million	Total
Vehicles			
Buses	43,169	20,088	63,257
Heavy Rail	10,273	0	10,273
Light Rail	1,216	46	1,262
Self-Propelled Commuter Rail	2,520	0	2,520
Commuter Rail Trailers	2,757	0	2,757
Commuter Rail Locomotives	624	0	624
Vans	12,620	8,662	21,282
Other (including Ferryboats)	145	138	283
Rural Service Vehicles	0	17,879	17,879
Special Service Vehicles	4,400	24,931	29,331
Total Active Vehicles	**77,723**	**71,745**	**149,468**
Infrastructure			
Track Mileage			
Heavy Rail	2,148	0	2,148
Commuter Rail	6,845	104	6,949
Light Rail	780	23	803
Other Rail	21	2	23
Total Track Mileage	**9,794**	**129**	**9,922**
Stations			
Heavy Rail	997	0	997
Commuter Rail	1,103	8	1,111
Light Rail	493	37	530
Other Rail	36	7	43
Total Transit Rail Stations	**2,629**	**52**	**2,681**
Maintenance Facilities			
Heavy Rail	53	0	53
Light Rail	23	3	26
Commuter Rail	41	0	41
Ferryboat	6	1	7
Buses	272	235	507
Demand Response	28	55	83
Other	9	3	12
Rural Transit Maintenance Facilities	0	450	450
Total Maintenance Facilities	**433**	**746**	**1,179**

Exhibit 2-19

Urban Transit Route Miles, 1987-1997

	1987	1989	1991	1993	1995	1997	Annual Rate of Change
Rail	5,966	6,754	7,003	7,334	8,206	8,602	3.7%
Non-Rail	141,915	146,589	149,332	158,779	158,076	156,733	1.0%
Total	**149,868**	**155,332**	**158,326**	**168,106**	**168,277**	**167,332**	**1.1%**
Percent Rail	*4.0%*	*4.3%*	*4.4%*	*4.4%*	*4.9%*	*5.1%*	

Source: National Transit Database.

Exhibit 2-20

Transit Capacity, 1987-1997
(Millions of Urban Transit Capacity-Equivalent Vehicle Revenue Miles)

	1987	1989	1991	1993	1995	1997	Annual Rate of Change
Rail	1,406	1,539	1,558	1,564	1,646	1,722	2.0%
Non-Rail	1,468	1,562	1,619	1,659	1,689	1,718	1.6%
Total	**2,873**	**3,100**	**3,178**	**3,223**	**3,335**	**3,440**	**1.8%**
Percent Rail	*48.9%*	*49.6%*	*49.0%*	*48.5%*	*49.4%*	*50.0%*	

Source: National Transit Database.

Passenger Travel

Transit travel is measured by passenger miles traveled (PMT), the total number of miles traveled by passengers in transit vehicles. Transit PMT is described in Exhibit 2-21. Urban transit passenger miles grew at an annual rate of 1.0 percent from 1987 to 1997. Passenger travel growth on rail modes was more than three times higher than on non-rail modes (1.5 percent versus 0.4 percent annually). In 1997, rail travel was 21.1 billion PMT, which accounted for nearly 53.0 percent of transit passenger miles (while serving just 5.1 percent of route miles, as noted above). Passenger mile growth was especially significant between 1995 and 1997, as rail modes grew by 7.4 percent and non-rail modes by 4.1 percent during that two-year span. This difference again reflects the recent expansion of rail transit in the U.S.

Exhibit 2-21

Urban Transit Passenger Miles, 1987-1997 (Millions of Miles)

	1987	1989	1991	1993	1995	1997	Annual Rate of Change
Rail	18,131	19,766	18,551	17,867	19,682	21,138	1.5%
Non-Rail	18,241	18,455	18,921	18,353	18,289	19,043	0.4%
Total	**36,372**	**38,221**	**37,472**	**36,220**	**37,971**	**40,180**	**1.0%**
Percent Rail	*49.8%*	*51.7%*	*49.5%*	*49.3%*	*51.8%*	*52.6%*	

Source: National Transit Database.

Vehicle Occupancy

Transit vehicle occupancy is calculated as passenger miles traveled divided by capacity-equivalent vehicle revenue miles. This measure relates transit service consumed by passengers to the transit service supplied by the operators of vehicles. In 1997, vehicle occupancy was 11.7 passengers for all transit services, 12.3 passengers per capacity-equivalent vehicle for rail modes, and 11.1 passengers per vehicle for non-rail modes (Exhibit 2-22). While these figures reflect a decline relative to 1987 for both rail and non-rail modes, they have been increasing since 1993 for rail and 1995 for non-rail modes.

Q. **Are there any major changes that might explain the recent growth in rail passenger mileage?**

A. Over 80 percent of the nationwide growth in rail PMT between 1995 and 1997 occurred on the heavy rail system of the New York City Transit Authority. Much of the increase in that city can be attributed to the change in fare structure that occurred with the introduction of the Metrocard system.

Exhibit 2-22

Transit Vehicle Occupancy (Passengers per Capacity-Equivalent Vehicle)

	1987	1989	1991	1993	1995	1997
Rail	12.9	12.8	11.9	11.4	12.0	12.3
Non-Rail	12.4	11.8	11.7	11.1	10.8	11.1
Total	**12.7**	**12.3**	**11.8**	**11.2**	**11.4**	**11.7**

Source: National Transit Database.