U.S. Department
of Transportation

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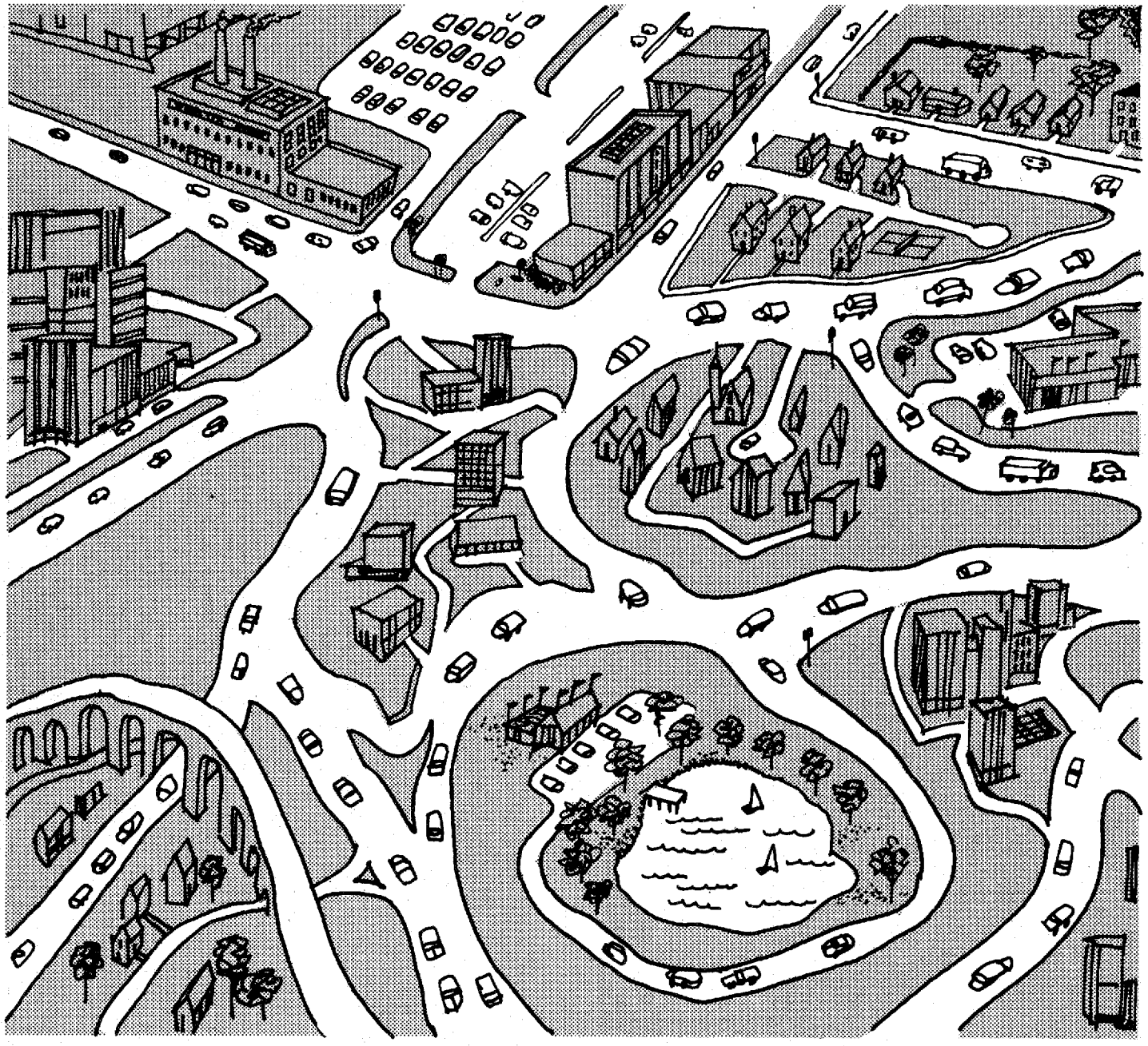
Office of Highway Planning

Highway Travel Trends during the 1970's

A special report concerning the period of fuel shortages and its impact on highway travel patterns

July 1980



HIGHWAY TRAVEL TRENDS DURING THE 1970's

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OFFICE OF HIGHWAY PLANNING

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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WASHINGTON, D.C. 20590

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I. INTRODUCTION

A. Purpose

This review was initiated in response to inquiries concerning the variations in highway travel patterns due to fuel shortages, which became apparent in 1973-1974 following the Arab oil embargo and in 1979 following restraints imposed on imported oil supplies.

B. Scope

The review focuses on highway travel activity in the United States in the 1970's and trends in some related fields, such as fuel consumption and passenger vehicle occupancy, that influence travel. Time series data are presented for most items, but current coverage is provided only at the national level.

Variations in highway travel activity, included in the review for 1980 and earlier years, are based on the latest revised annual estimates reported by the State highway agencies. These annual estimates of travel within highway class have been prorated by month, based on the hourly traffic data that are collected from automatic traffic recorders located along approximately 3,000 roadway sections distributed throughout the United States. The results of the review, concerning traffic variations during two energy crises, have been summarized at the national level as well as at limited regional and State levels.

Changes in national levels of highway usage of motor fuel, summarized in this review, have been based on gallonage figures reported from the State taxation agencies. Data for 1979, only, were developed based on monthly trends of gross gallonage of gasoline and special fuels, which include highway use and a small percentage of nonhighway use and losses.

Results from several vehicle occupancy studies have been highlighted; and time series data have been included when available. Vehicle occupancy data have been derived from roadside surveys based on counted number of passengers (including driver) observed in passenger-type vehicles.

II. HIGHLIGHTS

During short periods of limited fuel availability:

- Vehicle occupancy rates appear higher when one-or-more lanes are reserved in rush hour for high-occupancy vehicles.
- Travel decreases drastically. Cutbacks in travel generally begin with and follow periods of fuel shortages in the short-term.
- Travel on high-order, rural highway facilities drops off about 6 percent more than on urban highways.
- Travel on weekends decreases 4-6 percent more than on weekdays. The weekend decrease began earlier and continued longer.
- Passenger vehicle travel accounts for most of the reduction while commercial truck travel shows little change.
- Sales of diesel fuels have remained up except in 1979, while sales of gasoline have been down.
- Long-distance discretionary travel appears to be off.
- Automobile occupancy rates tend to increase but quickly return to normal once fuel is readily available again.

III. GENERAL TRENDS AND CHARACTERISTICS OF NATIONAL HIGHWAY TRAVEL

A. Overview

In the 10-year period from 1969 through 1979, highway travel in the United States increased about 45 percent, or an average growth of 3.68 percent per year. The highest average annual increase in vehicle miles of travel (VMT) in the decade was 6.87 percent in 1972. Annual highway travel decreased twice as a result of fuel shortages in 1974 and in 1979. The estimated total travel for 1979 is 1.5 trillion VMT, a decrease of about 1.5 percent from 1978. The trend of annual total travel in the decade is shown in Table 1.

Highway travel on rural facilities (outside of those in places of population 5,000 or more) in the Nation, has grown at an average of 2.51 percent per year. Urban highway travel in the period from 1969 through 1979 has grown at an average of 4.73 percent per year. The highest annual growth in the decade for travel on rural highways was about 6.2 percent in 1971; the highest urban annual travel growth was 10.6 percent in 1972. When highway travel was influenced by fuel shortages, rural growth dropped more than the urban. In 1974 rural highway travel decreased 3.4 percent as compared to 1.7 percent for urban travel. Again, in 1979, rural travel dropped 2.6 percent and urban travel dropped 1.0 percent.

The urban share of total highway travel, which was 50.6 percent in 1969, has increased to 55.9 percent of the total in 1979. Perhaps the primary factors contributing to the increase in the percent of urban highway travel have been the increasing urbanization of the population, the inclusion within the urban boundaries of some mileage that was formerly classed as rural, and development of new beltways and local streets.

TABLE 1 - ANNUAL U.S. HIGHWAY TRAVEL

YEAR	RURAL		URBAN		TOTAL	
	VMT (BILLION)	PERCENT CHANGE	VMT (BILLION)	PERCENT CHANGE	VMT (BILLION)	PERCENT CHANGE
1969	524.4		537.4		1,061.8	
1970	539.5	2.88	570.2	6.10	1,109.7	4.51
1971	572.8	6.17	606.0	6.28	1,178.8	6.22
1972	589.8	2.97	670.0	10.56	1,259.8	6.87
1973	605.8	2.71	707.3	5.57	1,313,1	4.23
1974	585.3	-3.38	695.2	-1.71	1,280.5	-2.48
1975	601.7	2.80	726.0	4.43	1,327.7	3.69
1976	630.6	4.80	775.3	6.79	1,405.9	5.89
1977	657.2	4.22	813.3	4.90	1,470.5	4.59
1978	689.8	4.96	858.4	5.55	1,548.2	5.28
1979	672.0 P	-2.6 P	853.0 P	-1.0 P	1,525.0 P	-1.5 P
10-Year Average Annual Growth		+2.51		+4.73		+3.68

P = Preliminary

In the period from 1970 through May 1980, national highway travel, expressed in terms of average daily VMT by month (Figure 1), fluctuated on an annual cycle. Although the pattern may vary slightly each year, particularly in the periods of fuel shortages, national highway travel generally continued to increase. In 1970 daily travel averaged 3.0 billion VMT; in 1979 daily travel averaged about 4.2 billion VMT. The average difference between the low and high parts of the annual cycle, increased from 450 million VMT per day in 1970 to 650 million VMT per day in 1978.

The seasonal driving pattern in the rural and urban areas is repetitive (Figure 2) in the period 1970 through 1980. The rural pattern follows a flatter slope (growth rate) than the urban pattern during this period; the rural pattern also has about twice the annual fluctuation of the urban pattern. The rural and urban patterns generally have been affected by the fuel shortages in the 1970's. Slight short-term changes in the annual cycle were seen in the winter of 1974 and in the summer of 1979.

The peaks in the summer are normally characteristic of long trips being added to the short trips; the latter trips are generally taken for the purposes of "earning a living" and "family business," which are not usually affected by the season. The long trips, usually taken in the rural areas, are likely "social and recreational" trips such as those for vacations and sightseeing.

B. Recent Monthly Variations in National Highway Travel

Experience has indicated that national highway travel in the short-term has been affected during the fuel shortage periods of the 1970's. Plots of daily highway travel by rural, urban, and combined road classes, Figures 3, 4, and 5, indicate the monthly variation during the 1972 through 1974 period and the 1977 through 1980 period.

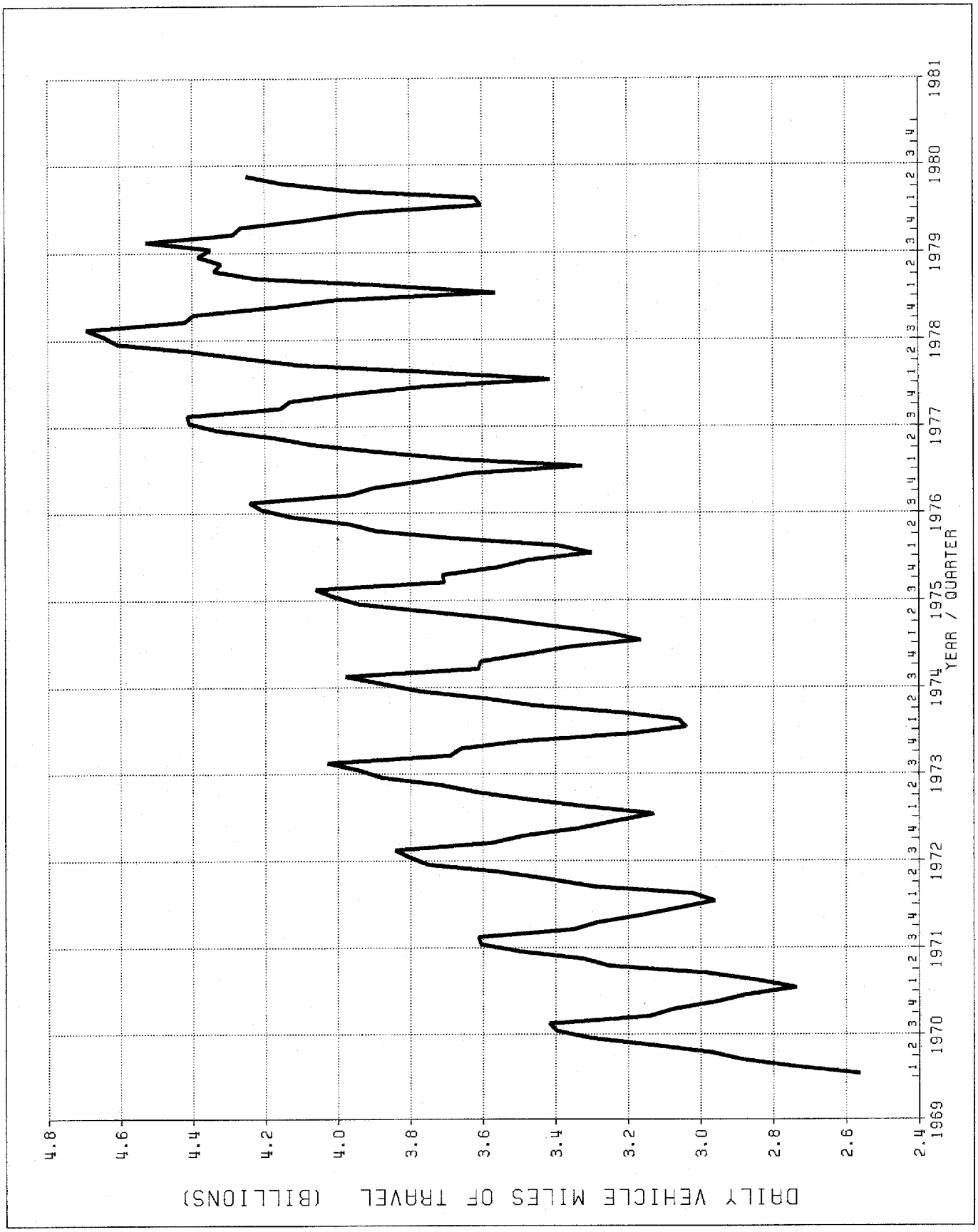


FIGURE 1. - AVERAGE DAILY U.S. HIGHWAY TRAVEL BY MONTH, 1970-1980

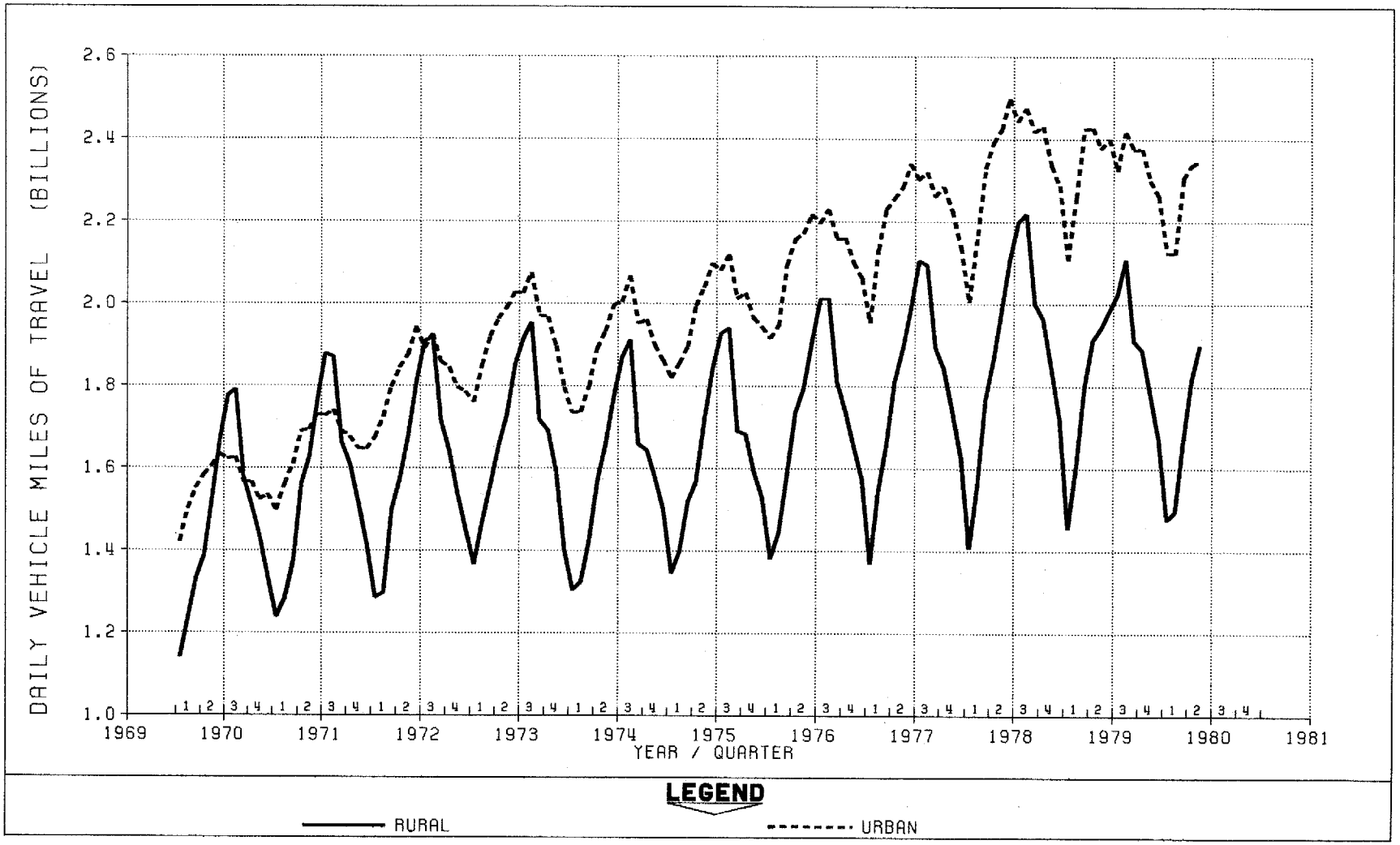


FIGURE 2. - AVERAGE DAILY U.S. HIGHWAY TRAVEL BY MONTH, RURAL AND URBAN, 1970 - 1980

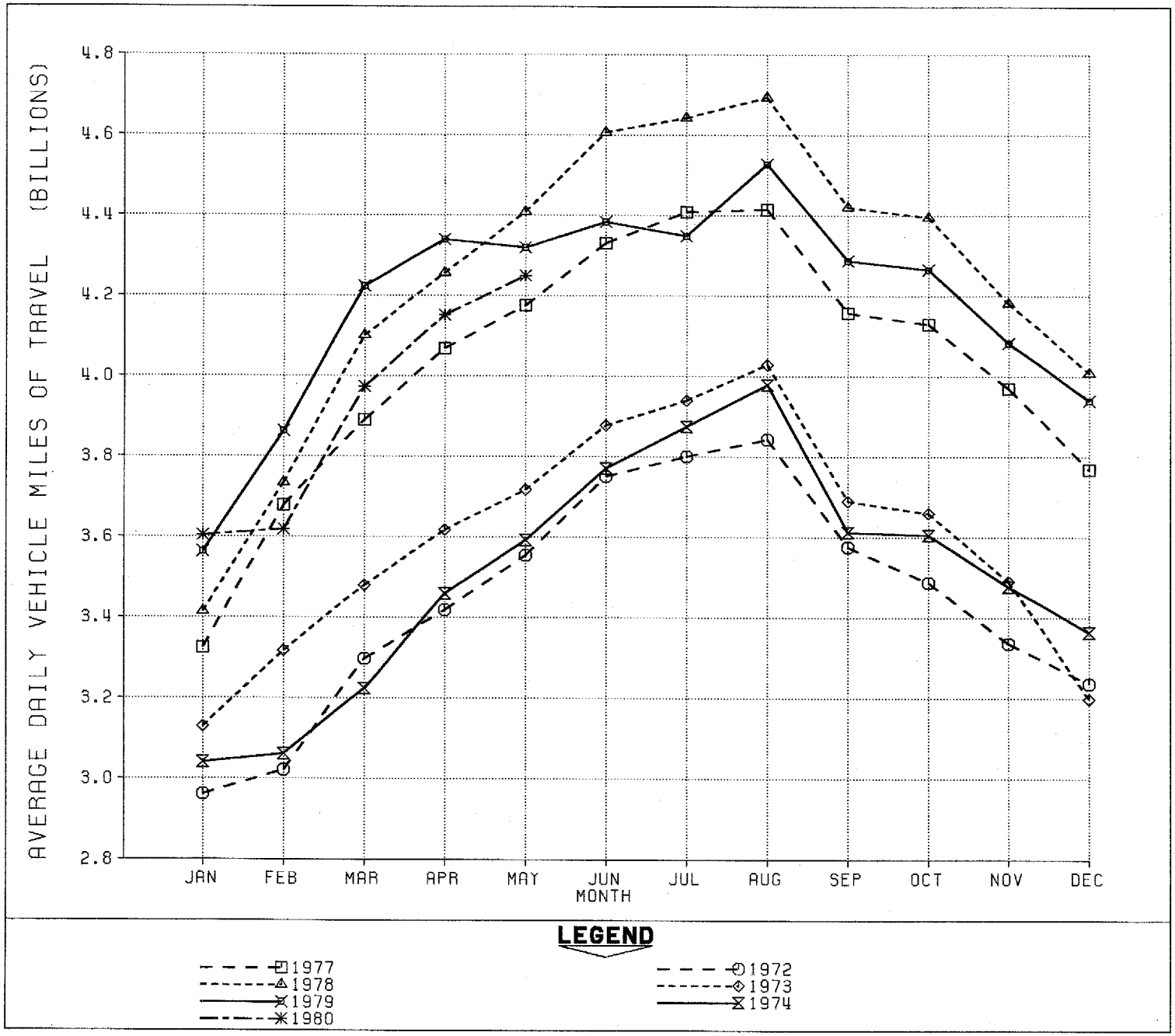


FIGURE 3. - AVERAGE DAILY U.S. HIGHWAY TRAVEL BY MONTH, 1972 - 1974 AND 1977 - 1980

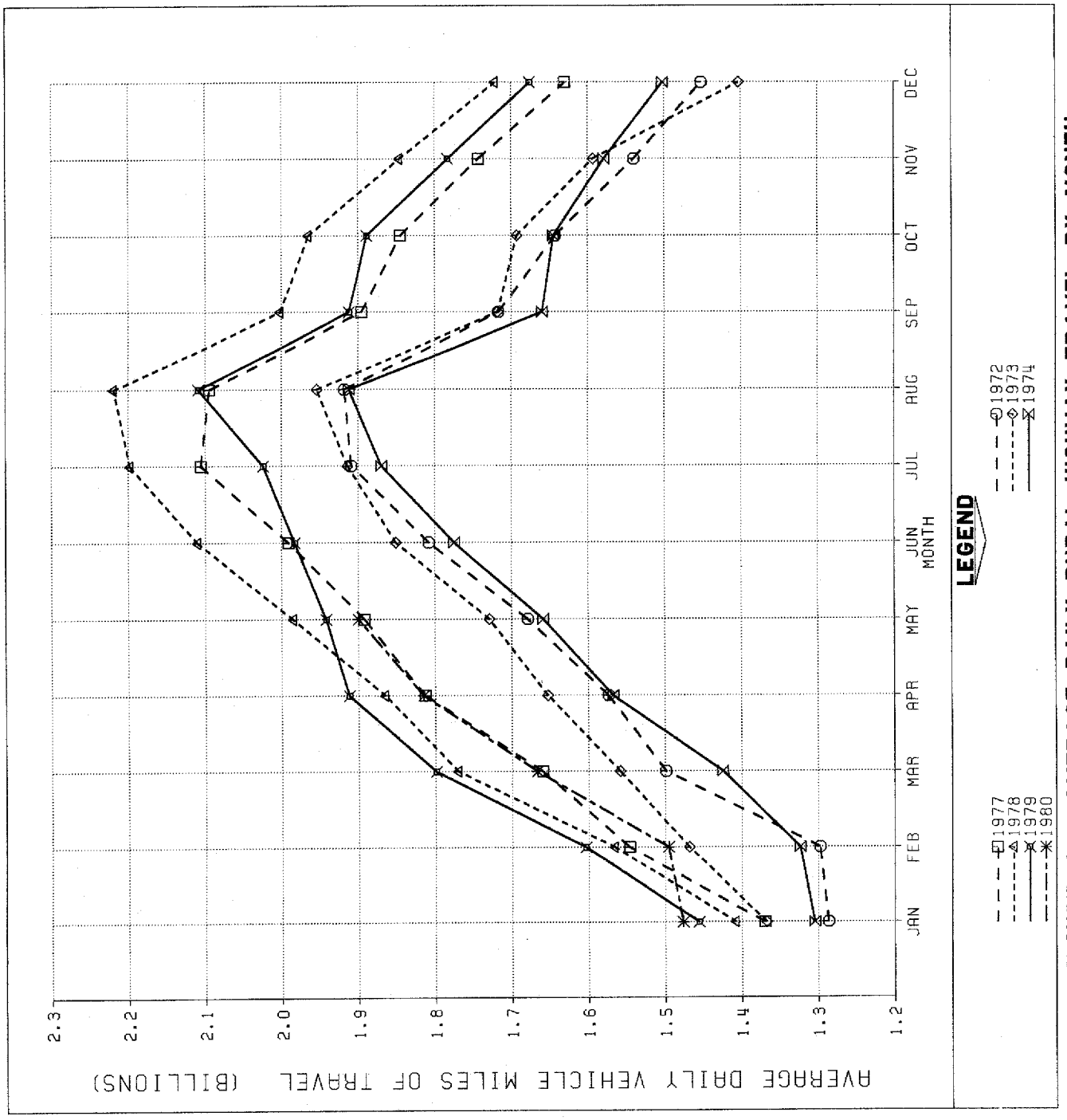


FIGURE 4. - AVERAGE DAILY RURAL HIGHWAY TRAVEL BY MONTH, 1972 - 1974 AND 1977 - 1980

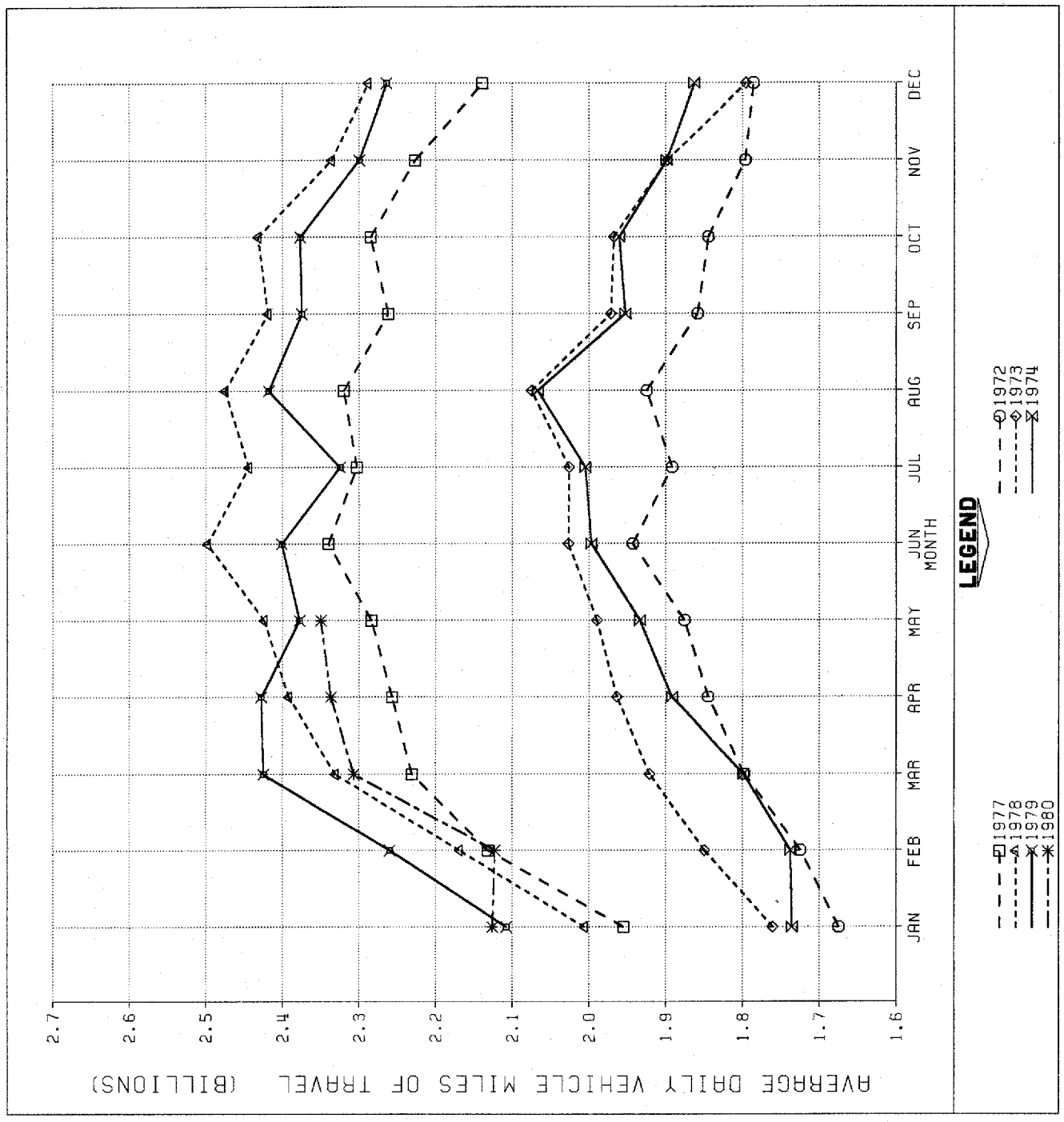


FIGURE 5. - AVERAGE DAILY URBAN HIGHWAY TRAVEL BY MONTH, 1972 - 1974 AND 1977 - 1980

However, to fully comprehend these changes in monthly travel patterns, a brief description of the typical monthly travel distribution, which has been established over time, may provide a meaningful background. The plots, shown for the years 1972 and 1977, are representative of the typical change in highway travel by month under a plentiful fuel situation.

The plot for rural and urban combined (Figure 3) shows that daily VMT is at a low point in January, rising steadily through February, with a continued rate of increase in March as the weather improves and becomes warmer. There is a slightly slower, yet steady, rise through April and May and continuing into June as schools close. In July and August, when the vacation season is in full swing, highway travel normally reaches a peak.

The sharp decrease in highway travel from August to September is partially attributable to the fact that school usually starts right after Labor Day ending most summer recreation travel for many families. The decrease in daily travel from October through December is more gradual and may be attributable in most of the United States to the general worsening of the weather. Daily travel continues to decline into January, and the annual pattern is repeated.

The pattern shown for rural highway travel (Figure 4) is similar to that for the rural and urban combined. The amount of variation in rural daily VMT with the season is considerable. For example, in 1977, the daily VMT ranged from a low of about 1,400 million in January to a high of 2,100 million in August or about a 50 percent increase. The average daily VMT by month is influenced by the greater weekend travel activity in the warmer months along major rural highway facilities. During the summer weekend recreational trips are common, as evidenced by the number of passenger vehicles

and camper-type vehicles bearing out-of-State license plates. The pattern is also influenced by the lack of agricultural activities in the winter months and high levels of activity in the spring, such as trucking the seed and fertilizers for planting the crops. In the summer and fall, the shipment of grains, fruits, and vegetables to the market places occurs.

Urban highway travel (Figure 5) starts at a low in January, gradually increasing to a peak during June or August and decreasing from August through December, until it reaches the low again the following January. The amount of daily VMT appears to be more stable in urban areas than in rural areas. For example, in January 1977, the low averaged under 1,950 million VMT per day, and in June 1977, the high totaled just over 2,350 million VMT per day, or a 20 percent variation.

Much of the urban highway travel is comprised of trips not affected by seasonal variation such as trips taken for "earning a living" and "family business." Typically much of the urban travel occurs during the week with reductions in traffic volumes on weekends, particularly on Sundays. Fridays are usually the highest travel day of the week in urban areas.

C. Changes in Monthly Travel Patterns Due to Fuel Shortages

Fuel availability has a direct influence on highway travel, affecting discretionary travel (e.g., weekend vacations) more than the average weekday travel. During each of the energy crisis periods in the 1970's, the President made appeals to the public to conserve fuel through reduced driving speeds, carpooling, and avoiding some discretionary trips. Special news coverage concerning fuel saving strategies was frequent. Service stations used reduced service hours, Sunday closings, and minimum and maximum purchase plans

to handle an allocated supply. Some States imposed even-odd plans to assist in reducing the long lines of vehicles at the service stations during the critical times in the early months of 1974 as well as the summer 1979. The uncertainty of fuel availability resulted in a cancellation of many long-distance, discretionary trips. Major increases in fuel prices, particularly in the late 1970's, have contributed to reduced purchases and improved fuel availability to those users who could afford it.

In the period from 1972 through 1974, the Nation experienced about a 10 percent drop in fuel availability for the first quarter of 1974. In December 1973, travel decreased 1.2 percent (Table 2 and Figure 3). Travel over the next three months continued to drop --January 1974 was off 2.8 percent, February was off 7.7 percent, and March was off 7.4 percent. In March 1974, the daily VMT had dropped below the 1972 level. After March 1974, the fuel supplies returned to nearly normal levels, but travel continued in a depressed fashion for the next eight months. In December 1974, the first monthly travel increase for the year was reported, 4.8 percent. Overall the 1974 level of daily VMT by month remained slightly above the 1972 level, except for March, and also below the 1973 level, except for December, when travel first rebounded above the 1973 level (Figure 3).

National travel in the 1970's received its second critical test with about a 5 percent shortfall in fuel supplies for the second and third quarters of 1979. In 1978, Americans had driven more than in 1977, particularily following the major snow storms in January and February 1978. Average daily VMT by month in 1979 also continued to increase over the same months in 1978, but the percentage increases were gradually getting smaller. In May 1979, daily travel fell below the 1978 level, -2.0 percent, and continued in June, -4.8 percent (Table 2). In July the largest decrease, 6.3 percent, was

TABLE 2 - PERCENT CHANGE IN MONTHLY U.S. HIGHWAY TRAVEL
COMPARED TO SAME MONTH IN THE PREVIOUS YEAR
1972 - 1974 and 1977 - 1979

MONTH	1973/1972	1974/1973	1974/1972	1978/1977	1979/1978	1979/1977
Jan	5.7	-2.8	2.7	2.7	4.4	7.2
Feb	6.0*	-7.7	-2.2*	1.5	3.4	5.0
Mar	5.5	-7.4	-2.2	5.4	3.0	8.6
Apr	5.8	-4.4	1.2	4.6	1.9	6.6
May	4.6	-3.4	1.1	5.6	-2.0	3.4
June	3.4	-2.8	0.5	6.4	-4.8	1.2
July	3.7	-1.6	2.0	5.3	-6.3	-1.4
Aug	4.8	-1.2	3.5	6.3	-3.6	2.5
Sept	3.2	-2.1	1.0	6.3	-3.0	3.1
Oct	5.0	-1.5	3.4	6.4	-3.0	3.3
Nov	4.6	-0.4	4.2	5.3	-2.4	2.9
Dec	-1.2	4.8	3.9	6.4	-1.7	4.5

* In leap year 1972, February had 29 days instead of the normal 28. This causes one additional day of travel to be assigned and also distorts the percentage change figures.

recorded and the daily travel fell below the 1977 level. In August 1979, a partial comeback above the 1977 level was reported, following better fuel supplies, but national travel continued to remain below 1978 levels. Total 1979 travel is estimated to be 1.5 percent below the 1978 level. Historically normal annual increases have been approximately 4 to 5 percent, thus the estimated 1979 travel is about 5 to 7 percent below anticipated levels.

Changes in monthly highway travel are more evident in rural areas than in urban areas during fuel shortage periods (Tables 3 and 4). The first decrease recorded in rural travel was December 1973; the first decrease recorded in urban travel was January 1974. Rural travel in 1974 declined for the first 6 months by more than 4 percent below the 1973 levels. Urban travel in 1974 declined by more than 4 percent for two months, February and March. Overall for 1974, highway travel losses were recorded in 11 months, both in the rural and urban areas, although the urban travel losses were always less.

During the 1979 fuel shortage, the reported decreases on rural highways were generally greater than on urban facilities. The first decreases recorded in 1979 began with May and continued through December into the first months of 1980. Rural travel in 1979 dropped below the 1977 levels in the months of June and July; urban travel in 1979 never fell below the 1977 levels.

Rural and urban shifts in daily travel by month during the 1979 and 1973-1974 crises occurred during the spring and summer seasons and the winter and spring seasons, respectively. Because of differences in availability of fuel, not all of the United States were affected equally. In the 1973-1974 crisis, the eastern and western coastal States probably were affected more severely than the other contiguous 48-States; the 1979

TABLE 3 - PERCENT CHANGE IN MONTHLY RURAL HIGHWAY TRAVEL
COMPARED TO THE SAME MONTH IN THE PREVIOUS YEAR
1972 - 1974 AND 1977 - 1979

MONTH	1973/1972	1974/1973	1974/1972	1978/1977	1979/1978	1979/1977
Jan	6.4	-4.7	1.4	2.8	3.4	6.2
Feb	9.3*	-9.8	-1.5*	1.2	2.4	3.7
Mar	4.0	-8.6	-5.0	6.6	1.6	8.3
Apr	5.1	-5.2	-0.4	2.9	2.5	5.5
May	2.9	-4.0	-1.2	4.9	-2.1	2.6
June	2.4	-4.1	-1.9	6.0	-6.0	-0.4
July	0.2	-2.3	-2.1	4.4	-7.9	-3.9
Aug	1.9	-2.2	-0.3	5.9	-4.9	0.7
Sept	0.0	-3.4	-3.3	5.6	-4.5	0.9
Oct	3.0	-2.8	0.2	6.5	-3.8	2.4
Nov	3.4	-0.9	2.5	5.9	-3.4	2.3
Dec	-3.4	7.0	3.4	5.6	-2.6	2.8

* In leap year 1972, February had 29 days instead of the normal 28. This causes additional day of travel to be assigned and also distorts the percentage change figures.

TABLE 4 - PERCENT CHANGE IN MONTHLY URBAN HIGHWAY TRAVEL
COMPARED TO THE SAME MONTH IN THE PREVIOUS YEAR
1972 - 1974 AND 1977 - 1979

MONTH	1973/1972	1974/1973	1974/1972	1978/1977	1979/1978	1979/1977
Jan	5.1	-1.4	3.6	2.6	5.1	7.8
Feb	3.6 *	-6.0	-2.7 *	1.7	4.2	6.0
Mar	6.8	-6.4	0.0	4.5	4.1	8.7
Apr	6.5	-3.7	2.5	6.0	1.5	7.6
May	6.1	-2.8	3.1	6.1	-1.9	4.1
June	4.3	-1.5	2.8	6.7	-3.9	2.6
July	7.1	-1.0	6.0	6.1	-4.9	1.0
Aug	7.8	-0.4	7.4	6.7	-2.3	4.2
Sept	6.1	-1.0	5.1	6.9	-1.8	5.0
Oct	6.7	-0.3	6.3	6.4	-2.3	4.0
Nov	5.6	0.0	5.7	4.9	-1.5	3.3
Dec	0.6	3.7	4.3	7.0	-1.0	5.9

* In leap year 1972, February had 29 days instead of the normal 28. This causes one additional day of travel to be assigned and also distorts the percentage change figures.

fuel shortage seemed to have a more widespread impact. Travel for the Nation during the early months of 1980 continued to be below normal anticipated levels. At the same time fuel prices were about 300 percent higher than those during the 1973-1974 crisis.

D. Traffic Volume Change Along Selected Highway Facilities

Weekly monitoring of nine toll facilities in the east and mid-central States in 1979 illustrates the significant traffic decrease. Beginning in early May, traffic showed significant drops, particularly on the weekends (Figure 6). The extreme situation seem to be during the last week in June, with weekend travel off nearly 30 percent. Beginning with the week of the Fourth of July, traffic showed a slight recovery, but continued below 1978 levels through the last week of the survey late in October.

Weekday traffic continued above 1978 levels several weeks after the weekend traffic had showed a noticeable drop, and the weekday decrease was not as severe as that for weekends. Overall 7-day vehicle transactions were off about 15 percent during the worst week, the last week of June 1979.

Major rural and urban highways in the southern and western regions of the United States were monitored in 1979 by continuous traffic recorders at approximately 70 locations in selected States with telemetry reporting capability. Rural Interstate facilities indicated the largest decrease as determined by change in traffic volumes (Figure 7). Traffic had fallen below the 1978 levels beginning the last few weeks in April 1979, dropped to about a 15 percent decrease in the last week of June, eased to a 10 percent decrease in July, and indicated about a 5 percent decrease during October. Interstate rural traffic may have remained below 1978 levels longer than other facilities because of the number of intercity trips it handles which may have been curtailed.

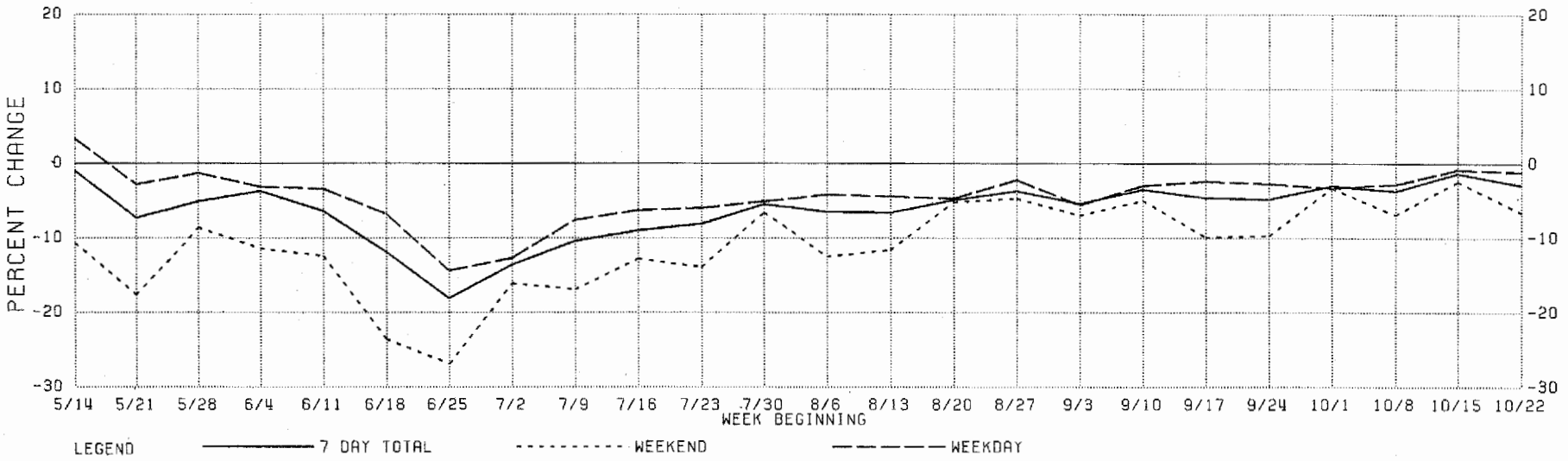
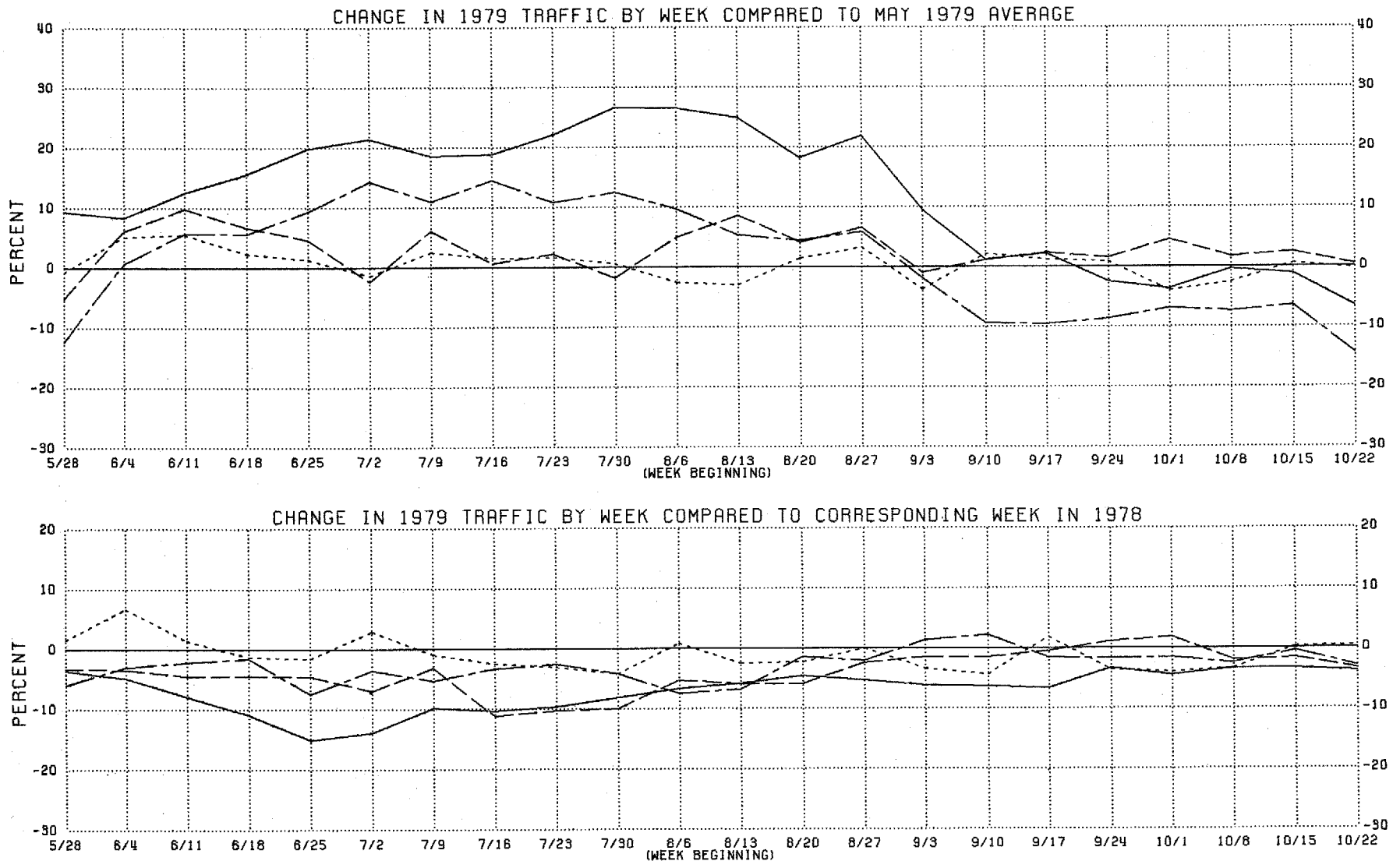


FIGURE 6. - TOLL ROAD MONITORING
PERCENT CHANGE IN WEEKLY 1979 VEHICLE TRANSACTIONS
COMPARED TO CORRESPONDING WEEK IN 1978



NOTE: BASED ON CONTINUOUS TRAFFIC COUNTS AT APPROXIMATELY 70 LOCATIONS IN SELECTED STATES WITH TELEMETRY REPORTING CAPABILITY.

FIGURE 7. - WEEKLY TRAFFIC MONITORING SUMMARY, 1979

The remaining classes of highway facilities monitored were other rural, Interstate urban and other urban. The other urban systems appeared to have been affected the least. During several weeks of summer 1979, traffic exceeded the 1978 levels. Traffic on Interstate urban and other rural facilities appeared to be generally 5 percent below 1978 levels and appeared to return to near 1978 levels in September. None of the facilities experienced the normal anticipated growth in traffic in the May through October period.

E. Specific State Experiences

Travel on California State Highway Systems showed a significant drop in May 1979 and continued below 1978 levels for six months. Beginning with August, California travel has followed the seasonal pattern, but at a reduced level (Figure 8 and Table 5). In November and December, a slight increase in highway travel occurred above the 1978 levels and has continued through the first quarter of 1980. Highway travel on weekends appears to be more affected by the fuel shortages than on weekdays. Weekend travel in California dropped nearly 20 percent in May 1979; weekday travel dropped about 4 percent compared to the same month in 1978 (Table 5). Travel on weekends has remained below 1978 levels through February 1980 although weekday travel rebounded above the 1978 levels beginning in August 1979, and has since remained above.

Data for Texas indicates that average annual traffic in 1979 decreased by 0.7 percent; weekday traffic increased by 0.7 percent while Saturday and Sunday traffic decreased by 3.5 and 4.5 percent, respectively (Figure 9). A similar pattern occurred in 1974 (Figure 10). Sunday traffic appears to have dropped the most.

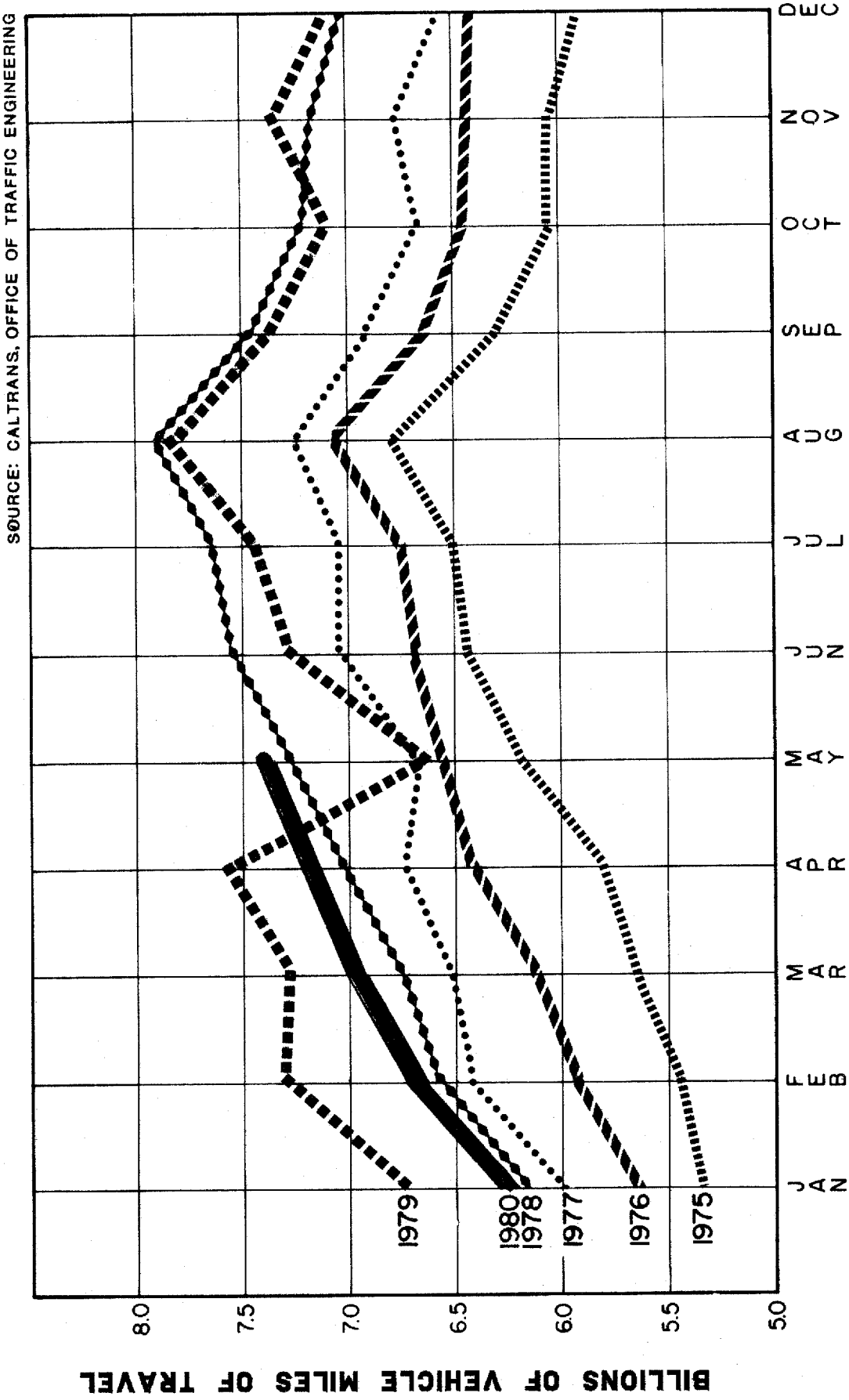


FIGURE 8. - CALIFORNIA STATE HIGHWAY TRAVEL, 1975 - 1980

TABLE 5
SUMMARY OF CALIFORNIA
STATE HIGHWAY TRAVEL, 1978 - 1980
(Billion VMT)

WEEKDAY TRAVEL

	1978	1979	1980	Percent Change 78 to 79	Percent Change 79 to 80
J	4.56	4.81	4.66	+ 5.5%	- 3.1%
F	4.79	5.20	4.89	+ 8.6	- 6.0
M	4.91	5.16	4.98	+ 5.1	- 3.5
A	5.04	5.47	5.18	+ 8.5	- 5.3
M	5.14	4.92	5.28	- 4.2	+ 7.3
J	5.35	5.25		- 1.9	
J	5.40	5.30		- 1.8	
A	5.59	5.60		+ 0.2	
S	5.22	5.30		+ 1.6	
O	5.15	5.19		+ 0.8	
N	5.14	5.36		+ 4.3	
D	5.04	5.32		+ 5.6	
	61.33	62.88		+ 2.5%	

WEEKEND TRAVEL

J	1.68	1.83	1.65	+ 8.9%	- 9.8%
F	1.81	2.04	1.75	+12.7	-14.2
M	1.83	2.07	1.93	+13.1	- 6.7
A	1.98	2.06	2.01	+ 4.0	- 2.4
M	2.13	1.71	2.05	-19.7	+19.9
J	2.18	1.99		- 8.7	
J	2.23	2.07		- 7.2	
A	2.32	2.23		- 3.9	
S	2.22	2.06		- 7.2	
O	2.05	1.94		- 5.4	
N	2.05	1.97		- 3.9	
D	1.99	1.79		-10.1	
	24.47	23.76		- 2.9%	

TOTAL TRAVEL

J	6.24	6.64	6.31	+ 6.4%	- 5.0%
F	6.60	7.24	6.64	+ 9.8	- 8.3
M	6.74	7.23	6.91	+ 7.2	- 4.4
A	7.02	7.53	7.19	+ 7.3	- 4.5
M	7.27	6.63	7.33	- 8.8	+10.5
J	7.53	7.24		- 3.9	
J	7.63	7.37		- 3.4	
A	7.91	7.83		- 1.0	
S	7.44	7.36		- 1.1	
O	7.20	7.13		- 1.0	
N	7.19	7.33		+ 1.9	
D	7.03	7.11		+ 1.1	
	85.80	86.64		+ 1.0%	

*1979 Data Adjusted 5-1-80 (Rev. 5/22/80)
Source: Caltrans, Traffic Engineering

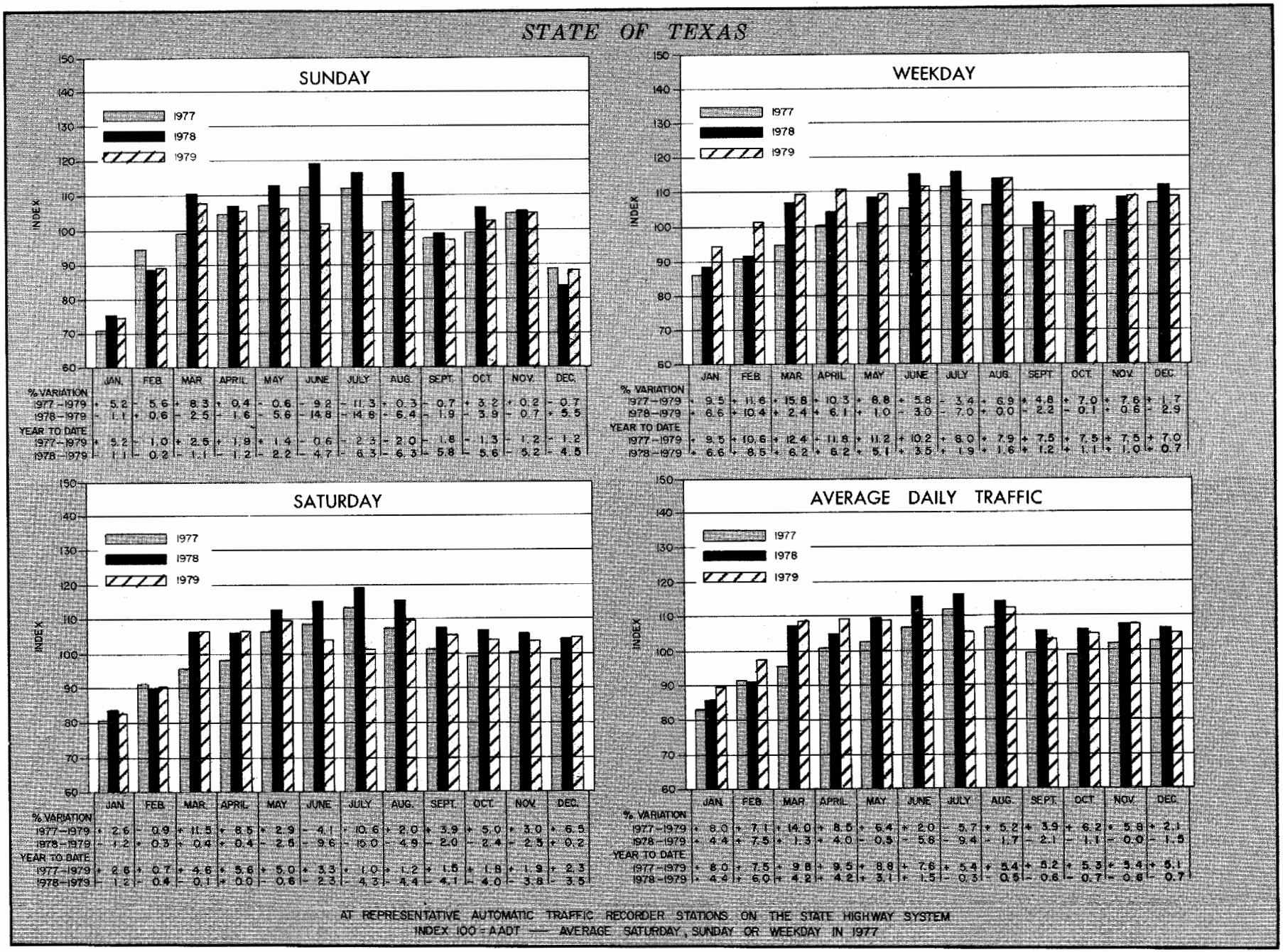
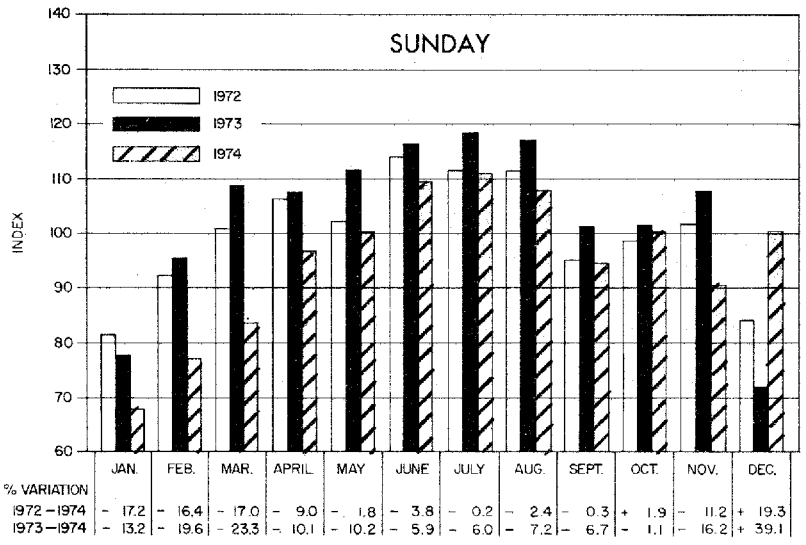
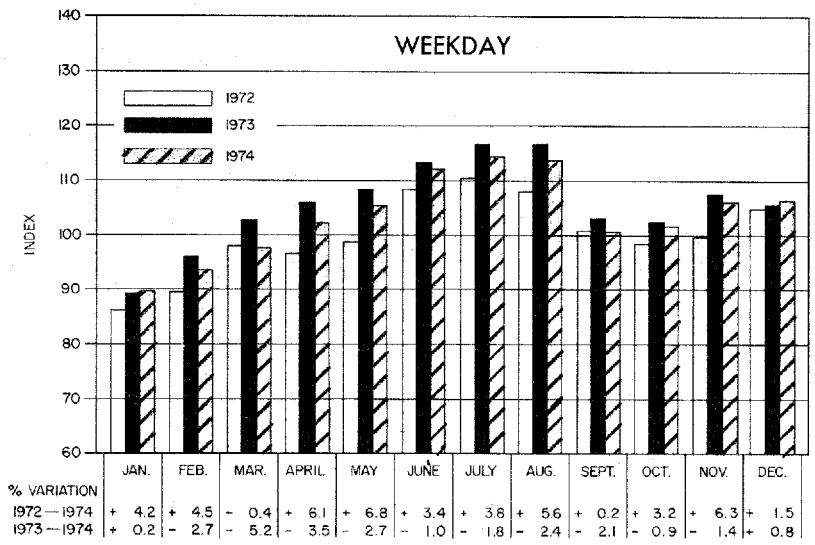


FIGURE 9. - VARIATIONS IN TEXAS STATE HIGHWAY TRAFFIC VOLUMES. 1977 - 1979

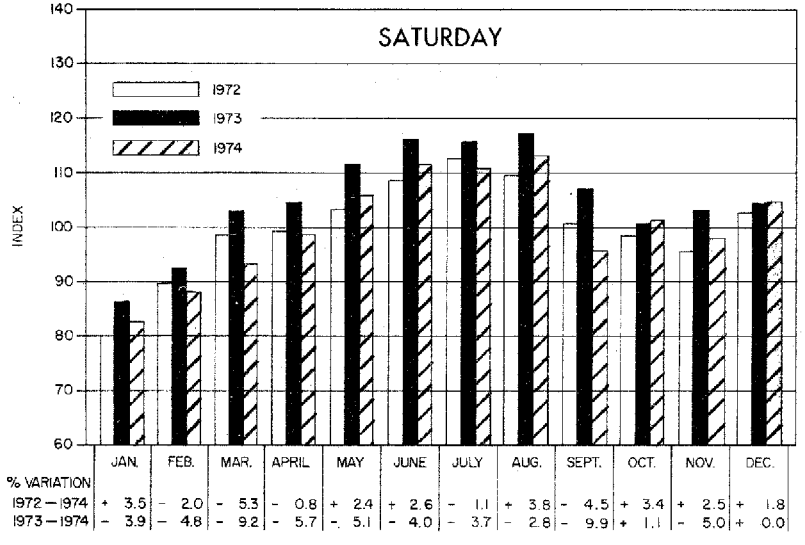
STATE OF TEXAS



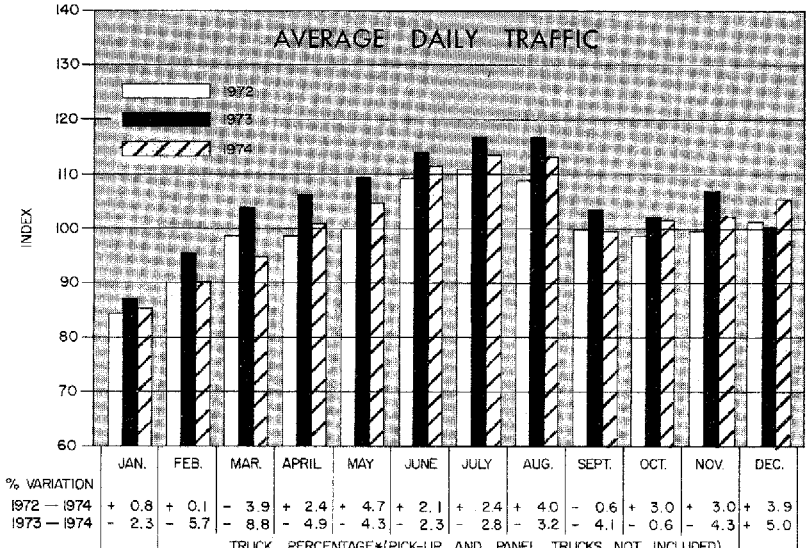
% VARIATION	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1972—1974	- 17.2	- 16.4	- 17.0	- 9.0	- 1.8	- 3.8	- 0.2	- 2.4	- 0.3	+ 1.9	- 11.2	+ 19.3
1973—1974	- 13.2	- 19.6	- 23.3	- 10.1	- 10.2	- 5.9	- 6.0	- 7.2	- 6.7	- 1.1	- 16.2	+ 39.1



% VARIATION	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1972—1974	+ 4.2	+ 4.5	- 0.4	+ 6.1	+ 6.8	+ 3.4	+ 3.8	+ 5.6	+ 0.2	+ 3.2	+ 6.3	+ 1.5
1973—1974	+ 0.2	- 2.7	- 5.2	- 3.5	- 2.7	- 1.0	- 1.8	- 2.4	- 2.1	- 0.9	- 1.4	+ 0.8



% VARIATION	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1972—1974	+ 3.5	- 2.0	- 5.3	- 0.8	+ 2.4	+ 2.6	- 1.1	+ 3.8	- 4.5	+ 3.4	+ 2.5	+ 1.8
1973—1974	- 3.9	- 4.8	- 9.2	- 5.7	- 5.1	- 4.0	- 3.7	- 2.8	- 9.9	+ 1.1	- 5.0	+ 0.0



% VARIATION	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1972—1974	+ 0.8	+ 0.1	- 3.9	+ 2.4	+ 4.7	+ 2.1	+ 2.4	+ 4.0	- 0.6	+ 3.0	+ 3.0	+ 3.9
1973—1974	- 2.3	- 5.7	- 8.8	- 4.9	- 4.3	- 2.3	- 2.8	- 3.2	- 4.1	- 0.6	- 4.3	+ 5.0
TRUCK PERCENTAGE*(PICK-UP AND PANEL TRUCKS NOT INCLUDED)	12.0	16.5	12.4	15.1	17.2	11.0	13.0	13.8	11.3	13.3	13.6	10.7

AT REPRESENTATIVE AUTOMATIC TRAFFIC RECORDER STATIONS ON THE STATE HIGHWAY SYSTEM
INDEX 100 = AADT — AVERAGE SATURDAY, SUNDAY OR WEEKDAY IN 1972

FIGURE 10. - VARIATIONS IN TEXAS STATE HIGHWAY TRAFFIC VOLUMES, 1972 - 1974

F. Shifts in Highway Travel by Vehicle Type

Daily vehicle travel on the Pennsylvania Turnpike during the 1979 energy crisis showed a significant change in seasonal pattern. Daily travel of all vehicles on the turnpike in January for 1977 and 1978 was about 5 million, increased to over 10 million in July and August, and thereafter declined to about 6.5 million in December (Figure 11). Daily travel in 1979 fell below anticipated levels and reached a low point in July with only 8 million daily vehicle miles recorded compared to an expected level of 10 million. Much of the decline in 1979 turnpike travel can be attributed to fewer passenger vehicles. Commercial vehicle patronage on the Pennsylvania Turnpike appears to have maintained a normal pattern in 1979. This indicates that when diesel fuel supplies are plentiful for the diesel powered vehicles, commercial travel continues at near normal levels.

G. Variations in Visits to Major Recreation Areas

The National Park Service reported that visits to major recreational areas and monuments were below 1978 levels during the spring and summer quarters. Areas with the lowest visits in 1979 were situated in the remote and rural areas of the United States (Table 6). Areas near the urbanized areas were generally better attended. Only recreational areas and monuments located in or near major cities, such as the Statue of Liberty in New York City and the monuments in Washington, D.C., maintained pre-1979 visitation levels All 100 major areas reported average attendance up 7 percent during the winter quarter, down 2 percent in the spring quarter, and down 13 percent during the summer quarter.

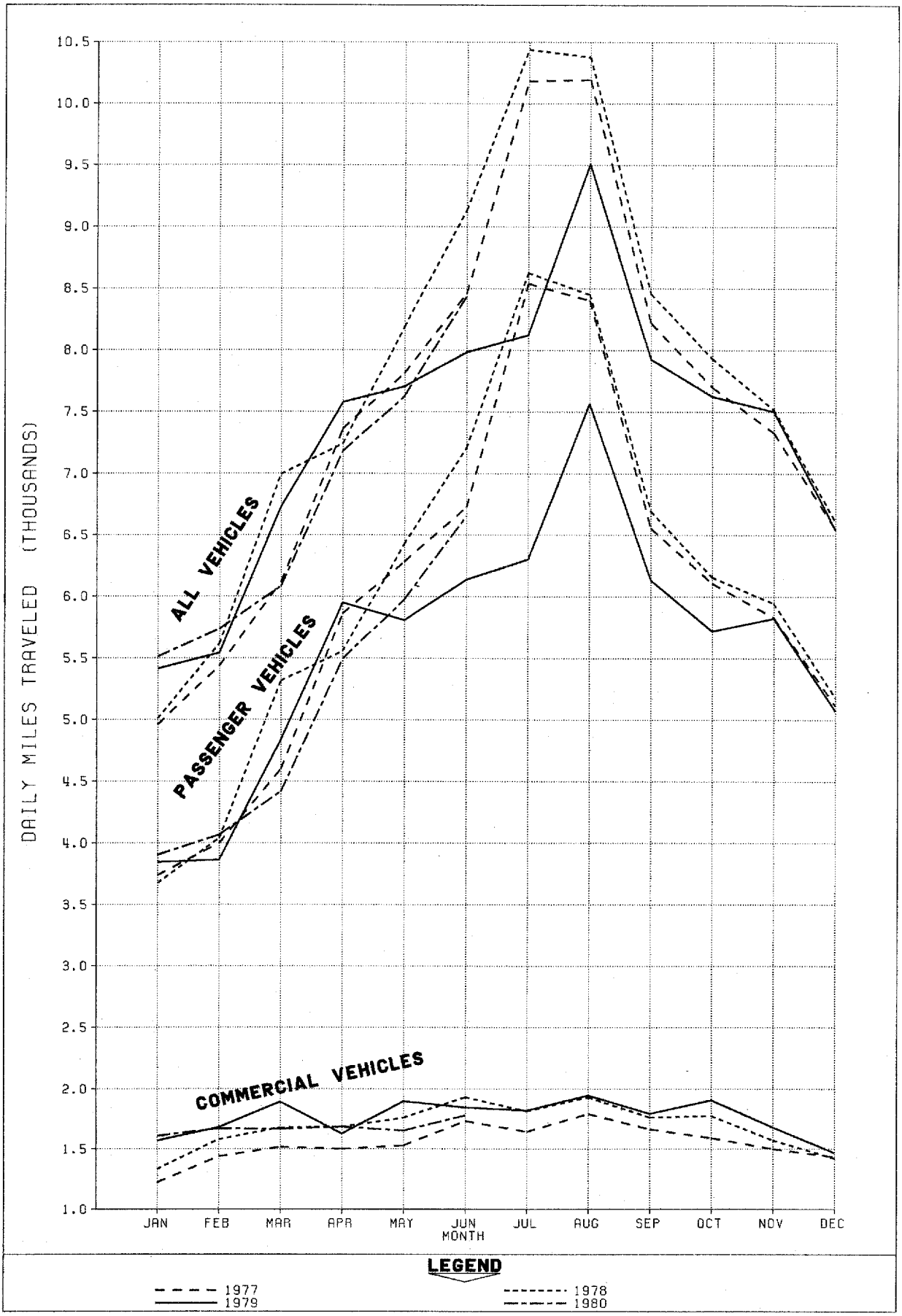


FIGURE 11. - AVERAGE DAILY TRAVEL BY MONTH AND VEHICLE-TYPE ON THE PENNSYLVANIA TURNPIKE. 1977 - 1980

TABLE 6 - PERCENT CHANGE IN VISITS TO
MAJOR RECREATION AREAS ADMINISTERED
BY THE NATIONAL PARK SERVICE
1979

PERCENT CHANGE
CALENDAR YEAR QUARTER 1979 COMPARED TO SAME QUARTER 1978

AREA LOCATION	WINTER	SPRING	SUMMER
Urban	+25	+4	-3
Suburban	+12	+5	-4
Outlying	+4	-3	-14
Rural	-11	-10	-19
Remote	+29	-2	-9
All Major Areas	+7	-2	-13

IV. GENERAL TRENDS OF USAGE OF HIGHWAY MOTOR FUEL

A. Annual Trends in Highway Use of Motor Fuel

Highway use of motor fuel increased an average rate of 3.14 percent in the 10-year period from 1969 through 1979 (Table 7). Motor fuel consists primarily of gasoline and special fuels such as diesel, liquified petroleum gas and others. The usage of motor fuel has totaled about 120 billion gallons a year in 1979 or about 330 million gallons daily.

The use of special fuels as a share of all highway motor fuel increased from 7.2 percent in 1969 to nearly 10 percent in 1979. The average decade growth for special fuels is 6.26 percent as compared with 2.86 percent for gasoline.

Highway usage of fuel in the period 1970 through 1979 follows an annual cycle with some seasonal variation (Figure 12). Unlike national travel, depicted in Figure 1, these figures are based on tax receipt data for fuel sold at the wholesale level for gasoline, and generally at the pump for diesel fuel, although in some States bulk users may be bonded and report their own taxes. Thus the figures may not reflect the actual month of consumption. In addition, delays in reporting data and usage of fuel several weeks after purchase are reasons that make monthly schedule of reported sales of fuel vary from the actual month of consumption.

Although time in secondary and tertiary storage and reporting schedule delays may vary throughout the year, the data (Figure 12) indicates fewer gallonage purchases the first quarter than later in the summer months. If special fuel consumption is normally stable with little variation throughout the year, then the highway use of gasoline appears mainly responsible for the variation in seasonal pattern.

TABLE 7 - ANNUAL HIGHWAY USE OF GASOLINE AND SPECIAL MOTOR FUELS

YEAR	GASOLINE		SPECIAL FUELS		TOTAL		PERCENT SPECIAL FUELS
	GALLONS IN BILLIONS	PERCENT CHANGE	GALLONS IN BILLIONS	PERCENT CHANGE	GALLONS IN BILLIONS	PERCENT CHANGE	
1969	81.81		6.33		88.14		7.18
1970	85.60	5.1	6.73	6.3	92.33	4.8	7.29
1971	89.98	7.3	7.57	12.5	97.55	5.7	7.76
1972	96.54	4.2	8.52	12.5	105.06	7.7	8.11
1973	100.64	4.2	9.84	15.5	110.48	5.2	8.90
1974	96.50	-4.1	9.80	-0.4	106.30	-3.8	9.22
1975	99.35	3.0	9.63	-1.7	108.98	2.5	8.84
1976	104.98	5.7	10.72	11.3	115.70	6.2	9.27
1977	107.98	2.9	11.65	8.6	119.63	3.4	9.74
1978	112.24	3.9	12.83	10.1	125.07	4.5	10.26
1979	108.42P	-3.4P	11.62P	-9.4P	120.04P	-4.0P	9.68P
10-year Average Annual Growth		2.86		6.26		3.14	

P - Preliminary

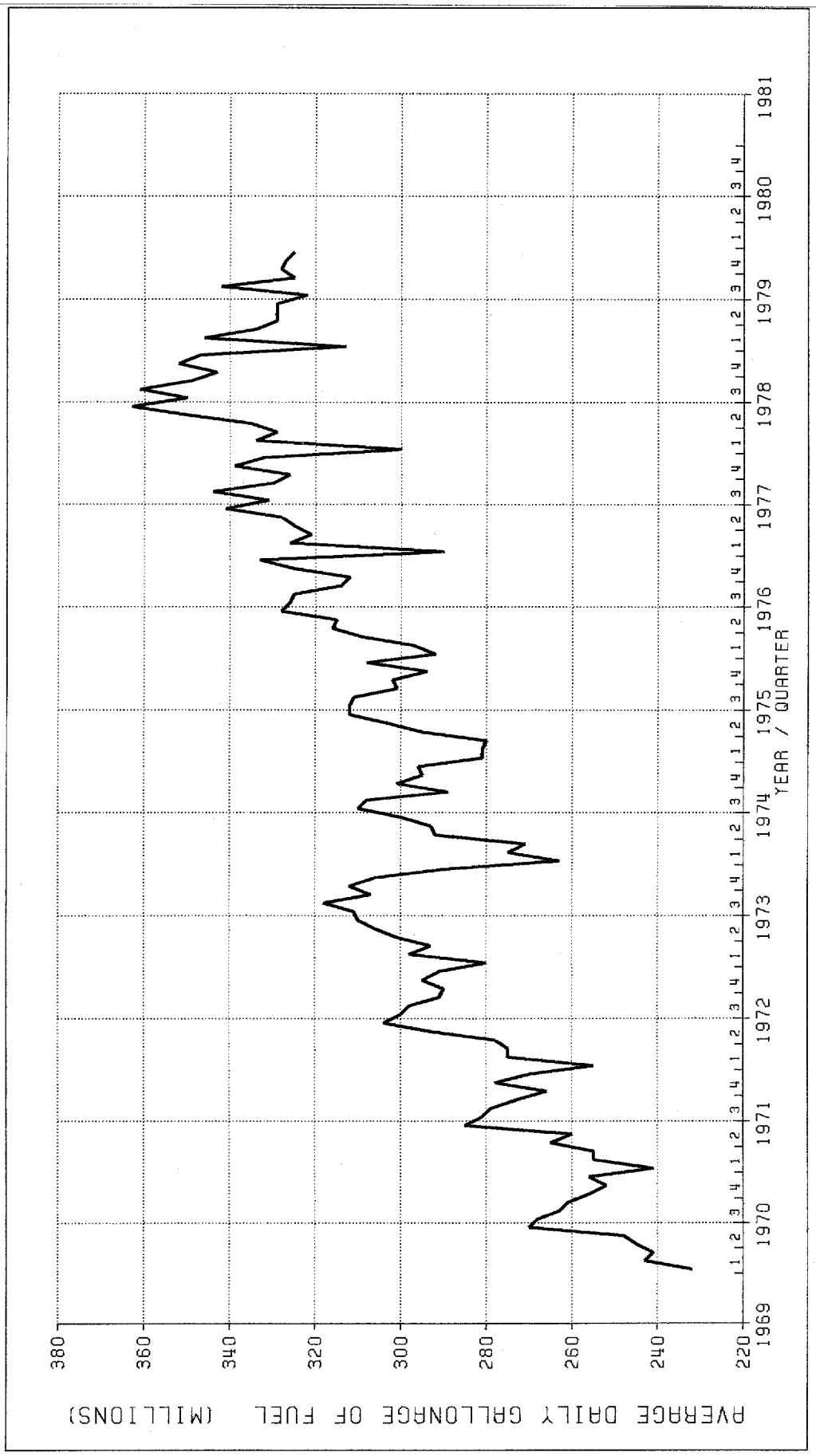


FIGURE 12. - AVERAGE DAILY U.S. HIGHWAY USE OF MOTOR FUEL BY MONTH, 1970 - 1979

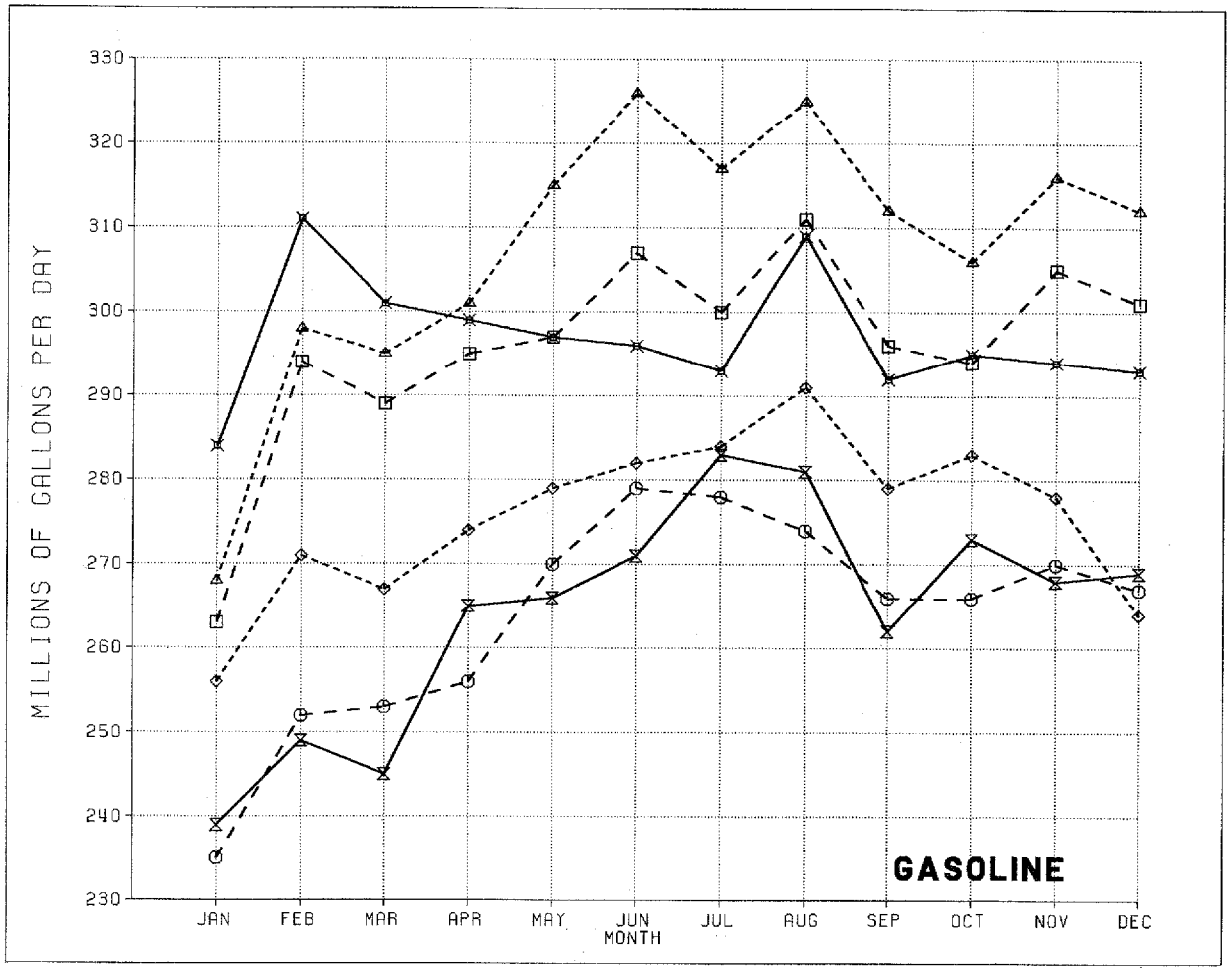
The change in highway use in the period of fuel shortage can be seen in the fuel pattern in 1973-1974 (Figure 12). It appears the energy crisis slightly offset the annual cycle in 1974 delaying anticipated higher levels of fuel use to later in the 1970's. Highway usage of motor fuel appears to have reached a peak in 1978. Although usage has been affected by the 1979 crisis, it is not clear at this time whether the reduced usage will continue or historical growth will resume.

B. Changes in Monthly Usage of Highway Motor Fuel

Average daily highway use of gasoline and special fuels by month is shown in Figure 13. Use of special fuels (namely, diesel) is generally stable by season. Use of gasoline indicates a change by season as evidenced by the 1972 and 1973 curves as well as the 1977 and 1978 curves.

Twice in the 1970's, gasoline fuel sales showed annual decreases, first in 1974, and next in 1979. Special fuel sales, declined only in 1974, and 1975 (not shown), and in 1979. Use of gasoline in 1978 averaged about 308 million gallons per day, and use of special fuels averaged about 35 million gallons per day.

Due to the decrease in gasoline availability in 1979, sales of motor fuel fell below the 1978 levels. The first three months showed increases of 6.1 percent in January, 4.5 percent in February, and 2.1 percent in March. Beginning with April, gasoline use dropped off and continued at a lowered level through the end of the year. Sharp decreases of 5 to 9 percent were reported for the months of May through September. It is estimated that 1979 gasoline consumption fell 3.4 percent below the 1978 level.



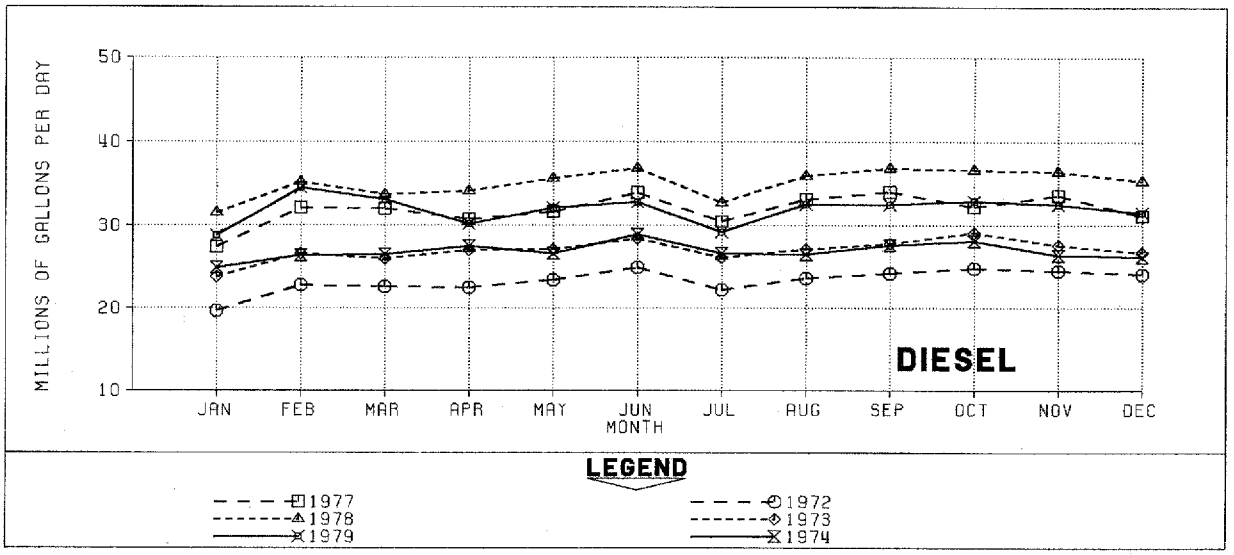


FIGURE 13. - AVERAGE DAILY U.S. HIGHWAY USE OF MOTOR GASOLINE AND DIESEL FUELS BY MONTH, 1972 - 1974 AND 1977 - 1979

The seasonal pattern of sales of gasoline for the periods 1972 through 1974 and 1977 through 1979 (Figure 13) varies considerably from the pattern for travel. Though it does tend to be low during the winter months and higher in the summer months, there is not as much difference betwen low and high points as is displayed by highway travel. In addition, the high points do not always occur in the same months. For example, over the years, July or August have invariably been the high travel months (with little difference between them, usually) whereas gasoline sales are quite often higher in June than in July. This is probably caused by the wholesalers building their inventories in advance of the high demand in July. This and other factors contributed to a lag between gasoline sales and actual consumption which may range from 2 to 6 weeks. Travel trends on the other hand are based on traffic counts, and reflect the actual variations in the use of the highways.

Gasoline data for 1974 indicate that, during the energy crisis, fuel sales dropped to approximately the 1972 levels. Fuel sales dropped beginning in December 1973 to below the 1972 level (Figure 13), following the Petroleum embargo that began in October 1973, and remained depressed for the first 11 months of 1974; then sales showed a slight increase over 1972 levels. Sales in early 1979 continued above the 1978 levels; however, beginning with April, they fell below the 1978 levels, and in May fell below the 1977 levels. For the year gasoline sales were 3.4 percent below the 1978 level.

There is much less variation in the sales of diesel fuel than there is for gasoline (Figure 13). The preponderance of diesel fuel usage is by trucks, and buses which show much more stability in travel patterns than passenger cars.

C. Shifts in Highway Fuel Consumption by Vehicle Type

The number of registered light and heavy trucks has grown in the 10-year period 1968 through 1978 from 17.0 million units to 31.7 million units, respectively. Trucks represented 16.5 percent of all motorized highway vehicles in 1968 and increased to 20.6 percent in 1978 (Table 8). The popularity of the lighter truck for personal transportation (in lieu of a passenger-car) and additional freight movement by highway mode are perhaps some reasons for the greater truck component in highway travel.

Travel by truck totaled about 197 billion VMT in 1968 and has increased to about 348 billion VMT in 1978. The truck share of U.S. highway travel gradually increased from 19.4 percent in 1968 to about 22.5 percent in 1978. About half of this increase has occurred in the single-unit truck sector, which is primarily comprised of light trucks. Fuel consumption by truck, totaled about 23.5 billion gallons in 1968 and has grown to about 40.3 billion gallons in 1978. The truck share of highway use of motor fuel has grown from 28.3 percent in 1968 to about 32.2 percent in 1978.

Fuel efficiency of all highway vehicles has shown some continued improvement in spite of the increased proportions of truck travel. Overall vehicle efficiency averaged about 12.25 miles per gallon in 1968, continued a slow downward trend to a low of 11.89 miles per gallon in 1973 and slowly rebounded beginning in 1974. It reached a level of 12.38 miles per gallon in 1978. Factors influencing fuel efficiency include reduced speed limits, more fuel efficient vehicles in the light vehicle population, changes in driving habits, and improved freeway systems.

TABLE 8 -U.S. HIGHWAY TRAVEL, VEHICLE REGISTRATIONS, FUEL CONSUMPTION, AND RELATED DATA BY VEHICLE TYPE - 1978 VERSUS 1968

ITEM	PASSENGER VEHICLES			TRUCKS			ALL MOTOR VEHICLES
	CARS AND MOTORCYCLES	BUS	SUBTOTAL	SINGLE - UNIT	COMBINATION	SUBTOTAL	
Motor Vehicle Travel (millions)							
Rural 1978	500,656	3,227	503,883	131,507	54,563	186,070	689,953
1968	375,338	2,724	378,062	97,426	26,872	124,298	502,360
Urban 1978	693,575	2,849	696,424	149,071	12,765	161,836	858,260
1968	438,692	2,244	440,936	61,512	10,841	72,353	513,289
Total 1978	1,194,231	6,076	1,200,307	280,578	67,328	347,906	1,548,213
1968	814,030	4,968	818,998	158,938	37,713	196,651	1,015,649
Registered Vehicles (thousand)							
1978	121,717	500	122,217	30,336	1,367	31,703	153,920
1968	85,793	352	86,145	16,124	871	16,995	103,140
Average Miles Traveled Per Vehicle							
1978	9,812	12,143	9,821	9,249	49,267	10,974	10,059
1968	9,488	14,122	9,507	9,857	43,299	11,571	9,847
Fuel Consumed (million gallons)							
1978	83,775	1,021	84,796	27,780	12,491	40,271	125,067
1968	58,524	932	59,456	15,674	7,808	23,482	82,938
Average Fuel Consumption Per Vehicle							
1978	688	2,041	694	916	9,141	1,270	813
1968	682	2,649	690	972	8,964	1,382	804
Average Miles Traveled Per Gallon of Fuel							
1978	14.26	5.95	14.16	10.10	5.39	8.64	12.38
1968	13.91	5.33	13.77	10.14	4.83	8.37	12.25

V. VEHICLE OCCUPANCY RATES

A. Summary of Results Found in Selected U.S. Vehicle Occupancy Studies

Special vehicle occupancy studies were conducted in urban areas to determine the average vehicle occupancy rates along selected highway facilities.

In late September and October 1979, 17 locations were monitored along urban radial, arterial, commuter facilities in 13 U.S. cities in connection with the pending energy situation. Results from this survey indicate that afternoon rush-hour vehicle occupancy is generally about 10 percent greater than the morning rush-hours on weekdays (Table 9).

The average morning rush-hour vehicle occupancy on arterial facilities has a lower but wider variation than in the afternoon. On non-Interstate arterial facilities, the morning rush-hour vehicle occupancy averaged between 1.2 to 1.4, whereas in the afternoon, on similar facilities, the vehicle occupancy averaged about 1.3 to 1.4. On Interstate facilities, during the morning rush-hours, vehicle occupancy averaged about 1.2, but where special carpool incentives existed, the vehicle occupancy averaged about 1.4 to 1.5. The special surveys did not include any Interstate facilities during the afternoon rush-hour.

Weekend vehicle occupancy is greater than on weekdays during the same hours of the day. Saturday afternoon vehicle occupancy averaged slightly higher; Sunday afternoon vehicle occupancy ran about 30 percent higher as shown in the Sioux Falls survey.

TABLE 9 - RUSH HOUR VEHICLE OCCUPANCY BY SELECTED ARTERIAL LOCATIONS - FALL 1979

CITY/STATE	MORNING TIME	MORNING VEHICLE OCCUPANCY**	AFTERNOON TIME	AFTERNOON VEHICLE OCCUPANCY**
Boston, MA (1)	7-8	1.30		
(2)	7-8	1.49		
(3)	7-8	1.42		
Manchester, NH			4:30-5:30	1.43
New York, NY	7-8	1.44		
Pittsburg, PA	8-9	1.24		
Atlanta, GA	7-8	1.20		
Miami, FL (1)	8-9	1.24	4-5	1.39
(2)	8-9	1.27	4-5	1.32
(3)	7-8	1.16	4-5	1.35
Cleveland, OH	7-9	1.18	4-6	1.32
Columbus, OH	7-9	1.25	4-6	1.34
Cincinnati, OH	7-9	1.38	4-6	1.44
Salt Lake City, UT			4:30-5:30	1.33
Dallas/Fort Worth, TX	7:15-8:15	1.22		
Lincoln, NB	7:30-8:30	1.22		
Sioux Falls, ND*			5-6	1.43

* Vehicle occupancy surveys, taken during the afternoon hours 5-6 on Saturday and Sunday, averaged 1.54 and 1.96 persons per passenger vehicle, respectively.

** Average persons per vehicle is calculated based on the persons seen in passenger carrying vehicles.

Average automobile occupancy by purpose of trip and day of week has been found to increase on weekends, particularly on Sunday (Figure 14). Travel for the purpose to "earn a living" generally has an average occupancy of about 1.4 persons per trip for all days of the week. Travel for other purposes, such as family business, educational, civic, religious, social and recreational, has an average automobile occupancy of about 2.0 or greater for all days of the week. Travel for purposes such as social and recreational has a greater vehicle occupancy particularly over the weekend. Vehicle occupancy for purposes such as social and recreational was shown by the same survey, the Nationwide Personal Transportation Study, to be higher in the summer as compared with the other three seasons. Travel for the purpose of school as well as social and recreation also varies with the season, thus the higher summer vehicle occupancy rates (Table 10).

B. Individual Study Findings

Extensive monitoring along highway facilities in Monterey County, California, showed minor changes in vehicle occupancy rates in 1979 compared to base data from 1978. Surveys were taken on a Tuesday, Wednesday, or Thursday during the months of January through October. Results show that 1979 rates were slightly less than those found in 1978 (Table 11). Overall vehicle occupancy averaged about 1.28 in the morning peak and 1.48 in the afternoon. As expected, summer averages were slightly higher than those for the winter months. Major highway facilities surveyed, which served longer type trips, usually were found to have higher occupancy rates than the local functional routes. The fact that vehicle occupancy in the summer may have slightly been depressed from normal anticipated rates may be due to the drastic reduction in discretionary travel (normally higher occupancy rate trips) because of limited fuel supplies in 1979.

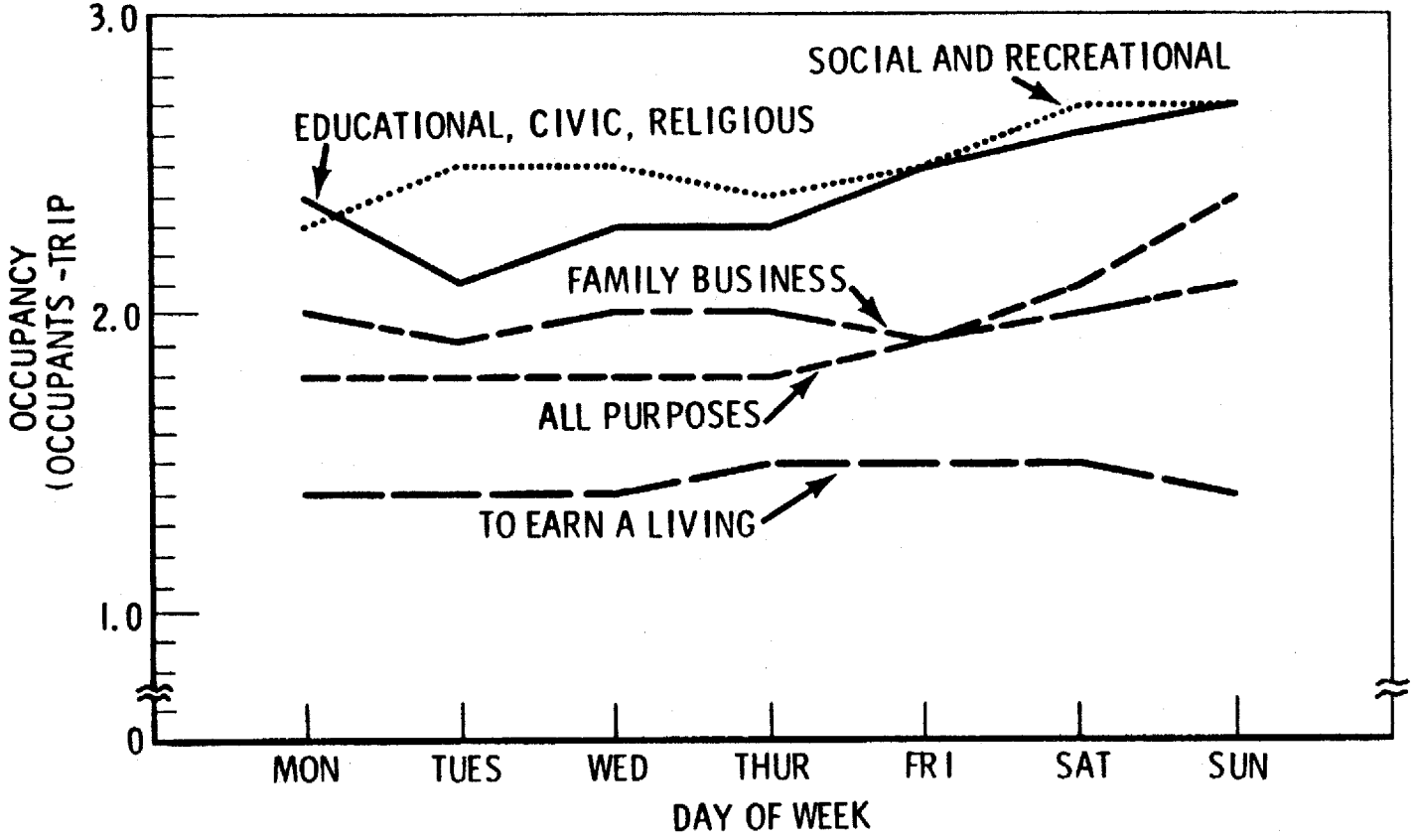


FIGURE 14. - AVERAGE AUTOMOBILE OCCUPANCY BY PURPOSE OF TRIP AND DAY OF WEEK

TABLE 10 - PERCENTAGE OF AUTO VEHICLE MILES OF TRAVEL BY SEASON FOR EACH PURPOSE AND AVERAGE VEHICLE OCCUPANCY CLASSIFIED BY PURPOSE OF TRIP

Season of the year	Purpose of trip													
	Earning a living			Family business				Educational civic and religious	Social and recreational					All purposes
	To and from work	Related business	Total	Medical and dental	Shopping	Other	Total		Vacation	friends relatives	Pleasure rides	Other	Total	
Spring (April)	25.7	19.9	24.6	30.6	26.0	29.8	27.5	28.6	*	27.0	30.5	25.2	25.0	25.6
Summer (July-August average)	26.2	26.3	26.2	25.6	30.1	24.4	27.5	16.0	*	27.4	39.5	30.8	32.6	28.2
Fall (October)	24.1	29.2	25.1	19.9	23.2	22.4	22.3	26.7	*	27.2	21.7	24.4	24.9	24.4
Winter (January)	24.0	24.6	24.1	23.9	20.7	23.4	22.7	28.7	*	18.4	8.3	19.6	17.5	21.8
All seasons	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent of daily number of total vehicle-miles	32.9	7.7	40.6	1.8	7.6	10.6	20.0	4.9	3.3	12.0	3.1	14.9	33.3	100.0 1/
All Seasons Average Vehicle Occupancy	**1.4**	**1.6**	**1.4**	**2.1**	**2.0**	**1.9**	**2.0**	**2.5**	**3.3**	**2.3**	**2.7**	**2.6**	**2.5**	**1.9**

* Data insufficient for analysis. Data were judged to be insufficient when fewer than 50 trips were included in the sample in a particular cell.

1/ Not included in the table is 1.2 percent for "other or not available" trip purposes. Based on 2,124,598,550 vehicle-miles of travel per day.

SOURCE: Based upon unpublished table T-5 for the Nationwide Personal Transportation Survey conducted by the Bureau of the Census for the Federal Highway Administration, 1969-1970.

TABLE 11 - VEHICLE OCCUPANCY RATES ON HIGHWAY FACILITIES IN MONTEREY COUNTY, CALIFORNIA

	1978	1979
Summer (June, July, Aug.)		
AM Peak	1.41	1.27
PM Peak	1.56	1.50
Off Peak	1.52	1.51
Combined	1.51	1.47
Winter		
AM Peak	1.26	1.27
PM Peak	1.48	1.45
Off Peak	1.47	1.47
Combined	1.45	1.44
All (Jan. - Oct.)		
AM Peak	1.30	1.27
PM Peak	1.50	1.46
Off Peak	1.48	1.48
Combined	1.47	1.45

In June the city of Portland conducted peak-hour vehicle occupancy studies at three freeway locations in the years 1977, 1978, and 1979 (Table 12). Generally, vehicle occupancy rates in 1979 had increased slightly, principally due to a shift to more 2-person carpools. The percentage of 3-or-more person carpools remained about the same. Perhaps, temporarily, more carpools for home-to-work commuting purpose are formed during fuel crisis times, but are disestablished once the fuel supply returns to near normal.

Results from the Dallas-Fort Worth area (Figure 15) indicate that automobile occupancy rates increased 3.15 percent in the summer of 1979 compared to the previous year. Within the central business districts, the rates of increase were 4.36 and 2.47 percent for Dallas and Fort Worth, respectively. Reflecting the fuel shortage of early summer, these increases in automobile occupancy rates occurred simultaneously with annual decreases in vehicle volumes of five and four percent in Dallas and Fort Worth, respectively, during the month of July 1979 as compared to July 1978. All automobile occupancy counts were conducted during the morning peak period between 7 a.m. and 9 a.m.

Results from a repeat survey in the Dallas-Fort Worth area late in the summer 1979, under an improved fuel supply situation, suggested some erosion had taken place. This repeat survey provided a comparison to a period of reduced fuel supply. Historically since the 1973-74 energy crisis, the vehicle occupancy rates in the area have declined but improved with the 1979 crisis. Again the rates may decline with adequate fuel supplies.

During the months of March and June 1979 the Illinois Department of Transportation conducted vehicle occupancy studies in Chicago along four freeways (Eisenhower,

TABLE 12 - PEAK HOUR OCCUPANCY IN PORTLAND, OREGON

(Banfield, Sunset, & Minnesota Freeways)

	1977 June	1978 June	1979 June	2 year change
BANFIELD FREEWAY (I-80N)@ 47				
Westbound 1 occupant (7-8 a.m.)	78.3%	81.4%	73.2%	-5.1%
Westbound 2 occupants	16.0%	14.0%	23.1%	+7.1%
Westbound 3 or more occupants	5.7%	4.6%	3.7%	-2.0%
Westbound occupancy rate	1.259	1.232	1.304	+0.045
Eastbound 1 occupant (4:30-5:30 p.m.)	73.3%	73.9%	69.4%	-3.9%
Eastbound 2 occupants	20.1%	18.0%	23.7%	+3.6%
Eastbound 3 or more occupants	6.6%	8.1%	6.9%	+0.3%
Eastbound occupancy rate	1.362	1.342	1.376	+0.014
Combined occupancy rate	1.309	1.286	1.340	+0.031
Combined 3 or more occupants	6.2%	6.3%	5.3%	-0.9%
SUNSET (HWY-26) FREEWAY @ ZOO-OMSI				
Westbound 1 occupant (4:30-5:30 p.m.)	77.9%	77.0%	75.6%	-2.3%
Westbound 2 occupants	19.3%	20.4%	21.4%	+2.1%
Westbound 3 or more occupants	2.8%	2.6%	3.0%	+0.2%
Westbound occupancy rate	1.249	1.256	1.274	+0.025
Eastbound 1 occupant (7-8 a.m.)	81.9%	81.4%	79.6%	-2.3%
Eastbound 2 occupants	17.1%	16.5%	18.2%	+1.1%
Eastbound 3 or more occupants	1.0%	2.1%	2.2%	+1.2%
Eastbound occupancy rate	1.191	1.207	1.225	+0.014
Combined occupancy rate	1.218	1.232	1.262	+0.044
Combined 3 or more occupants	1.9%	2.3%	2.6%	+0.7%
MINNESOTA FREEWAY (I-5)@ AINSWORTH				
Southbound 1 occupant (7-8 a.m.)	82.7%		80.2%	-2.5%
Southbound 2 occupants	14.8%		16.8%	+2.0%
Southbound 3 or more occupants	2.5%		3.0%	+0.5%
Southbound occupancy rate	1.197		1.227	+0.030
Northbound 1 occupant (4:30-5:30 p.m.)	67.8%		72.7%	+4.9%
Northbound 2 occupants	23.2%		20.8%	-2.4%
Northbound 3 or more occupants	9.0%*		6.5%	-2.5%
Northbound occupancy rate	1.413		1.339	-0.074
Combined occupancy rate	1.280		1.283	+0.003
Combined 3 or more occupants	5.8%		4.7%	-1.1%

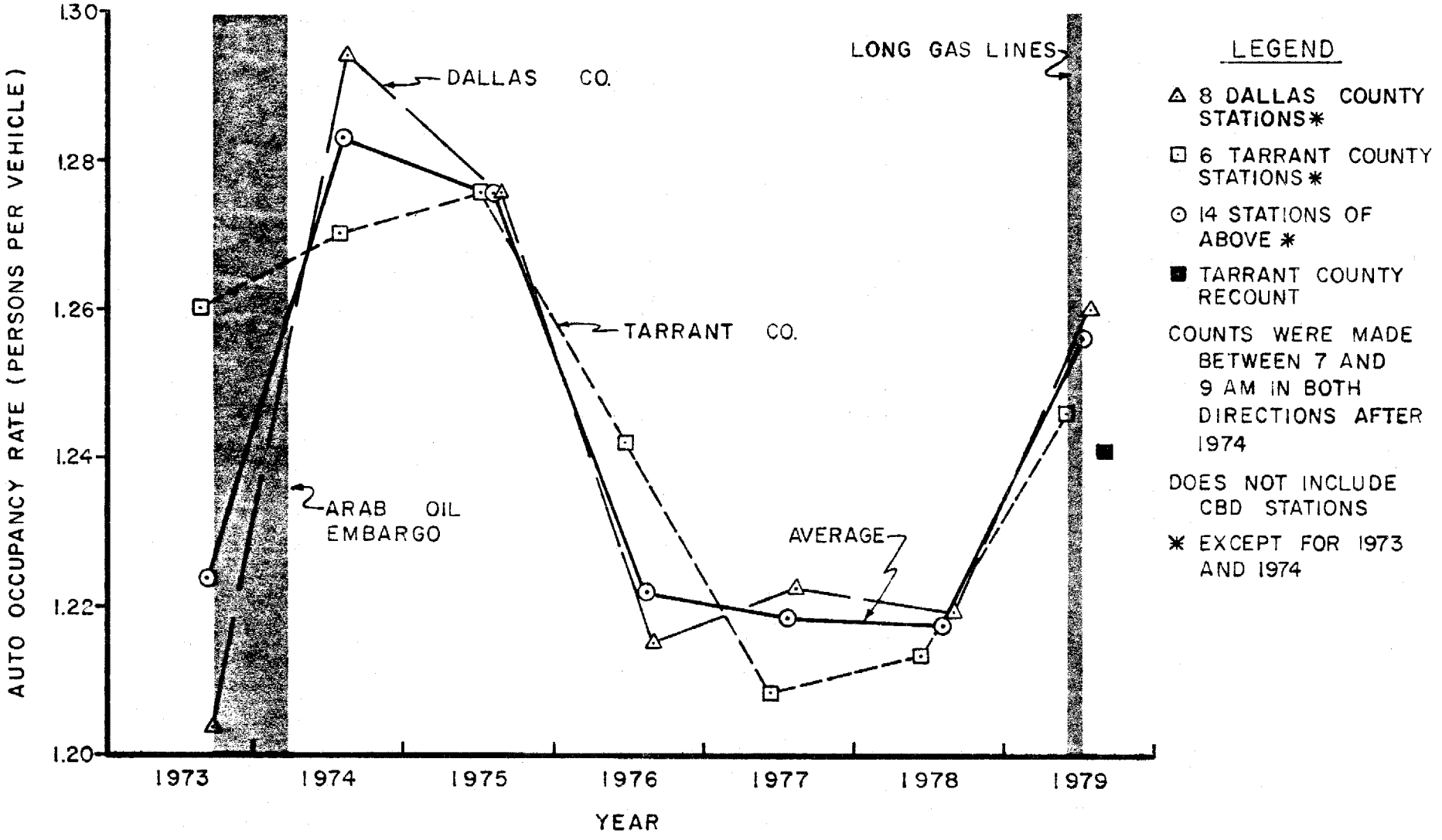


FIGURE 15. - DALLAS-FORT WORTH AUTO OCCUPANCY HISTORY

TABLE 13 - FREEWAY RUSH-HOUR AUTO OCCUPANCY RATES IN CHICAGO, 1979

FACILITY	DAN RYAN				EDENS			
MONTH	MARCH		JUNE		MARCH		JUNE	
AUTO COUNTS	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
AUTO OCCUPANCIES	INBOUND (7-10 AM)							
1 Occupant	16,877	76.2	15,743	76.8	8,320	83.3	7,762	80.8
2 Occupants	4,616	20.8	4,202	20.5	1,495	15.0	1,717	17.9
3 Occupants	484	2.2	398	1.9	136	1.4	72	0.7
4+ Occupants	176	0.8	159	0.8	34	0.3	61	0.6
Total	22,153	100.0	20,502	100.0	9,985	100.0	9,612	100.0
AVERAGE AUTO OCCUPANCY	1.28		1.27		1.19		1.22	
AUTO OCCUPANCIES	OUTBOUND (3-6 PM)							
1 Occupant	17,646	76.0	14,611	71.4	7,096	74.0	5,674	78.0
2 Occupants	4,764	20.5	5,107	24.9	2,141	22.3	1,220	16.8
3 Occupants	543	2.3	565	2.8	274	2.8	230	3.2
4+ Occupants	264	1.1	191	0.9	79	0.8	154	2.1
Total	23,217	100.0	20,474	100.0	9,590	100.0	7,278	100.0
AVERAGE AUTO OCCUPANCY	1.29		1.34		1.31		1.30	

TABLE 13 - FREEWAY RUSH-HOUR AUTO OCCUPANCY RATES IN CHICAGO, 1979

FACILITY	EISENHOWER				KENNEDY	
MONTH	MARCH		JUNE		MARCH	
AUTO COUNTS	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
AUTO OCCUPANCIES	INBOUND (7-10 AM)					
1 Occupant	11,178	79.1	10,797	75.8	15,054	76.2
2 Occupants	2,786	19.7	3,013	21.2	4,122	20.8
3 Occupants	122	0.8	302	2.1	408	2.1
4+ Occupants	37	0.2	126	0.9	182	0.9
Total	14,123	100.0	14,238	100.0	19,766	100.0
AVERAGE AUTO OCCUPANCY	1.22		1.28		1.28	
AUTO OCCUPANCIES	OUTBOUND (3-6 PM)					
1 Occupant	10,517	77.1	8,173	67.0	17,031	74.3
2 Occupants	2,904	21.3	3,528	28.9	5,069	22.1
3 Occupants	157	1.2	330	2.7	509	2.2
4+ Occupants	56	0.4	169	1.4	294	0.1
Total	13,634	100.0	12,200	100.0	22,903	100.0
AVERAGE AUTO OCCUPANCY	1.25		1.39		1.31	

Edens, Dan Ryan, and Kennedy) inbound mornings and outbound afternoons. The results (Table 13) indicate significant short-term changes even though Chicago has reserved no high occupancy lanes near the downtown area.

Vehicle occupancies on the Chicago freeways basically showed minor change between surveys taken in March and June 1979. Only the Eisenhower showed a strong gain in passenger vehicle occupancy. However, the key changes during the fuel shortage month of June are: 1) a reduction in traffic volumes during the rush-hours from anticipated seasonal adjusted levels, and 2) an improvement in the percentage as well as the numbers of passenger vehicles carrying 2-or-more occupants shown at 4 out of 6 location sites. In spite of reduced overall traffic volumes in June compared with March, the volume of vehicles carrying 4-or-more occupants significantly increased on the Edens and Eisenhower freeways, but showed some erosion on the Dan Ryan. No survey was scheduled for June on the Kennedy.

C. Average Vehicle Occupancy from the Highway Performance Monitoring System Case Study

During the fall of 1979, as part of the Highway Performance Monitoring System (HPMS), information on average vehicle occupancy was gathered to determine person miles of travel (PMT). The States that collected the field data are Iowa, Kentucky, Maryland, Michigan, Ohio, Oregon, South Dakota, and West Virginia.

Average vehicle occupancies ranged from 1.35 to 2.21 (Table 14) and are much higher than 1.2-1.4 which represents the work trip. Differences in average vehicle occupancy were found for rural and urban areas and for functional class of highway. It should be noted that the occupancies given are 24-hour, rather than peak hour averages. The findings that agree with previous studies are the following:

TABLE 14 - AVERAGE VEHICLE OCCUPANCY BY SELECTED HIGHWAY SYSTEMS AND REGION, FALL 1979

RURAL	Interstate	Other Principal Arterials	Minor Arterials	Major Collectors	Minor Collectors	Total
Eastern & Western States						
Rural Average	2.11	1.98	1.71	1.69	1.77	1.93
Range (by State)	1.86-2.39	1.94-2.06	1.51-1.94	1.58-2.24	1.53-1.98	1.85-1.99
Central States						
Rural Average	1.85	1.80	1.65	1.84	1.58	1.83
Range (by State)	1.85	1.62-2.01	1.59-1.70	1.64-2.24	1.54-1.62	1.65-2.06

URBAN	Interstate	Other Freeways and Expressways	Other Principal Arterials	Minor Arterials	Collectors	Total
All States						
Urban (5000+Pop.)	1.76	1.54	1.56	1.53	1.59	1.59
Range (by State & Urban Pop. Size)	1.52-2.21	1.36-1.74	1.35-1.79	1.29-1.71	1.38-1.82	1.47-1.73

Source: FHWA Case Study in the following States (Fall 1979):
Eastern & Western States: Kentucky, Maryland, Oregon, and West Virginia
Central States: Iowa, Michigan, and South Dakota.

1. Vehicle occupancies are higher in rural areas than in urban areas. The higher occupancy is likely due to the longer trips and the larger proportion of nonwork trip purposes that occur on rural systems.

2. Vehicle occupancies are lower in the rural portion of the central States as compared with Oregon and the eastern States. This is likely due to the lower population density.

3. Vehicle occupancies are higher on weekends than on weekdays. This is likely due to the larger proportion of trips for the purposes of recreation, visit friends and relatives, and shopping. When Saturday and Sunday data are added to Monday through Friday data, the daily average vehicle occupancy is increased by 12 percent.

4. Vehicle occupancies vary among functional classes of highway with the highest functional classes having the highest vehicle occupancies. This is likely due to the longer trips taking place on these facilities. However, collectors and minor arterials still have a fairly high vehicle occupancy since they carry not only local trips, but also the beginning and ending portions of high occupancy long trips.

5. The variation in vehicle occupancy among the different population sizes of urban areas was small and not significant at the national level.

6. The afternoon period provides a good representation of the 24-hour average vehicle occupancy. When monitoring of work travel is also important, a split shift covering the morning peak period, as well as the afternoon off-peak and peak periods was generally successful in providing data for both purposes.

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