

**A METHODOLOGY FOR DETERMINING
RURAL PUBLIC TRANSPORTATION NEEDS IN VIRGINIA**

by

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Highway Research Engineer**

**Virginia Highway Research Council
(A Cooperative Organization Sponsored Jointly by the Virginia
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PREFACE

The members of the Virginia General Assembly, during the 1973 session, instructed that the Virginia Metropolitan Areas Transportation Study Commission make a study of and report on rural public transportation. The study was contracted to the Virginia Polytechnic Institute and State University, which institution requested the assistance of the Virginia Highway Research Council in developing a methodology for determining rural transportation needs. This report summarizes the methodology developed by the Council and presents the findings of a case study conducted in Madison County, Virginia in which the procedures were field tested.

SUMMARY

The need for rural public transportation is coming into focus, although its magnitude is unknown because of limited data. This study was initiated to develop an efficient and economical methodology for determining the transportation needs of the rural population. A case study was conducted in one rural county so that any potential problems could be identified on at least a partially factual basis. The methodology developed for the survey utilizes a simple home-interview questionnaire, volunteer interview personnel, and a sampling process based on aerial photographs.

In the case study, a comparison of the trips made by families with transportation (two or more vehicles) to those without transportation revealed there were many people in Madison County, Virginia, who could not take advantage of available opportunities and services because of the lack of transportation.

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INTRODUCTION

In our increasingly mobile society a day rarely passes that one does not hear of some type of urban transportation problem. Traffic congestion, fringe parking, express bus lanes, fare increases, and carpools are common topics of conversations. Yet with all this concern, little has been done to provide transportation for rural residents — more basically, the rural poor. In the past, the automobile has been the primary mode of transportation for these people, and often the expenses of purchasing, maintaining, and operating a private vehicle drain the family budget and limit the funds available for other necessities. In addition, there are those who are stranded at home because the only vehicle is being used by one member of the family, usually to go to work.

Most governmental attempts to increase accessibility for the rural populace have been confined to road developments or improvements, which certainly have been of significant benefit. Yet certain groups, like the poor, the handicapped, the young, and the elderly, are not always able to take advantage of such programs.

Because of these problems, and because there have been relatively few formal attempts to provide any sort of public transportation in rural areas, several states have initiated studies in this area of concern. This study represents part of an effort started in Virginia.

PROBLEM

It has been reported that the low income resident in rural America makes only 15 percent of the trips that the average American makes. ⁽¹⁾ Because of the lack of travel opportunities, some of the very basic needs of the rural people in poverty are not being met. It is not suggested that the lack of transportation can cause poverty, but certainly there is a relationship between the two. ⁽²⁾ One of the greatest contributions to the continuance of rural poverty is the inability of the poor to make use of existing resources, because of inadequate transportation. Hospitals, health clinics, and doctors are non-existent for people who have no means of getting to them. The people eligible for food stamps and job training cannot take advantage of these programs without transportation. Shopping becomes a chore, and often the cost of transportation limits the funds available for necessities such as food and medicine. Educational, recreational, religious, and social activities are out of reach to those who cannot afford to hire a taxi or own a vehicle.

Factual data relative to rural public transportation needs are difficult to find, especially in Virginia. Most research and data collection have been focused on metropolitan areas where funds have been available. Origin and destination studies have been conducted in the metropolitan areas, yet there have been no corresponding studies for rural areas.

Statistics for rural Virginia counties within the Appalachian region show that 30.6 percent of the households have no access to cars. ⁽³⁾ In one case, a woman who owned no vehicle, lived in a rented, dilapidated shack 15 miles from town with her two mentally retarded sons, and earned \$2,000 per year as a domestic helper, spent \$20 a week (or \$1,000 per year) for taxi fares to town for grocery shopping and visiting the welfare office. Thus it appears that many rural residents of the state are suffering economically, socially, and physically because of their inability to travel.

It is encouraging that state and local officials are becoming more concerned about the lack of transportation for the rural poor. At the state level, the members of the 1973 session of the General Assembly directed that a study be conducted on the availability of public transportation in rural areas, especially that available to the poor. The local officials of rural counties and planning districts realize that many citizens are without transportation, and they are seeking means of filling these needs. Unfortunately, each agency, such as welfare, health and medicade, is seeking to solve its individual problems rather than coordinating its efforts with those of others in a unified program.

Why all the concern now for rural public transportation—rural folks always seemed to get along before without it? The most important reasons are noted in advanced technology and increased urbanization. Technology has greatly improved farming techniques during the past two decades. In 1950, 3.8 million Southerners were employed in farm work; 2.4 in manufacturing. In 1972, only 1.5 million were still on the farm, while 4.4 million were in manufacturing. ⁽⁴⁾ Instead of staying home and working on the farm, the one-time farmer now has to commute to the employment centers for work. Also, services have been attracted to these centers which have resulted in the decline of county doctors and general stores. Therefore, all trips for the rural residents become longer.

Along with urbanization has been the decline of the close-knit families, which has created a hardship for many people, especially the elderly. Relatives no longer necessarily live near-by and thus cannot be depended upon for transportation.

As mentioned earlier, little information on the need for rural public transportation is available in Virginia, as is most likely the case across the country. The main objective of this study was to develop an efficient and economical methodology for determining the transportation needs of the rural population. A case study was conducted in one rural county so that potential problems could be identified on at least a partially factual basis. This study should serve as a prototype for future endeavors by local, district, and state governments.

SURVEY AREA CHARACTERISTICS

Since cost and time constraints would not allow for an intensive study of the transportation problems in all rural areas of the state, the survey had to be restricted to only one area. The rural character of the proposed Virginia Ninth Planning District (Culpeper, Fauquier, Orange, Madison and Rappahannock Counties), plus the great concern expressed by many people in the region over rural transportation needs, were important considerations in its selection as an area of study. The location of the Ninth Planning District within the state is shown in Figure 1.

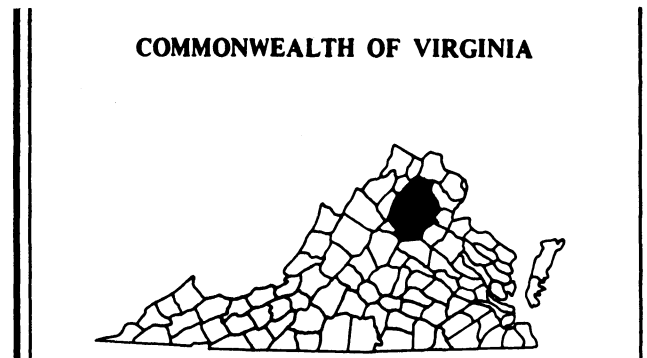


Figure 1 - Index to Ninth Planning District

Madison County was chosen as the specific survey territory because it possesses a number of characteristics thought to be of value in determining the needs for a rural transportation system. The county: 1) is rural, 2) has within it the incorporated Town of Madison (the county seat) which offers many of the jobs and lower-order services to the remainder of the county, and 3) is dependent upon the surrounding areas for some of its employment and high-order services.

Madison, with an area of 327 square miles (209,280 acres), lies in the upper Piedmont Plateau and has the Blue Ridge Mountains as its western border as shown in Figure 2. The terrain varies from the rugged mountains with altitudes exceeding 4,000 feet to the rolling hills along the eastern border, which are only 500 feet above sea level. Much of the mountainous area is within the Shenandoah National Park.

In Madison County the population has grown only 4 percent during the past twenty years, as compared to a 40 percent statewide increase. Of the total population, 20.4 percent are negro. The population growth rate is expected to remain at a relatively low figure as predictions for 1980 indicate a population of 9,100, or an increase of 5.4 percent.











In 1971, the work force in the county consisted of 29.0 percent of the total population of which 4.6 percent were unemployed. Improvements in agriculture techniques and urbanization have had an impact upon Madison County as many people have left the farms for other employment. In 1950, 57.5 percent of the work force was employed in agriculture as compared to 25.3 percent in 1970. Unfortunately, the industry growth in the county has not kept pace with the employment diversion from agriculture to manufacturing; subsequently, 1,300 residents are commuting to nearby counties for employment. Only 155 working people are commuting from adjacent areas into the county.

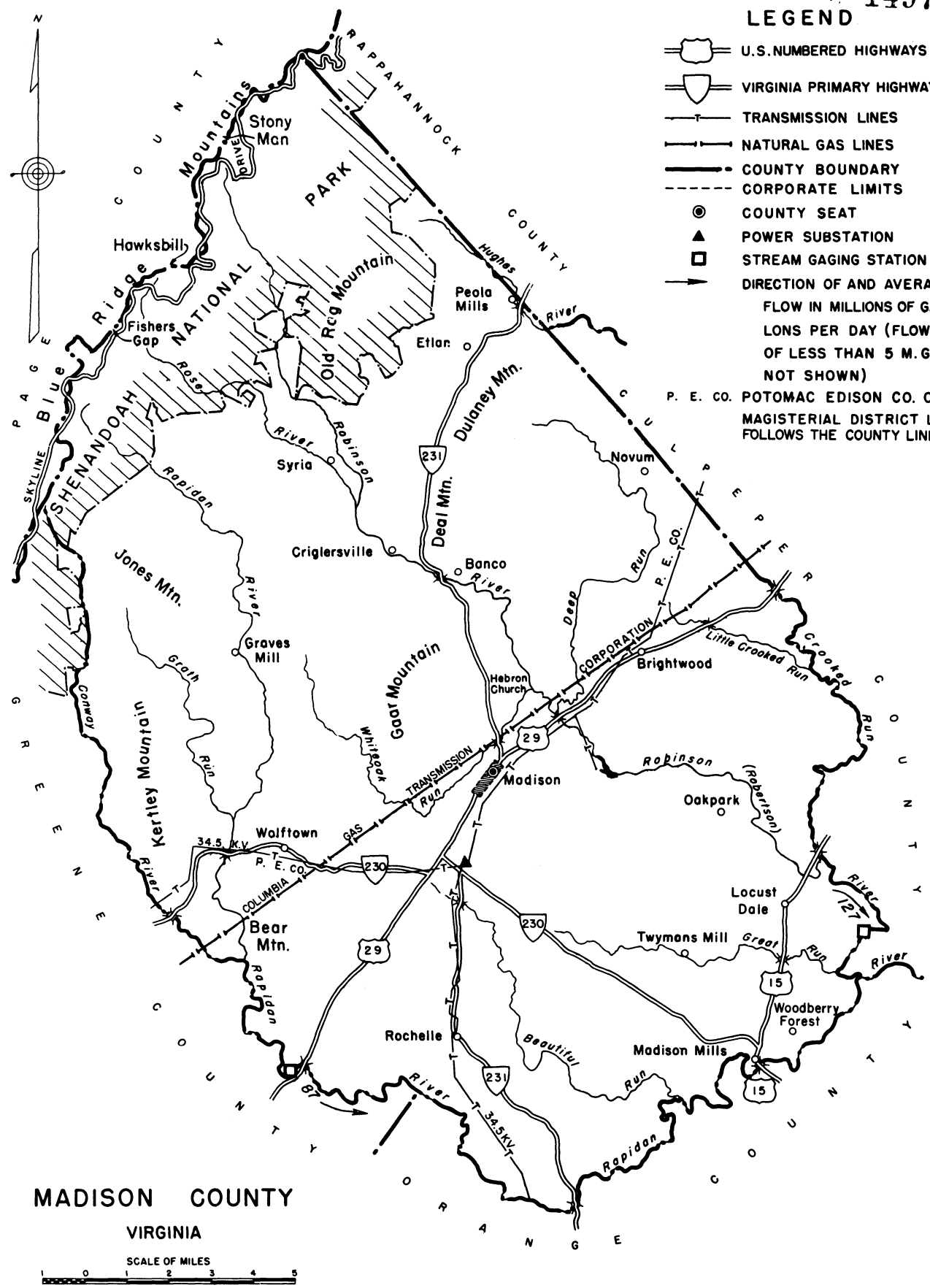
The county has the lowest per capita income in the Ninth Planning District and is well below the state level. The annual per capita income for the county was \$1,780 in 1969 as compared to the state level of \$3,348. Thirty percent of all persons were below the poverty level while the same statistic for the state was 15.5 percent. During that same year 23.1 percent of the families residing in the county received social security income.

According to the U.S. Bureau of Census, all of the housing in the county is considered rural, even though the town of Madison (299 population) is incorporated. (By definition, any incorporated area having less than 2,500 inhabitants is considered rural.) During the past ten years there has been a 32 percent increase in housing units, however, 37 percent of the total housing units lacks some or all plumbing facilities. Figure 3 shows a comparison of the housing in the county, but generally the housing must be considered "poor" as 49 percent of the units have a total value of less than \$10,000. This compares to a statewide statistic of 22 percent.

Transportation is a problem for all of the Ninth Planning District. The automobile is the primary mode of travel. The Virginia Department of Highways maintains 63 and 303 miles of primary and secondary highways, respectively. The major highway through the county is Arterial Route 29, which serves the north-south traffic.

LEGEND

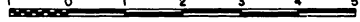
-  U.S. NUMBERED HIGHWAYS
 -  VIRGINIA PRIMARY HIGHWAYS
 -  TRANSMISSION LINES
 -  NATURAL GAS LINES
 -  COUNTY BOUNDARY
 -  CORPORATE LIMITS
 -  COUNTY SEAT
 -  POWER SUBSTATION
 -  STREAM GAGING STATION
 -  DIRECTION OF AND AVERAGE FLOW IN MILLIONS OF GALLONS PER DAY (FLOWS OF LESS THAN 5 M.G.D. NOT SHOWN)
- P. E. CO. POTOMAC EDISON CO. OF VA.
MAGISTERIAL DISTRICT LINE FOLLOWS THE COUNTY LINE



MADISON COUNTY

VIRGINIA

SCALE OF MILES



1973

OFFICE OF THE GOVERNOR
DIVISION OF STATE PLANNING AND COMMUNITY AFFAIRS

Figure 2 - Madison County

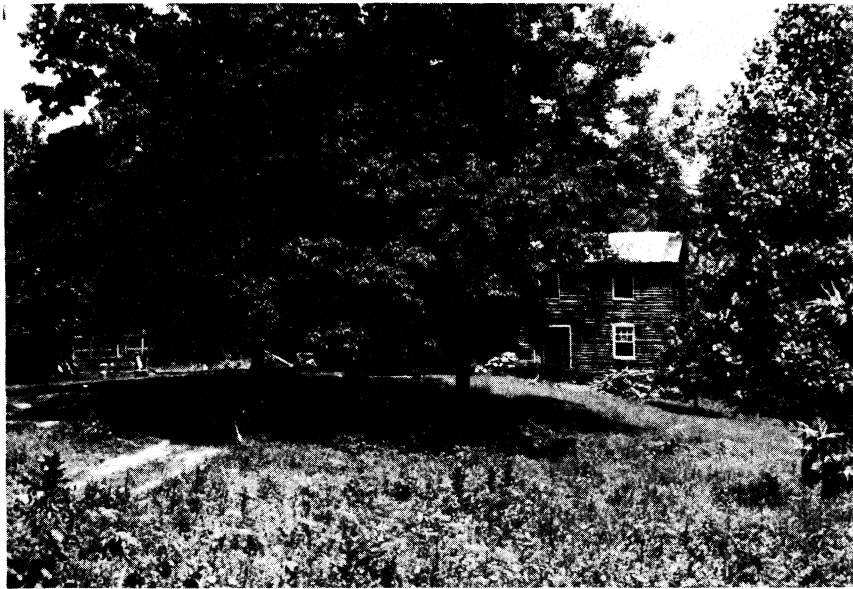
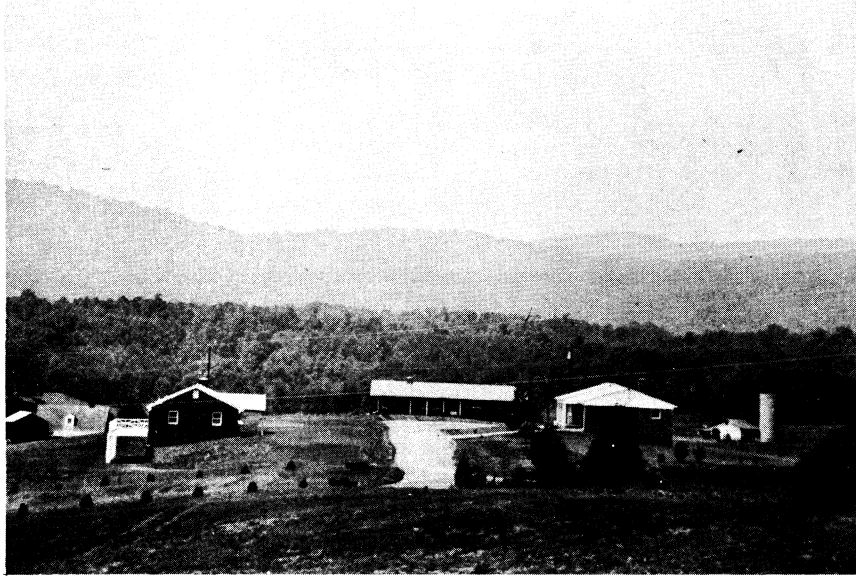


Figure 3 - Typical housing in Madison County

The Trailways Bus Company has routes that travel Route 29 with a stop in the Town of Madison; however, there is no local bus service. The only other public transportation is one taxi cab that is headquartered in the town. The service provided by the taxi for general transportation is somewhat limited because it is frequently used to carry medicade patients on long trips to clinics and doctors located outside of the county.

SURVEY METHODOLOGY

The methodology developed for the survey involved a simple home interview questionnaire, volunteer interview personnel, and a sampling process utilizing aerial photographs.

Home interviewing was chosen as the survey technique since it offers the greatest reliability of all methods in getting correct information on travel patterns and characteristics. The advantages of personal questioning at home are countered by several disadvantages such as cost (50-60 percent of the total study cost) and the inability to obtain complete information because of the interviewees' reservations about answering questions for a stranger. It is surmised that rural people may be more reluctant to reveal complete information because the publicity programs about the survey are not as effective in rural areas as they are in urban centers. Another problem is the fact that many rural people are not aware of the available opportunities and services, and therefore are not cognizant of their transportation needs. In other words, it is difficult to get complete information about potential trips until the population is fully aware of the available programs, and unfortunately, much of the educational process for this particular population is by personal contact, which is dependent upon transportation.

Questionnaire

An objective of this study was to reduce the cost of data collection without adversely affecting the information obtained. Consequently, during the preliminary stages of the study it was decided to utilize volunteer interviewers from a select group consisting of social workers, retired persons, housewives, etc. Because of the local volunteers, many precautions had to be taken in the design of the questionnaires to ensure the omission of personal and embarrassing questions. Therefore, the questions were related to travel patterns rather than economic factors.

Travel data includes origin, destination, purpose, frequency, mode, and time of trip making. Although questions were incorporated to obtain latent demand, it was surmised that it would be of little value as other surveys have indicated that the desired trips are generally similar to the present trips. Further, it was considered poor public relations to advise the interviewees that the home interview survey was being conducted to determine

their needs and then not allow them to express their views. Consequently, the question pertaining to the number of operable vehicles was of primary concern as the latent demand can be estimated through a comparison of the trips made by the people who have transportation (two or more vehicles) with the trips made by the people without transportation.

Additional information was sought relative to telephone availability, occupation of head-of-household, willingness to provide transportation for others, and the number of people in the household.

To determine the travel patterns, it was necessary to divide the county into zones. The twelve zones chosen corresponded to the Enumeration Districts (ED's) used by the U. S. Census Bureau in Madison County. Trips to places outside the county were assigned to large pseudo zones in the surrounding areas. The territorial divisions are shown in Figure 4. A zonal map was furnished each interviewer to assist in the proper recording and coding of data.

Interviewers

As previously mentioned, the interviewers used in the home interview survey were volunteers. A social worker for the welfare department accepted the responsibility of soliciting the volunteers, and the interview team consisted of the following: four housewives, two retired people, two college graduate students majoring in social services, two students majoring in transportation, and three county employees (a social worker, the zoning administrator, and an extension agent).

Each volunteer was furnished a copy of the home interview instructions, and a completed sample questionnaire (included in the Appendix) with the request that they review them before a training session (one day) given by employees from the Virginia Highway Research Council. In this session, the questionnaire and survey techniques were explained, questions were clarified, and the volunteers went through "trial runs" of interviewing. After training, the volunteers were assigned a specific area (approximately 20 interviews in each area). Attempts were made to assign each interviewer in his or her local community in an effort to ensure that the interviewer was familiar with the characteristics of the persons to be interviewed, and to conserve the volunteer's time and use of personal vehicle.

Sample

The households to be sampled were to be chosen from an aerial photograph of the county. This procedure proved to be unsatisfactory for three reasons: (1) The photograph was outdated (October 1969), thereby eliminating any new developments; (2) it was difficult to identify houses from barns, stores, gas stations, abandoned buildings, etc.; and (3) it was

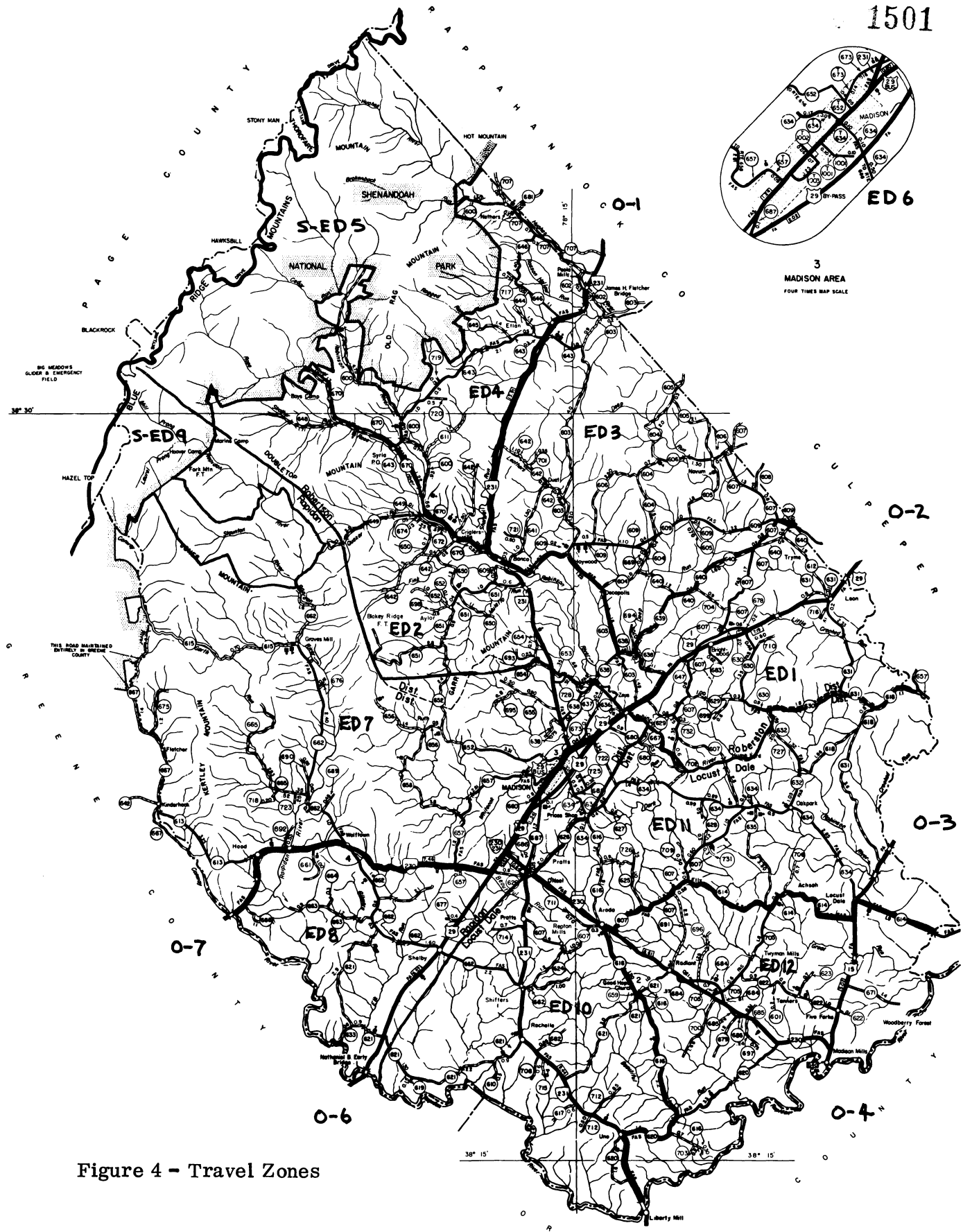


Figure 4 - Travel Zones

not possible to provide adequate directions or descriptions needed for the interviewers to locate the sampled dwellings. To remedy these problems, a windshield survey was also executed. This survey involved driving through the county and choosing a random sample. The photographs, although outdated, assisted in the location of remote dwelling units.

An eight percent sample was used and, therefore, every twelfth household was chosen for an interview. All houses to be interviewed were identified according to the location (mileage) and orientation (east, west, etc.) to the nearest road or intersection. A physical description of each house was also recorded. This scheme established sufficient criteria to assist the interviewers in locating the sampled dwelling units.

SURVEY RESULTS

Methodology

The home interview survey was conducted with fewer problems than had been anticipated. Only minor complications were encountered during the interviewing and reliable data were obtained because the majority of the citizens freely related their trips during the month. The experiences during each phase of the survey will be covered in the following sections.

Questionnaire

The interviewers reported little trouble with the questionnaire, and it was effective in obtaining the general information sought in the survey. It would have been desirable to have had more specific questions so as to eliminate interpretation by the interviewers. Further, a written introduction would have been helpful to ensure that all interviewers related the same objectives and goals of the survey.

During the survey, it was revealed that there were many non-reliable vehicles throughout the county, and that this fact had a drastic impact on the travel of many residents. Many residents reported that they could obtain a better job outside of the county but their vehicles were not capable of operating the greater distances. Also the number of retired and elderly people was greater than anticipated. Questions covering these matters should have been in the questionnaire.

Information related to the availability of transportation would have been beneficial. The questionnaire should have included an open-ended question similar to -- Is transportation a problem to you; do you ever have problems getting where you want to go?

Interviewers

The volunteer interviewers performed remarkable well and must be commended for devoting their time and personal vehicles to the study. Attempts were made to utilize only local volunteers in the survey as it was hypothesized they could obtain detailed information because of their knowledge of the characteristics of the people being interviewed. Some of the interviews were conducted by students majoring in social services and transportation who were not residents of Madison County, and generally, the information gathered by these students was not as detailed as the information secured by the local volunteers. The most serious deficiency in the use of local volunteer interviewers was the fact that many of them worked in their local communities. Some residents hesitated to respond freely to their neighbor's questions about personal travels. It should be pointed out that in the areas where the interviewers worked outside their own community, no such instances were reported.

At the beginning of the project, it was anticipated that two weeks would be required for the interviewing. Because of the inability of the local volunteers to assist on a full-time basis, this work took approximately six weeks. It did not appear that the time period adversely affected the results of the survey.

Case Study

A case study was conducted to determine the travel patterns of the residents in Madison County in an effort to delineate the transportation needs of the rural people. In analyzing the trips, it should be remembered that a trip is defined as being one-way. For example, a person going from home to work and then back home makes two trips. Also, the statistics presented in this report are taken from the sampled population, and projections have not been made to reflect the entire population in the county.

Total Travel

As previously mentioned, public transportation is practically nonexistent in the county, and consequently, the trips reported by the interviewed families were made by automobile (car, truck, motorcycle), school bus, or walking. Approximately 16,300 trips were made during a one-month period by members of the 171 households interviewed (Table 1). Of these trips 8.2, 23.7, and 68.1 percent were made by families that own 0, 1, and 2 or more vehicles, respectively (Tables 2, 3, 4). Twenty-one percent of the total trips were intrazonal, or trips that ended in the same zone in which they began. As might be expected, the Town of Madison Zone (ED 6) was the destination of the greatest number of trips (13.1 percent of the total as shown in Table 5). This indicates the town's significance as a county center since it actually has the lowest population of the inhabited zones (ED's 5 and 9 are a part of the Shenandoah National Park).

TABLE 1

INTERZONAL TRIPS BY ALL HOUSEHOLDS
(vehicle trips per month)

From	Enumeration Districts*												External Zones							Total
	TO	1	2	3	4	6	7	8	10	11	12	01	02	03	04	05	06	07		
1	950	13	40	24	224	27	146	4	65	12	6	473		7		34	2	2,027		
2	13	398	5	125	103	24	116	4	4		4	101		1	4	37	1	940		
3	40	5	174	170	140		74	4	16		36	276		1	1	51		988		
4	20	98	166	309	179	4	70	20		1	46	22				5		940		
6	192	68	196	129	386	269	189	205	203	141		43		24		13		2,058		
7	22	24	20		285	240	172	52	16	45		69		37	18	40	21	1,061		
8	190	100	30	90	213	172	260	142	110	133		16		34	5	94	12	1,601		
10	4	4	4	4	197	84	122	454		4		2		245	49	80		1,253		
11	53	4	16	8	180	16	136		120	16		54	128	206	20	62	4	1,023		
12	7			9	141	45	133	4	16	215	1	53	48	332	35			1,080		
01	6	5	36	45												115		207		
02	483	84	280	14	55	73	8	1	38	55		91						1,182		
03					7	4			116	40				3				170		
04	7	15	1		14	47	34	244	193	393				38		2		988		
05		4	1			18	5	49	20	35								132		
06	36	41	47	4	12	44	97	84	63	106						34		568		
07	2	1	1		4	20	16			41								105		
Total	2,025	864	1,017	931	2,140	1,087	1,578	1,267	980	1,237	93	1,200	176	928	132	567	20	16,323		

* Enumeration Districts 5 and 9 lie in the Shenandoah National Park.

TABLE 2
 INTERZONAL TRIPS FOR NO VEHICLE HOUSEHOLDS
 (vehicle trips per month)

From	Enumeration Districts*												External Zones							Total
	TO	1	2	3	4	6	7	8	10	11	12	01	02	03	04	05	06	07		
1	38		8		5	4							4						57	
2		150		20	10	4							2						186	
3	8																		8	
4		20		48	8														76	
6	4	10		8	45	51	12	64		1						2			197	
7					51	182	50		1				1						285	
8	4	4			12	50	64	5					2	4		3			148	
10					64		5	72						50	24	1			216	
11						1				1									2	
12					1				1	1				30	4				37	
01																			0	
02	4	2				1	2												9	
03																			0	
04							4	50		30						2			86	
05								24		4									28	
06	2				1		3	3						4		5			16	
07																			0	
Total	60	186	8	76	197	285	148	218	2	37	0	9	0	88	28	13	0		1,354	

* Enumeration Districts 5 and 9 lie in the Shenandoah National Park.

TABLE 3
 INTERZONAL TRIPS FOR ONE VEHICLE HOUSEHOLDS
 (vehicle trips per month)

From	TO	Enumeration Districts*										External Zones							Total						
		1	2	3	4	6	7	8	10	11	12	01	02	03	04	05	06	07							
1	110			24	4	11	4	25		20					50		1								249
2			36	4	40	4																			84
3	24	4	4	120	96	78		40	4	8					4	52	1						35		466
4		4	4	92	161	82		24						45	9								1		417
6	11	4	4	118	42	176	42	100		12	32				22	4	1					3			567
7	4					42	42	74			1				24		21	1	31	2					242
8	25			20	24	96	74	104	24	26	48				6	4	4	32	12						499
10				4				24	74							29						4			135
11	8			8		12		26		44	8				52	25									183
12						32	1	48		8	136				6	4	117	3	26						381
01		1	4	44																					49
02	62			52	1	26	24	2		36	8														211
03						4				29	4														37
04	1			1		1	21	4	29		117					4									178
05							1	4			3														8
06				35	1	3	31	32	4		22							4							132
07								2	12																14
Total	245	49	482	413	567	242	519	135	183	379	49	221	34	178	8	136	14								3,854

* Enumeration Districts 5 and 9 lie in the Shenandoah National Park.

TABLE 4
INTERZONAL TRIPS FOR HOUSEHOLDS WITH

TWO OR MORE VEHICLES
(vehicle trips per month)

From	TO		Enumeration Districts*										External Zones							Total
	1	2	3	4	6	7	8	10	11	12	01	02	03	04	05	06	07			
1	802	13	8	20	208	18	117	4	45	12	6	419	6	34	2	1,714				
2	13	212	1	65	89	24	112	4	4	4	4	99	1	4	37	1	669			
3	8	1	54	74	62		34		8		32	224		1	16		514			
4	20	74	74	100	89	4	46	20		1	1	13			4		446			
6	177	54	78	79	165	176	77	141	191	108		21	23		8		1,298			
7	18	24	20		192	16	48	52	15	44		44	16	17	9	19	534			
8	161	96	10	66	105	48	92	113	84	85		8	26	1	59		954			
10	4	4			133	84	93	308		4		2	166	25	75		898			
11	45	4	8		168	15	112		76	7		2	103	20	62	4	832			
12	7			9	108	44	85	4	7	78	1	47	44	185	28	89	777			
01	6	4	32	1													43			
02	417	82	228	13	29	48	4	1	2	47		91					962			
03					3				87	36			3				129			
04	6	15			13	16	26	165	193	246			34				714			
05		4	1			17	1	25	20	28							96			
06	34	41	12	3	8	13	62	77	63	84					25		422			
07	2	1			4	18	4			41						20	90			
Total	1,720	629	526	430	1,376	541	913	914	795	821	44	970	147	666	96	418	87	11,093		

* Enumeration Districts 5 and 9 lie in the Shenandoah National Park.

TABLE 5
MONTHLY VEHICLE
POPULATION AND TRIP DESTINATIONS
BY ZONE

ED	Population		Total Trips Ending in Zone	
	Number	Rank	Number	Rank
1	1118	3	2025	2
2	680	7	864	10
3	653	8	1017	7
4	643	9	931	9
5	0	-	-	-
6	299	10	2140	1
7	928	5	1087	6
8	1131	2	1578	3
9	0	-	-	-
10	874	6	1267	4
11	932	4	980	8
12	1380	1	1237	5

Route 29, the major highway in the county, passes through ED's 1, 6 and 8. Much of the growth in the county has been along this transportation facility, and 43.7 percent of all intra-county trips had destinations in these zones.

Travel to areas outside Madison County constitutes 19.1 percent of all trips. The majority of these trips are to the zones which include the Towns of Culpeper (0-2) and Orange (0-4) and the City of Charlottesville (0-6). As can be seen from comparing the zonal map and Table 6, the zones closest to these municipalities have the highest percentage of trips to them with a corresponding decline in the trips to the Town of Madison.

TABLE 6
SOME CHARACTERISTICS OF
ZONAL TRIPS

ED	Most Frequently Visited External Zone	Percent of Total Trips	Trips to Madison as % of Total Trips	% Intrazonal Trips
1	2	23.3	11.0	46.8
2	2	10.7	10.9	42.3
3	2	27.9	14.2	17.6
4	1	4.9	19.0	32.9
5	-	-	-	-
6	2	2.1	18.7	18.7
7	2	6.5	26.9	16.2
8	6	5.8	13.3	36.2
9	-	-	-	-
10	4	19.6	15.7	36.2
11	4	20.1	17.6	11.7
12	4	30.7	13.1	19.9

Trips vs. Vehicle Ownership

In Table 7, a comparison is made between trip characteristics and vehicles per household. Fifty-six percent of the households interviewed owned two or more vehicles while 28 and 16 percent of the families owned one and zero vehicle, respectively. By "owned", is meant that the vehicle (car, truck, motorcycle) was operative, had a current inspection sticker, and was licensed to be driven on the highway.

Vehicle ownership had an identifiable impact on the total trips made. The amount of tripmaking was directly related to vehicle ownership. While 56 percent of the households interviewed owned two or more vehicles, this group was responsible for 68 percent of all trips made. On the other hand, the households owning no vehicle (16.4 percent) accounted for only 8.2 percent of the total trips. Of the trips made by the households without a vehicle 32.0 percent were made by walking. The households with two or more vehicles reported only 1.4 percent of the total travel as walk trips while the one vehicle households made 2.6 percent trips by walking.

The number of vehicles also influenced the zonal travel. The no-vehicle families limited 44.3 percent of their trips to within the zone of origin. Of these, approximately 50 percent were made by walking. The intrazonal trips decreased to 26 percent for the families with one car and to 17.1 percent for the households with two or more vehicles. This might indicate that the families with transportation are taking advantage of the better shopping and service facilities which may be located outside the zone where they live. Those with one or no car are restricted to a more limited travel pattern and can make only short trips.

Since limited travel seemed to be a characteristic of low car ownership, it was hypothesized that this group would make many trips to the Town of Madison and a fewer number of trips to areas outside of the county. Table 7 shows there was no significant relationship between vehicle ownership and trips to Madison. While 12.4 percent of all trips made by the two or more vehicle households and 14.7 percent of all one-vehicle family trips were destined for Madison, only 14.5 percent of the trips made by the no-car families fell into this category. These findings show again that the travel of the last group was restricted, since they did not have the transportation to travel frequently to Madison for their needs. Instead, they had to shop at the country stores or have someone bring the required goods to them. Many retired people reported that a relative did the shopping for them, and that they made few, if any, trips. The number of trips outside the county showed a positive relationship to car ownership, with the percentage for zero, one, and two-vehicle households being 10.2, 16.6, and 21.1 percent, respectively.

TABLE 7

TRAVEL VS. VEHICLE OWNERSHIP

Vehicles/ Household	% of House- holds	% of Total Trips	% Intra- zonal Trips	% Trips to Madison	% Walk Trips	% External Trips
0	16.4	8.2	44.3	14.5	32.0	10.2
1	28.1	23.7	26.0	14.7	2.6	16.6
2 (or more)	55.5	68.1	17.1	12.4	1.4	21.1
Totals	100	100	21.5	13.1	4.2	19.1

Vehicle Ownership vs. Trip Purpose

Table 8 shows the distribution of trips for different purposes by the number of vehicles owned. Again, these statistics confirm the relationship between vehicle ownership and trip-making--the fewer vehicles owned, the less the travel. For families with no cars, the total number of monthly trips per household was 45.57. The figure increases almost proportionately for one- and two- or more vehicles per family as the monthly household trips were 82.87 and 116.57, respectively.

When the travel data were reduced into trip purposes, some interesting differences appeared. The lack of a vehicle resulted in a greater percentage of the total trips being made for necessities. Shopping and health trips for households with no vehicle, for example, were a greater percentage of the total travel than for the one- and two- car families. Similarly, recreational, church, and visiting trips were consistently a smaller percentage of the zero-vehicle family's trips. The only inconsistency with these trends was the increased percentage of shopping trips by the two-car over the one-car household, but this may have been due to luxury shopping trips.

The work trips were approximately in the same proportion for all categories, but it must be remembered that the absolute number of trips made by the zero- and one- car households was considerably less than those of the high car ownership. The school trips appear to have been under reported in all categories. This may be expected as the survey was conducted during the summer months and some interviewers may have forgotten to ask for the school trips usually made during the year. However, the limited data do indicate that the no-vehicle families made fewer school trips, which is reasonable, considering the

TABLE 8
VEHICLE OWNERSHIP AND TRIP PURPOSE

Purpose	No Vehicles			One Vehicle		Two or More Vehicles			
	% of All Trips	Trips/hsehd (month)	Trips/indiv (month)	% of All trips	Trips/hsehd (month)	Trips/indiv (month)	% of All trips	Trips/hsehd (month)	Trips/indiv (month)
School	3.0	1.43	.60	7.5	6.25	2.24	6.0	7.0	2.04
Work	24.4	11.11	4.64	23.7	19.60	7.02	26.6	31.0	9.03
Home	49.5	22.57	9.43	48.1	39.92	14.30	46.4	54.12	15.77
Shopping	15.8	7.21	3.01	10.0	8.25	2.96	11.8	13.71	3.99
Health	1.4	.64	.29	.9	.71	.25	.8	.91	.26
Church	2.6	1.18	.49	4.5	3.75	1.34	3.0	3.44	1.00
Visit	2.9	1.32	.55	4.0	3.31	1.19	3.1	3.61	1.05
Recreational	.02	.11	.04	1.3	1.08	.39	2.4	2.78	.81
TOTAL	100	45.57	19.04	100	82.87	29.69	100	116.57	33.95

high number of retirees in this category. Trip information for welfare programs was also requested, but the response was negligible and, therefore, omitted in the tabulations. The small response may be due to the embarrassment of giving this information, or there may be an actual lack of participation in the welfare programs. If the latter is the case, then the lack of transportation may be one factor which is limiting the eligible people from participating in the program.

Vehicle Ownership vs. Household Characteristics

Table 9 summarizes household characteristics by vehicle ownership groupings. It was expected that the greater the household population, the greater would be the vehicle ownership. This was the case as the average number of members per household was 2.39, 2.79, and 3.43 for the zero, one, and two- or more vehicles per family, respectively. Also, the occupation of the head-of-household for each category followed expectations. A high percentage of the retired people and the blue-collar workers had either no car or just one. This finding confirms the inability of these people to buy and operate automobiles.

The people in the county who lacked transportation also had deficient means of communications. Of the families who did not own a car, 39.3 percent did not have a telephone. This is an important factor in the planning of future transportation systems which are designed to accommodate the needs of the rural poor.

TABLE 9
HOUSEHOLD AND TRAVEL CHARACTERISTICS
Percentages in Parentheses

Vehicles per HH	Total HH's Surveyed	Total* Persons	Average No. Persons/HH	Occupation of Head of Household					Phone Available to HH	
				Retired	Blue Collar	White Collar	Unemployed	Unknown	Yes	No
0	28 (16)	67	2.39	15 (54)	13 (46)	0	0	0	17 (60.7)	11 (39.3)
1	48 (28)	134	2.79	17 (35)	26 (54)	5 (11)	0	0	37 (77.1)	11 (22.9)
2+	95 (66)	326	3.43	10 (11)	61 (64)	20 (21)	2 (2)	2 (2)	87 (91.6)	8 (8.4)
Total	171 (100)	527	3.08	42 (25)	100 (59)	25 (14)	2 (1)	2 (1)	141 (82.4)	30 (17.6)

* Five years and older

CONCLUSIONS

The following conclusions are based on the findings from this study.

1. The questionnaire developed in the study was effective in obtaining the general information sought in the survey. This questionnaire could serve as a prototype for future studies although the specific goals and objectives of a particular project may require some modifications in the questions.
2. The performance of the volunteer interviewers was most gratifying. Their interest in the project, along with their knowledge of the characteristics of the people being interviewed, were great assets in obtaining detailed and complete information. Furthermore, it appeared that the people being interviewed were less suspicious of the survey because it was locally administered.

In addition to the above advantages, the survey was conducted at a minimal expense because the volunteers contributed their time and personal transportation.

3. The results of the case study depict a real need for additional transportation in Madison County. Using trips made by a two-car family as a standard, the families with less car ownership are seriously deficient in travel capability. Not only did the zero- and one- vehicle families make fewer trips (32 percent of the total) but they were mostly short distance trips for necessities. A public system, hopefully, would decrease the gap between those with and those without sufficient transportation.
4. It is concluded that the volunteer administered home interview survey developed in this study is an effective tool for gathering reliable data at minimal cost. This technique surveys the entire transportation need and provides a basis for a unified planning process rather than the previous individual approach by service agencies.

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APPENDIX

HOME INTERVIEW INSTRUCTIONS

Purpose of Survey

Transportation is a vital element to mankind. With transportation, an individual may participate in the opportunities he chooses; without transportation he has no choice. Usually the people who are in the greatest need of transportation have the least services available. This group includes the poor, handicapped, elderly, and others. A recent report indicated that the poor in rural America made only 15 percent of the trips that the average American makes. Deprivation that is this severe obviously cannot be ignored and the General Assembly of Virginia recently directed the Virginia Metropolitan Area Transportation Study Commission (VMATSC) to make a study and report on rural public transportation, especially for the poor. This survey will be focused upon the trips made and/or the trips needed to be made by the rural people. The main emphasis will be on connecting the poor with available employment placement, physical or mental health care, sales, adult education, and other services.

The results of this survey will indicate the magnitude of public transportation needs and the likely demand that may develop. It must be emphasized that the information gathered is of extreme importance as the needs will dictate the technology required to satisfy this critical problem.

The best known method of determining travel data for persons living in a rural area is to interview each person at his place of residence. As this procedure would be a very time-consuming task, a statistical sample of the population is determined selecting a number of dwelling units. Past studies have shown that the occupants of selected dwelling units had travel patterns representative of all persons residing in the survey area.

Interviewers

Interviews in the field have a most important role in this undertaking. It is the interviewer who meets and talks with the people whose transportation needs are to be determined. It is also the interviewer who gives the general public the only firsthand contact with the survey and the sponsoring agencies, thus determining, in large measure, whether public response is to be free and cooperative, or suspicious and uncooperative.

As publicity programs in the rural areas are ineffective, it is highly possible that the majority of people to be interviewed will not know of the survey until contacted by the interviewer. Therefore, it is imperative that only selected interviewers be utilized. It is desirable to have interviewers (welfare and health personnel, ministers, teachers, etc.) who are already familiar with many of the interviewees and have a good knowledge of the study area. Above all, the interviewers must get complete travel data for every member of each household selected in the sample. To do this it will be necessary, in a courteous manner, to prompt the memory of the person being questioned. Also, to bring about understanding and confidence, and answer questions that may be asked, interviewers should know the purpose of the survey. Persons reluctant to answer questions, either in whole or in part, are to be assured that the information will be treated confidentially and will be used only to improve their future travels.

Equipment

An up-to-date county map will be supplied to the interviewer, not only for his

own use in recognizing locations of addresses where interviews are to be made, but also for reference purposes, if necessary, in locating trip origins and destinations of persons interviewed. The interviewer will also be supplied pencils, erasers, and a sufficient supply of interviewing forms.

Reasons Interview Cannot Be Made

If an interview cannot be made at a sample dwelling because of one of the six reasons listed below, the appropriate reason should be reported under Item 15, INCOMPLETE INTERVIEW REASON, and the form turned in to the supervisor as incomplete.

- | | |
|------------------------|------------------------------------------------|
| 1. Dwelling vacant | 4. Serious or contagious illness in household. |
| 2. Dwelling demolished | 5. No one at home after repeated attempts. |
| 3. Not a dwelling unit | 6. Resident refused to answer questions. |

If, however, an interview cannot be made because the interviewer is unable to locate the address of the sample dwelling, the interview form should be turned in to the supervisor together with any comments which may help in locating the dwelling, but in this case the interview must not be considered as complete. Some specific dwelling was selected for interview by the samplers; hence, the supervisor will determine why the sample dwelling cannot be located, correct the error, and return the interview form to the interviewer for completion.

II. THE INTERVIEW FORM

Item

1. Specify your name and assigned number.
2. Number interviews in accordance with the numbers found on the map and directions to the dwelling unit.
3. Enter proper month and date.
4. Enter respondent's name. If the individual refuses to give name enter the sex and approximate age.
5. Try to get location of dwelling relative to nearest road intersection, utility pole number, or any other marker of significance (e.g., 1/2 mile south of Rt. 230). Locate the approximate location on the zone map and record the proper code.
6. Record proper information.
7. Record proper information.
8. Enter the telephone number of the respondents who have one. This question has a twofold purpose. First, to have the number readily available if additional information is required, and second, to determine if communications are adequate to support a demand-responsive system such as dial-a-bus whereby the person telephones and requests that a bus pick him up at a specified time. If the respondent does not have a telephone but has access to a neighbor's or relative's, please note same on form.
9. Sometimes it may be preferable to defer this inquiry until the end of the interview and, if possible, avoid asking a direct question. Very often, in the course of other questions, the person being interviewed may volunteer the information or it may be deduced from remarks made during the interview. Some persons are sensitive about such questions and it is better to obtain first the other information which is not quite so personal.
10.
 - (a) Include only those people five (5) years of age or older.
 - (b) Do not include temporary visitors
 - (c) Do not include anyone in the armed services and living away from home.
11. Enter the total number of vehicles owned by all residents of the household. Include only those that are licensed and are in operating condition (have an inspection sticker not over 6 months old). Include a vehicle owned by the employer of a member of the household, or government owned cars.

12. a. Check proper information.
b. Check proper information.
13. Securing the travel data is the most important part of this survey. It is suggested that you guide the person being interviewed by asking specific questions. Each interviewer will develop his own technique for asking questions, however, a breakdown of time intervals and trip purposes may be helpful. First, break down the questions into categories similar to the following:
1. trips made daily during the week (Monday through Friday)
 2. trips made everyday during the weekend (Saturday and Sunday)
 3. trips made once every 2 days
 4. trips made once every week
 5. trips made once every month

Then, break down the trip purposes into the following categories:

1. home
2. work
3. shopping
4. welfare, food stamps and/or adult education
5. school
6. medical
7. church
8. visitation, recreation, other

The trips made by all members of the household should be recorded. Attached is an example of a typical family's travels, along with a completed interview form.

- 13-A. (a) A "trip" is intended to be any one-way journey. Thus, be sure to include the trips back home.
- (b) Include walking trips only if they are 500 feet or more in length and are off the property on which the household is located.
- (c) Include trips only by persons five (5) years or older.
- (d) We are concerned with normal, average, usual tripmaking during a month. Thus, you would include, for example, trips to public schools even if they are not made during the summer.
- 13-B. Origins at home can be listed as "home." Otherwise, try to identify a specific address or location as described in 5 above. Find the location on the zone map and record the proper code.

- 13-C. Destinations at home can be listed as "home." Otherwise, try to identify a specific address or location as described in 5 above. Find the location on the zone map and record the proper code.
- 13-D. The trip purposes are listed in Item 13. Select the one that is appropriate and record. It is important that the purpose be specified for each trip.
- 13-E. (a) Frequency would be in trips per day, week, or month, whichever is easiest to elicit from respondent.
 (b) Put the time period (day, week, or month) under the slash in each row for column 15.
- 13-F. (a) Include only those tripmakers who are members of the household.
 (b) Include only those tripmakers five (5) years of age or older.
- 13-G. Modes that should be noted are:
- | | |
|------------------------|-------------------------------|
| 1. auto or truck | 4. bus (including school bus) |
| 2. walk | 5. taxi |
| 3. motorcycle or cycle | 6. other |
- 13-H. (a) Time to be reported to the nearest 15 minutes (e.g., 2:15 P.M.)
 (b) Be sure to note whether A.M. or P.M.
- 13-J. (a) If done on more than one day per week, list those days.
 (b) If done every weekday, write "every weekday."
 (c) If done everyday (including Saturday and Sunday), write "everyday."
- 13-K. Costs should be reported only if out-of-pocket to pay, for example, for a taxi, for a trip provided by a neighbor, etc. Do not include costs for gasoline, etc. for a household member's own car or truck.
14. The potential trips may be difficult to obtain as many individuals are unaware of the services available. Generally discuss the available services and probe for answers. It is suggested that the same procedure be used in obtaining this information as was utilized in the actual trip portion (question 13) of the questionnaire.
- 14-A. Same as 13-A.
- 14-B. Same as 13-B.
- 14-C. Same as 13-C.
- 14-D. Same as 13-D.

- 14-E. Same as 13-E.
- 14-F. Same as 13-F.
- 14-G. (a) Time to be reported to the nearest 15 minutes (e.g., 2:15 P.M.)
(b) Be sure to note whether A.M. or P.M.
- 14-H. (a) If done on more than one day per week, list those days.
(b) If done every weekday, write "every weekday."
(c) If done everyday (including Saturday and Sunday), write "everyday."
15. If interview was not completed enter reason for incomplete interview in this section.

SAMPLE INTERVIEW

DIRECTIONS - Go north on Route 662 from Wolftown. Travel approximately 1/2 mile and interview green house with white trim on right side of road. THOMAS is on mailbox.

After the interviewer (Mrs. Jane Davis, number 9) arrived at the above dwelling unit on June 11, 1973, she found no one at home. Therefore, she returned on June 13 and was welcomed by a Mrs. J. F. Smith. The Smiths' address was Star Route 1, Box 234, Wolftown, Va., 22748. They did not have a telephone but a relative lived next door and a phone was available for their use. The Smiths had 3 children (ages 8, 6, & 4). Also, Mrs. Smith's mother lived with them. The Smiths owned two vehicles (a car and a truck) however, the truck was unlicensed and did not have a current inspection sticker.

Mr. Smith worked at Jim Carpenter Co. six days a week and also worked at the Madison BP station on Saturday evenings (3-12 P.M.). A neighbor usually rode with him to the Jim Carpenter Co., however, he was dissatisfied with his rider and desired to discontinue this service at the first opportunity. Mr. Smith did not travel much but he did go by the Hood Grocery Store each evening (Mon.-Fri.) on his way home from work. Also, he was a member of the Aylor Hunt Lodge and attended the weekly meetings on Wednesday evenings.

Mrs. Smith did the shopping on Fri. evenings in Madison and the children attended the school in Madison. Mrs. Smith also had to carry her mother to Charlottesville once a month for a doctor's appointment. The family, except Mr. Smith, regularly attended the Shelby Baptist Church, with the exception of the mid-week prayer meeting when Mr. Smith needed the car to go to the Lodge. Every other Sunday the Smiths visited Mr. Smith's father in Culpeper.

In regard to the trips the family would like to make, Mr. Smith could get a better job in Culpeper but he doesn't feel his car is dependable enough to make the daily trips. Mrs. Smith and her mother would desire to participate more in the Circle meetings (meets every two weeks) and prayer services at the Church. The oldest child would like to stay after school for the 4-H Club meeting on Thursday evenings. Mrs. Smith's mother would like to visit her relatives and friends in Etlan occasionally (she would not be able to make more than 1 such trip per month).

FIVE COUNTY AREA TRANSPORTATION STUDY (5 CATS)

1. Interviewer's Name Mrs. Jane Davis Number 9
2. Interview Number 1
3. Date: Month June Day 13
4. Respondent's Name Mrs. J. F. Smith
5. Address S.R. 1, Box 234
Wolfstown, Virginia
6. County Madison
7. Zip Code 22748
8. Telephone Number none (uses relative next door)
9. Occupation of the head-of-household skilled laborer (lumber yard)
10. Number of people over 5 years old in household 5
11. Number of operable vehicles owned by members of household 1
12. a. Do you or any other member of your household provide transportation for your friends and neighbors. Check: yes no
b. Would you be willing to provide (this or additional) service? Check: yes no
13. See attached pages
14. See attached pages
15. Incomplete interview reason:

13. Actual Trips Made - The following information relates to the trips made by the members of the household during the previous month. Please ask questions in the order recommended in the instructions and refer to the check list to insure that all information is gathered.

A. Trip No.	B. Origin of Trip	Code Block	C. Destination of Trip	Code Block	D. Trip Purpose	E. Frequency: Trips/?	F. No. of Riders	G. Mode	H. Time	J. Day	K. Cost
1	Home	7	Jim Carpenter	8	work	6/wk.	1	Auto	7:30 am	Mon.-Sat.	
2	Jim Carpenter	8	Hood Gro. Store	8	Shop.	5/wk.	1	Auto	5:00 pm	Week-days	
3	Hood Gro. Store	8	Home	7	Home	5/wk.	1	Auto	5:30 pm	Week-days	
4	Jim Carpenter	8	Home	7	Home	1/wk.	1	Auto	12 noon	Sat.	
5	Home	7	Madison BP	8	Work	1/wk.	1	Auto	2:30 pm	Sat.	
6	Madison BP	8	Home	7	Home	1/wk.	1	Auto	12 mid.	Sat.	
7	Home	7	Aylor Hunt Lodge	2	Rec.	1/wk.	1	Auto	6:00 pm	Wed.	
8	Aylor Ht. Lodge	2	Home	7	Home	1/wk.	1	Auto	10 pm	Wed.	
9	Home	7	Madison Elem. School	6	School	5/wk.	2	Bus	8:00 am	Week-days	
10	Madison Elem. School	6	Home	7	Home	5/wk.	2	Bus	2:30 pm	Week-days	
11	Home	7	IGA Food Store	8	Shop.	1/wk.	1	Auto	6:00 pm	Fri.	

13. Actual Trips Made - The following information relates to the trips made by the members of the household during the previous month. Please ask questions in the order recommended in the instructions and refer to the check list to insure that all information is gathered.

A. Trip No.	B. Origin of Trip	Code Block	C. Destination of Trip	Code Block	D. Trip Purpose	E. Frequency: Trips/?	F. No. of Riders	G. Mode	H. Time	J. Day	K. Cost
12	IGA	8	Home	7	Home	1 / wk.	1	Auto	7:30 pm	Fri.	
13	Home	7	Charlottesville	0-6	Dr.	1 / month	2	Auto	9:00 am	Wed.	
14	Charlottesville	0-6	Home	7	Home	1 / month	2	Auto	11 am	Wed.	
15	Home	7	Shelby Baptist Church	8	Church	1 / wk.	4	Auto	9:15 am	Sun.	
16	Shelby Baptist Church	8	Home	7	Home	1 / wk.	4	Auto	12 noon	Sun.	
17	Home	7	Culpeper	0-2	Visit	2 / month	5	Auto	2:00 pm	Sun.	
18	Culpeper	0-2	Home	7	Home	2 / month	5	Auto	6:00 pm	Sun.	
						/					
						/					
						/					
						/					

14. Desired Potential Trips - The following information pertains to trips the members of the household would like to make if transportation was available. Much probing will be required to obtain this information, therefore, it is suggested that the instructions and checklist be followed very closely.

A. Trip No.	B. Origin of Trip	Code Block	C. Destination of Trip	Code Block	D. Trip Purpose	E. Frequency: Trips/?	F. No. of Riders	G. Time	H. Day
1	Home	7	Culpeper	0-2	Work	5 /wk.	1	7:15 am	Week-days
2	Culpeper	0-2	Home	7	Home	5 /wk.	1	4:30 pm	Week-days
3	Home	7	Shelby Baptist	8	Church	2 /month	2	10 am	Thurs.
4	Shelby Baptist	8	Home	7	Home	2 /month	2	11:30 am	Thurs.
5	Home	7	Shelby Baptist	8	Church	1 /wk.	4	7:15 pm	Wed.
6	Shelby Baptist	8	Home	7	Home	1 /wk.	4	8:45 pm	Wed.
7	Madison Elem. School	6	Home	7	Home	1 /wk.	1	5:00 pm	Thurs.
8	Home	7	Etlan	3	Visit	1 /month	1	9:00 am	Tues.
9	Etlan	3	Home	7	Home	1 /month	1	3:00 pm	Tues.
						/			
						/			