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THE LOCAL RURAL ROAD PROBLEM

**A Report to the Subcommittee on Roads
of the Committee on Public Works,
United States Senate**

**by the
Bureau of Public Roads
Department of Commerce**

January 1950

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THE LOCAL RURAL ROAD PROBLEM

Part I.--INTRODUCTION

In April and May 1949, hearings were held on two bills, S.244 and S.1471, before the Subcommittee on Roads of the Committee on Public Works, United States Senate. These two bills were designed to supplement the Federal-aid Road Act, approved July 11, 1916, as amended and supplemented, to authorize regular appropriations for the construction of local rural roads, and for other purposes.

Differing facts and opinions presented during the course of the hearings indicated the desirability of a factual appraisal of the economic, engineering, financial, and administrative phases of the local rural road problem. Accordingly, on May 27, 1949, the following letter was received from the Chairman of the Committee on Public Works:

UNITED STATES SENATE
Committee on Public Works

May 27, 1949

Honorable Thos. H. MacDonald, Commissioner
Public Roads Administration
Federal Works Agency
Washington, D. C.

Dear Mr. Commissioner:

In connection with the Committee's consideration of S. 244 and S. 1471, dealing with rural local roads, there has been considerable discussion regarding the need for basic data concerning the present condition and future requirements of rural roads. As a result of this discussion, the Committee has decided that a study and report on this subject should be made in order that they may give adequate consideration to this problem.

The Committee has, therefore, requested that the Public Roads Administration, in cooperation with the State Highway Departments, Counties, and related political subdivisions undertake a study and make a report to the Committee on the existing status and future needs of rural local roads, including appropriate consideration of financing and social and economic aspects. In the expectation that further Federal-aid highway authorizations will be taken up by Congress during the next regular session, it is the desire of the Committee that this report be available January 1, 1950. The information developed in this report can then be considered by the Committee in conjunction with the regular Federal-aid authorizations.

In the meantime, the sub-committee which held hearings on Senate Bill 244 and Senate Bill 1471 will continue its study of the rural local roads problem, and of the two bills referred to.

By direction of the Committee this letter is addressed to you to serve as the formal authority and request of the Committee for the above mentioned study and report.

Sincerely yours,

/s/ Dennis Chavez U.S.S.
Chairman
Committee on Public Works

The limited time made available for the conduct of the study presented a serious problem, particularly in the collection and assembly of data for the more than 18,000 governmental units which exercise jurisdiction to various extents over the Nation's local rural roads. Excellent cooperation was received from all authorities, however, as attested by the completeness of the coverage and the vast amount of information made available for study. In the interest of brevity, only the summary data are included in the following report, since a mere listing of the details would require several hundred pages.

Following receipt of the Committee's letter of May 27, 1949, an appraisal was made by the Bureau of Public Roads of the information required for the report. Although a large amount of information relating to usage, mileage, and finances was on hand, principally in the records of the State-wide highway planning surveys, additional data were required and several lines of attack were developed to fill this need.

Inventory of local highway administration.--In February 1949, the Board of County Engineer Consultants 1/ agreed to undertake a study of local highway administration with the understanding they would have the full cooperation of the State highway departments and the field organization of the Bureau of Public Roads. Impetus was given to this proposal by the letter of May 27, 1949; and on June 10, 1949, forms and instructions were issued by the Bureau of Public Roads for the conduct of this study.

Figure 1 shows the nature of the form employed in recording, for each county, data relating to type of organization, resources, mileages, costs, and maintenance of local rural roads. The desired data were obtained for every county in the United States with the exception of those in Delaware, North Carolina, Virginia, and West Virginia, where local rural roads are under State control. In addition to the data on the forms, supplementary data were also obtained relating to governmental

1/ This Board is composed of 10 county engineers selected from various regions of the United States to advise and consult with the Bureau of Public Roads and State highway departments on road matters of joint Federal, State, and local interest. The names and addresses of the members of the Board are given in an appendix to this report.

COUNTY (SEE PAGE 5-TABULATION OF DATA)	POPULATION (1000'S)	LAND AREA (SQ. MILES)	TYPE OF ORGANIZATION												RESOURCES									
			GOVERNMENTAL TYPE (UNIT OR SUPERVISOR)	EXECUTIVE HEAD OF DEPARTMENT	ENGINEERING EMPLOYEES		OTHER EMPLOYEES		ANNUAL REVENUE (1947 DATA)			EQUIPMENT INVENTORY	CAPITAL INVESTMENT	BASE & SUP- FACE AGGRE- GATES-TYPE & SOURCES										
					ENGINEER OR NONTECHNICAL SUPERINTENDENT	APPOINTED OR ELECTED	TERM OF OFFICE (YEARS)	AVERAGE TENURE (YEARS)	NO. OF ENGINEERS (PROFESSIONAL)	NO. OF SUB-PROFESSIONALS AND ADMIN. EMPLOYEES	NO. OF ENGINEERS PART-TIME & CONSULTING				NO. OF SUB-PROFESSIONALS AND ADMIN. EMPLOYEES	FULL TIME	SEASONAL	FULL TIME	SEASONAL	TOTAL - 1000'S DOLLARS	CONSTRUCTION & MAINTEN. EQUIPT. - 1000'S DOLLARS BY RANGE (1-10)(10-25) (25-50)(50-75)(75-100) (100-150)(150+)	SUPPLY FACILITIES - 1000'S DOLLARS (BY RANGE)(1-10) (10-25)(25-50)(50-75) (75-100)(100+)	STORAGE, REPAIR, AND OTHER (10)DESCR. IN REMARKS	
																								NO. OF EQUIPT. OPERATORS & MECHANICS (BY RANGE) (1-5)(5-10)(10-15)(15-20)(20+)
COLES COUNTY	39	507	CU-TU	E	A	6	6	1	1	1	-	-	-	22 1/2	15	5	24 1/2	0	1	S&G	10			
12 TOWNSHIPS				NT	E	4	6	-	12	-	-	8	-	13	-	-	14 1/2	60	205	15 1/2	26			
TOTALS								1	13	1	-	8	-	17	-	22 1/2	160	65	449	15 1/2	27			
COOK COUNTY	1063	95 1/2	CU-TU	E	A	6	36	136	639	1	-	41	10	51	-	6009	2932	59	9000	36 1/2	109			
22 TOWNSHIPS				NT	E	4	12	-	22	4	55	-	-	28	2	-	272	112	384	106	8			
TOTALS								136	661	5	55	41	10	79	2	6009	3204	171	9384	47 1/2				
FEDERAL-AID SECONDARY																								
CRAWFORD COUNTY	21	44 1/2	CU-TU	E	A	6	18																	
10 TOWNSHIPS				NT																				
TOTALS																								
FEDERAL-AID SECONDARY																								

PRESENT STAGE OF DEVELOPMENT-RATE OF IMPROVEMENT AND CONSTRUCTION COSTS FOR ROADS UNDER COUNTY & TOWNSHIP CONTROL														CHARACTERISTICS OF MAINTENANCE		REMARKS	
TOTAL MILEAGE		UNSURFACED MILEAGE	PIONEER ALIGNMENT, PROFILE, CROSS-SECTION, AND DRAINAGE				CONTROLLED ALIGNMENT, PROFILE, CROSS-SECTION, AND DRAINAGE				ROUTINE MAINTENANCE (TYPE) CONTINUOUS (C) SEASON (S) INTERMITTENT (I) SURFACES (RANGE IN YEARS) (2-4)(4-6)(6-8)(8+) SURFACE TREATMENTS & ROAD MIXES (RANGE IN YEARS) (2-4)(4-6)(6-8)(8-10)(10+)	INTERVAL IN YEARS BETWEEN RESURFACING OPERATIONS					
			SURFACED WITH GRANULAR MATERIAL		DUSTLESS SURFACE (ALL TYPES)		SURFACED WITH GRANULAR MATERIAL		DUSTLESS SURFACE (ALL TYPES)								
			ESSENTIAL	NON-ESSENTIAL	TOTAL MILES	MILEAGE INCREASE DURING 1947	TOTAL MILES	MILEAGE INCREASE DURING 1947	TOTAL MILES	MILEAGE INCREASE DURING 1947			TOTAL MILES	MILEAGE INCREASE DURING 1947			
25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
179	1	-	-	-	-	-	-	-	39	4	5-10	139	7	25-50	S	4-6	
764	87	-	63	+5	1-3	32	+1	1-3	261	+15	5-10	321	+16	5-10	S		5/ OILE' EARTH SURFACE
943	88	-	63	+5		32	+1		320	+11		460	+23				
76	-	-	-			-			17			59					
839	6	-	19	-	1-3	4	-	1-3	159	+8	5-17	651	+12	25-50	C	6-8	
601	97	-	100	+1	1-3	10	-	1-3	316	+13	5-10	78	4	10-25	C	6-8	
1440	103	-	119	+1		14	-		475	+5		729	+16				
162	-	-	-			-			-			162					
157	1	-	-			-			-			-					
655																	

Figure 1.—Recording form used in the inventory of local highway administration.

and operating characteristics; administrative, executive, and supervisory responsibilities; and intergovernmental working relationships.

In its report to the Bureau of Public Roads, the Board of County Engineer Consultants has included the detailed results of this comprehensive inventory.

Maryland county studies.--In the fall of 1949, the Department of Agricultural Economics of the University of Maryland and the Maryland State Roads Commission, at the request of the Bureau, undertook studies in selected Maryland counties of the importance of the transportation services rendered to rural areas by local roads. These studies were conducted in cooperation with the Maryland Farm Bureau, the National and State Granges, the State Department of Education, the extension service of the University of Maryland, the State Agricultural Experiment Station, county agents, supervisors, superintendents of schools, and other local officials, the Automotive Safety Foundation, and the Bureau of Public Roads. They were undertaken for the purpose of portraying the importance of the service rendered by rural roads to education, mail delivery, and movement of farm products. In addition, an inquiry was made concerning the attitudes of rural residents with respect to the improvement of local roads. Some of the exhibits and findings thus far developed by these studies are included in this report. The final report on these studies will be available in the near future.

Inventory of culture and service.--On June 29, 1949, the Bureau of Public Roads undertook to compile information for each State relating to the number of dwellings of various kinds directly served by rural roads; vehicle-miles of travel; and mileage of mail delivery, school-bus,

and milk-collection routes. The majority of the States, through their State-wide highway planning surveys, furnished the desired information.

Special studies of local road administration.--In order to appraise the quality of administration achieved under actual operating conditions, field studies of administrative practices were conducted by the Bureau of Public Roads in the following counties during the summer and fall of 1949; Dallas and St. Clair Counties, Alabama; Decatur and Owen Counties, Indiana; Wilkin County, Minnesota; Benton and Coahoma Counties, Mississippi; Ransom County, North Dakota; Cherokee and Harrison Counties, Texas; Grays Harbor and Skagit Counties, Washington.

Special studies of equipment performance.--There are wide variations in field practices and utilization of equipment among local road units. To determine the approximate extent of some of these variations, studies of equipment performance on blading, hauling, ditching, grading, and other local road operations were conducted in selected counties from August to October 1949. These field studies were made by the Bureau of Public Roads engineering personnel in Benton and Coahoma Counties, Mississippi; Hickman County, Tennessee; and Cherokee and Harrison Counties, Texas.

Area maintenance studies.--On June 24, 1949, a study of road maintenance was initiated by the Bureau of Public Roads. The study provided for the selection of one or several adjoining counties in each State in which the local road maintenance needs were to be appraised in relation to the total road maintenance problem. Specifically, the purpose of the study was to analyze within a fixed area of operating significance, the road maintenance problems, methods, equipment usage, work

loads, deficiencies, normal and peak needs, patterns of efficient road maintenance performance, and inter-highway agency relations. These studies were made through the joint cooperative effort of the personnel of the Bureau of Public Roads, the State highway departments, and the local highway agencies.

Inventory of statutes.--A comprehensive inventory of legislation relating to local road matters was undertaken from August to November 1949. Provisions in regard to the following items were among those inventoried for each State: Type of local administration, tax powers, intergovernmental relations, accounting, auditing, budget, construction standards, qualifications of supervisory personnel, personnel practices, and salaries.

The foregoing undertakings were the principal special measures instituted for the purpose of providing needed information on local road matters for this report. Numerous contacts were made directly with personnel of local road agencies and in all instances the cooperation received was most gratifying.

Part II.--EXTENT AND USAGE OF LOCAL RURAL ROADS

BACKGROUND OF THE PRESENT SITUATION

Excepting a few undertakings by the Federal Government and some of the States, in our early history, participation in highway improvement at a level higher than the county or other local unit had its beginning in 1891 when New Jersey initiated State aid to the counties. By 1917, every State had some form of State participation in highways.

Most of the State highway departments were formed to administer aid to the counties. Later they undertook construction, often with county assistance, and turned completed roads over to the counties for maintenance. The final step, strongly supported by the rural population, was eventually taken in every State when the State highway department was charged with full responsibility for construction and maintenance of a system of primary highways with State funds. Roads connecting the county seats and other centers of population were selected to form these systems.

Federal highway aid to the States was initiated in 1916. Originally made available for the improvement of any post roads, it was, in 1921, restricted to a system of primary and secondary roads to be selected not exceeding in extent 7 percent of the rural road mileage.

These assumptions by the State and Federal governments of responsibility for the principal rural roads resulted in the rapid initial improvement of a relatively small but highly important segment of the rural road system. By the same actions, moreover, the counties and other local units of government were relieved of their most burdensome problems.

Since the transfer of roads to State control has been in most States progressive, and since the roads transferred have been invariably the more heavily traveled, the job left for the local governments has been steadily reduced, and in the same time there has been an equally steady increase in the proportion and amount of State-collected road-user revenues allotted for their expenditure. Unfortunately, this greater allotment of new revenue has been accompanied in many instances by reduction in the rate of local property taxation, so that the funds available for local road improvement have not invariably been increased.

When, in earlier years, the State and Federal governments took responsibility for the improvement of primary rural roads, streets of the cities were regarded adequate. The aid extended for primary rural highway improvement was withheld from extensions of the same roads within city boundaries. In later years the problem of city street congestion having emerged and become critical, the States at various times and to different degrees and the Federal Government under the provisions of the Acts of 1944 and 1948 have undertaken responsibilities in respect to the improvement of city arteries.

By the same Acts, the Federal Government has also enlarged its participation in the improvement of rural roads below the level of the primary highways.

Meanwhile, the joint expenditures of the State and Federal governments over an extended period have effected a vast and useful improvement of the primary rural roads. It is as yet a far from adequate improvement, as strongly indicated by the recent inventory of the

condition of the National System of Interstate Highways, 2/ and by State-wide highway needs studies conducted in a number of States. 3/

This is the background of the present situation, an over-all view of which reveals that there are large unfulfilled needs on all segments of the entire street and highway system of the country.

There is unquestionable need for the further improvement of secondary and local rural roads, to be particularly considered in this report. But there is equally unquestionable need for a vast further improvement of primary rural highways and principal city arteries, which in point of cost far exceeds the needs of the lesser rural roads.

The Federal Government is already contributing to the meeting of all these needs. It will doubtless be asked to increase its contribution in each category.

Hitherto the Federal contribution to rural roads below the level of a primary system has been qualified as available only for "principal secondary and feeder roads." Systems of such principal secondary roads have been designated in all States, amounting in present total to 393,000 miles. No arbitrary limitation has been set upon the extent of these systems and they are still in process of enlargement by further designation. Only the relative terms "principal" and "secondary" qualify the extent to which this enlargement may be continued.

2/ Highway Needs of The National Defense, House Document No. 249, 81st Congress, 1st Session.

3/ California, Illinois, Iowa, Kansas, Maine, Michigan, Mississippi, Nebraska, New Hampshire, Oregon, Vermont, and Washington.

The question now before the Committee is whether the Federal contribution to secondary and local rural roads should be so qualified and limited; and this report aims to provide information as to the extent, condition, and uses of all rural roads exclusive of those included in the State and Federal-aid primary systems as basis for the consideration of this question.

PRESENT EXTENT OF VARIOUS SYSTEMS

In consequence of the progressive participation of the State and Federal governments, what was formerly a single system of rural roads controlled and administered by local governments has been classified into jurisdictional groups or systems, which correspond closely with the classification primary; secondary; tertiary.

Of some 3 million miles of rural roads now existing, primary and secondary roads under State control, and roads in the National forests, parks, and Indian and other reservations under Federal control, embrace about one-half million miles.

The remaining 2.5 million miles are classed as local rural roads, of which 95 percent are under the jurisdiction of local governments, and 5 percent are under State control.

Mileages of the various rural road systems, as of June 30, 1949, are shown in table 1.

There are several incorporated counties which, because of their development as urban communities, have no mileage in the rural category. San Francisco County, California; Orleans Parish, Louisiana; and Suffolk County, Massachusetts are typical examples of these areas for which

Table 1.--Mileages of rural road systems in the
United States, as of June 30, 1949

System	Miles (1,000)	Percentage
Primary and secondary roads under State control <u>1/</u>	440	15
National forest highways, Indian reservation roads, etc. <u>2/</u>	72	2
Local roads under State jurisdiction <u>3/</u> . . <u>4/</u>	121	4
Local roads under local jurisdiction:		
On the Federal-aid secondary system . . <u>5/</u>	202	7
Not on the Federal-aid secondary system <u>5/</u>	<u>2,177</u>	<u>72</u>
Total	3,012	100

- 1/ Existing mileage of roads and streets under State control, Bureau of Public Roads tables SM-1, 1949, and OSM, 1947.
- 2/ Bureau of Public Roads table OSM, 1947.
- 3/ Local rural roads are under State jurisdiction in four States: Delaware, North Carolina, Virginia, and West Virginia.
- 4/ Bureau of Public Roads table RM-1, 1947.
- 5/ Report of the Board of County Engineer Consultants.

there is no rural mileage included in table 1. In addition, there are many other counties such as Los Angeles County, California; Cook County, Illinois; and Dade County, Florida whose urban characteristics are so pronounced that the Bureau of Census classes them as "metropolitan." There are approximately 203,000 miles of local rural roads under local jurisdiction in these metropolitan counties which are included in table 1. 4/

EXTENT OF LOCAL ROAD SURFACING

Progress in the surfacing of local rural roads is shown in table 2 for selected years since 1921. It will be noted there has been a steady decrease in the amount of unsurfaced mileage which has been accompanied by a corresponding increase in surfaced mileage.

4/ Report of the Board of County Engineer Consultants.

Table 2.--Mileage of surfaced and unsurfaced local rural roads in selected years 1/

Condition	Mileage of local rural roads on:			
	December 31, 1921	December 31, 1931	December 31, 1941	June 30, 1949
	(1,000)	(1,000)	(1,000)	(1,000)
Unsurfaced	2,419	2,120	1,580	1,291
Surfaced	<u>303</u>	<u>587</u>	<u>1,011</u>	<u>1,209</u>
Total	2,722	2,707	2,591	2,500

1/ Data for 1921-41 are from Bureau of Public Roads table RM-200; data for 1949 are from the report of the Board of County Engineer Consultants.

The downward trend of total mileage is the net result of several factors, including (1) reduction of local mileage by transfer to the State primary and secondary systems, (2) increases due to new roads built, (3) decreases caused by abandonments, and (4) increases and decreases resulting from the gradual accumulation of more accurate records of mileage in service.

Table 2 shows that 1,209,000 miles, more than 48 percent of the total local rural road mileage, was surfaced as of June 1949. There are considerable variations among the States as shown in detail by table 3, and in summary by the following listings:

<u>Percentage of local rural roads which are surfaced</u>	<u>Number of States</u>
Less than 20	6
20 to 39.9	14
40 to 59.9	9
60 to 79.9	10
80 and more	9

Further detail with respect to the type of surface improvement, as of June 30, 1949, is presented in summary in table 4, and in detail in tables 5, 6, and 7.

Table 4.--Mileage of local rural roads classified according to type of surface improvement existing on June 30, 1949 1/

Type of improvement	Miles (1,000)	Percentage
Unsurfaced roads	1,291	51.7
Surfaced, on pioneer alinement:		
Granular	464	18.5
Dustless	46	1.8
Surfaced, on improved alinement:		
Granular	500	20.0
Dustless	<u>199</u>	<u>8.0</u>
Total	2,500	100.0

Table 3.— Percentages of local rural road mileage surfaced and unsurfaced, as of June 30, 1949
(Data compiled from reports submitted to the Board of County Consultants)

State	On Federal-aid secondary system			Other local roads			Total local road distribution		
	Unsurfaced	Surfaced	Total	Unsurfaced	Surfaced	Total	Unsurfaced	Surfaced	Total
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Alabama	7.8	92.2	100.0	41.6	58.4	100.0	36.4	63.6	100.0
Arizona	16.3	83.7	100.0	78.0	22.0	100.0	73.0	27.0	100.0
Arkansas	14.1	85.9	100.0	81.4	18.6	100.0	71.7	28.3	100.0
California	2.0	98.0	100.0	14.9	85.1	100.0	13.9	86.1	100.0
Colorado	45.3	54.7	100.0	90.2	9.8	100.0	90.1	9.9	100.0
Connecticut	0.0	100.0	100.0	4.6	95.4	100.0	4.5	95.5	100.0
Delaware 1/	-	-	-	24.3	75.7	100.0	24.3	75.7	100.0
Florida	50.6	49.4	100.0	71.3	28.7	100.0	68.9	31.1	100.0
Georgia	8.3	91.7	100.0	51.5	48.5	100.0	48.5	51.5	100.0
Idaho	3.0	97.0	100.0	55.4	44.6	100.0	51.3	48.7	100.0
Illinois	1.8	98.2	100.0	21.1	78.9	100.0	19.7	80.3	100.0
Indiana	0.0	100.0	100.0	14.7	85.3	100.0	14.1	85.9	100.0
Iowa	21.6	78.4	100.0	51.7	48.3	100.0	40.5	59.5	100.0
Kansas	14.6	85.4	100.0	77.9	22.1	100.0	68.4	31.6	100.0
Kentucky	20.4	79.6	100.0	56.7	43.3	100.0	54.0	46.0	100.0
Louisiana	6.5	93.5	100.0	65.8	34.2	100.0	65.5	34.5	100.0
Maine	-	-	-	64.2	35.8	100.0	64.2	35.8	100.0
Maryland	5.3	94.7	100.0	31.7	68.3	100.0	25.6	74.4	100.0
Massachusetts	0.0	100.0	100.0	5.0	95.0	100.0	4.3	95.7	100.0
Michigan	5.3	94.7	100.0	34.5	65.5	100.0	31.7	68.3	100.0
Minnesota	3.3	96.7	100.0	31.8	68.2	100.0	29.1	70.9	100.0
Mississippi	5.3	94.7	100.0	61.2	38.8	100.0	56.0	44.0	100.0
Missouri			(No breakdown reported)				42.6	57.4	100.0
Montana	28.7	71.3	100.0	79.0	21.0	100.0	77.4	22.6	100.0
Nebraska	34.1	65.9	100.0	79.1	20.9	100.0	76.2	23.8	100.0
Nevada	59.4	40.6	100.0	90.3	9.7	100.0	89.4	10.6	100.0
New Hampshire	8.3	91.7	100.0	35.3	64.7	100.0	35.2	64.8	100.0
New Jersey	0.0	100.0	100.0	24.1	75.9	100.0	21.7	78.3	100.0
New Mexico	79.5	20.5	100.0	98.0	2.0	100.0	97.8	2.2	100.0
New York	-	-	-	27.7	72.3	100.0	27.7	72.3	100.0
North Carolina 1/	18.7	81.3	100.0	53.0	47.0	100.0	49.8	50.2	100.0
North Dakota	25.8	74.2	100.0	87.1	12.9	100.0	83.2	16.8	100.0
Ohio	2/ 0.0	100.0	100.0	17.5	82.5	100.0	16.3	83.7	100.0
Oklahoma	48.3	51.7	100.0	89.4	10.6	100.0	85.7	14.3	100.0
Oregon	14.5	85.5	100.0	54.5	45.5	100.0	53.1	46.9	100.0
Pennsylvania	-	-	-	60.9	39.1	100.0	60.9	39.1	100.0
Rhode Island			(No breakdown reported)				19.8	80.2	100.0
South Carolina	15.9	84.1	100.0	77.2	22.8	100.0	76.8	23.2	100.0
South Dakota	14.0	86.0	100.0	75.2	24.8	100.0	69.6	30.4	100.0
Tennessee	2.2	97.8	100.0	28.8	71.2	100.0	27.5	72.5	100.0
Texas	-	-	-	70.8	29.2	100.0	70.8	29.2	100.0
Utah	26.8	73.2	100.0	72.2	27.8	100.0	70.1	29.9	100.0
Vermont	0.6	99.4	100.0	47.5	52.5	100.0	43.1	56.9	100.0
Virginia 1/	1.3	98.7	100.0	26.7	73.3	100.0	18.8	81.2	100.0
Washington	2.5	97.5	100.0	41.8	58.2	100.0	38.3	61.7	100.0
West Virginia 1/	-	-	-	65.3	34.7	100.0	65.3	34.7	100.0
Wisconsin	0.1	99.9	100.0	14.3	85.7	100.0	12.8	87.2	100.0
Wyoming	69.1	30.9	100.0	85.1	14.9	100.0	84.6	15.4	100.0
Weighted average	14.2	85.8	100.0	55.4	44.6	100.0	51.6	48.4	100.0
Arithmetic average	17.0	83.0	100.0	52.8	47.2	100.0	49.4	50.6	100.0

1/ Local rural roads are under State control (three counties excepted in Virginia).
2/ Less than 0.05 percent

Table 5. - Local rural road mileage included in the Federal-aid secondary system by surface types, as of June 30, 1949

(Data compiled from reports submitted to the Board of County Consultants)

State	Unsurfaced	Surfaced					Total	
		On pioneer alinement		On improved alinement		Total		
		Granular	Dustless	Granular	Dustless			
	Miles	Miles	Miles	Miles	Miles	Miles	Miles	
Alabama	627	4,384	-	1,566	1,461	7,411	8,038	
Arizona	209	-	-	468	608	1,076	1,285	
Arkansas	946	3,052	-	2,497	208	5,757	6,703	
California	104	211	697	334	3,902	5,144	5,248	
Colorado	48	-	-	51	7	58	106	
Connecticut	-	-	-	-	62	62	62	
Delaware 1/	-	-	-	-	-	-	-	
Florida	1,753	382	-	357	972	1,711	3,464	
Georgia	450	4,000	-	139	837	4,976	5,426	
Idaho	59	-	-	1,362	533	1,895	1,954	
Illinois	126	124	5	3,529	3,287	6,945	7,071	
Indiana	-	-	-	708	2,292	3,000	3,000	
Iowa	7,423	7,606	182	18,566	587	26,941	34,364	
Kansas	2,651	6,975	312	7,410	749	15,446	18,097	
Kentucky	705	726	293	1,158	574	2,751	3,456	
Louisiana	9	27	-	59	43	129	138	
Maine	-	-	-	-	-	-	-	
Maryland	147	150	509	705	1,256	2,620	2,767	
Massachusetts	-	-	92	-	1,924	2,016	2,016	
Michigan	435	1,798	291	2,509	3,139	7,737	8,172	
Minnesota	307	2,329	160	5,600	1,038	9,127	9,434	
Mississippi	263	3,292	125	962	337	4,716	4,979	
Missouri	-	(No mileage breakdown reported)					-	2,588
Montana	520	585	-	642	62	1,289	1,809	
Nebraska	1,947	1,425	-	2,328	18	3,771	5,718	
Nevada	367	-	-	224	27	251	618	
New Hampshire	2	-	-	22	-	22	24	
New Jersey	-	-	431	7	1,201	1,639	1,639	
New Mexico	497	111	-	-	17	128	625	
New York	-	-	-	-	-	-	-	
North Carolina 1/	872	1,037	-	1,038	1,716	3,791	4,663	
North Dakota	1,737	2,916	-	2,085	1	5,002	6,739	
Ohio	2	652	253	1,291	2,900	5,096	5,098	
Oklahoma	3,762	1,099	12	2,447	465	4,023	7,785	
Oregon	188	28	-	674	404	1,106	1,294	
Pennsylvania	-	-	-	-	-	-	-	
Rhode Island	-	(No mileage breakdown reported)					-	64
South Carolina	25	6	-	66	60	132	157	
South Dakota	1,165	1,964	-	5,050	157	7,171	8,336	
Tennessee	61	1,613	46	1,015	-	2,674	2,735	
Texas	-	-	-	-	-	-	-	
Utah	191	15	18	271	219	523	714	
Vermont	6	638	-	42	403	1,083	1,089	
Virginia 1/	157	803	1,753	3,145	6,460	12,161	12,318	
Washington	88	114	139	852	2,341	3,446	3,534	
West Virginia 1/	-	-	-	-	-	-	-	
Wisconsin	7	948	1,656	2,325	2,805	7,734	7,741	
Wyoming	392	119	-	32	24	175	567	
Total (46 States) 2/	28,248	49,129	6,974	71,536	43,096	170,735	198,983	
Total (48 States)							201,635	

^{1/} Local rural roads are under State control (three counties excepted in Virginia).

^{2/} Mileage for Missouri and Rhode Island not included.

Table 6. -- Local rural road mileage not included in the Federal-aid secondary system by surface types, as of June 30, 1949

(Data compiled from reports submitted to the Board of County Consultants)

State	Unsurfaced	Surfaced					Total
		On pioneer alignment		On improved alignment		Total	
		Granular	Dustless	Granular	Dustless		
	Miles	Miles	Miles	Miles	Miles	Miles	Miles
Alabama	18,578	24,933	-	739	430	26,102	44,680
Arizona	11,349	618	-	1,921	661	3,200	14,549
Arkansas	32,227	3,922	-	3,217	220	7,359	39,586
California	8,941	8,437	6,845	8,588	27,015	50,885	59,826
Colorado	56,904	-	-	6,039	154	6,193	63,097
Connecticut	347	55	52	1,882	5,236	7,225	7,572
Delaware 1/	791	-	-	1,150	1,312	2,462	3,253
Florida	18,847	751	1,215	2,725	2,895	7,586	26,433
Georgia	36,741	33,420	25	496	596	34,537	71,278
Idaho	12,671	5,537	-	4,275	398	10,210	22,881
Illinois	18,420	8,753	955	47,947	11,170	68,825	87,245
Indiana	10,320	1,938	512	47,768	9,460	59,678	69,998
Iowa	30,106	4,793	214	22,611	504	28,122	58,228
Kansas	79,974	15,818	111	6,513	222	22,664	102,638
Kentucky	25,069	13,145	1,198	3,640	1,188	19,171	44,240
Louisiana	16,747	4,482	-	3,908	326	8,716	25,463
Maine	7,386	1,272	641	1,098	1,116	4,127	11,513
Maryland	2,924	1,369	868	2,325	1,736	6,298	9,222
Massachusetts	654	263	296	5,627	6,238	12,424	13,078
Michigan	26,476	27,655	1,121	15,299	6,106	50,181	76,657
Minnesota	29,058	35,346	361	25,812	837	62,356	91,414
Mississippi	29,989	14,063	73	4,646	257	19,039	49,028
Missouri			(No mileage breakdown reported)			-	89,571
Montana	44,055	5,142	-	6,031	517	11,690	55,745
Nebraska	66,998	8,880	15	8,723	99	17,717	84,715
Nevada	18,482	-	-	1,756	219	1,975	20,457
New Hampshire	2,721	1,681	361	1,953	993	4,988	7,709
New Jersey	3,565	2,976	1,438	2,226	4,616	11,256	14,821
New Mexico	46,450	785	-	41	99	925	47,375
New York	18,790	9,075	7,492	15,135	17,238	48,940	67,730
North Carolina 1/	24,276	9,582	-	9,582	2,345	21,509	45,785
North Dakota	87,911	10,712	-	2,353	1	13,066	100,977
Ohio	11,487	8,904	1,932	27,564	15,705	54,105	65,592
Oklahoma	69,999	6,095	344	1,309	511	8,259	78,258
Oregon	18,686	2,991	30	10,221	2,333	15,575	34,261
Pennsylvania	29,170	6,889	2,698	5,174	3,976	18,737	47,907
Rhode Island			(No mileage breakdown reported)			-	1,658
South Carolina	22,935	765	79	4,415	1,530	6,789	29,724
South Dakota	62,379	18,801	-	1,717	22	20,540	82,919
Tennessee	15,635	27,145	-	8,187	3,353	38,685	54,320
Texas	122,981	21,770	4,042	17,798	7,103	50,713	173,694
Utah	10,741	532	97	3,147	361	4,137	14,878
Vermont	4,968	2,609	-	2,531	349	5,489	10,457
Virginia 1/	7,259	3,404	597	13,496	2,420	19,917	27,176
Washington	15,325	2,942	344	14,400	3,660	21,346	36,671
West Virginia 1/	18,492	2,132	903	3,197	3,611	9,843	28,335
Wisconsin	9,649	28,309	3,123	22,329	4,010	57,771	67,420
Wyoming	15,880	2,324	-	266	195	2,785	18,665
Total (46 States) 2/	1,223,353	391,015	37,982	401,777	153,343	984,117	2,207,470
Total (48 States)	-	-	-	-	-	-	2,298,699

1/ Local rural roads are under State control (three counties excepted in Virginia).

2/ Mileage for Missouri and Rhode Island not included.

Table 7. -- Total local rural road mileage, by surface types, as of June 30, 1949
(Data compiled from reports submitted to the Board of County Consultants)

State	Unsurfaced	Surfaced					Total
		On pioneer alinement		On improved alinement		Total	
		Granular	Dustless	Granular	Dustless		
	Miles	Miles	Miles	Miles	Miles	Miles	Miles
Alabama	19,205	29,317	-	2,305	1,891	33,513	52,718
Arizona	11,558	618	-	2,389	1,269	4,276	15,834
Arkansas	33,173	6,974	-	5,714	428	13,116	46,289
California	9,045	8,648	7,542	8,922	30,917	56,029	65,074
Colorado	56,952	-	-	6,090	161	6,251	63,203
Connecticut	347	55	52	1,882	5,298	7,287	7,634
Delaware 1/	791	-	-	1,150	1,312	2,462	3,253
Florida	20,600	1,133	1,215	3,082	3,867	9,297	29,897
Georgia	37,191	37,420	25	635	1,433	39,513	76,704
Idaho	12,730	5,537	-	5,637	931	12,105	24,835
Illinois	18,546	8,877	960	51,476	14,457	75,770	94,316
Indiana	10,320	1,938	512	48,476	11,752	62,678	72,998
Iowa	37,529	12,399	396	41,177	1,091	55,063	92,592
Kansas	82,625	22,793	423	13,923	971	38,110	120,735
Kentucky	25,774	13,871	1,491	4,798	1,762	21,922	47,696
Louisiana	16,756	4,509	-	3,967	369	8,845	25,601
Maine	7,386	1,272	641	1,098	1,116	4,127	11,513
Maryland	3,071	1,519	1,377	3,030	2,992	8,918	11,989
Massachusetts	654	263	388	5,627	8,162	14,440	15,094
Michigan	26,911	29,453	1,412	17,808	9,245	57,918	84,829
Minnesota	29,365	37,675	521	31,412	1,875	71,483	100,848
Mississippi	30,252	17,355	198	5,608	594	23,755	54,007
Missouri	39,303	23,791	1,212	25,984	1,869	52,856	92,159
Montana	44,575	5,727	-	6,673	579	12,979	57,554
Nebraska	68,945	10,305	15	11,051	117	21,488	90,433
Nevada	18,849	-	-	1,980	246	2,226	21,075
New Hampshire	2,723	1,681	361	1,975	993	5,010	7,733
New Jersey	3,565	2,976	1,869	2,233	5,817	12,895	16,460
New Mexico	46,947	896	-	41	116	1,053	48,000
New York	18,790	9,075	7,492	15,135	17,238	48,940	67,730
North Carolina 1/	25,148	10,619	-	10,620	4,061	25,300	50,448
North Dakota	89,648	13,628	-	4,438	2	18,068	107,716
Ohio	11,489	9,556	2,185	28,855	18,605	59,201	70,690
Oklahoma	73,761	7,194	356	3,756	976	12,282	86,043
Oregon	18,874	3,019	30	10,895	2,737	16,681	35,555
Pennsylvania	29,170	6,889	2,698	5,174	3,976	18,737	47,907
Rhode Island	341	-	-	749	632	1,381	1,722
South Carolina	22,960	771	79	4,481	1,590	6,921	29,881
South Dakota	63,544	20,765	-	6,767	179	27,711	91,255
Tennessee	15,696	28,758	46	9,202	3,353	41,359	57,055
Texas	122,981	21,770	4,042	17,798	7,103	50,713	173,694
Utah	10,932	547	115	3,418	580	4,660	15,592
Vermont	4,974	3,247	-	2,573	752	6,572	11,546
Virginia 1/	7,416	4,207	2,350	16,641	8,880	32,078	39,494
Washington	15,413	3,056	483	15,252	6,001	24,792	40,205
West Virginia 1/	18,492	2,132	903	3,197	3,611	9,843	28,335
Wisconsin	9,656	29,257	4,779	24,654	6,815	65,505	75,161
Wyoming	16,272	2,443	-	298	219	2,960	19,232
Total (48 States)	1,291,245	463,935	46,168	500,046	198,940	1,209,089	2,500,334

1/ Local rural roads are under State control (three counties excepted in Virginia).

FARM LOCATION IN RELATION TO ALL-WEATHER ROADS

In 1945 more than two out of every three farms in the United States were served directly by all-weather roads, and 20 percent more were within two miles of such a road, as shown below, in data from the 1945 Census of Agriculture. This situation is not uniform throughout the United States, or within individual States.

<u>Farm location, distance in miles</u> <u>from an all-weather road</u>	<u>Percentage of</u> <u>all farms</u>
On an all-weather road	64
Within 1 mile	10
From 1 to 2 miles	9
From 2 to 5 miles	8
Over 5 miles	4
Not reported	<u>5</u>
Total	100

Figure 2 shows that there are nine States in which less than 50 percent of the farms have direct access to an all-weather road. These States are in the Great Plains and intermountain areas where grain raising and the grazing of stock predominate in the rural economy. In eight States 50 to 60 percent of all farms have direct access to all-weather roads, and in 15 of the remaining 31 States 75 percent or more of the farms are located on such roads.

A sample of 1,038 counties in 41 States indicates that about one-third of all rural dwellings are located along primary and secondary roads, and the remaining two-thirds are on local roads. The frequency of dwellings ranges from 4.3 per mile along the primary and secondary roads to 2.6 per mile along the local roads. 5/

5/ Bureau of Public Roads, special study, 1949.

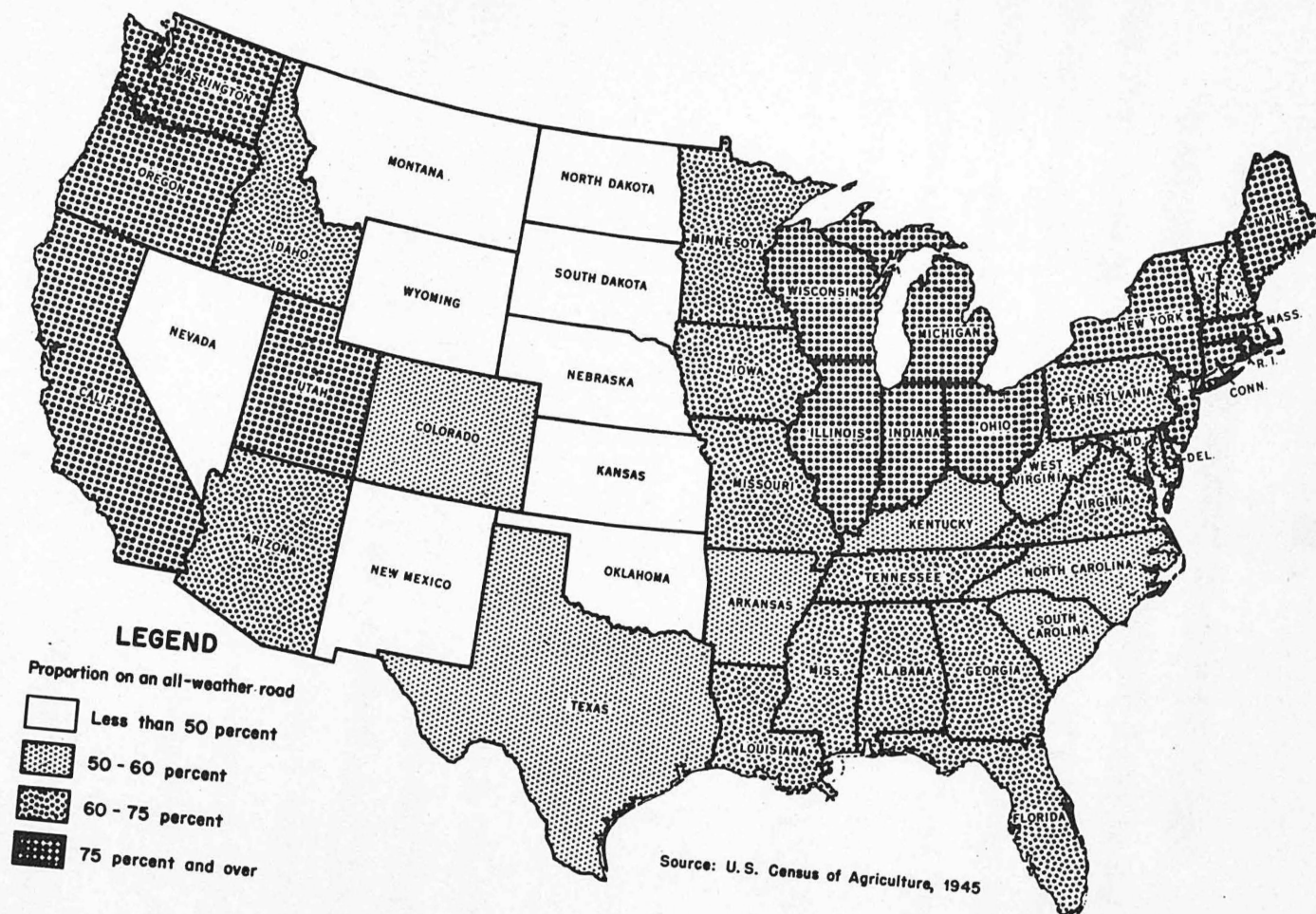


Figure 2.—Proportion of farms on all-weather roads, by States.

POPULATION DATA

Population data for the last five decennial years and for 1947 are shown in table 8. It is significant to note that the number of persons classified as farm residents has been decreasing while the number in other categories has been increasing materially. Accompanying the decrease in farm population there has been a corresponding decrease in the number of farm dwellings from 6.8 million in 1935 to a little over 5.8 million in 1945. 6/

In the non-farm group resident in unincorporated areas there are more than 21 million people, or 15 percent of the total population. A major segment of this latter group is a growing number of people who live in suburban areas and who drive to their work on the farms or in town.

6/ Census of Agriculture, 1945.

Table 8.--Population of the United States, in incorporated and unincorporated areas, and non-farm and farm, 1900 to 1947 1/

Year	Population in incorporated areas	Population in <u>unincorporated areas</u>		Total population United States
		Non-farm	Farm <u>2/</u>	
	(1,000)	(1,000)	(1,000)	(1,000)
1900	36,682	<u>3/</u> 39,313		75,995
1910	50,169	<u>3/</u> 41,804		91,972
1920	63,127	11,225	31,359	105,711
1930	78,138	14,479	30,158	122,775
1940	83,766	17,687	30,216	131,669
1947	93,460	21,296	27,305	142,061

1/ Department of Commerce, Bureau of Census.

2/ Persons living on farms, regardless of occupation.

3/ Distribution between non-farm and farm not available.

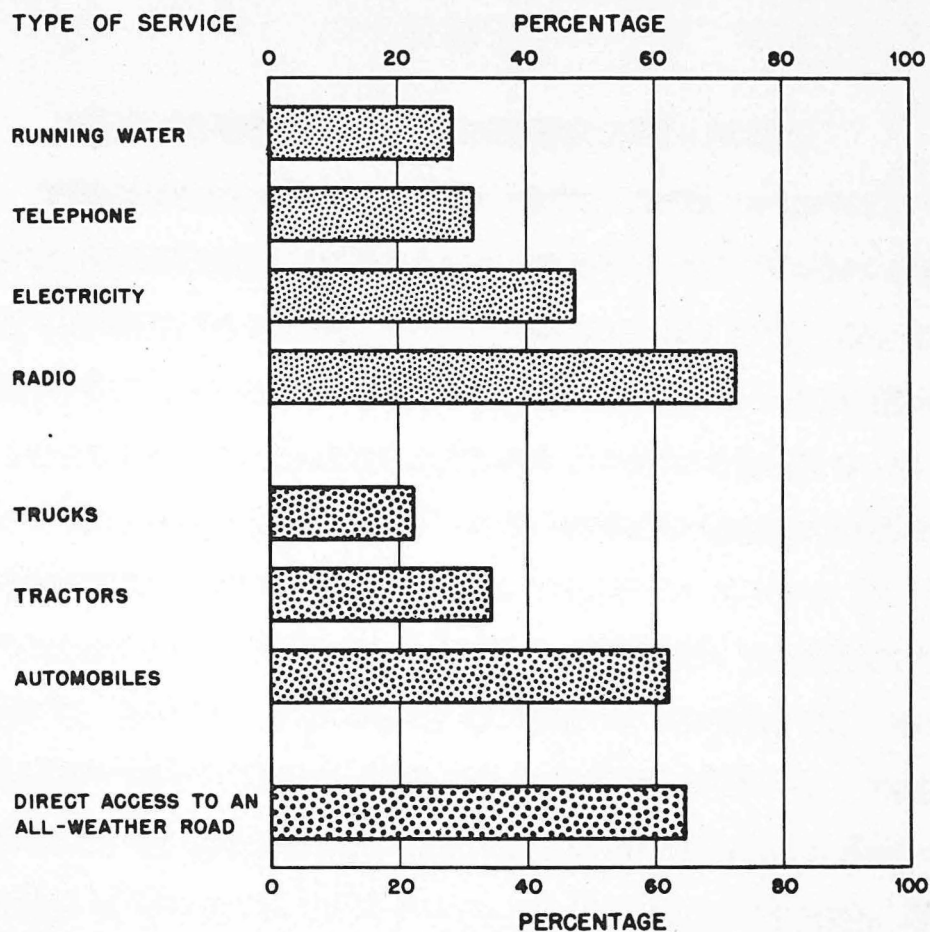
RURAL CONVENIENCES AND TRANSPORTATION SERVICES

Motor-vehicle transportation giving access to markets, to auctions, to community functions, to churches, and to other attractions, supplemented by rural electrification, the telephone, mechanization of farm equipment, running water, and modern household appliances have eliminated many inconveniences and disadvantages of rural life. Figure 3 shows the proportion of farms having various conveniences and transportation services in 1945. The proportion of farms that had direct access to an all-weather road was twice the proportion that had telephones; and farm ownership of automobiles exceeded the ownership of all other modern conveniences except radios. There was considerable variation in the possession of the various conveniences. Less than 20 percent of the farms in 12 States had telephones in 1945. In 14 States only one farm in five had running water; but in 11 of these same States more than half of the farms were on all-weather roads. ^{7/}

MOTOR-VEHICLE OWNERSHIP ON FARMS

Slightly over 4 million passenger cars and nearly $1\frac{1}{2}$ million trucks were owned on a little over 5.8 million farms in 1945. Passenger-car ownership had increased rapidly from 30 percent in 1920 to 58 percent in 1930. There was possibly a decline in the percentage during the depression years but the census of 1940 found the proportion of farms owning cars to be again 58 percent, after which there was an increase to 62 percent by 1945, according to the Census of Agriculture of that year.

^{7/} Census of Agriculture, 1945.



Source: U. S. Census of Agriculture, 1945

Figure 3.—Proportion of farms having various conveniences and services.

Farm ownership of motor trucks has been increasing more rapidly than ownership of passenger cars. In 1920 trucks were owned on only 2 percent of the farms, but by 1945, 22 percent of the farms had trucks. It was estimated 8/ in 1948 that trucks were then owned on 29 percent of the farms.

Truck ownership varies with the size of farms, as disclosed by the fact that only 16 percent of all farms under 10 acres in size reported trucks, while 40 percent of the farms of 100 acres or more own trucks. There is also a considerable variation in truck ownership according to type of farm, ranging from 17 percent of the tobacco farms to 50 percent of the wheat farms. Regional variations also occur, as is evident in the northeastern and western areas where about half of the dairy farms own trucks.

The capacity of farm-owned trucks is relatively low, 57 percent of them being rated by the manufacturers at less than $1\frac{1}{2}$ tons. 9/ Farm trucks are also normally older than the average of other trucks. Slightly more than half of the trucks on farms in 1948 were pre-1940 models, and 22 percent were postwar models. There has been a greater-than-average increase in truck ownership in the South where there is also a higher percentage of the newer models. 10/

8/ Bureau of Agricultural Economics, "The Marketing and Transportation Situation," June 1949.

9/ Census of Agriculture, 1945.

10/ 1948 Bureau of Agricultural Economics Enumerative Survey.

ROAD USAGE BY FARMERS AND OTHER RURAL DWELLERS

In 1948, 83 percent of all travel in rural areas was on a combined system of State and Federal-aid primary and secondary roads, consisting of about one-fifth of the total rural mileage. The average traffic volume on these roads was 785 vehicles per day. The remaining four-fifths of the rural mileage was made up of local roads which carried 17 percent of all rural road travel and had an average traffic volume of only 43 vehicles per day. 11/

Although these figures indicate the high traffic importance of the primary and secondary roads, it is often said that farmers do most of their driving on the local roads and thus derive little or no direct benefit from improvements made on the limited mileage comprising the primary and secondary roads. The facts do not support this.

A study by the Federal Coordinator of Transportation reported in Volume IV of the 1940 document, "Public Aids to Transportation," showed that considerably more than half of the travel of farm passenger cars and trucks was on primary highways and city streets. This finding is borne out by a recent study of the travel habits of rural residents of Logan County, Colorado, where 60 percent of the population is rural and where several widely different types of agricultural activity are practiced. In this predominantly rural area, it was found that 82 percent of the rural-road travel of the rural residents occurred on a system of primary and secondary roads comprising only 20 percent of the total rural-road mileage. Only 18 percent of the rural-road travel of

11/ Bureau of Public Roads, special study, 1949.

these rural residents was served by the local roads which comprised 80 percent of the county's total rural-road mileage.

In Logan County, 93 percent of all rural dwellings are located within 3 miles of a road included in either the primary or the secondary system. Of all the driving done on rural roads by residents of these dwellings, 16 percent is on local roads and 84 percent is on the primary and secondary highways.

As might be expected, the rural residents who use local roads for the greatest proportion of their travel are those who reside farthest from a primary or secondary highway. However, in Logan County it was found that even those persons residing 5 or more miles from a primary or secondary highway, used the primary and secondary highways for 51 percent of their travel and local roads for only 49 percent.

Other interesting facts relating to the travel of rural people disclosed by the Logan County study were that each farm or rural dwelling generated 4.8 trips each day, and that each trip averaged 10 miles in length, one way. In addition, each farm or rural dwelling generated 1.1 stops by mail, school-bus, and miscellaneous route services.

The uses which farmers make of their cars are as varied as those of other classes of passenger-car owners. This fact was revealed by studies made in connection with the State-wide highway planning surveys, during the period 1936-38, and which are summarized in table 9. 12/

12/ From a report by the Automobile Manufacturers Association summarizing 1936-38 highway planning survey data.

Table 9.--Percentage distribution of annual mileage of passenger cars according to purpose of trip

Purpose of trip	Percentage of annual mileage	
	Farmers	All groups
To work	3.9	14.6
Business	52.0	34.3
Shopping	5.0	3.8
Hauling, etc.	2.0	0.8
To school	1.8	0.6
To church	<u>2.1</u>	<u>0.7</u>
Total necessity use	66.8	54.8
Recreational use	<u>33.2</u>	<u>45.2</u>
Total use	100.0	100.0

During this prewar period, the average passenger car was driven between 8,500 and 9,000 miles per year. 13/ Farm-owned passenger cars, however, were driven only about 70 percent of this average, 14/ the difference being principally in the lesser amount of recreational driving done by farmers.

By 1948, the average passenger car was being driven 9,566 miles annually. Although no recent studies have been made to determine the annual mileage driven by particular groups, it is possible that the annual travel of farm passenger cars is now closer to the national average for all passenger cars than it was 10 or 15 years ago.

13/ Table VM-1, Bureau of Public Roads.

14/ From a report by the Automobile Manufacturers Association summarizing 1936-38 highway planning survey data.

SOCIAL AND WELFARE BENEFITS OF IMPROVED ROADS

Farm living is no longer as isolated as it formerly was and the farm family is not required to be in the same degree self-dependent. As a result of road improvement and the use of motorized equipment, farmers and other residents in many rural areas now benefit from fire and police protection, sanitary services, social services, and other welfare activities. In the deeper rural areas these services are, of course, most limited. Nevertheless it is not uncommon for fire equipment to go far into rural territory, and for law enforcement personnel, dispatched by radio, to reach most rural areas in a matter of minutes.

The better access provided by improved local roads makes it possible for the average rural resident readily to obtain the services of a doctor or a hospital. Likewise visiting nurses travel the rural roads and make important contributions to the health of the Nation, and mobile units designed to combat specific diseases are routed through rural areas to furnish chest X-rays, treatments, inoculations, and other medical services. All members of the farm family can participate in a wide variety of community activities, including those of farm organizations, fraternal groups, clubs, extension programs, cooperatives, churches, voting, and public office. To the extent that free time and funds are available, the rural family has increasingly wider choice of its entertainment and recreation.

MAIL SERVICE

Provision of rural free-delivery mail service involves one of the most extensive and continuous day-to-day ~~uses~~ of local rural roads.

At present such service is provided to rural areas by more than 30,000 carriers traveling over 1.5 million vehicle miles daily. 15/

This travel makes use of about 1.3 million miles of rural roads, of which 29 percent are in the primary and secondary systems, and 71 percent are other local roads. However, the primary and secondary roads so used make up 69 percent of the mileage of these systems, as compared with the 40 percent of other local roads used for mail delivery purpose. 16/

Since 93 percent of the primary and secondary road mileage is surfaced and only 69 percent is used for mail delivery it is apparent that the condition of the roads of these systems is no deterrent to the further extension of rural mail service. Surprising as it may be, it is also a fact that the surfaced mileage of local roads, outside the primary and secondary systems, is greater than the mileage of that class of roads used by mail carriers. The comparative figures are 44.6 percent surfaced and 40 percent used by mail routes. This does not mean, of course, that all roads used by mail carriers are surfaced. It does serve to indicate, however, to anyone conscious of the ubiquity of the mail carrier in the rural scene, how widespread has been the extension of local road surfacing.

Moreover, there is strong evidence that deficient improvement of local roads is not the controlling factor determining the extension of mail routes over roads of that class. The fact is that in the group of States in which the smallest percentage of local roads is used by mail

15/ From an address by Willard Manning, President, National Rural Letter Carriers Association, delivered at the American Road Builders Association conference, Washington, D. C., February 1949.

16/ Bureau of Public Roads, special study, 1949.

carriers, the surfaced percentage of such roads exceeds the percentage used for mail delivery by a wider margin than in States in which the mails are carried over larger segments of the local road systems.

This fact is indicated by table 10, in which there is a comparison of 14 States in which less than 25 percent of local roads are used by mail carriers, with 30 other States in which more than 25 percent of the local road mileage is so used, according to the 1949 study. 17/

In the first group of States the percentage of local roads used by mail carriers averages 18, the percentage of local roads surfaced, 37. In the second group, where an average of 58 percent of the local roads are surfaced, 51 percent are used for mail delivery.

In its indication of the average number of occupied dwellings per mile of rural road in the two groups of States, table 10 points to what is probably the more important factor determining the extension of mail routes than the surface condition of roads. It shows that the frequency of occupied dwellings per mile of road in the States of lesser mail route extension is substantially lower than in the States where mail delivery has been extended over larger percentages of the local road system.

There are wide variations among individual States in the values averaged in table 10. It appears, however, that the extension of mail service is more strongly influenced by the frequency of occupied dwellings than by the amount of surfaced road mileage.

17/ The States omitted are Florida, New York, North Carolina, and South Carolina, for which the data were not available.



Table 10.--Use of local roads as mail routes compared with frequency of occupied dwellings and road surface condition in 44 States 1/

Group	Occupied dwellings per mile of rural road	Percentage of local roads used by mail carriers	Percentage of local roads surfaced
14 States, each having less than 25 percent of local roads used by mail carriers	1.0	18	37
30 States, each having 25 percent or more of local roads used by mail carriers	2.6	51	58

1/ Each State given equal weight in computing averages.

An example of a widely extended mail delivery system is shown by the map of Carroll County, Maryland, figure 4. In this county 73 percent of all rural roads are used for mail delivery. Surfacing, applied to 48 percent of the county's roads, is less fully extended than the mail system. (Thirty miles of non-public roads used by mail carriers appear on the map without road band indication.)

SCHOOL BUS SERVICE

New and increased educational needs, arising from changes in the social and economic life of rural areas, have created demands upon the country school for the superior educational opportunities offered in the schools of urban communities. That this demand is being met is evidenced by the gradual disappearance of the little red school house.

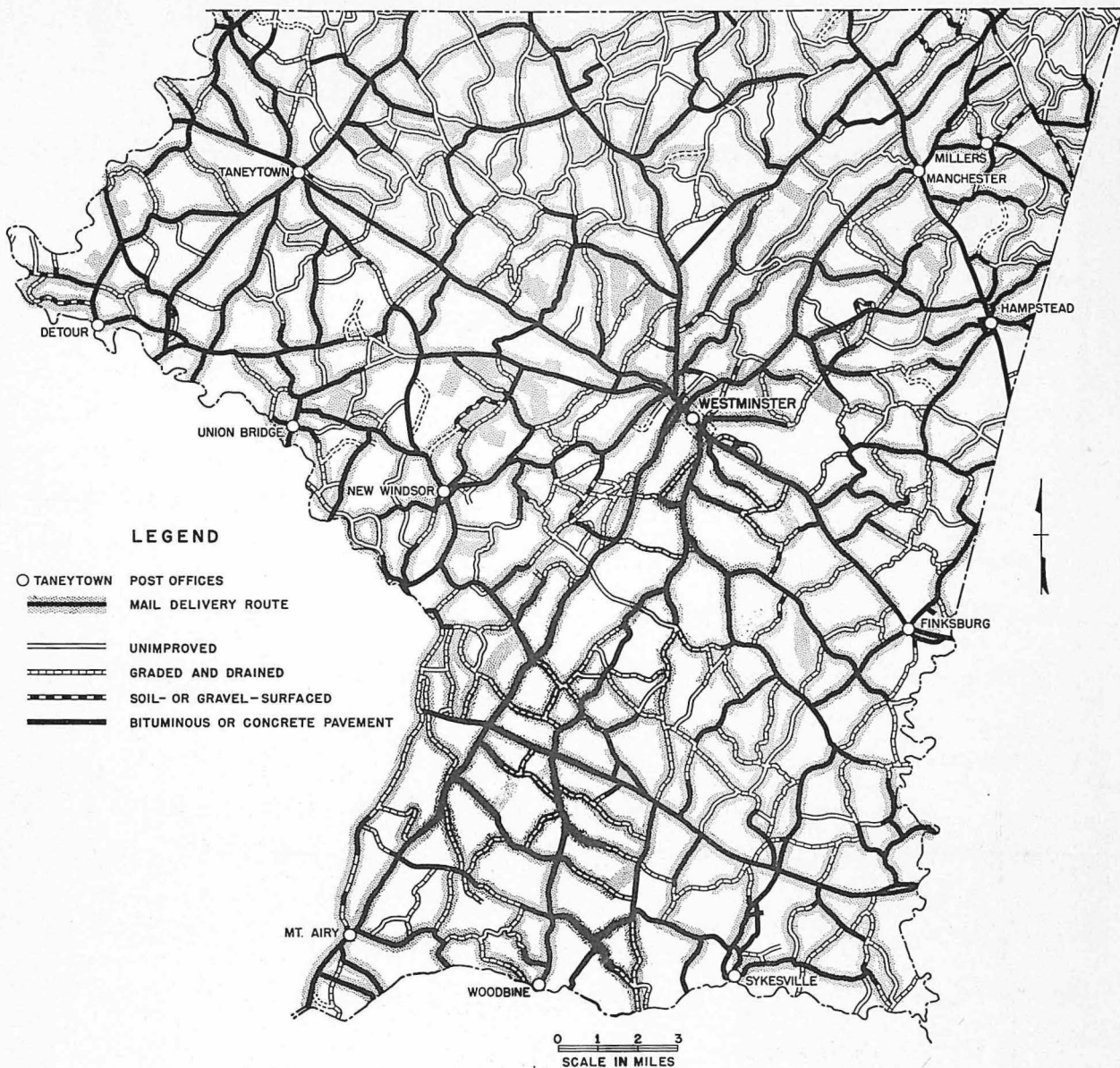


Figure 4.—The extensive use of rural roads for mail delivery is shown by this map of mail routes in Carroll County, Maryland. Seventy-three percent of all rural roads are used for mail delivery in this county. Forty-eight percent of the county's rural roads are surfaced.

Over the past 20 years the number of one-teacher schools has been reduced by over 45 percent. 18/ During this same period the number of pupils transported daily by school busses and the mileage of one-way school bus routes has each multiplied nearly five times. Today nearly half of the 12 million rural school children are transported to consolidated schools in more than 90,000 busses. 19/

School-bus service is operated at present over a little more than 1 million miles of rural roads, of which nearly 300,000 miles are on the primary and secondary systems and more than 700,000 miles are on local roads. As in the case of mail service, the percentage of the primary and secondary roads used is greater than the percentage of local roads. School-bus routes are operated on 64 percent of the primary and secondary systems and on 29 percent of the local roads. 20/

As in the case of mail service, there are wide variations among the States in respect to the degree to which the local roads are used by school busses. An inventory of school-bus route mileage in 43 States, made by the State-wide highway planning surveys, reveals that the States which show the least extensive use of local roads by school busses are, in general, those States which have the least number of occupied dwellings per mile of rural road.

Less than 10 percent of the local road mileage is traveled by school busses in the States of Arizona, Montana, Nevada, North Dakota, South Dakota, Utah, and Vermont. In these seven States there is approximately 0.8 occupied dwelling per mile of rural road.

18/ Office of Education, Federal Security Agency.

19/ Bus Transportation, McGraw Hill Publishing Company, N. Y.

20/ Bureau of Public Roads, special study, 1949.

On the other hand, the States of Alabama, Connecticut, Indiana, Maine, North Carolina, and West Virginia each report from 50 to 85 percent of their local roads used by school busses. There is an average of 3.1 occupied rural dwellings per mile in these six States.

Figures 5 and 6 illustrate how the school-bus service operates in counties extensively covered. The map of Frederick County, Maryland, (fig. 5) shows the locations of the schools, the home location of each rural pupil, and the roads used by the school busses. In this county all children are transported. On the map of Carroll County, Maryland, (fig. 6) the manner in which the number of child passengers increases from the starting point of each route to the school is well illustrated.

TRANSPORT OF FARM PRODUCTS

The first haul of produce from farm to initial market is very largely by motor truck, and nearly half the tonnage of agricultural products which is moved is carried in farm-owned equipment. 21/ The method of hauling individual commodities varies considerably depending on the nature of the commodity, the distance to market, availability of farm-owned trucks, alternative and subsequent transportation available, convenience, necessity, custom, climate, and even topography.

An example of the importance of rural roads to agriculture is shown in figure 7, a flow map of the annual tonnage of locally produced agricultural products to primary markets in the Centerville election district of Queen Annes County, Maryland.

21/ Bureau of Agricultural Economics, "The Marketing and Transportation Situation," June 1949.

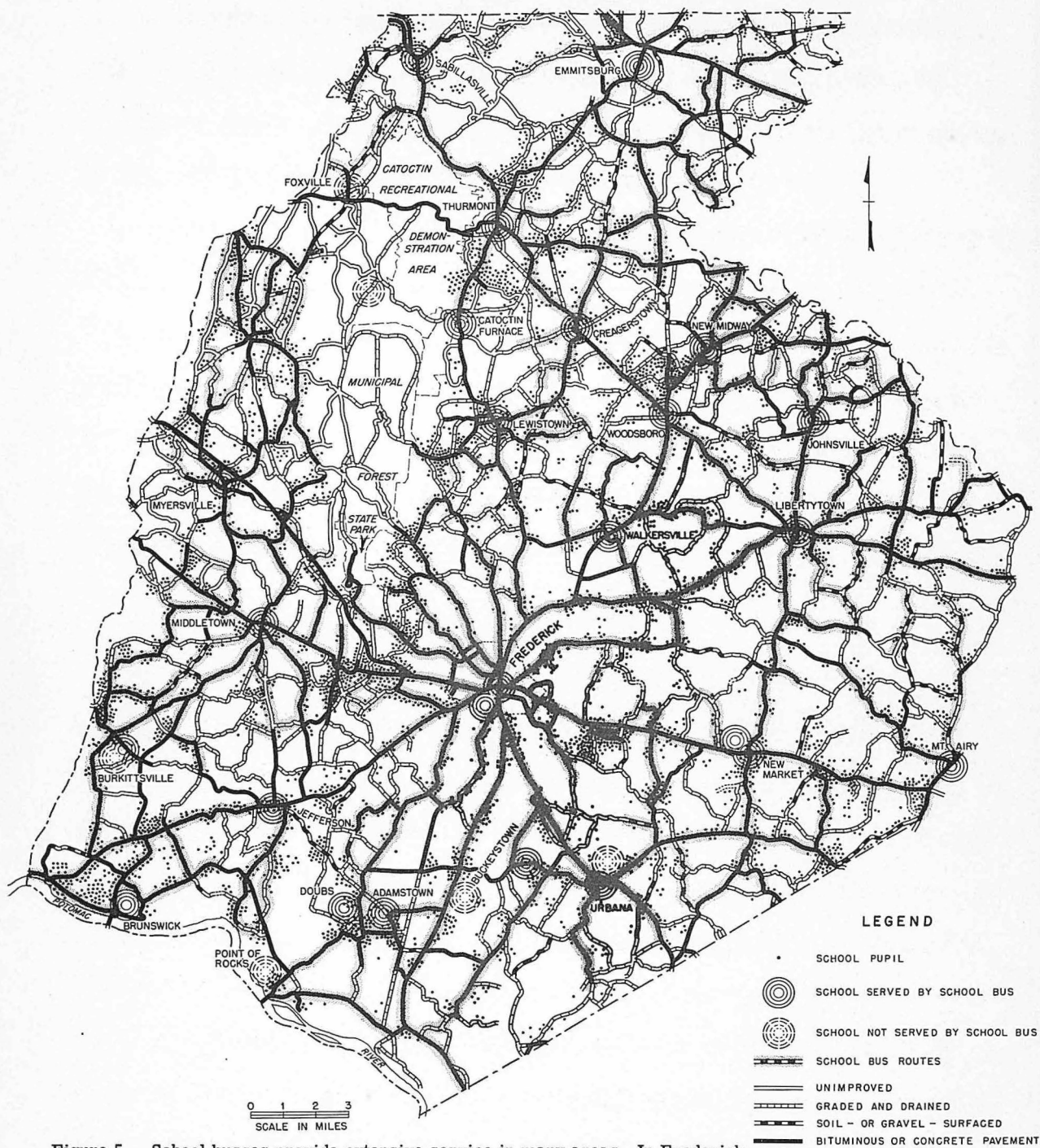


Figure 5.—School busses provide extensive service in many areas. In Frederick County, Maryland, school bus routes operate over 40 percent of the rural roads.

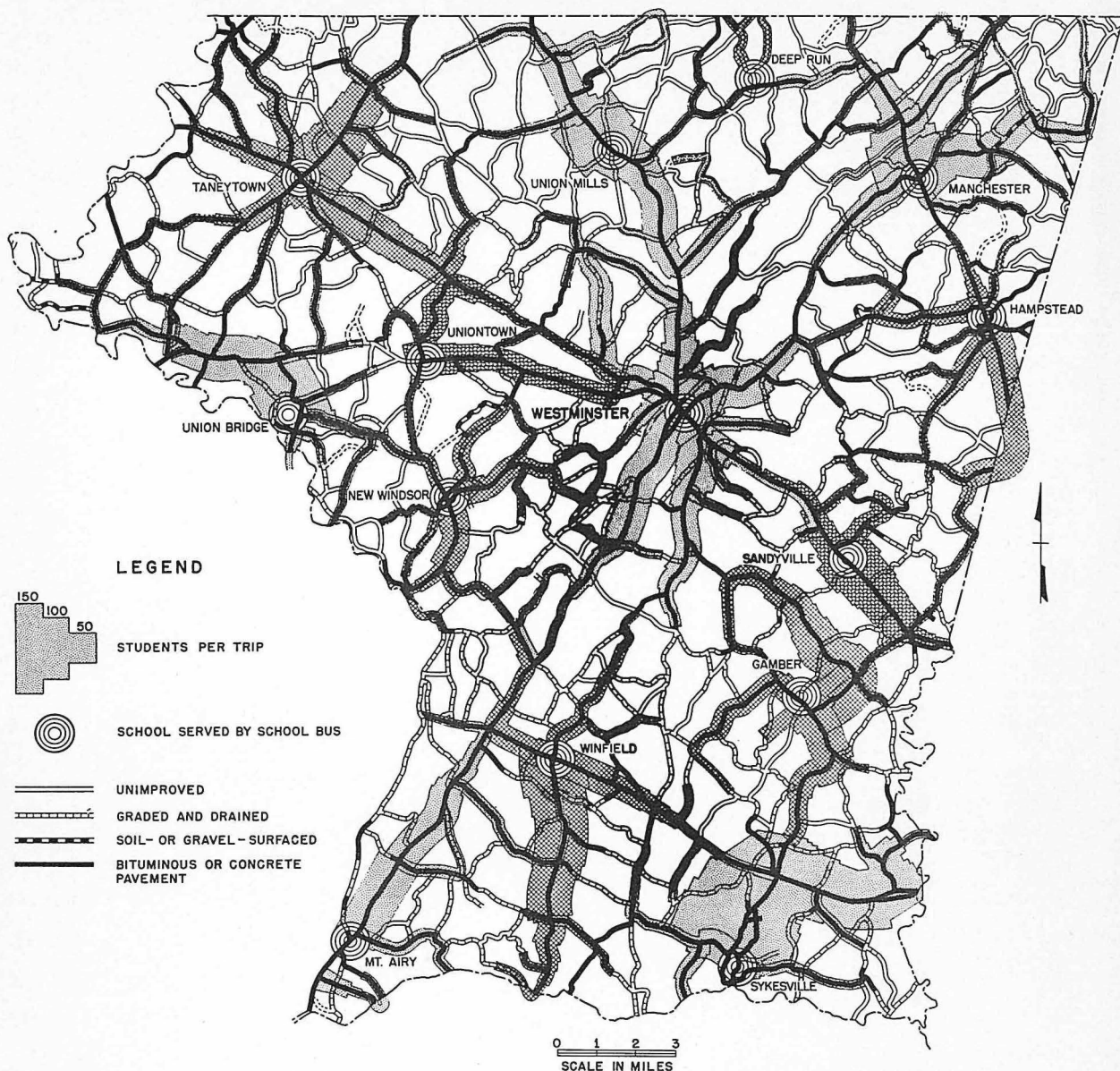


Figure 6.—On this map of Carroll County, Maryland, is shown the daily flow in numbers of elementary school children transported over rural roads by school busses. In this county 61 percent of the rural non-farm school children and 28 percent of the farm school children have bus service from their dwelling unit entrance. Less than 2 percent of the pupils walk more than $1\frac{1}{2}$ miles to a pick-up point.

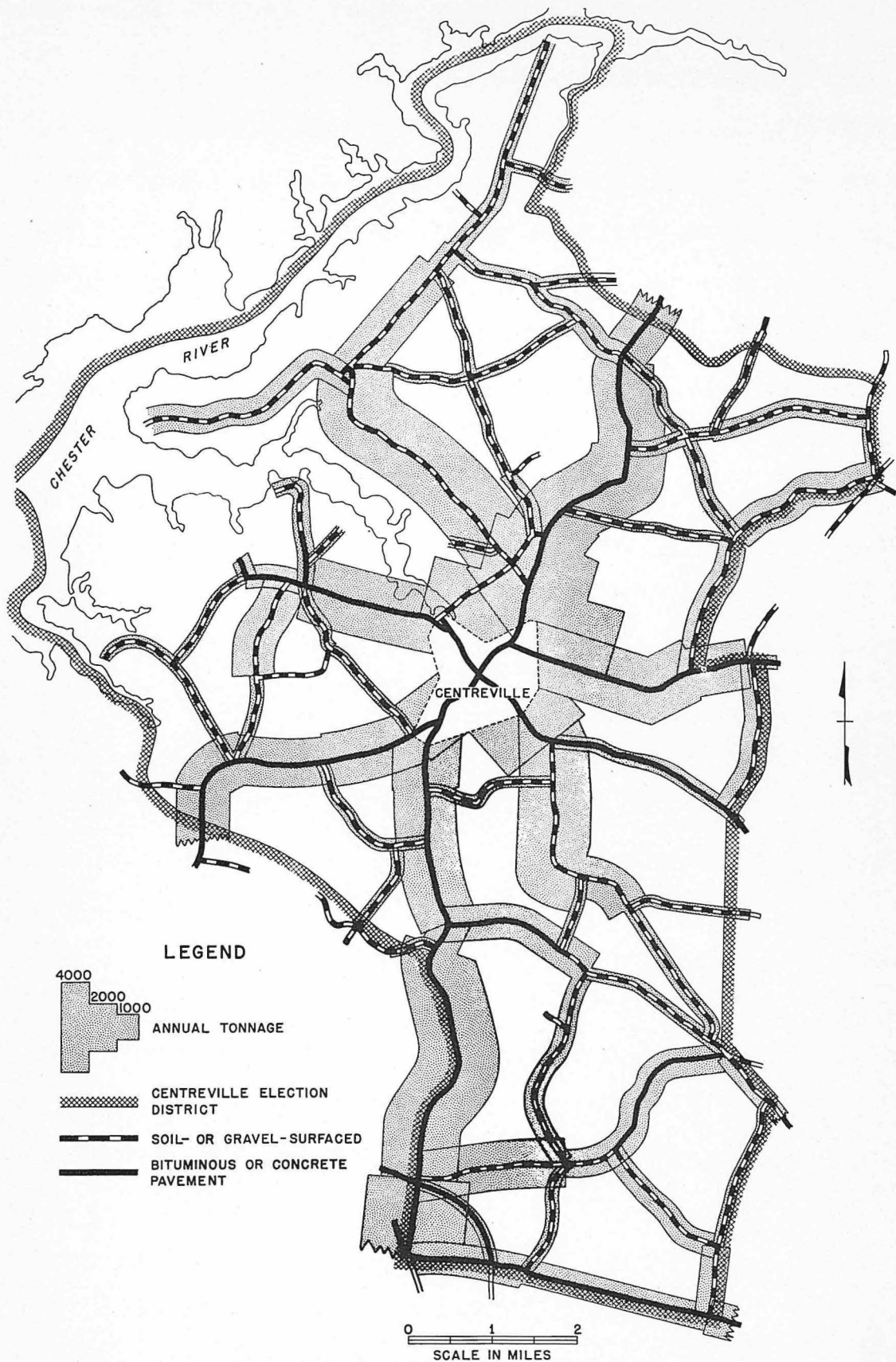


Figure 7.—The importance of rural roads to agriculture is shown by this flow map of the annual tonnage of locally produced agricultural products transported to primary markets in the Centerville election district of Queen Annes County, Maryland.

In general, farm-owned equipment is used principally in the off-farm movement of grains, fruits, vegetables, cotton, and miscellaneous crops. For-hire or contract transport is important in the moving of livestock and milk. Buyers' equipment is used principally in the hauling of poultry and eggs.

Some products, such as many of the harvested crops, require good roads for only a short period during the year; other products, such as milk, demand road conditions which will permit daily pick-up service year-in and year-out. Reports from 33 States show that 21 percent of the local rural roads and half of the primary and secondary roads serve milk collection routes. Most of the roads used for this purpose are followed by more than one collection route. In 24 States which reported the number of milk routes operating, there was an average of two routes on each mile of primary and secondary roads, and 1.6 routes per mile on the local rural roads. 22/

The character of routes driven by daily milk collectors varies within each State and among States. Some routes terminate at county receiving plants and others at large centers of population. In Connecticut the average length of the commercial collection routes was 37 miles in 1942 and less than 10 percent used unimproved roads. In a relatively small area in Oklahoma the average route was found to be 18 miles in length and almost half the distance traveled was on dirt roads.

22/ Bureau of Public Roads, special study, 1949.

Of 32 States 23/ included in a recent inventory of milk routes, there are 11 in which milk is hauled on 25 percent or more of the local roads. In these 11 States, 24/ an average of 50 percent of the local roads is used for milk hauling as compared with 64 percent of the local roads which are surfaced. In only two 25/ of the 32 States did the mileage of milk routes exceed the mileage of road surfacing. It is estimated for the country at large that milk is hauled over about 500,000 miles of the local rural roads.

LAND VALUES

From the farmers' viewpoint, the advantages of all-weather local roads mean increased earning power because of increased opportunities in production and marketing, both of which are prime determinants of land value. When comparing farms on unimproved and improved roads, the premium value per acre resulting from road surfacing has been found to be from 20 to 50 percent for gravel and hard surfacing, respectively, according to studies made by W. M. Curtiss of Cornell University in 1935.

23/ Arizona, Arkansas, Colorado, Connecticut, Delaware, Idaho, Indiana, Kansas, Kentucky, Louisiana, Maine, Michigan, Minnesota, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, and Wyoming.

24/ Connecticut, Delaware, Indiana, Maine, Michigan, Minnesota, New Hampshire, Pennsylvania, Rhode Island, Vermont, and West Virginia.

25/ Maine and Pennsylvania.

Tangible evidence of the influence of improved roads on rural land values is to be found in real estate appraisal manuals of State tax commissioners, which suggest adjustments in value depending upon the type of adjoining road. In Illinois, for example, the 1942 appraisal manual suggests adjustments upward from nothing to 3 percent for land adjacent to a paved road and a deduction of 4 percent of the value for land adjacent to a dirt road.

Whatever the actual amount may be, the one-third of all farms which are still located on unsurfaced roads would probably experience some increase in value if the roads on which they are located were improved for all-weather use.

VEHICLE OPERATING COSTS

For those who drive their vehicles over rough, muddy, dirt roads, the benefits from road improvements are reflected in substantial savings in the cost of owning and operating motor vehicles as well as time savings. Results of studies made during 1938 by R. A. Moyer of Iowa State College covering thousands of miles of vehicle travel over all types of roads show that unimproved roads add materially to the annual cost of motor-vehicle operation. These studies also embrace records of operating costs incurred by 293 rural mail carriers in Iowa and Indiana during more than 3 million miles of travel and revealed that the per-mile cost on paved roads was 3.8 cents compared with 4.5 and 7.8 cents, respectively, on gravel and earth roads, and that average travel time on earth roads was twice as great as on gravel or paved roads. Other

studies made by the same author show that fuel consumption by vehicles traveling on mud roads was 2-1/3 times greater than on paved roads.

The greatest direct benefits from road improvements accrue to the rural resident. The immediate community likewise benefits from road improvements through the development and success of community activities, business establishments, public welfare, and participation of the population in voting and public service. On a State-wide basis, the benefits are reflected in increased wealth, standard of living, potential future development, level of literacy, recreational facilities, and police and fire protection, among many others. And the flow of benefits does not stop at State boundaries. The Nation as a whole makes measurable gains toward a higher economic level as a result of permanent benefits accruing to any major segment of the population.

VOLUME OF TRAFFIC ON LOCAL RURAL ROADS

The roads described herein as local rural roads are all of the country's rural roads that are not in the Federal-aid primary system or one of the State highway systems. These systems take in most of the roads serving the larger volumes of traffic. A small mileage, which serves traffic of substantial volume, in the main clustered about the cities, escapes the two major systems and is included among the local roads. The mileage of this character which carries more than 1,000 vehicles a day is only a fraction of 1 percent of the local road total.

From this highest level of traffic service the local rural roads grade down rapidly. About 10 percent carries more than 100 vehicles a day and only about 21 percent serves more than 50 vehicles daily.

Another 17 percent serves between 25 and 50 vehicles daily, and about 22 percent serves between 10 and 25 vehicles a day. Approximately 40 percent of the total mileage of local rural roads is traveled by 10 or less vehicles daily.

The outer curve in figure 8 shows the estimate of the manner in which the entire mileage of local rural roads is distributed percentage-wise according to the volume of traffic served.

Of the approximate $2\frac{1}{2}$ million-mile total there are about 202,000 miles that have thus far been taken into the Federal-aid system of principal secondary roads. The greater proportion of local roads serving the larger volumes of traffic are in this group, which includes very little mileage carrying less than 25 vehicles daily. The curve bounding the shaded area in figure 8 shows the approximate traffic-volume distribution of this mileage which is already eligible for improvement with Federal aid.

The local roads with which the Committee's consideration is now concerned are those represented by the open area under the outer curve in figure 8, to the right of the shaded area.

This open area represents about 92 percent of the entire local road mileage. It includes, as its largest part, about 48 percent of the entire mileage which is used by traffic averaging between 10 and 100 vehicles daily. The roads included in it which carry more than 100 vehicles a day are about 4 percent of the total mileage, but at the other extreme it includes, as previously stated, 40 percent of the total which is used by 10 vehicles or less daily.

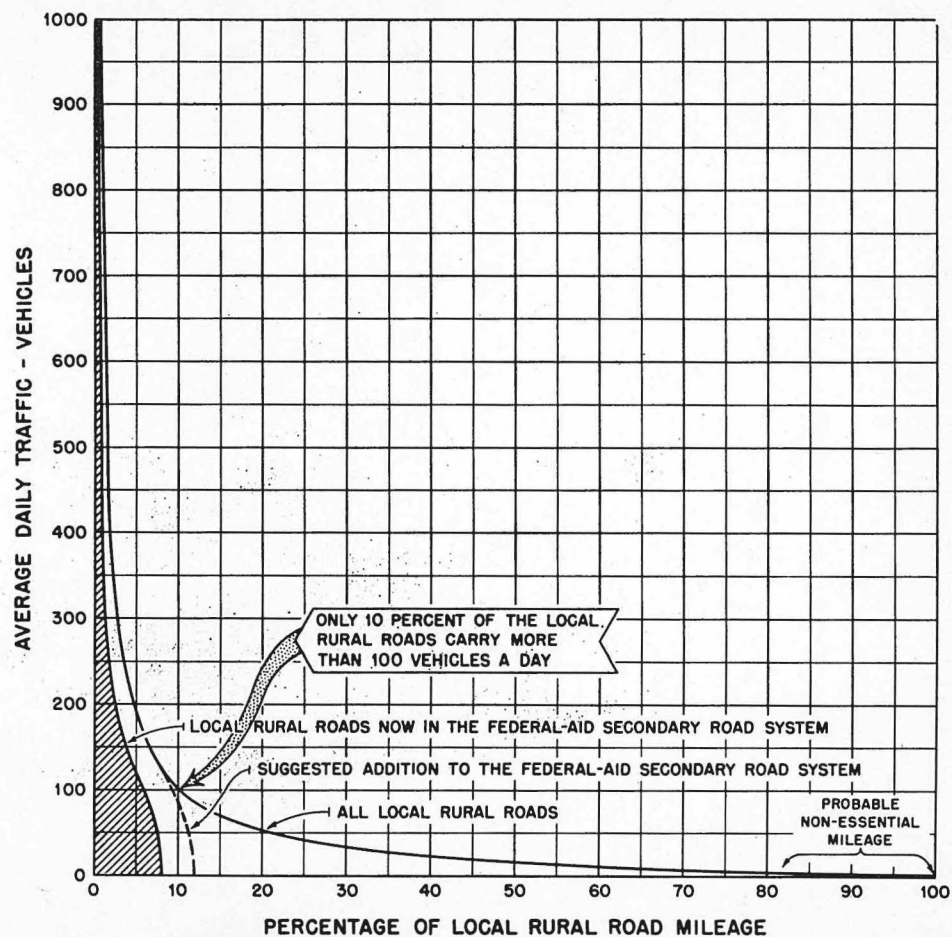


Figure 8.—Cumulative percentage of local rural road mileage carrying various average daily traffic volumes.

In this latter group of roads there are many that are wholly nonessential. A large segment consists of those "section-line" roads which in reality are only rights-of-way, seldom used, and which are recognized as public ways only by virtue of their legal reservation for road purposes. Mileage of this character is extensive in Kansas, New Mexico, North Dakota, and South Dakota. In these four States alone an inventory reveals some 97,000 miles, about 27 percent of their local road mileage, that are considered nonessential.

But such nonessential mileage is not confined to any one group of States or to section-line roads only. The inventory is not complete, but it is of interest to note that one of the New England States (Vermont) reports 24 percent of its local roads as of this character; a southern State (Louisiana) reports 10 percent; and two far western States (Oregon and Nevada) report an average of 17 percent. Further study will doubtless reveal substantial proportions of the local road mileage of all States that render little or no service of any kind.

Roads of this character, whose existence cannot be justified by any consideration of economic or social need, should be vacated as public ways and thus be permanently eliminated as an actual or potential drain upon the public highway revenues.

The average traffic carried by the approximate $2\frac{1}{2}$ million miles of local rural roads, including a part of the Federal-aid secondary system, is about 56 vehicles per day. The 8 percent of this mileage thus far taken into the Federal-aid secondary road system serves on the average 212 vehicles a day.

It would be possible under existing Federal legislation to add to the Federal-aid secondary system practically all of the local roads not already included in it which serve 100 or more vehicles daily. Addition of from 90 to 100 thousand miles, selected appropriately from each State, would be sufficient to accomplish this purpose, and the entire Federal-aid system of primary and secondary roads would then comprise about 700,000 miles. The secondary system in figure 8 would then be practically identical with the outer curve at the higher volumes of traffic and would be continued approximately as indicated by the dotted line in the lower left corner of the graph.

If then, as seems quite probable, it were possible to abandon 400,000 miles of the least traveled roads as nonessential, the mileage of all local roads would be reduced from 2.5 to 2.1 million, and the roads outside of the Federal-aid system to about 1.8 million miles. The roads that would be thus abandoned are those represented by the curve in figure 8 at its extreme right end, as indicated.

The suggested addition to the Federal-aid secondary system would increase the average traffic volume of that system about 50 percent. Of the 1.8 million miles remaining outside of the Federal-aid system there would be little on which the traffic volume would be as much as 100 vehicles a day, and not more than about 225,000 miles which would carry as much as 50 vehicles per day. The average usage of the entire mileage outside the Federal-aid system would be about 24 vehicles per day.

If the foregoing suggestions were adopted, the road mileage left outside the scope of the Federal-aid systems would consist of mileage carrying various volumes of traffic approximately as follows:

<u>Roads serving:</u>	<u>Approximate mileage:</u>
Over 100 vehicles daily	25,000
50 to 100 vehicles daily	225,000
25 to 50 vehicles daily	425,000
10 to 25 vehicles daily	525,000
Less than 10 vehicles daily	<u>600,000</u>
Total	1,800,000

While the foregoing analysis is not exact (the magnitude of the inventory task and the time and means available have precluded exactness) it can be accepted as affording an approximate representation of the area of the whole road problem which the Committee now has under consideration. It is an area embracing a very large mileage of rural roads (about 70 percent of the essential total, inclusive of primary and secondary roads) which probably serve less than 10 percent of the total rural travel.

PART III. - REQUIRED IMPROVEMENT AND ITS COST

EXISTING CONDITION UNSATISFACTORY

As previously shown, the local rural roads now reported as surfaced total more than 1.2 million miles. This is a mileage about as great as the total of local roads estimated to carry daily traffic of 10 vehicles or more; and this would appear to indicate that a very reasonable state of improvement of the local rural roads already exists. However, the situation is not quite so good, for the following reasons. First, the mileage reported as surfaced is not all adequately surfaced. Second, a substantial part of the surfaced mileage, about 170,000 miles of it, is on the Federal-aid secondary system as presently designated and some more is in the suggested 90,000-mile addition to the Federal-aid system. These mileages are therefore not within the 1.8 million miles with which the total of surfaced mileage is compared. The surfaced fraction of this mileage is probably nearer to one-half than the two-thirds which the comparison indicates. And, finally, the comparison is made for the country at large, and the surfaced mileage is not distributed by States in uniform relation to the traffic volume classification. There are some States in which the situation is better than the country-wide comparison suggests. There are some in which it is much worse.

There is no doubt that a completely satisfactory state of improvement does not exist on the entire 1.8 million miles of local roads indicated as the area of the Committee's present consideration.

But, what sort of improvement do these roads actually require to fit them satisfactorily for the service they are called upon to

render? And what will this improvement cost? The following discussion is addressed to these questions.

It is to be expected that roads carrying close to 100 vehicles per day will require improvement of higher type and greater capacity and construction cost than roads carrying less than 10 vehicles per day. The difference in width required, for example, would account for a considerable difference in the essential cost of roads built for these two orders of traffic service. The necessity of dustless surfacing will also vary with the volume of traffic. The small amount of dust raised by traffic of 10 or 25 vehicles a day can be tolerated. Indeed, it must be tolerated, because the cost of providing a dustless surface for roads of these lowest traffic volumes will be beyond all reason, and can be entertained only for the smaller mileage in the traffic range of roughly 50 to 100 vehicles per day.

REQUIRED ABILITY TO SUPPORT HEAVY VEHICLES

But traffic volume alone is not the sole determinant of needed road improvement. Weight of the vehicles to be accommodated is also a factor. It can no longer be assumed that all vehicles traveling the local roads are light vehicles. It is still true, in the main, that farm-owned motor trucks are of the lighter orders. But trucks used for the transportation of logs over local roads in some areas are not light trucks. Nor are the trucks now widely used to collect milk for city dairies; nor trucks used for the collection of other farm products; nor trucks which regularly deliver fuel to farms and communities on local roads; nor are school busses light vehicles. And besides

these there are other types of vehicles of heavy weight that occasionally make use of local roads; trucks hauling gravel, stone, and sand for construction purposes, as one example, and, increasingly, the mechanized equipment of agriculture itself, as another.

It is true that the provision that must be made in the road for the support of these heavier vehicles depends to a considerable extent upon the frequency of their passage. It depends also upon the seasonality of their use. But milk must be collected daily the year round; fuel for motor vehicles is needed in winter and spring as well as in summer and fall; and the service afforded by school busses is appreciated more in seasons of inclement weather than when the days are fair and warm. Any of these vehicles will sometimes bog down in an inadequately constructed road; and just a few of them passing daily over a lightly constructed surface laid on an inadequately drained clayey soil may render the road well nigh impassable for all other vehicles.

Tests made by the Minnesota Department of Highways and others have revealed that the bearing power of road surfaces and foundations during the spring thaw may be reduced by 50 percent below their late summer and fall stability; and the tests have shown also that the recovery of strength after the thawing period may be quite slow, with full restoration of bearing capacity unattained until midsummer.

It has been shown previously that school busses are operated regularly over more than 700,000 miles of the local rural roads, and that some 500,000 miles are used for the collection of milk. The

mileage subjected regularly to other heavy vehicle usage is probably within this range. These mileages, as will be noted, are at least as great as the mileage classified as carrying 25 and more vehicles daily. And, by and large, they are probably made up of the same roads. It may be concluded that at least 700,000 miles of the local roads here under consideration, including all that carry at least 25 vehicles a day, must be capable of supporting the weight of such vehicles as school busses and milk collection trucks in the frequency and regularity with which these and similar heavy vehicles are operated over them. And this conclusion applies to the bridges and culverts on such roads as well as to their surfaces and roadbeds.

A goodly part of the existing deficiency of the local road network lies in the fact that much of the mileage that is subjected to this regular heavy vehicle usage is not adequate in its foundations, surfaces, and structures for such use.

STANDARDS PROPOSED BY THE MISSISSIPPI REPORT

The report of the State-wide study of Mississippi highways recently initiated by the State legislature, referring to the standards of improvement essential on local roads for adequate year-round service, set forth the following as minimum requirements:

When the road is to be used as both a school bus and mail route, the surface should be gravel, stone, or shell at least 3 inches thick and 16 feet wide on a 20-foot roadbed properly graded and drained with reasonably safe curves for moderate speeds of 30 miles an hour or even less in hilly country. Right-of-way widths should be at least 40 feet; and bridges should be at least 18 feet wide and designed to carry 10-ton loads in each lane and constructed of treated timber or better materials.

When the road is to be used for land access, it should have a well graded and drained earth surface made passable by spot graveling; crown widths should be at least 16 feet with 30-foot rights-of-way; and bridges should be at least 16 feet wide and safe for 10-ton loads.

These are certainly not excessive requirements. As minima they may be accepted as sufficient. Yet, moderate as they are, a large part of the local road mileage, both surfaced and unsurfaced, does not in its present condition measure up to these standards.

The Mississippi report distinguishes between two classes of roads described as roads used as both school-bus and mail routes and roads used for land access. On the basis of the traffic volume classification used herein the line between these two classes of use probably falls somewhere within the group of roads carrying between 10 and 24 vehicles daily.

It will be noted that for both classes of roads adequate grading and drainage are set forth among the minimum requirements. This is as it should be.

DRAINAGE REQUIREMENTS

Proper drainage is the first essential for durability and travelability in any road. It is needed to keep the roadbed reasonably dry and firm and enable it to support the weight of vehicles. It is needed on lightly traveled roads as well as on roads heavily traveled. It is needed whether the road is surfaced or unsurfaced. It is needed to protect the road against the erosive and other effects of surface and ground water as well as to render it capable of supporting vehicular

loads. No road that is not adequately drained can be satisfactorily maintained.

Adequate drainage is not provided merely by crowning the road surface. It involves a proper placement and sufficient capacity of culverts and bridges to carry the cross water flows. It involves the construction of side ditches of ample capacity with gradients steep enough to assure the prompt discharge of surface water but not so steep as to produce destructive velocities of flow.

The lack of adequate drainage is a fault of a large part of the local road mileage in its present condition.

GRADING REQUIREMENTS

The grading to which the Mississippi report refers as a minimum requirement for all roads is not simply a matter of easing the hills for vehicles. The principal purpose of grading on local roads is the production of a maintainable road that can be kept passable for traffic at tolerable expense in all weather. Gradients must be reduced in the degree required to avoid erosion. If this is done the safety and convenience of traffic will, in most cases, be reasonably served. Some grading is necessary to develop safe curvature and tolerable alinement. Of much greater importance on local roads is the grading necessary to prevent the ponding or pocketing of water; to raise the roadbed above standing roadside water; to prevent damaging and traffic-obstructive overflows; and, in areas of heavy snowfall, to create conditions conducive to wind-sweeping, the avoidance of heavy drifts, and the lowest practicable cost of such snow removal as may be necessary.

Grading of this kind has not been done on a large part of the local road mileage. It can seldom be done simply by running a blade machine over the ground to dig a ditch and raise a crown.

SURFACING REQUIREMENTS

The occurrence of such locally available surfacing materials as gravel, shale, chert, scoria, caliche, and other similar natural deposits is often the principal factor that has determined the extent of surfacing initially provided and the frequency of surface replacement on local roads. The surfacing of all mileage on which it is desirable will require in many instances the haulage of materials for considerable distances. Not only do surfacing materials represent a large portion of the cost of a road at the time of its initial improvement, but they are also a major item in the annual cost of upkeep. Once a road has been surfaced, there is continuing necessity to replace the loss of material that results from wear, erosion, scattering, and penetration. In general, this loss of surfacing material progresses at an average rate of about one-half inch a year. This means that the entire depth of a 3-inch surface, the minimum required for the more heavily traveled local roads, must be replaced, on the average, about every 6 years.

In some localities the natural soil is of such composition that additional material is not required to produce an adequate surface for light traffic roads. In other instances, only occasional sections may require the addition of surfacing material to attain the same result. For the most part, however, some method of stabilization must be employed

on local roads to achieve the desired all-weather passability.

Stabilization is usually effected by adding selected mineral aggregates to the natural soil, either as an applied surface course or as an admixture with the natural soil. This method becomes expensive where the materials must be hauled from distant sources. Admixtures of chemicals, such as sodium and calcium chlorides, are also used in many areas to maintain in the natural soil a moisture content at which it possesses maximum stability. Portland cement and bituminous materials may also be used as admixtures to effect stabilization of the natural soil, but their use in this manner, as well as their use as binders for the production of dustless surfaces, is limited, by reasons of expense, to the more heavily traveled local roads.

WIDTH REQUIREMENTS

The surface and roadbed width required on local roads depends upon the volume and character of traffic to be served. Roads serving upwards of 25 vehicles daily, which are generally the roads on which operation of school busses, milk trucks, and other larger vehicles is to be expected, require a minimum surfaced width of 16 feet on a roadbed of 20-foot width, shoulder to shoulder.

More lightly traveled roads may be built somewhat narrower, but should not in any case have less than a 14-foot roadbed. In mountain areas some contraction of general width may be accepted in roads carrying more than 25 vehicles daily if turnouts are provided at suitable intervals to permit vehicles to pass in safety.

BRIDGE REQUIREMENTS

Design for 10-ton vehicle loads, applied in each lane where the traffic is greater in volume and singly at the center where traffic is very low in volume, are minimum requirements for bridges on local roads. Where the traffic approaches 100 vehicles a day, design for 15-ton vehicles is desirable.

Bridge materials should be treated timber or better.

To avoid the expense of larger structures over shallow water courses, paved fords and overflow structures have some application in areas subject to periodic heavy run-offs of short duration.

CONSTRUCTION COSTS

The degree of improvement that can be attained with a given expenditure varies to a considerable extent throughout the country. Climate, topography, and availability of local materials are the principal natural factors which result in cost variations of several hundred percent.

The State-by-State inquiry that was made during 1949 by the Board of County Engineer Consultants elicited statements of the costs incurred by local highway agencies in the improvement of over 50,000 miles of local roads in 1947.

Of the costs reported for 15,900 miles of construction, involving the placement of granular surfacing on existing pioneer alignments, including incidental grading and structures, 76 percent

were in the range of \$1,000 to \$3,000 per mile; and 16 percent were between \$3,000 and \$5,000 per mile. Of the remaining 8 percent of mileage, 6 percent cost over \$5,000 per mile, and 2 percent was reported as costing less than \$1,000 per mile.

For 21,800 miles of local road improvements, involving the placement of granular surfacing on adequately graded and drained roads, including grading and structures, 23 percent were reported as costing from \$1,000 to \$3,000 per mile; 20 percent from \$3,000 to \$5,000 per mile; 47 percent from \$5,000 to \$10,000 per mile; and 10 percent over \$10,000 per mile.

Reports of costs incurred in the improvement of over 12,000 miles of local roads with surfaces of dustless type were substantially higher than the costs reported for granular surfaced roads. More than half of the dustless-type roads were reported as costing in excess of \$10,000 per mile in 1947.

Costs reported by local authorities are often less than complete, omitting in many cases significant items which the rudimentary accounting methods employed have failed to record or properly charge. Moreover, the actual expenditures made are often inadvisedly low, and, achieving no lasting result, should be regarded as costs of maintenance rather than construction.

Table 11 lists estimated construction costs to achieve various definite standards of improvement on roads carrying

traffic less than 50 vehicles per day. Rolling terrain is selected as the most representative of average topographic conditions throughout the country. The estimates include not only labor, materials, and equipment operating expenses but in addition equipment repair and depreciation charges. Often these equipment items are ignored in the reported figures.

The 8- and 10-foot widths listed are included in the table for comparative purposes only and are not recommended as standards of construction. The following unit costs were used in the preparation of the table:

Excavation	\$0.35 per cubic yard.
Gravel surfacing . .	\$2.00 per cubic yard, delivered.
Culverts	\$5.00 per lineal foot, in place.
Structures	\$100.00 per lineal foot, single lane.
Structures	\$150.00 per lineal foot, double lane.

MAINTENANCE COSTS

When maintenance costs are taken into account, it becomes apparent that higher standards of grading contribute to a reduction in annual operating costs. Table 12 gives estimated maintenance costs for roads constructed to the standards listed in table 11.

Higher gravel replacement costs are to be expected on the ditched sections due to erosion and settlement losses. Although gravel replacement is ordinarily done at periodic intervals, the cost is shown in table 12 on an average annual basis in order to facilitate comparison.

Table 11.-- Estimated construction costs per mile for roads carrying less than 50 vehicles per day, built in rolling terrain to various standards

Construction type	Width		Construction cost per mile				
	Graded	Surfaced	Grading or ditching	Surfacing, 3-inch gravel	Culverts	Bridges	Totals
	(Feet)	(Feet)					
Ditched on pioneer location	8	8	\$ 110	\$ 780	\$200	\$1,000	\$2,090
	12	12	140	1,170	220	1,000	2,530
	16	16	170	1,560	450	2,160	4,340
	20	20	220	1,950	650	2,700	5,520
Graded and drained on adequate alignment	10	8	1,400	780	280	1,000	3,460
	14	12	1,750	1,170	310	1,000	4,230
	20	16	3,050	1,560	700	2,160	7,470
	24	20	4,200	1,950	850	2,700	9,700

Table 12.-- Estimated maintenance costs per mile for roads carrying less than 50 vehicles per day, built in rolling terrain to various standards

Construction type	Width		Average annual maintenance cost per mile ^{1/}			
	Graded	Surfaced	Blading, ditching, reshaping, mowing	Gravel replacement	Structures	Total
	(Feet)	(Feet)				
Ditched on pioneer location	8	8	\$59	\$130	\$10	\$199
	12	12	59	195	12	266
	16	16	70	260	16	346
	20	20	85	335	20	440
Graded and drained on adequate alinement	10	8	40	98	10	148
	14	12	40	146	12	198
	20	16	51	195	16	262
	24	20	59	244	20	323

^{1/} Costs of snow removal are not included.

Blading and dragging of the surface, cleaning of ditches and drainage channels, replacement of surfacing material, mowing, repair of culverts and structures, and dust control are all routine operations confronting local highway departments. In some areas, the practices employed are comparable in efficiency and effectiveness to those of the most progressive State highway departments; in others, the methods are wasteful and ineffective.

In the colder regions, snow and ice control present additional problems. Because of the wide variation in snow removal practices, costs of snow removal have not been listed in table 12. These costs will vary in accordance with the local practices employed in removal of snow and with the effectiveness of the design and location of the road with respect to such items as snow storage, drainage, exposure, and elevation of grade. Insufficient attention given to these items can easily result in snow removal costs which are more than double those which would be incurred on roads properly located and designed. Average annual costs of from \$40 to \$100 per mile for adequate snow removal appear to be reasonable. The lower costs in this range would apply to roads properly located and designed; the higher figures would represent costs likely to be experienced on roads where requirements for effective snow removal have not been taken into account in the design and construction.

EXISTING DEFICIENCIES AND NEEDS

The deficiencies appearing most frequently on local rural roads are poor surface conditions, inadequate bases, narrow widths, excessive

curvature and grades, and low grade lines. The high percentage of deficiency in surface conditions reflects both lack of adequate maintenance and the need for more all-weather surfaces.

Bridge deficiencies loom important since failure of one structure completely closes a road to vehicular traffic. Where no alternate routes exist, the cost of replacing a bridge may be secondary to the economic loss suffered by the local road users.

To eliminate the existing deficiencies, a systematic program of reconstruction and betterment is needed. Only a negligible amount of additional new mileage will be required. Some construction on new locations will be needed, but this will occur predominantly in the form of minor relocations to correct poor alinements or eliminate local hazards.

Appraisals of needs embracing 726,000 miles of local roads in 17 States ^{26/} show that 354,000 miles, or 49 percent, have deficiencies that need correction. If this percentage is applied to the national total of 2.5 million miles of local roads, then approximately 1.2 million miles are in need of improvement at the present time, of which more than one-tenth is probably in the Federal-aid secondary system as it is now designated or subsequently will be extended. The great majority of this deficient mileage is on pioneer alinement and requires rebuilding to adequate line and grade.

^{26/} Arizona, Colorado, Delaware, Illinois, Iowa, Kansas, Kentucky, Maine, Massachusetts, Michigan, Mississippi, Nebraska, New Hampshire, Oregon, Vermont, Washington, and West Virginia.

According to reports of costs incurred by local road agencies in constructing granular surfaced roads on adequate alinement in 1947, nearly half, or 47 percent, were in the \$5,000 to \$10,000 per-mile range; about 43 percent were less than \$5,000 per mile, and nearly 10 percent were more than \$10,000 per mile. 27/

It would appear, therefore, that an average of about \$6,000 per mile would be a conservative estimate of the over-all average cost per mile for this type of construction in 1947. The 1947 price level was probably at least as high as the average that will prevail over a period extending from 10 to 20 years into the future. Applying the \$6,000-per-mile average cost to the estimated 1.2 million miles of deficient local rural roads gives a total existing need of \$7.2 billion.

To overcome present deficiencies within 10, 15, or 20 years would, therefore, require an annual expenditure of \$720 million, \$480 million, or \$360 million, respectively. Costs of surface replacements which will accrue during the various program periods are considered as elements of the program that will be absorbed by adequate maintenance.

In 1947, maintenance expenditures on local rural roads were \$453 million. Although some reductions in maintenance can be achieved through the rebuilding of sections requiring excessive maintenance, such reductions will be more than offset by the improvement of large mileages of existing roads by the addition of gravel or other surfacing. It is estimated that an adequate level of maintenance

27/ Report of the Board of County Engineer Consultants.

performance can be accomplished with an average annual expenditure of \$500 million.

In addition, administration and engineering costs, estimated at 4 percent of the combined construction and maintenance expenditure, will be \$49 million, \$39 million, or \$34 million annually for the 10-, 15-, or 20-year programs, respectively. The annual costs, exclusive of debt service, for the various program periods, are shown in table 13.

Table 13.-- Average annual cost, exclusive of debt service, of alternate programs of improvement of local rural roads

Item	Average annual cost, exclusive of debt service		
	10-year program	15-year program	20-year program
	(\$1,000,000)	(\$1,000,000)	(\$1,000,000)
Construction	\$ 720	\$ 480	\$ 360
Maintenance	500	500	500
Administration and engineering	49	39	34
Total	\$1,269	\$1,019	\$ 894

To the annual amounts shown in table 13 debt service must be added in order to arrive at the total expenditure requirements. In 1947, the debt service requirements of local road agencies amounted to \$115 million.

The actual expenditure for all local road purposes, inclusive of debt service, in 1947, was \$834 million. It is apparent that a relatively small addition, with efficient management, applied to a planned program would be sufficient to accomplish the satisfactory improvement of local roads in a period of 20 years.

Part IV.--LOCAL ROAD FINANCE

SHIFTS IN THE FINANCIAL BURDEN

In the face of increasing demands for schools, roads, hospitals, public safety, and other public functions since the turn of the century, it is not surprising that local units of government have continually sought to shift their financial burdens to the State and Federal governments, nor that they have enjoyed considerable success in so doing.

The earlier transfers of responsibility for rural roads from the subordinate units to the States involved almost exclusively road mileage that is now included in the States' primary and secondary systems. Most of these transfers, approximately 288,000 miles, were made by 1927; but since that date an additional 146,000 miles have been transferred. This mileage includes by far the most expensive roads, and accordingly the decrease in the road responsibility of local governments has been vastly greater than is indicated by the amount of mileage transferred. In mileage terms, the amount of State primary and secondary roads appears small, being only 14 percent of the total rural mileage. In terms of revenue, however, the State mileage accounted for over 60 percent of the total applied to all rural roads in 1947.

After 1927, and principally during the depression years, other expedients were employed to relieve the financial burden upon the local units. These included increasing cooperative State-local participation in the financing and management of local rural roads, and the outright sharing of State-collected taxes with local units or the payment of grants-in-aid from State income sources for the same purpose.

In addition, during the period 1931 to 1935, there were four States-- Delaware, North Carolina, Virginia (all but three counties), and West Virginia--in which administrative responsibility for local roads was transferred from county and local governments to State authority.

REVENUE TRENDS

Following a drop in revenues for county and local rural roads from a high level in 1927, there has been since 1932 a consistent increase in the amounts applied to these roads. The total amounts of revenue made available in five selected years were as follows:

1927	\$630,619,000
1932	554,154,000
1937	571,567,000
1942	577,188,000
1947	834,976,000

Between 1927 and 1947 there was a definitely increasing trend toward the support of local rural roads with State-collected revenue. In 1927 there was no State in which less than 40 percent of the revenue came from local sources. In 1937 there were 14 States, and in 1947 there were 23 States in which the locally raised proportion of revenue available for local road purposes had dropped below this percentage. In more than half of the States there has been an almost unbroken decline from 1927 to 1947 in the percentage of total revenue for local roads obtained from local sources, while in every instance there has been a corresponding increase in the percentage obtained from State sources. This trend on a nationwide basis is shown, in summary, in table 14, which reveals the striking fact that the relative contribution made to the support of local rural roads by local units of government has been cut more than half, from 81 to 39 percent,

over the period from 1927 to 1947. The corresponding trend by States is shown in table 15 and, graphically, by States and groups of States, in figure 9.

Table 14.-- Percentage of revenue received from various governmental sources for the support of local rural roads, 1927 to 1947

Year	Federal sources	State sources	Local sources
1927	-	18.8	81.2
1932	0.1	33.4	66.5
1937	3.7	48.6	47.7
1942	3.2	52.6	44.2
1947	4.2	56.4	39.4

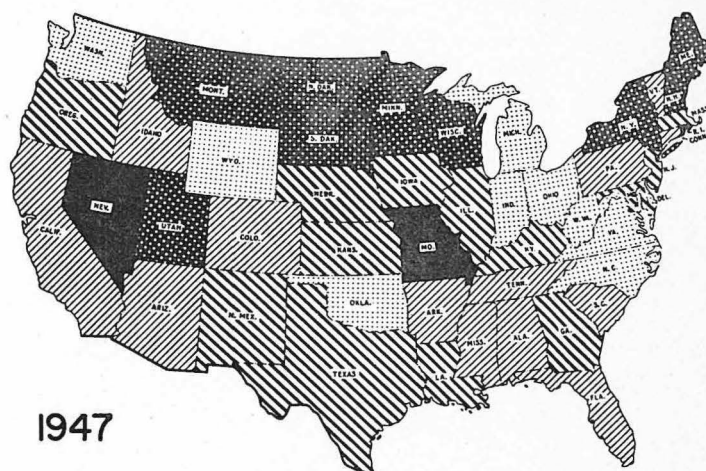
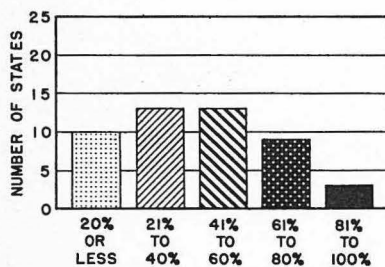
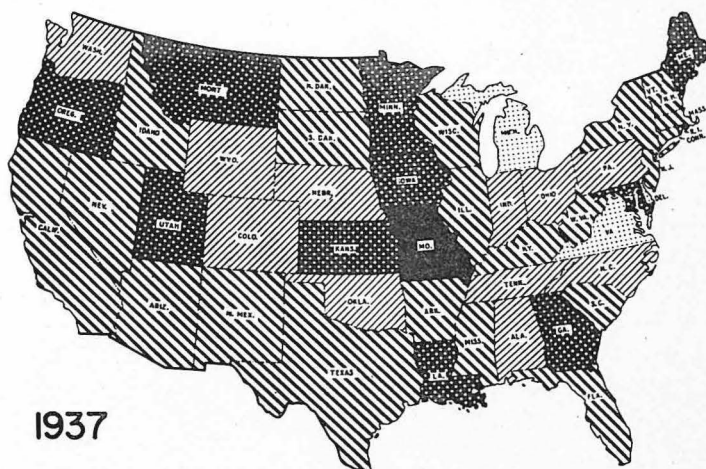
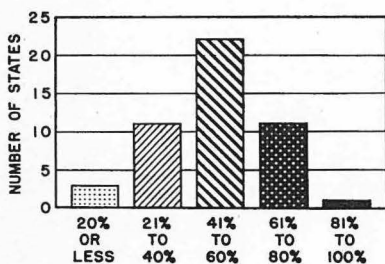
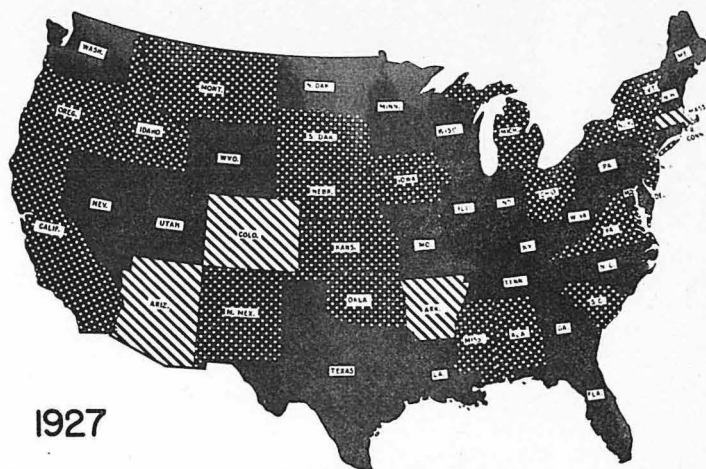
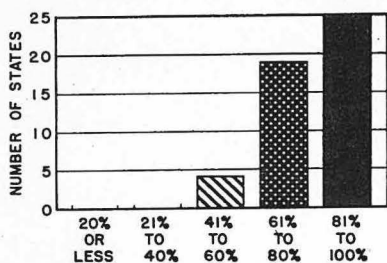
In some instances these trends reflect the avowed policy of certain State legislatures of providing additional State support to increase the total available for local roads. In some instances local units have utilized the additional State revenues merely as a substitute for local funds. This latter practice effectively defeats the intention of those State legislatures which may have supplied the State revenues in the expectation of expediting the improvement of the local roads.

Thus, even though the need for improvement of local roads can be demonstrated beyond question, the failure of many local government units to sustain their share of the financial burden when State revenues have been made available raises grave doubt of the depth of their interest in working out a solution of the financing problem.

TABLE 15.-ESTIMATED REVENUE FOR COUNTY AND LOCAL RURAL ROADS IN SELECTED YEARS, CLASSIFIED BY SOURCE 1/
(AMOUNTS IN THOUSANDS OF DOLLARS)

STATE	COUNTY AND LOCAL REVENUE					STATE REVENUE					FEDERAL FUNDS 2/					TOTAL					STATE
	1927	1932	1937	1942	1947	1927	1932	1937	1942	1947	1927	1932	1937	1942	1947	1927	1932	1937	1942	1947	
ALABAMA	7,715	4,228	3,338	3,963	7,425	3,270	3,035	6,591	9,514	17,889	-	-	1	993	1,765	10,985	7,263	9,930	14,470	27,079	ALABAMA
ARIZONA	873	1,664	2,221	1,029	1,029	787	1,899	2,000	2,399	2,399	-	10	179	219	987	1,660	2,645	4,299	3,248	4,415	ARIZONA
ARKANSAS	2,600	1,377	1,111	1,185	2,144	2,021	923	679	1,647	4,848	-	-	463	685	221	4,621	2,300	2,253	3,517	7,213	ARKANSAS
CALIFORNIA	18,251	9,916	10,163	8,452	13,094	10,857	13,498	13,319	20,066	29,098	-	60	3,759	4,316	29,108	23,474	23,336	32,277	46,508	-	CALIFORNIA
COLORADO	3,042	1,473	780	1,033	1,746	2,183	1,542	1,943	2,180	4,652	-	58	68	75	90	5,225	3,073	2,791	3,288	6,488	COLORADO
CONNECTICUT	2,799	4,109	2,520	2,300	3,281	-	2,823	2,683	2,850	6,675	-	-	-	-	2	2,799	6,932	5,203	5,150	9,958	CONNECTICUT
DELAWARE 3/	1,036	902	-	-	-	224	621	1,100	736	417	-	-	-	-	-	1,260	1,523	1,100	736	417	DELAWARE 3/
FLORIDA	18,126	6,472	6,537	4,003	3,939	4,213	6,280	9,122	8,699	12,127	-	-	354	12	43	22,339	12,752	16,013	12,714	16,109	FLORIDA
GEORGIA	13,044	4,906	5,059	4,947	9,278	2,079	1,836	3,262	5,178	5,351	-	-	-	1	204	15,123	6,742	8,322	10,329	15,565	GEORGIA
IDAHO	3,386	2,072	1,715	1,336	2,287	1,376	1,027	2,027	2,265	3,269	-	112	86	235	1,028	4,762	3,211	3,828	3,836	6,584	IDAHO
ILLINOIS	28,147	18,584	16,350	17,353	22,159	599	15,944	10,398	9,486	16,644	-	-	1,297	548	1,604	28,746	34,528	28,045	27,387	40,407	ILLINOIS
INDIANA	25,901	16,731	6,315	2,228	695	1,848	3,649	10,095	11,748	12,458	-	-	331	-	-	27,749	20,380	16,741	13,976	13,153	INDIANA
IOWA	17,520	15,101	13,589	13,620	20,719	4,351	4,798	9,870	16,900	-	-	937	234	2,270	21,871	19,839	20,579	23,724	39,889	-	IOWA
KANSAS 4/	13,819	9,641	7,440	8,131	11,305	7,054	4,466	3,617	3,843	7,980	-	-	279	74	1,691	20,873	14,107	11,336	12,048	20,976	KANSAS 4/
KENTUCKY	4,335	4,605	4,225	4,421	5,850	464	580	3,372	2,336	6,318	-	-	273	-	-	5,399	5,185	7,870	6,817	12,168	KENTUCKY
LOUISIANA 5/	9,547	6,072	4,964	5,290	4,937	101	-	1,987	2,770	6,382	-	-	-	5	12	9,648	6,072	6,951	8,065	11,331	LOUISIANA 5/
MAINE	2,707	2,266	2,914	2,499	2,129	-	211	912	204	932	-	-	-	225	-	2,707	2,477	3,826	2,328	3,061	MAINE
MARYLAND	2,878	3,797	1,893	2,681	3,075	-	257	930	1,850	3,494	-	-	-	-	831	2,878	4,054	2,823	4,531	7,400	MARYLAND
MASSACHUSETTS	8,342	8,095	5,580	4,236	4,100	6,475	4,788	4,856	4,795	3,286	-	-	-	-	-	14,817	12,883	10,436	9,031	7,386	MASSACHUSETTS
MICHIGAN	28,017	19,624	3,058	2,330	2,046	9,044	11,435	19,600	23,187	26,122	-	-	-	372	243	37,061	31,059	23,030	25,760	29,064	MICHIGAN
MINNESOTA	19,886	12,259	12,461	13,007	18,355	1,673	4,671	5,810	5,677	8,905	-	-	434	816	2,337	21,559	16,930	18,705	19,500	29,597	MINNESOTA
MISSISSIPPI	14,234	5,397	7,639	5,716	6,278	4,249	3,747	6,584	9,073	12,714	-	-	160	1	257	18,483	9,144	14,383	14,790	19,249	MISSISSIPPI
MISSOURI	11,207	8,530	8,778	9,581	15,910	10	1,664	95	14	1,086	-	-	37	219	-	11,217	10,194	8,914	16,956	9,814	MISSOURI
MONTANA	3,190	1,970	2,236	2,513	4,234	1,325	1,216	1,240	1,412	1,600	-	30	30	43	57	4,515	3,216	3,506	3,968	5,891	MONTANA
NEBRASKA	6,781	5,648	2,818	3,622	5,728	2,592	4,298	4,484	4,347	7,586	-	-	439	1	5	9,373	9,946	7,741	7,970	13,319	NEBRASKA
NEVADA	801	493	494	489	757	2	-	-	-	-	-	9	522	-	15	803	502	1,016	489	772	NEVADA
NEW HAMPSHIRE	3,720	1,306	1,792	895	1,922	67	162	1,662	762	804	-	2	298	-	4	3,787	1,470	3,752	2,730	-	NEW HAMPSHIRE
NEW JERSEY	8,537	15,383	10,944	10,318	11,544	3,688	7,428	10,737	8,899	11,203	-	-	2,412	813	277	12,225	22,811	24,093	20,030	23,024	NEW JERSEY
NEW MEXICO	285	328	291	273	388	155	85	234	358	-	-	16	13	49	64	441	429	538	541	810	NEW MEXICO
NEW YORK	29,367	37,856	33,821	34,476	33,826	10,093	18,076	22,305	16,455	21,992	-	-	-	-	-	40,000	55,932	56,126	50,931	55,818	NEW YORK
NORTH CAROLINA 3/	13,586	5,557	6,161	5,264	4,320	7,708	10,711	8,470	29,526	-	-	-	602	3,078	13,586	13,265	16,872	14,336	36,924	-	NORTH CAROLINA 3/
NORTH DAKOTA	4,000	2,116	1,570	2,268	4,373	649	1,098	1,504	1,744	1,703	-	-	503	-	157	4,649	3,214	3,577	4,012	6,233	NORTH DAKOTA
OHIO	44,122	23,679	13,407	6,329	6,544	11,170	13,262	22,068	24,297	27,806	-	-	1,210	35	8	55,292	36,941	36,685	30,661	34,358	OHIO
OKLAHOMA	8,750	6,692	3,390	3,326	3,177	4,988	5,929	6,468	7,722	11,546	-	-	-	-	-	13,738	12,621	9,858	11,048	16,281	OKLAHOMA
OREGON	6,150	4,489	4,744	4,167	4,042	2,780	2,106	1,935	3,046	5,405	-	-	316	415	128	8,930	6,595	6,995	7,628	9,575	OREGON
PENNSYLVANIA 3/	37,365	27,816	12,545	14,200	19,981	3,278	5,318	30,147	30,515	40,500	-	-	4,000	1,950	5,213	40,643	33,134	46,632	46,665	65,694	PENNSYLVANIA 3/
RHODE ISLAND	869	762	282	267	462	12	-	104	-	-	-	-	16	2	-	881	762	402	269	462	RHODE ISLAND
SOUTH CAROLINA	4,386	2,540	1,975	2,237	1,547	1,903	1,063	1,812	2,153	3,813	-	-	-	-	-	6,289	3,603	3,787	4,390	5,360	SOUTH CAROLINA
SOUTH DAKOTA	3,661	2,678	1,825	2,420	6,500	1,349	1,613	1,486	1,871	2,307	-	-	406	171	508	5,010	4,291	3,717	4,462	9,315	SOUTH DAKOTA
TENNESSEE	10,128	6,669	3,480	4,894	4,688	111	3,412	5,078	6,726	11,655	-	-	1,489	515	1,341	10,239	10,081	10,047	12,135	18,284	TENNESSEE
TEXAS	18,250	17,396	18,099	19,358	20,992	4,293	6,955	11,671	12,732	16,734	-	-	1,969	3,664	78	22,543	24,351	31,739	35,754	37,804	TEXAS
UTAH	1,479	1,142	1,424	927	1,343	7	450	16	450	586	-	-	420	410	28	1,486	1,142	1,060	1,787	1,957	UTAH
VERMONT	736	1,317	1,621	1,125	1,592	249	971	1,415	1,320	2,146	-	-	318	67	198	985	2,288	3,354	2,512	3,936	VERMONT
VIRGINIA 3/	6,762	4,582	1,691	1,185	1,294	1,882	3,150	7,267	7,034	19,642	-	-	-	-	757	8,644	7,732	8,958	8,219	21,693	VIRGINIA 3/
WASHINGTON	7,930	6,203	3,217	2,075	4,336	1,675	4,710	6,352	6,046	16,641	-	-	323	726	882	9,605	10,913	9,892	8,847	21,859	WASHINGTON
WEST VIRGINIA 3/	9,770	10,500	3,192	2,877	1,889	-	-	3,526	6,646	14,688	-	-	-	-	350	9,770	10,500	6,718	9,523	16,927	WEST VIRGINIA 3/
WISCONSIN	21,997	13,404	12,684	10,290	22,095	3,579	7,355	7,853	10,038	10,884	-	-	802	200	350	25,576	20,759	21,339	20,528	33,293	WISCONSIN
WYOMING	710	450	320	265	327	9	347	608	542	1,169	-	-	65	83	148	719	889	993	890	1,644	WYOMING
TOTAL	511,945	368,797	272,673	255,401	329,646	118,674	184,968	277,617	303,494	470,240	-	989	21,277	18,293	35,090	630,619	554,154	571,567	577,188	834,976	TOTAL

1/ For a number of States, county and local finance reports for the year 1947 had not been completed at the time this table was prepared; and for those States, estimates based on partial data reports for previous years, and other available information were used.
2/ Composed of Federal-aid secondary and other Federal aids paid through the Bureau of Public Roads; also other miscellaneous Federal aids and grants, and shares from sales of timber on Federal lands, grazing-permit incomes, etc. Work-relief expenditures and other direct Federal expenditures were not included.
3/ Income for expenditure on county roads transferred to State control in Delaware (1935), North Carolina (1931), Pennsylvania (1931), Virginia (1932), and West Virginia (1933) included in all years to afford comparison with county and local rural road income in other States with following exceptions: In Pennsylvania, State expenditures on county roads under State control could not be segregated from expenditures on primary State highways in 1932 and in Delaware, only the debt service on county road bonds could be segregated from primary road expenditures in 1947.
4/ Income for all rural roads, including those designated as State highways, probably included in 1927.
5/ Prior to 1937 the parishes did not share in the receipts from State motor-fuel taxes but were permitted to levy local motor-fuel taxes.



20% OR LESS

21% TO 40%

41% TO 60%

61% TO 80%

81% TO 100%

Figure 9.—Percentages of county and local rural road income derived from county and local sources.

SOURCES OF REVENUES, 1947

Over the past three decades, highway-user imposts have been the principal source of State highway revenue, and property taxes the principal source of the road revenue of local governments. In 1947 highway user revenue comprised 94 percent of the funds from State sources used for county and local roads, while property taxes amounted to 69 percent of the funds from local sources. Percentages of a total revenue of \$835 million received from several sources were as follows:

Source of revenue for county and local roads	Percentage, 1947
Federal aid	4.2
State:	
Highway-user imposts . .	52.9
Other	3.5
County:	
Property taxes	19.6
Other	7.3
Town, township, district:	
Property taxes	7.4
Other	5.1
Total	100.0

REVENUE APPLIED TO RURAL ROADS, 1947

Of the nearly \$3.0 billion made available for highway, road, and street purposes by the Federal, State, and local governments in 1947, \$0.8 billion was applied to urban streets and \$2.2 billion to State highways and county and local roads. Table 16 shows the distribution of the \$2.2 billion in accordance with the source of funds and the road system to which the funds were applied.

Table 16.—Revenue applied to rural road systems in 1947,
exclusive of borrowings, classified by source of
funds

Amounts applied to rural road systems in 1947			
Source of funds	State primary and secondary highways <u>1/</u>	County and local roads <u>2/</u>	Total
	(\$1,000,000)	(\$1,000,000)	(\$1,000,000)
Federal	254	35	289
State	1,097	470	1,567
County and local . .	<u>16</u>	<u>330</u>	<u>346</u>
Total	1,367	835	2,202

1/ In general, the funds applied for the support of urban extensions of State primary and secondary highways could not be segregated and hence are included in this table. However, a small amount of urban funds, \$4 million, applied principally to these urban extensions, is excluded.

2/ Includes local roads under State control in four States: Delaware, North Carolina, Virginia, and West Virginia.

State collected revenues, principally highway-user imposts, are by far the most important single source of revenue in each classification. For State highways, Federal aid is next in importance. County and local contributions for State highways are found in over half the States, but with the exception of a half-dozen States, the amounts involved are negligible.

For the county and local roads, 56.4 percent of the funds are from State sources with 39.4 percent coming from county and local

sources. Federal sources accounted for the remaining 4.2 percent. In 1947, the Federal-aid secondary road program was receiving its initial impetus, and the Federal funds applied to county and local roads were substantially less than in 1948 and 1949.

The resources of local road units vary widely. For example, revenues per mile of road for towns in the New England area ranged from \$312 in Maine to \$1,182 in Massachusetts. In the western States of Nevada, Arizona, and California, the range of income per mile of county road was from \$16 to \$380; \$64 to \$790; and \$211 to \$3,570; respectively. Similarly, the range in revenues per mile of road for the States of Louisiana, Texas, Arkansas, and Oklahoma was \$59 to \$3,000; \$60 to \$2,195; \$71 to \$584; and \$174 to \$787; respectively.

Variations in the amount of annual revenue received by individual counties are indicated for the States of Colorado, Utah, New Mexico, and Wyoming, the extremes in these States being \$26,000 and \$470,000; \$5,000 and \$655,000; \$4,000 and \$211,000; and \$23,000 and \$158,000; respectively. Corresponding revenues per mile of road under county administration are \$180 and \$90; \$50 and \$950; \$3 and \$275; and \$65 and \$110. Hence the variation in these four States of annual revenue for individual counties is from \$4,000 to \$655,000; while the variation in revenue per mile of road is from \$3 to \$950. Similar variations exist in other States and sections of the country.

INCOME FROM BORROWINGS, 1947

Few governmental units are in a position to finance large construction programs without borrowing, either directly or indirectly. The inherent nature of traditional governmental finance policies which, among other things, generally oppose the building up of large cash surpluses, except in debt retirement funds, foster this type of financing.

In 1947, borrowings by counties and local units of government for county and local roads amounted to slightly over \$95 million, exclusive of refunding issues and income from short-term loans made and repaid during the year. This amount is not as high as might be expected under the circumstances. That it is not larger is due in some measure to the facts that by 1947 the postwar highway program had not yet reached its stride; many governments had reserves for postwar construction that had not yet been depleted; and many units were reluctant to undertake work in the face of rising prices and critical shortages of labor, equipment, and materials.

EXPENDITURES, 1947

Expenditures for county and local roads amounted to approximately \$884 million in 1947, including \$62 million expended on local roads under State control in four States: Delaware, North Carolina, Virginia, and West Virginia. Table 17 shows the amount and percentage of expenditures by purpose.

Table 17.--Total expenditures for county and local roads in 1947

Purpose	Amount	Percentage
	(\$1,000,000)	
Capital outlay	285	32.2
Maintenance	453	51.3
Debt service:		
Principal	85	9.6
Interest	30	3.4
Miscellaneous <u>1/</u> . . .	<u>31</u>	<u>3.5</u>
Total	884	100.0

1/ Includes overhead, administration, and equipment purchases not chargeable to capital outlay or maintenance.

As might be expected, the percentage of disbursements varies considerably among the States. For example, debt service varied from nothing or a negligible amount in a half-dozen States to more than 25 percent of the total expenditures in another half-dozen States. Debt service payments include those made upon debt incurred for roads that were under county or local control at the time the debt was incurred but have since been transferred to State control, as well as payments upon debt incurred for roads that are still under county or local control.

FUND TRANSFERS, 1947

Although the States are the principal source of revenue for local roads, the majority of such funds raised by the States are transferred to the counties and local units, in the form of aids,

shared taxes, and so on. Thus, the counties and local units are the principal disbursing units for county and local roads. In 1947, for example, they accounted for 86 percent of all direct expenditures. The remaining 14 percent was disbursed directly by the States, practically all of which was for construction and maintenance. The four States of Delaware, North Carolina, Virginia, and West Virginia, in which all or most local roads are under State control, account for nearly half of the disbursements made directly by the States.

Not all of the money spent directly by the States on county and local rural roads during 1947 came from State sources. The Federal-aid secondary funds used on local roads were, of course, disbursed by the States, and in addition there was a small amount of county funds, some \$8 million, which was transferred from local units to the States to be spent for work on county and local roads.

DEBT STATUS, 1947

The outstanding road debt of county and local units rose to a maximum of \$1.8 billion in 1929 and thereafter has declined steadily. At the beginning of 1947 the debt was estimated to be \$870 million. Although county and local road units in more than half of the States reported reductions in road debt during the year, the increases in the remaining States were sufficient to cause a net increase of \$9 million. This resulted in a total road debt of \$879 million by the end of 1947. More than 50 percent of the total was accounted for by the county and local road units of only four States.

STATE-ASSUMED OBLIGATIONS

In many cases the transfer of the more important roads from local to State jurisdiction has been accompanied or followed by the assumption of certain financial obligations on the part of the State. These obligations are generally in one of two forms: (1) Reimbursement of local units for capital outlays made by the local units on roads later taken over by the State; and (2) assumption of outstanding local debt in amounts equivalent to the expenditures made by the local units for the improvement of roads subsequently transferred to State jurisdiction.

The extent of such obligations which have been assumed by the States is estimated to be between \$500 million and \$600 million over the past 30 years. Less than one-fourth of the States account for more than 90 percent of this amount.

FISCAL ABILITY

Considerations of equity are involved in any appraisal of the fiscal ability and responsibility of various governmental units for the support of local roads. Numerous authorities and students of the problem have presented many convincing arguments in support of widely differing premises over the past 30 years. Some have demonstrated that the financial support of local roads is primarily a local responsibility; others have concluded that local units should be given substantial aids from various other sources in the financing of road needs.

Obviously, any effort to generalize upon the propriety of any single proposal is certain to be subject to challenge. In addition, fundamental consideration of the problem is complicated by the existence of formidable pressures and influences which are continually exerted in the interest of particular groups or because of political expediency.

The efforts on the part of many local units to be relieved completely of the financial burden and at the same time to exercise complete local autonomy in the expenditure of road funds is not only incompatible with sound principles of government; it is an inordinate departure from any reasonable concepts of equity. Further, it is popular grass-roots politics to promise relief from the local tax burden by promoting the shift of that burden to superior levels of government. This practice, which has been successful to a considerable degree, frequently generates a reluctance on the part of local units to continue their financial support.

A sample of the attitudes of more than 1,300 rural residents with respect to willingness to pay property taxes for improved roads was made in Carroll and Frederick Counties, Maryland, in the fall of 1949. Following is an analysis of replies received from 375 of these residents who live adjacent to dirt or gravel local roads:

Question	Percentage distribution of replies received from 375 rural residents whose dwellings are adjacent to dirt or gravel roads			
	Yes	No	Indefinite	Total
Are roads satisfactory?	14	85	1	100
Would you be willing to pay property taxes for road improvements by your property?	66	28	6	100
Would you be willing to pay property taxes for road improvements by property of others?	60	35	5	100

Replies in the "indefinite" category include those which were qualified as "depending upon the cost," "depending upon other taxes," "depending upon kind of improvement," and so on.

In contrast to this expression of willingness by rural residents along the less improved roads to pay property taxes for road improvements is the attitude of 940 rural residents who live adjacent to a road already paved. The replies of these residents to the same questions were as follows:

Question	Percentage distribution of replies received from 940 rural residents whose dwellings are adjacent to paved roads			
	Yes	No	Indefinite	Total
Are roads satisfactory?	71	29	0	100
Would you be willing to pay property taxes for road improvements by your property?	22	61	17	100
Would you be willing to pay property taxes for road improvements by property of others?	43	49	8	100

The replies to these questions, at least in these two counties, would indicate that the type of road now existing adjacent to his property has a marked effect upon the willingness of the rural resident to support the further improvement of local roads through property taxes.

These, and other factors not involved in fundamental considerations of equity, have been inimical to a sustained high degree of effort in financing road needs at the local level. In 1947, when rural areas were enjoying a level of prosperity never before reached, the contributions by local units to the support of local roads were only 64 percent of their contributions in 1927. When adjustments are made for the price index 28/, the effective contribution in terms of relative accomplishments is less than half, or 47 percent, of the 1927 contribution. Similar comparisons for 1932 and 1937 show that the effective contribution in 1947 was 39 and 69 percent, respectively, of those two particular years, after adjustment is made for differences in price levels.

To varying degrees, this situation is common to all States. Based upon past evidence of effort, it appears, therefore, that local units have a capacity to make greater contributions than they now make to the financing of local road needs. An additional annual contribution from local sources ranging in amount from \$100 million to \$250 million appears both reasonable and possible.

28/ Price trends in highway construction, composite mile index: issued quarterly by the Bureau of Public Roads.

Such additional contribution would not be uniformly spread. Many local units would continue to require relief from other sources simply because of their insufficient capacity to raise the necessary funds to build and support an adequate local road system. In such instances, particularly, comprehensive studies of the present and long-range physical, financial, and administrative needs of all aspects of the State's road transportation problem are necessary in order to obtain the facts upon which a solution can be based.

Facts thus obtained are essential in order to avoid the pitfalls of inequity and confusion. In the final solution, however, maximum equity will be achieved in each State only through cooperation and compromise among the various levels of government. By such means only will proper recognition be given to the varying degrees of interest in, and responsibility for the development of a system of local roads to standards commensurate with the continuing and expanding economic health of the Nation's rural areas.

Part V.--LOCAL ROAD ADMINISTRATION

NATURE OF THE ADMINISTRATIVE PROBLEM

The land service characteristics of local roads, their importance in terms of service to individuals rather than volumes of traffic, and the day-to-day operations involved in their maintenance and upkeep are attributes which require maximum autonomy of local governmental units in the administration and management of local road affairs. Complete and full cooperation on the part of the State accompanied by limited State participation in local road programs are desirable in the interest of economies and efficiencies not otherwise attainable. To the extent that Federal interest in local road programs may be appropriate, Federal cooperation and participation can be best achieved through coordination and administration at the State level.

To better the job of improving and maintaining local roads, the first need is better laws. A good law is one which fixes responsibility and accountability, establishes standards of performance, embraces broad guides for administrative bodies in determining procedures, provides for adequate financial support, and creates efficient administrative machinery. Because of legislative deficiencies, the local units have been immeasurably more handicapped than have State highway departments. The administrative practices of the former frequently stem from statutes passed several generations ago and which at best have had only infrequent or minor revision in the interim. By way of comparison the bad effects of outmoded laws upon the operations of State highway departments have been observed and corrected much more promptly.

Before the evident weaknesses in local road administration can be corrected, the State legislatures must first eliminate some of the obstacles to more efficient operation. With the removal of these handicaps, accompanied by provisions for more adequate administrative machinery, and with the aid of progressive and cooperative State highway departments, the local units of government can take their proper place as cooperators in the task of improving the country's roads. The adoption of modern management practices by local government units is not only a requisite for obtaining more efficient and better methods of local road administration; it is the surest way to retain a desirable degree of control at the local level. In several States, where these practices are not specifically required by law, they could, nevertheless, be adopted without additional legal authority. In other States, the laws need to be changed.

An appraisal of the numerous local road administrative and operating practices provides necessary background for any consideration of statutory and administrative requirements in the fields of policy, organization and management, and intergovernmental relationships. The administration of county and local roads now varies from very good and effective to indifferent and inadequate. Where shortcomings exist, they are apparent in the lack of those attributes which are recognized as desirable and essential after more than four decades of building and maintaining the Nation's major road systems.

Because each State has its own particular needs, there is no standard prescription that can be applied directly to the variety of specific situations. Therefore, the suggestions for changes in legislation and administration herein offered should be regarded as principles and broad guides which must be adapted to the peculiar needs of the particular States.

POLICY

A common weakness of local highway laws is the absence of clear specification of legislative intent. The legislative declaration of policy should be clear and concise, and so written as to inspire administrators and encourage maximum use of administrative and technical skills and resources in achieving the stated objective. Illustrative of the desirable kind of policy statement is the preamble to the recent local road law passed in the State of Washington as follows:

The Act is passed to insure efficiency in the planning, laying out, constructing, repairing, improvement, and maintenance of county roads through local administration to the end that there shall be full coordination between the State and the counties but with a maximum of local autonomy and a minimum of State control. 29/

Such a statement leaves little doubt about the legislative intent. Its broad provisions likewise afford highway administrators the necessary latitude for the exercise of initiative and experimentation which are so essential to progressive highway administration.

29/ Laws of Washington, 1949; Chapter 156, HB 289, pp. 391-2.

STATE-LOCAL RELATIONS

To achieve a more effective intergovernmental cooperation in highway programs there should be no doubt as to the authority of the States, counties, and other local governments to discharge their respective responsibilities in connection with these cooperative programs. Some State highway departments have only recently been drawn into cooperative endeavor with the local government units. Relations between these State departments and local road agencies have previously been sporadic at best and in some cases virtually nonexistent. Where these conditions exist, they are due in large measure to a lack of legal sanctions, without which such relations as have developed have grown from the more or less haphazard choice of individuals.

To some extent, the preoccupation of State highway administrators with the tremendous job of managing the primary highways has militated against regular and effective State-local dealings. On the other hand, local government units also have responsibilities, and in some instances they have failed to appreciate that the development of good State-local relations is not a one-way affair. Inadequate financial participation by the local units in cooperative road programs, and their failure to provide adequate construction organization and improved management have been contributing factors in retarding State-local undertakings.

Experience of States with a long history of successful State-local cooperation bears out the wisdom of State laws which provide the principles and pattern of desirable relationships. While it is

administration of the law which actually counts, foundation in law is both desirable and helpful in achieving sustained intergovernmental operations. With legislative stipulation as a guide, the highway administrative agencies will be relieved of uncertainty, and their cooperative actions will be of a positive, rather than negative, nature as is often the case at present.

STATE AID

The backbone of the State-local relations law should be a State-aid program managed by the counties or local units with State assistance in planning, establishing priorities of improvement, and selecting road systems. Mandatory and voluntary features should be embodied in the law; the former should be confined largely to reporting and accountability of the local units for funds received and expended, State approval of plans and programs, and adequate provisions to insure a minimum standard of performance. More specifically, consideration should be given to the following items:

1. Selection and designation, with the assistance and approval of the State, of a State-aid system managed by the counties or other local units.
2. Development of a plan and improvement program by the counties with the assistance of, and for ultimate approval by the State highway department, and integration of State-local efforts in long-range planning of the rural systems.
3. Adequate provision for advisory services and relationships which will permit and encourage cooperative undertakings and the exchange of technical information and personnel.

4. Financial support to the extent necessary to reflect equitably the joint interest and responsibility of the State and local units in the State-aid and local road systems, and to place State-local relations on a continuing basis.

5. Allocation of a percentage of State-aid funds for county or local engineering services on a matched or an unmatched basis, preferably the former. Such sums should be available to all local units including those without qualified engineers in order to encourage local hiring of a qualified engineer, and facilitate the use of engineers and engineering services on local road work when necessary.

6. Proper State supervision of local highway affairs in a manner that will maintain a high level of local performance or at least insure a minimum standard.

JURISDICTIONAL UNITS

More than 18,000 local governmental units exercise jurisdiction to some extent over the local rural roads of the country. As nearly as can be determined the numbers of currently active units of the several principal classes are approximately as follows:

<u>Type of unit</u>	<u>Number</u>
Counties	2,800
Towns and townships	15,000
Special districts	900
Total	18,700

These administrative units vary in size from the smallest towns with areas less than 1 square mile to San Bernardino County, California, with more than 20,000 square miles of area. The roads they administer range from less than 5 to more than 5,000 miles. Their financial resources for road purposes range from annual receipts of \$500 or less to more than \$10 million. The size of the local road organization varies from a single part-time employee to more than 500 full- and part-time employees.

Existing patterns of county and local road administration are likewise varied. The unit of local road administration in the New England States is the town. In Pennsylvania, it is the township, although a handful of counties are active in local road affairs. In the South and West, local roads are generally under the jurisdiction of counties, while in the remainder of the country, with some exceptions, there exists a dual plan of administration, with main county roads under county supervision and the balance under township management. The exceptions are the States of Indiana, Iowa, and Michigan where townships are no longer concerned with local roads.

In a few States, townships have voluntarily transferred their responsibilities to the county. In Kansas, for example, this has been done to the extent that approximately one-half the counties are operating under county-unit administration. The States of Delaware, North Carolina, and West Virginia have placed control of all rural roads under the State highway department; and Virginia, except for three counties, has done likewise.

In addition to the previously mentioned local administrative units, there exist in a few widely scattered States special road and bridge districts of one kind or another which operate as agencies superimposed on the other basic road administrative units. In the southern and western sections of the country, where the county predominates, it is customary to divide the county area into precincts or supervisory districts for operating purposes. These precincts within the counties operate more or less independently of each other, and they usually have their own funds, equipment, and labor forces.

INTER-LOCAL RELATIONS

Legal authority for the necessary relations between counties, townships, towns, and municipalities varies widely among the States and is often unclear. Statutes permit cooperative highway undertakings under certain specified conditions only in some States; in others the absence of such specification leaves a question as to the validity or permissibility of such cooperation; and in still others the laws are not conducive to local intergovernmental highway relations.

In view of these conditions, the State laws should be examined and revised, if necessary, to permit and facilitate cooperative highway enterprises between all local civil subdivisions. Further, the abandonment of the precinct or special district type of operation is suggested in the interest of the greater efficiency and higher degree of accomplishment commonly associated with the single-unit type of operation. In a few cases revision of the State constitution may be necessary to effect such relationships.

GOVERNING BODIES

Local road affairs are usually under the general direction of a board that establishes policy governing road work. Generally these boards have many other responsibilities, notably for health, welfare, buildings and institutions, and the conduct of the general county or local business. The diversity of the county governing bodies is indicated by the following listing: 30/

30/ The American County - Patchwork of Boards, by Edward W. Weidner, published by the National Municipal League.

<u>Type of governing bodies</u>	<u>Number of counties</u>
Board of commissioners or supervisors	2,012
Judge and commissioners	350
Board composed of town supervisors	297
Judges and justices of the peace	193
Single judge	86
Plural-membered court	75
Single nonjudicial officer	32
Other	5
Total	3,050

The number of members of the county boards ranges from one to more than 80. Almost half the counties have memberships of three or less, about 30 percent have four or five members, and 20 percent have a larger membership. The western and New England States have the smallest governing bodies; the southern States, the midwestern States of Illinois, Michigan, and Wisconsin, and the State of New York have the largest county boards.

Eighty percent of the counties elect governing body members as representatives of particular districts; the balance elect members from the county at large. The most common practice, followed by more than a fourth of the total number of counties, is to elect members for four-year overlapping terms. More than 80 percent of the counties elect local boards to terms of four years or less, and in about 60 percent, the terms overlap. Chairmen of the boards are usually selected annually. 31/

31/ The American County - Patchwork of Boards, by Edward W. Weidner, published by the National Municipal League.

In New England, where the town predominates, the governing body is an elected board of selectmen or a town council--usually of less than five members. Terms of office are from one to four years. Pennsylvania second-class townships are governed by a board of three members elected for six-year staggered terms; first-class townships elect a minimum of five commissioners for four-year terms.

Where townships are active in road matters, the boards are usually composed of seven members or less, with three members most common. They are elected for two-, three-, or four-year terms, which in some cases overlap. In the States of Illinois, Michigan, New York, and Wisconsin, township elected officials also serve as members of the county governing boards.

As previously indicated, 80 percent of the counties elect members from particular districts. This practice hinders consideration of highway matters from a county-wide viewpoint, which is necessary for proper planning, programing, and management. Under this district election system, members are inclined to give district interests precedence over the general county interest. As a result there exists the tendency to log-roll, and each member of the board is given a relatively free hand in matters affecting his district. In this manner coordinated administration is defeated, and the policy-forming and administrative efficiency of the governing board is hampered.

The customary practice of selecting a chairman of the board annually is also a handicap to the formulation of policy by the governing bodies. Rotation of the chairmanship is the rule, and this custom

does not foster leadership. Additionally, the turnover of the elected officials in some areas is rather frequent; and although the staggering or overlapping of terms adds a degree of stability, this condition is hardly conducive to continuity of policy.

County or local boards are accountable for all highway policy and have some administrative responsibilities. They invariably authorize expenditures; and where a budget is prepared, they approve it or prepare it. These are functions which fall properly within the purview of a policy-making and governing body. However, it is the practice of approximately 40 percent of all local governing boards to concern themselves with such matters as the determining of construction details, plans for bridges, and supervision of maintenance operations. There are notable exceptions, of course, but generally the members of these elective boards are unprepared by training and experience to deal effectively with such essentially technical matters; and their attempt to do so, more or less directly, is one of the causes of observed inefficiency in county road administration.

OPERATIONS AND MANAGEMENT

There is actually little uniformity in the manner of carrying out the local road function. The survey by the Board of County Engineer Consultants discloses that elected county governing body officials or surveyors manage county road affairs in about 1,050 counties of a total of more than 2,800. In approximately 640 counties,

road management is in the hands of a road superintendent or supervisor appointed by the governing body. Appointed or elected engineers are in charge of road work in about 850 counties. It should be noted, however, that more than 80 percent of the engineers are employed in nine States, and about 90 percent of the total number operate in 12 States. The number of counties not reporting the type of management totaled about 340.

In 7,400 of more than 15,000 townships, road affairs were found to be under the jurisdiction of elected governing body officials. Town or township road supervisors or the equivalent are elected in approximately 2,200 units. Appointed officers manage road work in more than 2,300 jurisdictions; and engineers appointed by the governing boards are in charge of road matters in about 150 towns and townships. Approximately 3,100 units failed to report the type of management.

Reports received by the Board of County Engineer Consultants indicate that county-unit administration prevails in over 1,900 of the more than 2,800 counties. The corresponding figures for towns and townships are that more than 10,700 units of the 15,000 reporting, operate on the unit basis. Unit administration probably actually exists in considerably fewer road administrative units than the reports indicate. Although the law may require single-unit administration, there is frequent contravention of the law by local governing boards in actual practice, and actual operations often are on a precinct or district basis.

Unit administration, as reported, covers nearly 1.6 million miles of local roads. Mileage under engineering control in about 850 counties and 150 towns and townships totals 525,000.

In the conduct of local road affairs there are about 97,000 technical, skilled, and supervisory local road employees, of which approximately 67,000 are full-time employees and 30,000 are seasonal. Of the 67,000 full-time employees, about 12,000 are engineering employees, 44,000 are equipment operators, and 11,000 are superintendents or foremen; of the 30,000 seasonal employees, 11,500 are engineering employees, 16,000 are equipment operators, and 2,500 are superintendents or foremen. The average county has 22 technical, skilled, and supervisory road employees, 18 full-time and 4 seasonal; while the average township has only two such employees, one full-time and one seasonal. In the case of engineering employees, there are about as many seasonal as full-time employees, but for other classes of employees, the proportion of seasonal employees is small.

Well-defined personnel policies are rare. The absence of adequate civil service and retirement plans, and inadequate personnel policy, have resulted in lack of security or assurance of tenure. Also, there is usually no definite establishment of qualifications for employment, or establishment of inadequate qualifications.

Salaries, while improved considerably in recent years, are still relatively low compared with salaries for comparable work in State highway departments and private industry. The low salaries, coupled with the above features, are not conducive to the obtainment of competent help and building up of local road organizations.

As previously implied, sound management practice suggests the desirability of restricting the functions of local governing bodies to those of policy formulation, with execution reposed in a qualified executive or administrative officer appointed by the governing body. Approval of the executive appointment by the State highway department might be a salutary specification. Actually only five States appear to have legal provisions which are tantamount to requiring the appointment of an engineer qualified by education and training. In a number of other States the requirements as to qualifications are less strict, are optional, or apply only under certain conditions. There are nine States that impose by statute no requirements of this nature. Generally, the local road official, if there is one, is appointed by the governing body, but in many areas the official is elected.

To provide needed flexibility and permit the employment and retention of competent men, it is desirable that the salary of the county engineer or similar officer should not be rigidly fixed by statute but should be left to administrative determination by the local governing board, at least within prescribed limits. Twenty States now allow the governing body to fix the salary of the local road officer with no maximum or minimum limitations specified. Additionally, six States have no express provisions, and it may be implied that the governing body which appoints the official may fix his salary. In almost all other States statutes specify certain salaries for the office, impose minimum or maximum limits on salaries ranging from \$600 to \$7,200 per year, or place some restriction on the discretionary authority of the local governing body.

SUPERVISION AND CONTROL

The advantages and feasibility of engineering supervision of local road operations have been amply demonstrated in many States. It should be required by law in all States, and means should be devised to make it available to all local units on an acceptable and workable basis. The means employed may be adapted to the financial ability and other circumstances of the individual local units.

Where feasible, each local unit should employ its own engineering services. If this is not practicable, two or more units may share the services of an engineer employed by them jointly. Seven States already have statutes which authorize such joint employment of an engineer by two or more counties. Although such specific enabling legislation may not actually be necessary to permit an engineer to serve or be employed by two or more local units, the passage of similar laws by other States might encourage resort to the practice under appropriate circumstances.

Where township government survives and retains its road authority, responsibility for supplying the townships of a county with engineering and possibly other assistance might be lodged by suitable legislation with the county.

In addition to the above means there remains the possibility of supplying engineering services to local units of government through the State highway department. This may be legally permissible in most States without additional law; but such doubt as there may be should be

removed by the passage of appropriate State enabling laws, which might also desirably include the requirement of State highway department approval or advice in the appointment of engineers by local units of government.

EQUIPMENT REQUIREMENTS

Highway construction and maintenance is today a highly mechanized undertaking. Nearly one-third of all highway expenditure is directed toward the purchase, operation, and repair of motorized equipment. The effective use of these mechanical aids is an essential of any effort to improve and maintain the large mileage of local rural roads within reasonable cost limits.

Equipment should be selected and so managed as to obtain the lowest unit cost for construction and maintenance operations. This need is best met by the selection of multipurpose equipment which can be kept in use during a maximum part of the available working time. Development in highway equipment, especially the motor grader, has greatly increased the range of an efficient maintenance crew, but the advantages of the newer equipment cannot be fully realized in operations of the smaller governmental units. The average township and small political subdivision must either use its own obsolete equipment or contract for maintenance services at rates far in excess of those experienced by governmental units of sufficient size to permit the effective use of a better equipment plant.

As an illustration, in a midwestern county where the highway maintenance practices of all governmental units responsible for work within the area were analyzed, it was found that 35 townships were each responsible for approximately 50 miles of local roads. The county was responsible for a separate system of 342 miles, and the State was responsible for 105 miles of highways, all within the same county area. Because of the small mileage of roads and limited finances, the majority of the townships each owned two or three light graders of an obsolete horse-drawn type. Without motor power or personnel to operate the wholly inadequate pull-type graders, township officials were generally unable to maintain roads in their jurisdictions in satisfactory condition. An instance was found where the officials of three townships jointly obtained a motor patrol grader and operator from a local contractor for \$7.50 an hour. When work loads permitted, the county also rented to the townships a motor grader with operator at a rate of \$6.50 an hour. Blading performed by these machines and skilled operators was of good quality; but the approximate cost of \$7.00 an hour for blading was about 75 percent above the cost at which it would have been possible for a well-equipped organization to do the work with its own motor patrols.

Very few townships are financially able to own and operate efficiently the equipment plant essential for satisfactory highway maintenance. The mileage controlled by most counties is sufficient to justify the ownership and effective use of a proper plant. The inventory

of major equipment owned by a Minnesota county, shown in table 18, will illustrate approximately what is required in an area where snow removal is essential to year-round operation.

Table 18.--Inventory of major highway maintenance equipment owned by a Minnesota county

Type	Number of units	Original cost new
Automobiles (pickups and station wagons).	2	\$ 1,425
Graders; power	5	35,700
Graders, tow	2	1,750
Kettle; bituminous	1	2,000
Mowers, power	4	3,500
Snow plows; displacement	7	7,000
Snow plows, rotary	1	9,000
Trucks; 1½ to 2 ton	4	8,690
Trucks, 5 to 6 ton	3	22,300
Total	29	\$91,365

On December 31, 1948, the average age of this equipment was 6 years, and the accounting records showed a depreciated value of \$47,000. As of this same date, the estimated replacement cost new of the major equipment was \$130,000.

During the year 1948, about \$108,000 worth of maintenance work was performed, of which 89 percent was by county forces and 11 percent by contract.

This county performs year-round maintenance on 430 miles of county road, including 9 miles of unsurfaced roads, 395 miles of gravel roads, and 26 miles of bituminous-surfaced roads. In addition, it performs snow removal on 192 miles of township roads on a reimbursable basis. There are 252 miles of township roads altogether, but the 192 miles cleared of snow were sufficient to give access to all rural residents. The other 60 miles, comprising 24 percent of the township system, simply afford additional or optional access to some properties, a fact which indicates the possibility of eliminating some nonessential mileage.

The county lets contracts for gravel replacement, which accounts for an absence of crushing and screening equipment in its inventory. It is somewhat deficient in mechanical loading equipment and $1\frac{1}{2}$ - and 2-ton trucks.

Although winter maintenance of the 12 townships is performed by county forces, the township officials attempt to provide a minimum of the other maintenance and reconstruction required with their own facilities and supervision. With an average of only 23 miles of road, each township owned several light pull-type graders which were used occasionally with farm tractors. Blading operations were spotty, most of this work being done by small local contractors owning motor graders and underbody truck blades. These operations were carried on at the convenience of the contractors, without technical supervision. Unit costs of the blading work done in this way were nearly twice those of the county for similar work.

In this instance some type of cooperative arrangement, providing for joint ownership of modern highway equipment, or maintenance by county forces, appears desirable. If the county were to assume responsibility for year-round maintenance of the township roads, an additional investment of about \$30,000 in motor graders and $1\frac{1}{2}$ - and 2-ton trucks would be required.

ACCOUNTING AND REPORTING

In only a very few States are the local government units required to keep adequate account of their highway expenditures. Ultimately, provision for a system of uniform cost accounting and improved audit procedures will have to be made in all States to insure complete accountability of all local road units for the expenditure of public funds and to obtain adequate administrative control of local road operations. Uniform records and reports of highway funds should be required to be submitted at least annually to the State highway department, preferably on forms prescribed by that department. These reports should include receipts, expenditures, and other fiscal data, and such information as may be necessary to report accurately the year's accomplishments and the condition and status of roads under local jurisdiction. Only in this way can deficiencies of operation be discovered and corrected. Assembly and use of such data would supply accurate and current information on local road affairs upon which proper legislative and administrative action may be based.

PLANNING AND PROGRAMING

One of the most serious deficiencies in local road administration is the absence of systematic planning and programing. Lack of continuity of policy and random direction of effort, caused in part by the rapid turnover of officials, have been serious obstacles to sustained progress in local road building. In view of these conditions, the need for a stabilizing influence in the form of legislative specification in this area is indicated. State law should require the preparation and adoption of a plan of road development and associated implementing program by each local governing body, with the advice and approval of the State highway department. Cooperative State-local effort in the selection of a designated system of major local roads, comprising a locally managed State-aid system, should be a complementary requirement. Such a plan should perhaps be for a period of not less than three years and not more than ten years. The law should further require concentration of certain funds, especially State-aid funds, on the designated system of major local roads, to the extent necessary to insure its initial improvement and subsequent upkeep. The States of Iowa and Washington have incorporated essentially such features in recently enacted legislation.

FINANCIAL SUPPORT

Without adequate financial support there can be no adequate achievement in the provision of needed road service. Effective management can insure maximum service at lowest cost, but it cannot

surmount the obstacles of insufficient funds to perform a proper job. The degree and nature of adequate financial support, as previously pointed out, involve matters of equity and allocation that must be solved within and by each State. A comprehensive study of the transportation needs of the State, embracing all highways, roads, and streets, and involving considerations of long-range physical, administrative, and financial requirements, is the foundation upon which legislative action should be based.

RESEARCH

The confusion and conflicts of view which enter into all discussions of local road matters clearly indicate a general lack of knowledge of local road operations and requirements. Aimless direction and unscientific approaches and experiments in local road building and administration are evidence of the great need for more factual information concerning the management and operations; the existing physical facilities; and the physical, financial, and economic requirements of local road units. To supply this need each State should establish a fund for financing engineering and research studies. The investment in such projects would be relatively small but it would produce immeasurably beneficial results. The funds provided should be set aside for management by the State highway department, and the studies should be made by that department in cooperation with, and with the approval of the local units. Employment of consulting services and cooperation with

educational institutions should be permissive. In Iowa, which has a long record of State-county cooperation, the legislature recently passed a law providing that one and one-half percent of the receipts of the farm-to-market road funds are to be set aside in a fund known as the secondary road research fund. Research projects and engineering studies are to be conducted in cooperation with the county engineers. The purposes are set forth as follows:

Sec. 2 The secondary road research fund shall be used by the State highway commission solely for the purpose of financing engineering studies and research projects which have as their objective the more efficient use of funds and materials that are available for the construction and maintenance of secondary roads, including bridges and culverts located thereon. 32/

STATE ADMINISTRATION

Interdependence of State and local units in the management of the cooperative road programs requires complementary actions of an administrative character. State highway departments have a real opportunity to bring about beneficial results in local road administration by the exercise of their legal and discretionary authority, and many States have chosen to follow such a course. In other instances the highway departments have been handicapped in various ways in effecting the desirable cooperative relations, and this factor has contributed materially to the comparatively retarded development of local road administration.

32/ Iowa Code Annotated Legislative Service, Laws of the Fifty-Third General Assembly, Secondary Roads Research Projects, House File 54, sec. 2, p. 58.

There is need in all State highway departments of a division staffed with competent personnel, familiar and sympathetic with local road practices and problems, to be responsible for the coordination of State-local efforts in the execution of the secondary and local road programs. The passage of the Federal-aid Acts of 1944 and 1948 provided the impetus for many States to give appropriate consideration to this need, since Federal law and regulations more or less imposed upon the State the responsibility of obtaining the needed cooperation of local units. Further, the establishment of such a division has been recommended by the Board of County Engineer Consultants, and the majority of States have taken steps to comply.

Appendix A.--BOARD OF COUNTY ENGINEER CONSULTANTS

R. B. Traver, County Superintendent,
Syracuse, New York.

Arthur F. Ranney, County Engineer,
Summit County,
Akron, Ohio

B. T. Collier, County Engineer,
Coahoma County,
Clarksdale, Mississippi.

O. S. Hess, Engineer-Manager,
County Road Commission,
Kent County,
Grand Rapids, Michigan.

Earl Coyne, Superintendent of Highways,
Brown County,
Aberdeen, South Dakota.

L. W. Newcomer, County Engineer,
Butler County,
Eldorado, Kansas.

Manton Hannah, County Engineer,
McLennan County,
Waco, Texas.

H. L. Way, County Surveyor and Commissioner,
San Bernardino County,
San Bernardino, California

H. O. Walberg, County Engineer,
Skagit County
Mt. Vernon, Washington.

Van James,
Axial, Colorado.

