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A TRAFFIC SURVEY STATION IN NEW JERSEY

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The reports of research published in this magazine are necessarily qualified by the conditions of the tests from which the data are obtained. Whenever it is deemed possible to do so, generalizations are drawn from the results of the tests; and, unless this is done, the conclusions formulated must be considered as specifically pertinent only to described conditions

In This Issue

Page

Some Characteristics of Traffic on New Jersey Highways 17

Needed Research on Flexible-Type Bituminous Roads 32

Roadside Planting Survives Drought 34

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SOME CHARACTERISTICS OF TRAFFIC ON NEW JERSEY HIGHWAYS

EXTRACTS FROM A REPORT ON THE NEW JERSEY TRAFFIC SURVEY [1]

Reported by L. E. PEABODY, Senior Highway Economist, Division of Highway Transport, Bureau of Public Roads

COLLECTING DATA ON CHARACTERISTICS OF TRUCK TRAFFIC

FIELD observations in the New Jersey traffic survey were carried on at 352 observation stations located over the entire State highway system and on the principal county routes. Observations were made from August 1932 to August 1933. Traffic data were recorded upon more than 1,000 sections of highway at the stations with locations as shown in figure 1.

Traffic volumes of all motor vehicles, and of trucks, busses, and foreign vehicles are presented graphically in figures 2, 3, 4, and 5. Passenger cars were 86 percent of all observed vehicles, trucks 12 percent, and busses 2 percent. Heaviest traffic volumes were at the Holland Tunnel, Camden-Philadelphia Bridge, the High-Level Viaduct between Newark and Jersey City and on U S 1 southeast of Elizabeth. Average daily traffic exceeded 25,000 vehicles at all these locations, while west of Montclair on the Montclair-Caldwell Highway and west of Jersey City on the Newark Turnpike there were between 24,000 and 25,000 vehicles per day.

HEAVY PEAK TRAFFIC FOUND ON A NUMBER OF ROUTES

Peak traffic exceeded 50,000 vehicles per day on the Philadelphia-Camden Bridge and was more than 40,000 per day at other locations. Routes leading to shore resorts had the highest ratios of maximum daily traffic to average daily traffic. Near Weymouth on N J 42, the ratio exceeded 700 percent and ratios in excess of 500 percent were found southeast of Cedar Bridge on N J S–40 toward Long Beach and on a county route connecting with Atlantic Highlands southwest of New Monmouth. These ratios are of special significance in considering pavement width and right-of-way width requirements. Eighty-four sections of highway throughout the State were found with ratios of peak to average traffic in excess of 300 percent.

The heaviest traffic volume was on U S 1 between Trenton and the Holland Tunnel which averaged more than 16,000 vehicles per day throughout its length. Other routes with average volumes greater than 5,000 per day include: N J 4, George Washington Bridge to Paterson; county road, West Caldwell to Belleville to Jersey City; county road, N J S–1, N J 6, and N J 9–W, Bayonne to Coxiesville to Alpine to the New York State line; U S 9–W and county road, Hoboken to Leonia to New York State line; N J 5–N and 24, Mount Tabor to Morristown to Newark; N J 29, Hillside to Somerville; U S 22, Elizabeth to Somerville to Phillipsburg; county road, East Rutherford to Paterson to Pompton to Lakeside; N J 27, Trenton to Newark; N J 35, South Amboy to Point Pleasant to Lakewood; N J 2, Harrison to the New York State line; U S 30 and county road, Camden to Atlantic City; N J S–41, Berlin to Palmyra; N J 6 and S–6, Fort Lee to Paterson to Delaware; county road between Fort Lee and junction with N J 6 west of Bogota; N J 25, New Brunswick to Bordentown to Camden; U S 130, Bordentown to Trenton; N J 42 and county road, Camden to Atlantic City; N J 23 and 8–N and county road, Newark to New York State line; a total of 20 sections or 675 miles of highway. There are over 1,000 trucks per day on 4 of these routes, with the largest average, 2,690 trucks per

[1] The full report prepared by the Bureau has been submitted to the New Jersey State Highway Department and will not be published or distributed by the Bureau of Public Roads.

FIGURE 1.—LOCATION OF TRAFFIC SURVEY STATIONS ON STATE AND IMPORTANT COUNTY HIGHWAYS.

FIGURE 2.—AVERAGE DAILY MOTOR VEHICLE TRAFFIC ON STATE AND IMPORTANT COUNTY HIGHWAYS.

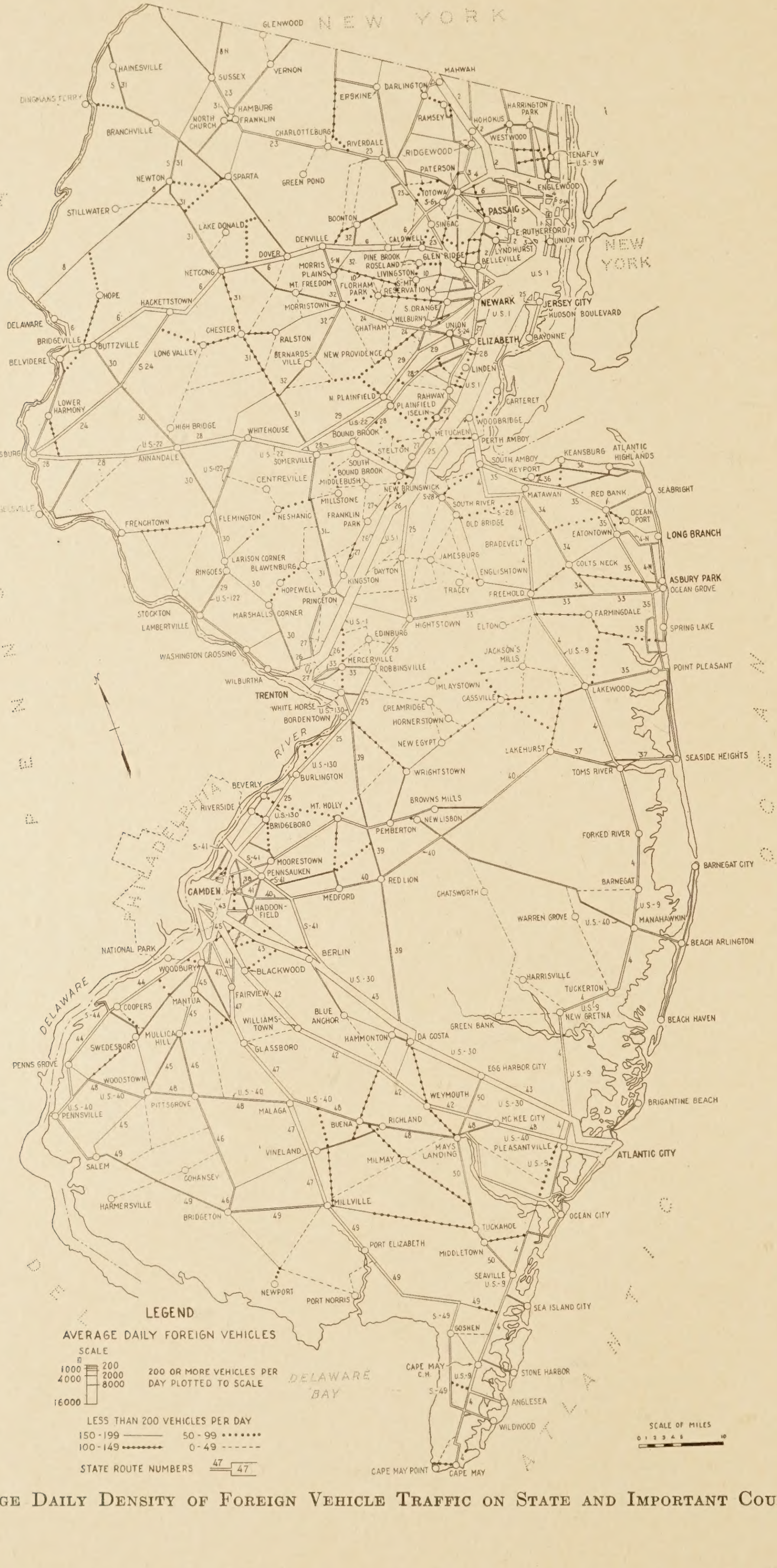


FIGURE 3.—AVERAGE DAILY DENSITY OF FOREIGN VEHICLE TRAFFIC ON STATE AND IMPORTANT COUNTY HIGHWAYS.

FIGURE 4.—AVERAGE DAILY DENSITY OF MOTOR TRUCK TRAFFIC ON STATE AND IMPORTANT COUNTY HIGHWAYS. NUMBER OF TRUCKS OF MORE THAN 1½ TONS CAPACITY ARE INDICATED BY SOLID BLACK WITHIN THE TRUCK FLOW BAND, AND ARE SHOWN ONLY FOR THOSE ROUTES WHERE DETAILED INFORMATION WAS OBTAINED IN THE FIELD. TRUCK CAPACITIES ON SECTIONS OF HIGHWAY WITHIN CLOSELY BUILT URBAN AREAS ARE NOT SHOWN WHERE INTERSECTIONS WITH CROSS ROUTES ARE FREQUENT.

day, on U S 1 between the High-Level Viaduct and Trenton.

Figure 2 shows the average daily traffic on State and important county highways.

Traffic volume was greatest in August—about 132 percent of that of the average month. Foreign traffic varied more widely than local traffic, the range being from 52 to 177 percent of that of the average month. Local traffic varied from a low of 77 percent in February to a high of 122 percent in each of the 3 months of June, July, and August.

Foreign traffic had a large daily variation from a low of 94 percent of the average on Tuesdays and Thursdays to a maximum of 206 percent on Sundays, as compared with a range of 92 to 122 percent for local traffic.

NEW JERSEY HIGHWAYS CARRY A LARGE VOLUME OF FOREIGN TRAFFIC

The average daily traffic density of foreign vehicles is shown in figure 3. Foreign vehicles averaged 18 percent of all observed vehicles. Nearly one-half (46 percent) of foreign vehicles were from New York, 41 percent from Pennsylvania, and not quite 13 percent were from other States. They follow well-known State and county highways and are most prominent on cross-State routes. Their volume has no fixed relation to total traffic. For example, U S 9–W from Jersey City to the northern New Jersey State line had a traffic of 11,821 vehicles per day, of which 26 percent was foreign, while the county road from West Caldwell to Jersey City—a direct connection from N J 6 to the latter city, though comparatively unknown to tourists—had practically the same traffic volume, and a percentage of foreign traffic of but 13. Similarly, U S 30 from Camden to Atlantic City, N J 6 and S 6 from Fort Lee to the Delaware line, each with an average traffic practically equal to that of N J 35 from South Amboy to Lakewood, carried 44 and 22 percent of foreign traffic as against 10 percent on N J 35.

THROUGH ROUTES CARRY LARGE VOLUME OF TRUCK TRAFFIC

The average daily density of motor truck traffic is shown in figure 4. Truck traffic in New Jersey was 12 percent of all motor traffic, although there was considerable variation in the percentages on different routes. For example, on the Pennsylvania Railroad ferries at Camden trucks were more than one-half of all traffic and on the Reading ferries, 44 percent. The heaviest truck traffic was found on U S 1, exceeding 1,200 trucks per day at all points except the by-pass around New Brunswick.

Figure 5 shows the average daily density of motor bus traffic.

INTENSIVE USE MADE OF STATE SYSTEM

The average daily traffic on the New Jersey State highway system was 4,659, of which 3,996 were passenger vehicles. This represents an annual use of the State system of 2,609 million vehicle-miles, or approximately 81 percent of the annual use of the Michigan trunk lines, although average use per mile in New Jersey is approximately four times that in Michigan.

Use per mile of the State system was greatest in Hudson, Union, Bergen, Camden, and Middlesex Counties—listed in order of magnitude. The average daily traffic was in excess of 8,000 vehicles in all five counties, with an average of 16,608 vehicles daily on State highways in Hudson County. Population per square mile is heaviest in these counties and follows the same order as the use of the highways. Hudson County has 16,063 persons per square mile and all of these counties, except Middlesex, have more than 1,000 persons per square mile. Average daily traffic was least in Cape May, Salem, and Sussex Counties, but in none of these does average traffic on State highways drop below 1,600 per day, indicating that even in counties of relatively light population density, usage of State highways is relatively high.

Foreign passenger cars constitute a much higher percentage of the total traffic on the New Jersey State highway system than they do in many other eastern States. For the whole State of New Jersey the percentage of highway use by foreign passenger cars was 24.3, as compared with 10.2 percent in Ohio and 10.8 in Michigan. This percentage is exceeded in several of the western States, but foreign passenger-car-miles in all such States are less than one-third of the amount in New Jersey.

Similar data were obtained on a portion of the county highways of New Jersey, but since only the important county routes were included in the survey, a direct comparison between State and county routes would be inaccurate. Although the coverage of county roads was incomplete some of the proportions are worth noting. Foreign passenger vehicles constituted 12 percent of the passenger vehicles on county roads, less than half the percentage found on the State system. A comparison of the density of passenger vehicle traffic on State and county roads in certain of the counties indicates the importance of certain county routes. In Essex County the figures are 4,838 passenger vehicles daily on State highways, and 5,987 on county roads. In Hudson, Monmouth, Passaic, and Salem Counties the averages for the county roads are close to those for the State highways.

Use of the State system by passenger cars originating in local and adjacent counties was 71.8 percent of the total use in Essex, Hudson, Union, Passaic, Morris, and Bergen Counties, and averaged 51.8 percent in the remainder of the State. Despite the large volumes of foreign traffic that pour through these counties, which are in the New York metropolitan area, the local use of the State system was nearly 40 percent more than in the rest of the State.

In the resort counties of Atlantic, Cape May, and Warren the percentage of use of the State system by foreign cars was 40.7, as compared with 22.7 percent for the remainder of the State. The significance of such foreign use is greatly increased when it is noted that both Atlantic and Cape May Counties are removed from adjacent States and that all foreign cars must pass through other counties to reach these two. Nearly 43 percent of the total travel in these two counties was by foreign cars. Warren County is adjacent to Pennsylvania and so receives large numbers of local trips by passenger cars with foreign plates.

Monmouth, Ocean, and Sussex are largely resort counties and are much more heavily patronized by New Jersey residents than by those from other States. The proportion of passenger car use of the State system in these three counties by residents of nonadjacent counties was 35.4 percent, as compared with 14.2 percent for the remainder of the State.

ORIGIN AND DESTINATION OF TRAFFIC AT PRINCIPAL STATE OUTLETS STUDIED

Nearly 125,000 motor vehicles entered or left New Jersey each day by way of 15 principal river crossings.

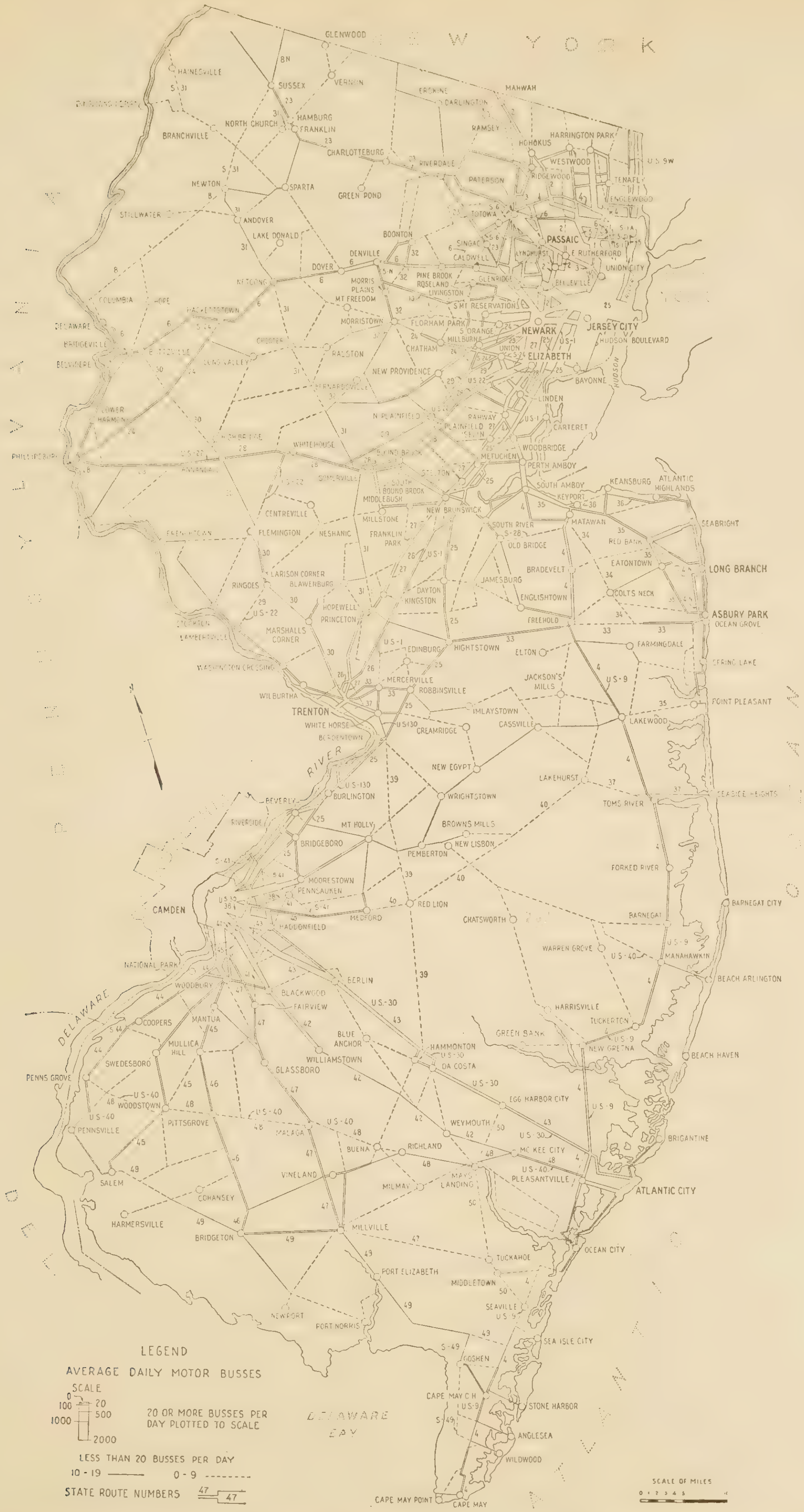
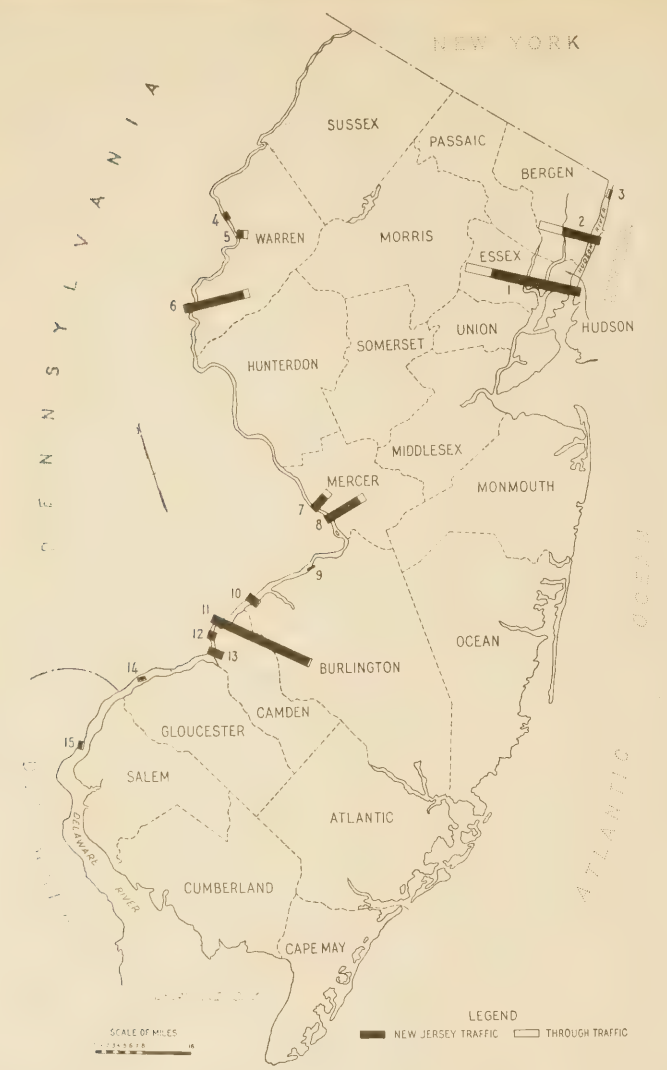


FIGURE 5.—AVERAGE DAILY DENSITY OF MOTOR BUS TRAFFIC ON STATE AND IMPORTANT COUNTY HIGHWAYS.



	Daily average traffic	Percent of total	
		New Jersey traffic	Through traffic
15 crossings, total	124, 277	83. 7	16. 3
Hudson River crossings			
1. Holland Tunnel	30, 036	18. 6	5. 6
2. George Washington Bridge	15, 840	7. 8	5. 0
3. Alpine-Yonkers Ferry	808	. 4	. 3
Delaware River crossings			
4. Columbia-Portland Bridge	952	. 7	(¹)
5. Delaware-Portland Bridge	2, 556	1. 2	. 9
6. Phillipsburg-Easton Bridge	16, 958	12. 5	1. 1
7. Trenton-Langhorne Bridge	6, 091	3. 6	1. 3
8. Trenton-Morrisville Bridge	11, 615	7. 8	1. 5
9. Burlington-Bristol Bridge	651	. 5	(¹)
10. Palmyra-Philadelphia Bridge	3, 443	2. 7	(¹)
11. Camden-Philadelphia Bridge	27, 491	21. 8	. 3
12. Camden-Philadelphia Ferry (Pennsylvania R. R.)	1, 938	1. 6	(¹)
13. Camden-Philadelphia Ferry (Reading R. R.)	3, 775	3. 0	(¹)
14. Bridgeport-Chester Ferry	762	. 6	(¹)
15. Pennsville-Newcastle Ferry	1, 361	. 8	. 3

¹ Less than $\frac{1}{10}$ of 1 percent

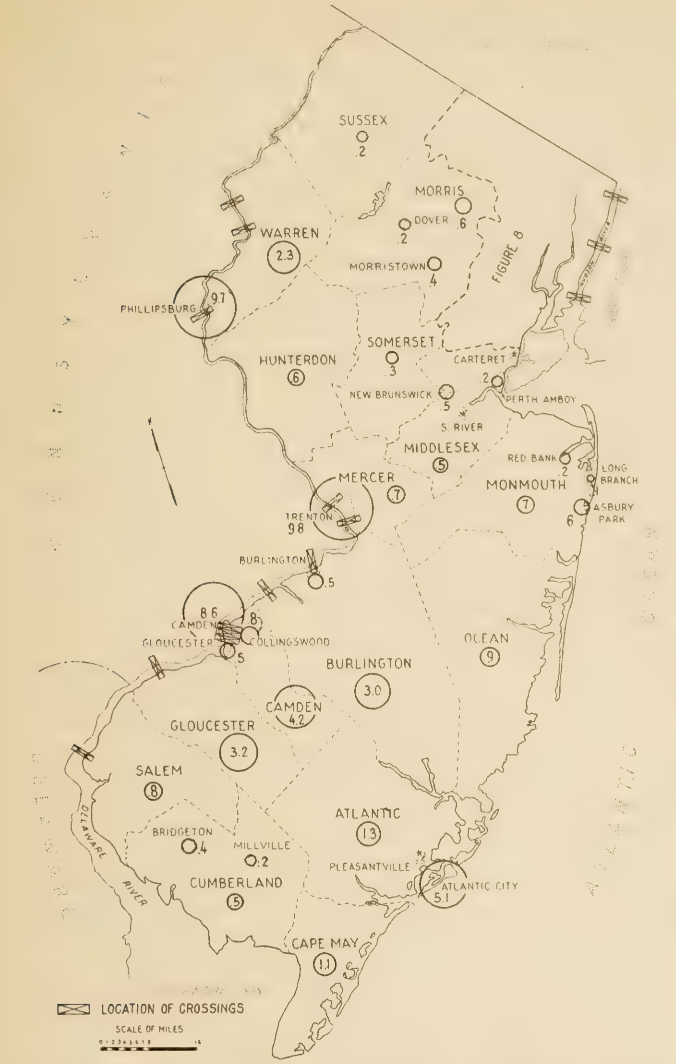
FIGURE 6.—TRAFFIC ORIGINATING OR TERMINATING IN NEW JERSEY AND THROUGH TRAFFIC USING HUDSON AND DELAWARE RIVER CROSSINGS.

About 47,000 crossed the Hudson River on the George Washington Bridge, the Holland Tunnel, or the Alpine-Yonkers Ferry, and nearly 78,000 crossed the Delaware River at 12 points. Twenty-nine percent of the cars which crossed the Hudson represented through traffic, originating at points outside of New Jersey and passing through the State without stop-over. In contrast only 9 percent of the vehicles crossing the Delaware passed through New Jersey without stopping, and 91 percent either stopped or started in New Jersey.

The location of each crossing, together with the amounts of through traffic and New Jersey traffic, are shown in figure 6. The total length of each bar represents the relative part of total traffic using the crossing, while the black portion represents New Jersey traffic and the white portion through traffic. Traffic through the Holland Tunnel was greater than that at any other crossing in respect to both total and through traffic. The George Washington Bridge, although carrying only a little more than half the total traffic volume of the Holland Tunnel, had almost as much through traffic as the latter.

Relatively more New Jersey traffic crossed the Camden-Philadelphia Bridge than at any other crossing, but through traffic was comparatively unimportant at this crossing. Traffic at the Phillipsburg-Easton Bridge was greater in volume than that at the George Washington Bridge but was almost entirely local—80 percent of it either originated or terminated in the county in which the crossing is located, and only 8 percent was through traffic. The Delaware-Portland Bridge carried 42 percent through traffic, a greater proportion than any other crossing. One-fourth of all vehicles crossing the Trenton-Langhorne Bridge had both termini outside New Jersey, and one-sixth of all cars crossing the Trenton-Morrisville Bridge were of this class. Through traffic was relatively unimportant at the Columbia-Portland, Burlington-Bristol, and Palmyra-Philadelphia Bridges, at both railroad ferries between Camden and Philadelphia, and at the Bridgeport-Chester Ferry. More than one-fourth of the traffic over the Pennsville-New Castle Ferry was through traffic.

The relative importance of the contribution of each New Jersey locality to the traffic traversing the 15 principal Hudson and Delaware River crossings is given in detail for each county and principal city in table 1. This information is also presented graphically in figures 7 and 8, in which the areas of the circles are proportional to the percentage of total traffic which originated or terminated in the designated cities and counties. The greatest percentage of this traffic centered in Camden County, where 14 out of every hundred vehicles entering or leaving New Jersey each day by way of these principal crossings either ended or began their journeys. Warren County was the origin or destination of almost 12 percent of all such traffic, 10 vehicles out of the 12 representing traffic to or from Phillipsburg. Mercer County, which accounted for 10.5 percent of total principal river-crossing traffic, is third in importance in this classification, with Trenton taking more than 90 percent of total county traffic. More than 9 percent of total river-crossing traffic was to or from Essex County, with Newark alone taking more than half that volume. Atlantic and Hudson Counties each accounted for more than 6 percent of



Areas of circles are proportional to percentage of total traffic originating and terminating in designated localities. An asterisk indicates localities for which traffic was less than 0.1 percent. Values for these localities are included in general county total wherever possible. No traffic was reported for cities or counties on left bank. Through traffic, neither originating nor terminating in New Jersey, is shown only in the table above.

Daily average number of vehicles using these crossings, 124,277

	Number	Percent
Through traffic	20, 282	16. 3
New Jersey traffic	103, 995	83. 7
Principal counties:		
Camden	17, 495	14. 1
Warren	14, 893	12. 0
Mercer	13, 056	10. 5
Essex	11, 342	9. 1
Atlantic	8, 000	6. 4
Hudson	7, 766	6. 3
Bergen	6, 186	5. 0
Total	78, 738	63. 4
Other counties	25, 257	20. 3

FIGURE 7.—AREAS SERVED BY FIFTEEN HUDSON AND DELAWARE RIVER CROSSINGS.

the total, and Bergen County, 5 percent. Traffic of Burlington, Gloucester, Passaic, and Union Counties each furnished between 2 and 4 percent of the total; Monmouth, Middlesex, Morris, Cumberland, and Cape May Counties, furnished between 1 and 2 percent each; and Ocean, Salem, Hunterdon, Somerset, and Sussex Counties furnished less than 1 percent each.

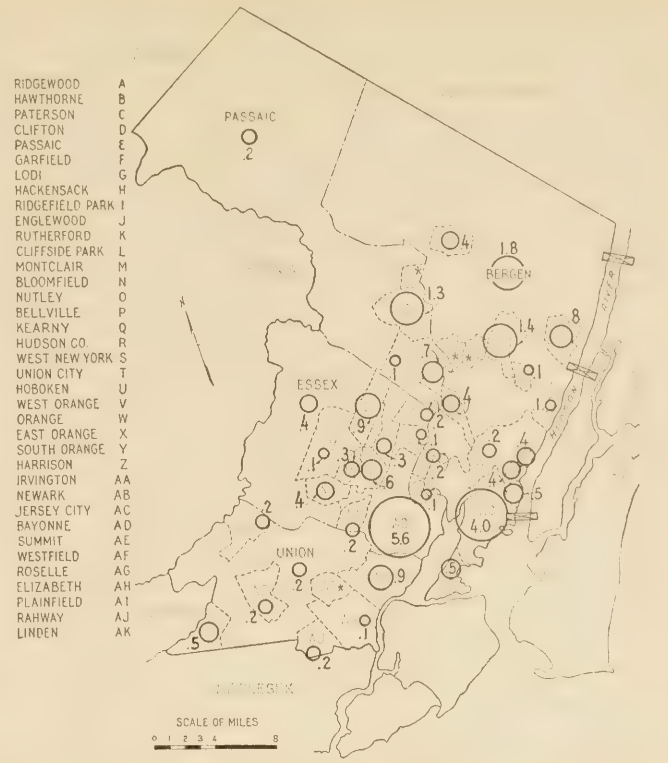


FIGURE 8.—AREAS SERVED BY FIFTEEN HUDSON AND DELAWARE RIVER CROSSINGS.

TRAFFIC FROM PRINCIPAL CITIES OF NEW JERSEY TO STATE OUTLETS STUDIED

The two chief factors which determined the route followed by traffic between outside States and certain New Jersey cities, by way of the principal Hudson and Delaware River crossings, were the proximity of the crossing to the city and the general nature and direction of the highways which connected them. The flow of average daily traffic to and from selected cities, shown in table 2, distinctly indicates this tendency. Figures for the 8 cities which have the greatest amount of traffic by way of the Hudson and Delaware River crossings here considered, are arranged in the general order of their location. The first 4 cities are in the Hudson River area, the next 3 on the Delaware, and the last on the Atlantic seaboard in the southern part of the State. Within the Hudson and Delaware River groups, the cities are arranged from north to south, Paterson and Hackensack being north of Jersey City and Newark, and Phillipsburg, Trenton, and Camden at about equal intervals from north to south on the Delaware, while Atlantic City is across the State southeast of Camden.

The Holland Tunnel and the George Washington Bridge are approximately the same distance from Paterson, but the highway to the bridge is much more direct. Hence almost half the Paterson traffic by way of Hudson and Delaware River crossings passed over the George Washington Bridge and something more than a third through the Holland Tunnel, which traffic, together with the small amount crossing on the Alpine-Yonkers Ferry, accounted for about seven-eighths of the total. Hackensack, on the other hand, which is about twice as far from the Holland Tunnel as from the George Washington Bridge, and is connected with both by equally good roads, received more than three-quarters of its river crossing traffic over the George Washington Bridge and about one-fifth through the Holland Tunnel.

TABLE 1.—*Daily average traffic using Hudson and Delaware River crossings analyzed by origin or destination*

Origin or destination	Daily average number of vehicles	Percent of total traffic
Total	124, 277	100. 0
Through traffic	20, 282	16. 3
New Jersey traffic	103, 995	83. 7
Sussex County, total	298	. 2
Passaic County:		
Clifton	167	. 1
Hawthorne	41	(1)
Passaic	830	. 7
Paterson	1, 622	1. 3
Other Passaic County	234	2. 2
Total	2, 894	2. 3
Bergen County:		
Cliffside Park	117	. 1
Englewood	933	. 8
Garfield	86	(1)
Hackensack	1, 735	1. 4
Lodi	68	(1)
Ridgefield Park	97	. 1
Ridgewood	489	. 4
Rutherford	498	. 4
Other Bergen County	2, 163	2 1. 8
Total	6, 186	5. 0
Warren County:		
Phillipsburg	12, 085	9. 7
Other Warren County	2, 808	2. 3
Total	14, 893	12. 0
Morris County:		
Dover	209	. 2
Morristown	443	. 4
Other Morris County	748	. 6
Total	1, 400	1. 2
Essex County:		
Belleville	189	. 1
Bloomfield	330	. 3
East Orange	755	. 6
Irvington	224	. 2
Montclair	1, 108	. 9
Newark	6, 926	5. 6
Nutley	196	. 2
Orange	382	. 3
South Orange	490	. 4
West Orange	188	. 1
Other Essex County	554	. 4
Total	11, 342	9. 1
Hudson County:		
Bayonne	665	. 5
Harrison	136	. 1
Hoboken	609	. 5
Jersey City	5, 035	4. 0
Kearny	211	. 2
Union City	456	. 4
West New York	460	. 4
Other Hudson County	194	. 2
Total	7, 766	6. 3
Hunterdon County, total	693	. 6
Somerset County, total	375	. 3
Union County:		
Elizabeth	1, 179	0. 9
Linden	132	. 1
Plainfield	565	. 5
Rahway	198	. 2
Roselle	79	(1)
Summit	215	. 2
Westfield	208	. 2
Other Union County	297	. 2
Total	2, 873	2. 3
Middlesex County:		
Carteret	43	(1)
New Brunswick	644	. 5
Perth Amboy	279	. 2
South River	49	(1)
Other Middlesex County	497	2. 5
Total	1, 512	1. 2
Mercer County:		
Trenton	12, 192	9. 8
Other Mercer County	864	. 7
Total	13, 056	10. 5
Monmouth County:		
Asbury Park	715	. 6
Long Branch	191	. 1
Red Bank	212	. 2
Other Monmouth County	896	. 7
Total	2, 014	1. 6
Burlington County:		
Burlington	657	. 5
Other Burlington County	3, 749	3. 0
Total	4, 406	3. 5
Ocean County, total	1, 174	. 9
Camden County:		
Camden	10, 641	8. 6
Collingswood	1, 032	. 8
Gloucester	607	. 5
Other Camden County	5, 215	4. 2
Total	17, 495	14. 1
Gloucester County, total	4, 024	3. 2
Atlantic County:		
Atlantic City	6, 396	5. 1
Pleasantville	74	(1)
Other Atlantic County	1, 530	2 1. 3
Total	8, 000	6. 4
Salem County, total	959	. 8
Cumberland County:		
Bridgeton	442	. 4
Millville	238	. 2
Other Cumberland County	611	. 5
Total	1, 291	1. 1
Cape May County, total	1, 344	1. 1

1 Less than 0.1 percent.
2 Includes cities for which traffic was less than 0. 1 percent.

Since the Holland Tunnel emerges in Jersey City, it is not surprising to find that 80 percent of the Jersey City river-crossing traffic passes through the tunnel, and about 13 percent over the George Washington Bridge, which is the second nearest principal crossing. Newark's nearest river crossing is also the Holland Tunnel and is connected with it by highly improved roads, with the result that 74 percent of its traffic is through the tunnel and 11 percent by way of the more distant George Washington Bridge. Hackensack is relatively near the George Washington Bridge and distant from the Holland Tunnel while the reverse is true of distances from Newark to the crossings. In both cases the percentages of traffic using the near and far crossings are about the same. Each city is also about the same distance from its next most important crossing, but almost twice as great a part of Hackensack's total traffic came from this secondary source. The greater importance of Newark as an industrial and commercial center, as well as its more direct accessibility to the principal crossings on the Delaware River, may explain a more general dispersion of its traffic with outside States than was found in the case of any other of the principal cities. Approximately half of Newark's daily traffic from river crossings other than the Holland Tunnel, came over the Hudson and the other half came over Delaware River crossings.

In marked contrast, the river-crossing traffic of Phillipsburg was confined almost exclusively to the Phillipsburg-Easton Bridge. Phillipsburg is not one of the larger cities of New Jersey, its population in 1930 being only 19,255. Its situation directly across the Delaware from Easton, Pa., which is about twice as large, and within 20 miles of Bethlehem and Allentown, Pa., both of which are of considerable importance industrially, accounts for an interchange of traffic over this principal river crossing similar to the shuttle-flow of traffic within the boundaries of a large city. On this account it is necessary to discount considerably the apparent importance of Phillipsburg as the point of origin or destination of a volume of river-crossing traffic which was exceeded only by similar traffic at Trenton. The traffic at Trenton is over its two important bridges, with 13 other crossings contributing small amounts.

As already indicated, the daily river-crossing traffic which originated or terminated at Trenton, averaging 12,192 cars a day, was greater than that of any other New Jersey city. Although Trenton is exceeded in population by Paterson, Newark, and Jersey City, it enjoys a unique position in being of historical interest, the State capital, an important industrial city, and it is at the head of tidewater navigation on the Delaware River. All of these factors contributed in varying proportion to its out-of-State traffic. Ninety-three percent of this traffic either entered or left the city by way of its two bridges across the Delaware, about 3 percent crossed the Hudson, and the remaining 4 percent used the other 10 Delaware River crossings.

As an important manufacturing and shipbuilding center directly across the Delaware from Philadelphia, and within the metropolitan area of Philadelphia, Camden is one of the most important New Jersey terminals of interstate highway traffic. More than 94 percent of Camden's traffic which came by way of Hudson or Delaware River crossings entered or left the city by one or another of the 3 principal crossings between Camden and Philadelphia; 73 percent of such traffic used the Delaware River Bridge; and the traffic from the Pennsylvania and Reading Railroad ferries amounted to more than 10 percent each. Almost half the remaining Camden traffic crossed the Palmyra-Philadelphia Bridge in going to or coming from Philadelphia, with the other 3 percent unevenly distributed among all other principal crossings.

Atlantic City is a middle Atlantic beach resort of widespread popularity. The daily ebb and flow of tourist traffic combined with the supplementary commercial traffic, a large part of which came from Phila-

TABLE 2.—*Daily average traffic which originates or terminates in designated cities using each principal Hudson or Delaware River crossing*

Crossing	Paterson		Hackensack		Jersey City		Newark		Phillipsburg		Trenton		Camden		Atlantic City	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Fifteen crossings, total	1,622	100.0	1,735	100.0	5,035	100.0	6,926	100.0	12,085	100.0	12,192	100.0	10,641	100.0	6,396	100.0
Hudson River crossings:																
Holland Tunnel	582	35.9	332	19.1	4,048	80.4	5,131	74.1	23	.2	292	2.4	97	.9	258	4.0
George Washington Bridge	803	49.5	1,314	75.8	651	12.9	781	11.3	4	(1)	56	.5	24	.2	44	.7
Alpine-Yonkers Ferry	23	1.4	30	1.7	24	.5	36	.5	(2)	(1)	3	(1)	1	(1)	2	(1)
Total	1,408	86.8	1,676	96.6	4,723	93.8	5,948	85.9	27	.2	351	2.9	122	1.1	304	4.8
Delaware River crossings:																
Columbia-Portland Bridge	9	.6	3	.2	6	.1	15	.2	2	(1)	2	(1)	1	(1)	(2)	(1)
Delaware-Portland Bridge	63	3.9	11	.6	78	1.5	185	2.7	55	.4	71	.6	15	.1	13	.2
Phillipsburg-Easton Bridge	73	4.5	13	.7	74	1.5	246	3.6	11,997	99.3	78	.6	8	.1	8	.1
Trenton-Langhorne Bridge	28	1.7	10	.6	60	1.2	220	3.2	1	(1)	3,347	27.4	6	(1)	3	(1)
Trenton-Morrisville Bridge	26	1.6	13	.7	58	1.2	215	3.1	2	(1)	8,048	66.0	40	.4	12	.2
Burlington-Bristol Bridge	1	(1)	------	------	1	(1)	5	(1)	(2)	(1)	21	.2	61	.6	26	.4
Palmyra-Philadelphia Bridge	2	.1	1	(1)	3	(1)	5	(1)	(2)	(1)	24	.2	288	2.7	754	11.8
Camden-Philadelphia Bridge	5	.3	5	.3	17	.3	44	.6	1	(1)	207	1.7	7,815	73.4	4,577	71.6
Camden-Philadelphia Ferry (Pennsylvania Railroad)	------	------	(2)	(1)	1	(1)	3	(1)	------	------	11	.1	1,082	10.2	46	.7
Camden-Philadelphia Ferry (Reading Railroad)	1	(1)	------	------	1	(1)	4	(1)	------	------	10	.1	1,123	10.6	226	3.5
Bridgeport-Chester Ferry	2	.1	------	------	5	.1	8	.1	------	------	10	.1	53	.5	142	2.2
Pennsville-New Castle Ferry	4	.3	3	.2	8	.2	28	.4	------	------	12	.1	27	.3	285	4.5
Total	214	13.2	59	3.4	312	6.2	978	14.1	12,058	99.8	11,841	97.1	10,519	98.9	6,092	95.2

1 Less than 0.1 percent.

2 Less than 1 vehicle a day.

delphia, explains the large volume of daily river-crossing traffic to and from this city. Almost 72 percent of this traffic entered or left New Jersey by the Delaware River Bridge at Camden, and about 12 percent by the Palmyra-Philadelphia Bridge. The Pennsville-New Castle ferry, the southernmost Delaware River crossing, carried 4.5 percent, and the Holland Tunnel carried 4 percent of such traffic. The Reading Railroad ferry at Camden and the Bridgeport-Chester ferry in Gloucester County, were the only other crossings carrying more than 1 percent of the Atlantic City total traffic, with all other crossings contributing something to its traffic.

CHARACTERISTICS OF TRUCK AND BUS TRAFFIC DETERMINED FROM SAMPLE COUNT

Trucks and busses were stopped and detailed information relating to their movement was recorded at 78 representative points throughout the State and at regular intervals during the year. Although information regarding only a part of total traffic was obtained, these sample data represented an average cross-section of truck and bus traffic in New Jersey at the time of the survey. Occasionally all the required information was not obtained and it may be found that figures for a given item of information in one tabulation differ slightly from those for the same item in another.

The following data relate to the selected sample of traffic passing over New Jersey highways and not to the actual number of individual vehicles of a certain type. For example, a bus making several trips a day would be counted as many times as it passed an occupied survey station. Statements regarding the proportions of various classes of vehicles refer to the sample of traffic under consideration, without taking account of the number of times an individual vehicle may be included therein. Thus, while it is correct to say that 30 percent of New Jersey bus traffic consists of 1929 model busses, this does not mean that 30 percent of the busses in New Jersey are 1929 models.

In the total sample, comprising 267,025 vehicles, there were 239,368 trucks and 27,657 busses, or almost 9 times as many trucks as busses. Approximately 53 percent of the total number of trucks and busses operated in the northeast section of the State adjacent to New York City, a large part of this section being included within the New York metropolitan area in New Jersey. The southwest section of the State, including the cities of Trenton and Camden and other districts in the neighborhood of Philadelphia, was traversed by about 22 percent of the total truck and bus traffic of the State, and the northwest and southeast sections, by about 10 and 15 percent, respectively.

Of the total sample of truck and bus traffic throughout the State, trucks represented 89.6 percent and busses 10.4 percent. In the northwest section, consisting of Sussex, Warren, Hunterdon and Somerset Counties, 91.6 percent of the combined traffic was by trucks, indicating a relatively greater transportation of commodities than passengers. On the other hand, in the southwest section which is traversed by a large part of the tourist traffic to New Jersey beach resorts, busses represented 11.8 percent of the combined truck and bus traffic of the section.

TRUCKS CLASSIFIED ACCORDING TO OWNERSHIP

Slightly more than half the trucks operating over New Jersey highways were owned by business organizations located in cities or towns of 2,500 inhabitants or more. Private individuals living in such urban areas owned 39 out of every 100 observed trucks. Trucks owned by persons living in rural districts or on farms represented less than 10 percent of the truck traffic, and trucks owned by governmental agencies represented only a little more than 1 percent. Table 3 shows the classification of trucks observed according to ownership.

The greater part of the northeast section of New Jersey is included within the New York metropolitan area. In this section trucks owned by city companies constituted a higher percentage than in any other part of the State. City companies owned about 57 out of each 100 trucks operating in this area. The companies were principally manufacturing and business organizations located within this district, but many trucks owned by New York firms as well as a smaller number owned

TABLE 3.—*Trucks observed on New Jersey highways, classified according to ownership*

Class of ownership	Number	Percent
Total, all classes	239, 368	100. 0
Farm ownership	22, 515	9. 4
Total city ownership	214, 228	89. 5
Company	121, 463	50. 7
Private	92, 765	38. 8
Government ownership	2, 625	1. 1

by establishments in Philadelphia and other cities were observed. Individuals living in northeastern New Jersey cities owned 36 percent of the trucks in the traffic sample, and were principally engaged in small businesses. Farm-owned trucks constituted about 7 percent of trucks operating in this area which has fewer farms than any other section of the State.

The northwest section of the State is largely a farming district, and its percentage of farm-owned trucks was almost twice as great as that of the northeast section. But even in this more rural district, 86 percent of observed trucks were city-owned.

The proportion of city-owned trucks operating in southeastern New Jersey was only slightly higher than that in the northwest section of the State, but there was a preponderance of company-owned trucks, which comprised almost 48 percent of truck traffic in this section. About 40 percent were privately owned. Although there are many business and industrial establishments in this district, the prevalence of company-owned trucks on its highways was partly due to the operation of trucks owned by large supply houses in New York City, Philadelphia, Camden, and other cities engaged in trucking to coast resorts. The farming industry is of considerable importance in this district and 11 percent of the trucks operating in this section were farm-owned.

The extensive rural areas in Burlington, Gloucester, and Salem Counties accounted for a large part of the 14 out of each 100 trucks operating in southwestern New Jersey which were farm-owned. This section had the smallest proportion of city-owned trucks, 84 percent being of this class, and these were almost evenly divided between company and private ownership.

OWNER-OPERATED TRUCKS MAKE UP GREATER PORTION OF TRUCK TRAFFIC

There are three principal classes of truck operation, if the small number of Government-operated trucks is included in the owner-operated class. The owner-operated class includes those trucks, whether of company, private, farm or Government ownership, which are operated by their owners either personally or by their employees in the business of the owner. Trucks operated as contract haulers are engaged in the business of trucking for others for hire, trips being made when and where desired at rates agreed upon by the contracting parties. Trucks operated as common carriers follow established routes between definite points, operate on a regular schedule, and charge standard published rates. Throughout the entire State, owner-operated trucks constituted 79 percent of the sample count, contract-hauler trucks 17.7 percent, common-carrier trucks 2.2 percent, and Government-operated trucks 1.1 percent.

Of the total volume of truck traffic included in the sample, almost two-thirds is State and a little more than one-third interstate traffic. This means that about 66 out of each 100 trucks have both their origin and destination within the State. In the northwest section of the State 42 percent of trucks were found to be operating in interstate traffic. This section of New Jersey lies in the path of traffic en route from central and western Pennsylvania to points in New Jersey, upper New York, or the New England States, and truck traffic between New York City and points in northern Pennsylvania, or beyond, also passes through this section. Only about 16 percent of trucks operating in the southeast section of New Jersey are engaged in interstate traffic.

Another analysis of the figures relating to trucks engaged in State and interstate traffic, according to class of truck operation, is given in table 4, and is also presented graphically in figure 9. In general, contract-hauler and common-carrier trucks operated more frequently in interstate traffic than did owner-operated trucks. This classification shows that 72.5 percent of owner-operated trucks were engaged in State traffic and that only 27.5 percent went outside of New Jersey. Among both contract-hauler and common-carrier trucks, only about one-third were engaged in State and two-thirds in interstate operation. Of the few Government-operated trucks recorded, 90 percent travel within the State and 10 percent between States.

TABLE 4.—*State and interstate traffic by class of truck operation*

Class of operation	Total traffic		State traffic		Interstate traffic	
	Number of trucks	Percent [1]	Number of trucks	Percent [2]	Number of trucks	Percent [2]
All classes, total	239, 368	100. 0	156, 732	65. 5	82, 636	34. 5
Owner operator	189, 159	79. 0	137, 152	72. 5	52, 007	27. 5
Contract hauler	42, 278	17. 7	15, 474	36. 6	26, 804	63. 4
Common carrier	5, 273	2. 2	1, 715	32. 5	3, 558	67. 5
Government operation	2, 658	1. 1	2, 391	90. 0	267	10. 0

[1] Percent of all classes of operation, total.
[2] Percent of total for each class of operation, respectively.

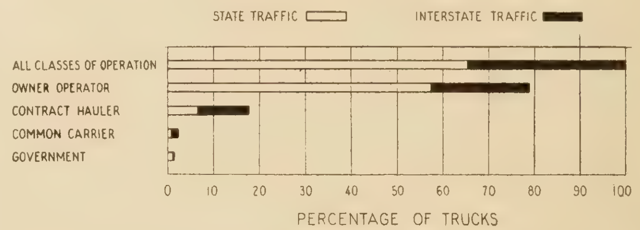


FIGURE 9.—PERCENTAGE DISTRIBUTION OF TRUCKS, BY CLASS OF OPERATION IN STATE AND INTERSTATE TRAFFIC.

TRUCKS CLASSIFIED ACCORDING TO COMMODITIES HAULED

Thirty-two percent of all trucks included in the New Jersey sample were running empty; 2.2 percent carried passengers; 65.7 percent carried commodities; and 0.1 percent had no load capacity, the latter group including chassis, tractors, or other vehicles without bodies designed for hauling loads. The loads carried by trucks were classified according to fixed commodity groups and the results are shown in table 5 and figure 10.

The loads of trucks classified according to type of operation are presented in table 6. Among trucks of the owner-operated class, 33 percent were found to be running empty, in contrast with about 30 percent of contract-hauler trucks, and only 12 percent of common-carrier trucks. Relatively more owner-operated trucks were found carrying passengers. It appears that there

TABLE 5.—*Nature of truck loads carried*

Nature of load	Number of trucks	Percentage of all trucks	Percentage by groups
All trucks, total	239,368	100.0	----------
No commodity or commodity not classified	82,328	34.4	100.0
Running empty	76,499	32.0	92.8
Carrying passengers	5,338	2.2	6.5
No load capacity	368	.1	.5
Loaded, commodity not classified	123	.1	.2
Commodity specified, total	157,040	65.6	100.0
Manufactured products, wholesale delivery, etc	87,437	36.4	55.7
Agricultural products	32,002	13.4	20.4
Retail delivery	17,595	7.4	11.2
Products of mines (coal, oil, etc.)	9,277	3.9	5.9
Household goods	5,156	2.2	3.3
Forest products (lumber, trees, shrubs, etc.)	4,073	1.7	2.6
State highway construction materials, etc	1,182	.5	.7
Valuables, mail, armored cars, etc	318	.1	.2

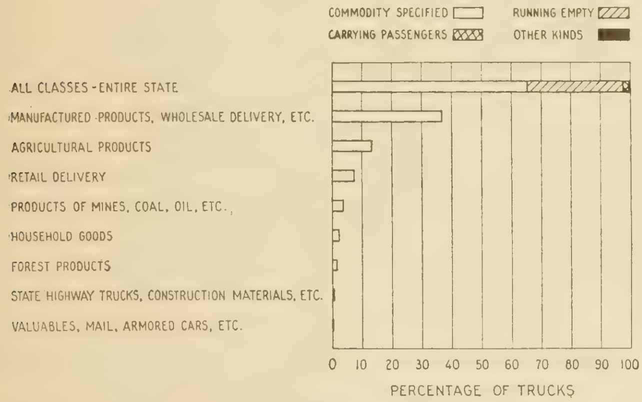


FIGURE 10.—PERCENTAGE DISTRIBUTION OF TRUCKS, BY NATURE OF LOAD CARRIED.

is less waste of truck capacity in common-carrier and contract-hauler operation than in owner operation. Owner-operated trucks carried a greater percentage of agricultural products, retail delivery, coal, oil, and forest products than either of the other two classes. In hauling these commodities the truck is usually loaded at a fixed point, deliveries are made, and the truck returns empty to the point of origin. In both contract and common-carrier hauling, on the other hand, trips are planned so as to have the truck loaded on both the outgoing and return trip whenever possible.

As shown in table 7, approximately 66 out of each 100 trucks were expected to bring back a return load; 31 were expected to return empty; 3 were not expected to return; and only 6 per 1,000 were expected to carry passengers, or had no load capacity.

CAPACITY OF TRUCKS STUDIED

Trucks observed in this survey were of many kinds and capacities, ranging from small roadsters of only a fraction of a ton capacity used for local light delivery to large trailer vans used for long-distance hauling. In order to reduce this great variety of sizes to a few comparable groups, trucks have been classified as light, medium, and heavy. Light trucks include all trucks of 1½ tons capacity and under; medium trucks include all trucks of capacities between 1½ and 5 tons; and heavy trucks include all trucks of 5 tons capacity and over. For the entire State, light trucks, including passenger cars used for delivery or other hauling, comprised 55.5 percent; trucks of medium capacity comprised 23.3 percent; and heavy trucks comprised 21.2 percent of the total.

TABLE 6.—*Nature of load carried by class of truck operation*

Nature of load	3 classes of operation		Owner operator		Contract hauler		Common carrier	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
All kinds, total	236,710	100.0	189,159	100.0	42,278	100.0	5,273	100.0
Running empty	76,034	32.1	62,840	33.2	12,569	29.7	625	11.9
Carrying passengers	5,006	2.1	4,831	2.6	158	.4	17	.3
No load capacity	354	.2	311	.2	43	.1	------	------
Loaded, commodity not specified	101	(1)	90	(1)	11	(1)	------	------
Commodity specified total [2]	155,215	65.6	121,087	64.0	29,497	69.8	4,631	87.8
Manufactured products, wholesale delivery, etc	86,624	[2] 55.8	63,137	[2] 52.2	19,297	[2] 65.4	4,190	[2] 90.5
Agricultural products	31,462	[2] 20.3	26,117	[2] 21.6	5,118	[2] 17.4	227	[2] 4.9
Retail delivery	17,617	[2] 11.3	17,246	[2] 14.3	323	[2] 1.1	48	[2] 1.0
Products of mines, coal, oil, etc	9,094	[2] 5.9	7,853	[2] 6.5	1,162	[2] 3.9	79	[2] 1.7
Household goods	5,100	[2] 3.3	2,694	[2] 2.1	2,442	[2] 8.3	64	[2] 1.4
Forest products, lumber, trees, shrubs, etc	4,039	[2] 2.6	3,670	[2] 3.0	360	[2] 1.2	9	[2] .2
State highway construction materials, etc	982	[2] .6	414	[2] .3	558	[2] 1.9	10	[2] .2
Valuables, mail, armored cars etc	297	[2] .2	56	(1)	237	[2] .8	4	[2] .1

[1] Less than 1/10 of 1 percent.
[2] Based on number of trucks for which commodity carried was specified.

TABLE 7.—*Nature of return load by class of truck operation*

Nature of return load	3 classes of operation		Owner operator		Contract hauler		Common carrier	
	Number	*Percent* [1]	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
All kind, total	236,710	100.0	189,159	100.0	42,278	100.0	5,273	100.0
Returning empty	72,612	30.7	57,688	30.5	14,080	33.3	844	16.0
Not returning	6,743	2.8	5,277	2.8	1,466	3.5	------	------
Carrying passengers	1,035	.4	872	.5	67	.2	96	1.8
No load capacity	369	.2	327	.2	42	.1	------	------
Returning loaded, total [1]	155,951	65.9	124,995	66.0	26,623	62.9	4,333	82.2
Commodity not specified	142,430	[1] 91.3	114,327	[1] 91.5	24,336	[1] 91.4	3,767	[1] 86.9
Commodity specified	13,521	[1] 8.7	10,668	[1] 8.5	2,287	[1] 8.6	566	[1] 13.1

[1] Based on number of trucks returning loaded.

It may be interesting to compare the capacities of trucks making up New Jersey traffic during 1932–33 with similar data compiled for other States during previous years. A survey of transportation on the State highway system of Ohio made in 1926, showed that 71.8 percent of all trucks were light capacity; 26 percent were medium capacity; and 2.2 percent were heavy capacity. The composition of New Jersey traffic is definitely affected by the large amount of heavy hauling to or from New York City and Philadelphia which lie at the termini of the principal traffic arteries of the State.

A survey of traffic on the Federal-aid highway system of 11 Western States was made during 1929–30 by the Bureau of Public Roads and the highway departments of the respective States. Nebraska, all the Mountain States except Montana, and the Pacific States were included in this survey. The classification of truck traffic of each of these States, according to the same capacity groups as those used for New Jersey, is presented in table 8.

A grouping of the truck capacities in New Jersey and the western States according to the percentage of farm and village ownership, as opposed to city ownership, indicates that the percentage of lighter trucks tends to increase with an increase in the percentage of farm and village ownership, while medium- and heavy-capacity trucks increase with an increase in city ownership, as shown in table 9. California stands alone as group 1, since it is the only one of the 11 western States for which the classification of trucks by ownership shows one-

Table 8.—*Percentage distribution of trucks in various States by capacity*

State	1½ tons and under	From 1½ to 5 tons	5 tons and over
	Percent	*Percent*	*Percent*
New Jersey, 1932–33	55.5	23.3	21.2
Ohio, 1926	71.8	26.0	2.2
11 western States, 1929–30	67.9	26.3	5.8
Arizona	64.7	31.8	3.5
California	58.6	30.2	11.2
Colorado	73.5	20.7	5.8
Idaho	72.5	20.8	6.7
Nebraska	74.4	24.1	1.5
New Mexico	79.8	18.7	1.5
Nevada	66.1	25.8	8.1
Oregon	63.1	30.9	6.0
Utah	77.2	20.1	2.7
Washington	64.6	27.0	8.4
Wyoming	78.3	19.9	1.8

third farm and village owned and two-thirds city owned. The second group is made up of Oregon, Utah, Arizona, Washington, Idaho, and Colorado, the relative percentages of ownership varying from about 40 to 60 percent farm and village ownership, with an average of 53.7 percent. The third group consists of Nebraska, New Mexico, Nevada, and Wyoming, for which the percentages of farm and village ownership range from 60 to 80 percent, with an average of 70.4 percent.

Table 9.—*Percentage of light and medium and heavy trucks compared with percentages of city and farm and village ownership*

	Average percentage of ownership		Average percentage of trucks	
	Farm and village	City	Light	Medium and heavy
New Jersey	9.5	90.5	55.5	45.5
Western States:				
Group 1	33.9	66.1	58.6	41.4
Group 2	53.7	46.3	69.3	30.7
Group 3	70.4	29.6	74.7	25.3

ONE-HALF OF TRUCKS MAKE ONE OR MORE TRIPS A DAY

The frequency of trips made by trucks over New Jersey highways ranged from a maximum of more than 10 trips a day to a minimum of only one trip at intervals of more than 30 days, as shown in table 10. Exactly one-half of the trucks made one trip or more a day, while the other half made trips at longer intervals. Of each thousand trucks observed 413 made one trip a day, 79 made from 2 to 5 trips a day, 7 made from 6 to 10 trips a day, and only 1 made more than 10 trips a day.

Table 11 shows the frequency of truck operation by classes of operation.

Table 10.—*Frequency of trips by class of truck operation*

Trip frequency group	3 classes of operation		Owner operator		Contract hauler		Common carrier	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*
All frequencies, total	236,710	100.0	189,159	100.0	42,278	100.0	5,273	100.0
More than 10 trips a day	251	.1	109	.1	133	.3	9	.2
6 to 10 trips a day	1,685	.7	1,157	.6	518	1.2	10	.2
2 to 5 trips a day	18,598	7.9	16,049	8.5	2,353	5.6	196	3.7
One trip a day	97,681	41.3	76,725	40.6	17,754	42.0	3,202	60.7
One trip every 2 days	33,354	14.1	25,418	13.4	7,037	16.6	899	17.0
One trip every 3 days	36,352	15.4	28,895	15.3	6,879	16.3	578	11.0
One trip every 4 days	1,197	.5	1,023	.5	160	.4	14	.3
One trip every 5 days	479	.2	386	.2	84	.2	9	.2
One trip every 6 days	780	.3	674	.4	104	.2	2	(1)
One trip every 7 days	38,203	16.1	32,108	17.0	5,784	13.7	311	5.9
One trip every 8 to 14 days	4,505	1.9	3,676	1.9	802	1.9	27	.5
One trip every 15 to 30 days	3,524	1.5	2,852	1.5	656	1.6	16	.3
Trips more than 30 days apart	101	(1)	87	(1)	14	(1)	------	------

[1] Less than 1/10 of 1 percent.

Table 11.—*Frequency of truck operation by classes of operation*

Class and frequency	Number of trucks	Percent	Average trip frequency
			Days
3 classes, total	236,710	100.0	3.03
More than 1 trip a day	20,534	8.7	.39
1 trip a day	97,681	41.3	1.00
Less than 1 trip a day	118,495	50.0	5.17
Owner operators, total	189,159	100.0	3.09
More than 1 trip a day	17,315	9.2	.40
1 trip a day	76,725	40.6	1.00
Less than 1 trip a day	95,119	50.2	5.27
Contract haulers, total	42,278	100.0	2.95
More than 1 trip a day	3,004	7.1	.34
1 trip a day	17,754	42.0	1.00
Less than 1 trip a day	21,520	50.9	4.91
Common carriers, total	5,273	100.0	1.87
More than 1 trip a day	215	4.1	.35
1 trip a day	3,202	60.7	1.00
Less than 1 trip a day	1,856	35.2	3.54

These same figures are presented in a different arrangement in table 12 for the purpose of showing the distribution of trucks in the respective trip frequency of groups among the various classes of operators. Nearly 80 percent of all trucks were operated in the business of owners; 17.4 percent were contract haulers; and only 2.8 percent were common carriers. The average trip frequency of these groups was 3.09 days, 2.95 days and 1.87 days, respectively, which means that common carriers as a class made the most frequent trips, contract haulers the next most frequent, and owner operators made the least frequent trips. Among trucks that made more than one trip a day, there was a considerably greater proportion of owner operators, 84.4 percent being of this class, but the average trip frequency for owner operators was less than that of either contract haulers or common carriers. Of the one-trip-a-day frequency group, owner operators represent the smallest percentage and there is a greater proportion of common carriers in this group than in any other group. Contract haulers appear in about the same proportion in both the one-trip-a-day and the less-than-one-trip-a-day groups. In the latter group, common carriers make trips more frequently and owner operators less frequently than any other class.

Table 12.—*Average trip frequency by class of truck operation*

Frequency and class	Number of trucks	Percent	Average trip frequency
			Days
All trip frequencies, 3 classes	236,710	100.0	3.03
Owner operator class	189,159	79.8	3.09
Contract hauler class	42,278	17.4	2.95
Common carrier class	5,273	2.8	1.87
More than 1 trip a day, 3 classes	20,534	100.0	.39
Owner operator class	17,315	84.4	.40
Contract hauler class	3,004	14.3	.34
Common carrier class	215	1.3	.35
1 trip a day, 3 classes	97,681	100.0	1.00
Owner operator class	76,725	78.3	1.00
Contract hauler class	17,754	17.6	1.00
Common carrier class	3,202	4.1	1.00
Less than 1 trip a day, 3 classes	118,495	100.0	5.17
Owner operator class	95,119	80.3	5.27
Contract hauler class	21,520	17.7	4.91
Common carrier class	1,856	2.0	3.54

MANY TYPES OF BODIES FOUND ON TRUCKS

A great variety of truck bodies is now seen upon our highways. Trucks are being adapted to many types of hauling requiring special equipment, of which the tank truck and the ready-mixed-concrete truck are familiar types. In the total volume of truck traffic in New Jersey, however, 7 out of every 8 vehicles used as trucks have a standard covered, stake, or open body. The covered truck was observed more frequently than any other type and represented 46.5 percent of all New Jersey truck traffic. Stake- and open- body trucks were in approximately equal proportions, comprising 21.4 percent and 19.8 percent of all trucks, respectively. Among the types which were found less frequently the truck with trailer appeared most often, about 5 percent being of this class. Tank trucks constituted 3.2 percent of New Jersey truck traffic and were in large part serving the extensive refining industry of the State. Trucks with unusual types of body occur less than 3 times in each 100 trucks, and one in every 100 vehicles classified as trucks was a passenger car used as a truck, often for retail delivery or other light hauling. Only 3 trucks per 1,000 had platform bodies. Table 13 shows the data on truck bodies in detail.

TABLE 13.—*Truck body types*

Type of body	Number of trucks	Percent of total
Covered	111, 376	48. 7
Stake	51, 078	22. 4
Open	47, 439	20. 8
Tank	7, 714	3. 4
Special body	6, 806	3. 0
Passenger cars (used to haul commodities)	2, 278	1. 0
Platform	764	. 4
Refrigerator	307	. 1
None (tractor without trailer)	290	. 1
Bus (used to haul commodities)	188	. 1
Total	228, 240	100. 0

ONLY 5 PERCENT OF TRUCKS HAULED TRAILERS

The extent to which trailers are used is shown in table 14. Passenger-car trailers are not included and no distinction is made between semitrailers and full trailers. Trailers are of relatively minor importance since 95 percent of all trucks operate without trailers. Only 1 truck in 20,000 hauled more than 1 trailer.

TABLE 14.—*Number of trailers observed*

Class	Number of trucks	Percent of total
All trucks, total	239, 368	100. 0
Without trailers	228, 240	95. 4
With 1 trailer	11, 117	4. 6
With 2 trailers	11	[1]

[1] Less than 1/10 of 1 percent.

80 PERCENT OF TRUCKS FOUND TO BE NOT OVER 5 YEARS OLD

The age of trucks operating in New Jersey at the time of this survey is shown in table 15 and figure 11. Since the survey was in progress from August 1932 to August

TABLE 15.—*Age of trucks*

Age	Number of trucks	Percent of total	Cumulative percentage
Less than 1 year (1933 model)	9, 337	3. 9	3. 9
1 year (1932 model)	33, 807	14. 1	18. 0
2 years (1931 model)	43, 540	18. 2	36. 2
3 years (1930 model)	40, 540	16. 9	53. 1
4 years (1929 model)	43, 012	18. 0	71. 1
5 years (1928 model)	22, 947	9. 6	80. 7
6 years (1927 model)	15, 596	6. 5	87. 2
7 years (1926 model)	11, 965	5. 0	92. 2
8 years (1925 model)	6, 979	2. 9	95. 1
9 years (1924 model)	4, 115	1. 7	96. 8
10 years (1923 model)	2, 725	1. 1	97. 9
11 and 12 years (1922–1921 models)	2, 519	1. 1	99. 0
13 to 15 years (1920–1918 models)	1, 639	. 7	99. 7
16 to 20 years (1917–1913 models)	612	. 3	100. 0
More than 20 years (earlier models)	[1] 35	[2]	
All ages, total	239, 368	100. 0	

[1] 10 of this number were models of years prior to 1910.
[2] Less than 1/10 of 1 percent.

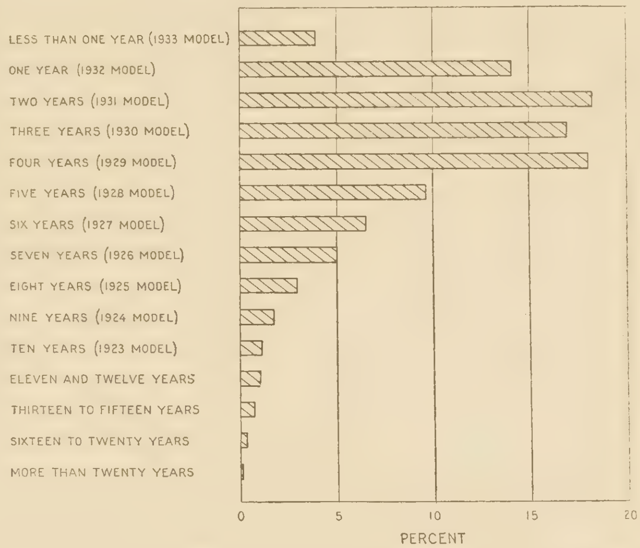


FIGURE 11.—PERCENTAGE DISTRIBUTION OF TRUCKS IN OPERATION IN 1932–33 BY AGE GROUPS.

1933 all trucks of the 1933 model are classified in the first age group as less than 1 year old. A 1932 model purchased in December of that year was not a year old at the latest date of this survey, but for the sake of simplicity and because the actual date of purchase of trucks was not known, all 1932 models were classified as 1 year old, and so on, for each of the other age groups. According to this classification, the median age, or an age so chosen that half the trucks are above and half below that age, is 3 years, 53 percent of all trucks being not more than 3 years old. The average life of a truck is probably about 5 years, although trucks depreciate more or less rapidly according to the nature of their construction and the kind of use to which they are put. Eighty percent of the trucks on New Jersey highways were not more than 5 years old. Ninety-nine percent of all trucks were not more than 12 years old, but a scattering of old-timers was observed, 4 trucks per 100,000 of those recorded being models of years prior to 1910.

NEEDED RESEARCH ON FLEXIBLE-TYPE BITUMINOUS ROADS[1]

By E. F. KELLEY, Chief, Division of Tests, Bureau of Public Roads

IN INTRODUCING a discussion of flexible-type bituminous roads it will be well to define first what is meant by the word "flexible." It is a term which is quite generally applied to road surfaces, without much regard to its exact meaning, to designate those types which have little or no flexural strength, as contrasted with the truly rigid types which have high flexural strength. Thus, a flexible-type surface may not be flexible in the true sense of the word but all surfaces of this type have the common characteristic of low beam-strength. Also, they have the ability, in varying degree, to adjust themselves to minor settlements without structural failure.

The function of a bituminous road surface of the flexible type is to carry the wheel loads of vehicles without failure of the bituminous wearing course, the base course, or the subgrade. These three component parts of a flexible type bituminous road are interdependent and the characteristics of each affect the performance of the whole.

MORE SATISFACTORY TESTS NEEDED FOR IDENTIFICATION OF BITUMINOUS MATERIALS

Subgrades.—During recent years great progress has been made in increasing our knowledge of soils and their use as subgrade materials. We have learned to differentiate with some precision between good subgrade soils and poor ones; we have learned something regarding frost action and the means for eliminating its detrimental effects; we are increasing our knowledge of the consolidation of fill materials; and, finally, we have learned much regarding the stabilization of soils, particularly by means of suitable combinations of soil materials. But soil science is still in its infancy and, in the larger sense, the research that is needed is barely under way. The possibilities of stabilization with admixtures of chemicals or bituminous materials are particularly promising.

Base courses.—What has been said with respect to subgrades is also generally applicable to base courses. Our knowledge of bases of the macadam type, which depend primarily on internal friction for stability, is largely the result of experience. But soil science, coupled with experience, has greatly extended our knowledge of the essential characteristics of such base-course materials as sand-clay, gravel, limerock, and caliche. Here, also, the possibilities of stabilization with other than soil materials merit careful investigation.

Bituminous wearing courses.—In bituminous wearing courses, as in subgrades and base courses, stability or resistance to lateral displacement is an essential characteristic. But here we have a part of the road structure in which other qualities are of increased importance. The wearing course is subjected to the direct action of traffic and weather. Adequate strength and durability of the mineral aggregate and durability of the bituminous binder are necessary.

Numerous investigations have developed valuable information regarding stability as affected by character and grading of mineral aggregate and character and quantity of bituminous binder. Further research on these materials is needed. The development of a test for stability, preferably a simple one, that will simulate the action of a paving mixture under wheel loads, would go far toward solving some of the questions that now confront the engineer.

With respect to mineral aggregates, much has already been learned regarding strength characteristics and durability, but further work remains to be done. The relative affinity of aggregates for water and for bitumen is a characteristic that has not yet received the attention it deserves.

The present question of pressing importance in the field of bituminous surfacing has to do with the durability of the bituminous material itself. The large programs of highway construction, involving a large mileage of the low-cost type, have focused attention on a problem that previously has not been of great concern.

It is known that some bituminous materials lack durability or resistance to weathering. In the road surface they soon lose their cementing properties and the friable mixture which results may fail rapidly under traffic. In the absence of a definite method of differentiating between good and poor materials, specification writers are now requiring compliance with test requirements which are primarily for the identification of the source of the material. While these requirements may exclude certain poor materials, they are so little a measure of quality that they may also exclude materials that are known to be satisfactory. There appears to be needed an accelerated weathering test which can be made in a few hours. Research on suitable test methods is under way and should be continued.

Inference should not be made that bituminous materials of low resistance to weathering are necessarily valueless. With a full realization of their limitations, economic considerations may sometimes dictate their use in preference to more expensive materials. It may be possible to use them advantageously in mixtures that are protected by weather-resistant wearing courses. However, we must have some means of identifying them so that they may not be used improperly.

RATIONAL METHOD FOR DESIGNING FLEXIBLE SURFACES NEEDED

The road structure.—We have learned much, both from practical experience and from research, regarding the design of the component parts of the flexible-type road. Concerning the design of the road structure as a whole we know very little except what has been taught us by experience. For roads of the rigid type the analyses of Westergaard, supplemented by research, have given us the basis for a rational theory of design applicable to concrete pavements. For roads of the flexible type no rational method of design exists and rule-of-thumb methods are still used. Attempts have been made to develop a rational theory but these are based on questionable assumptions of such far-reaching importance that they can scarcely be accepted without verification by further research.

From the structural standpoint, the function of a pavement of the flexible type is to distribute the wheel

[1] Presented before Highway Research Board on Dec. 7, 1934, as an introduction to a symposium on flexible-type bituminous roads.

load to the subgrade in such manner that the intensity of pressure will cause neither permanent nor elastic deformations of the soil sufficient in magnitude to produce failure of the pavement surface. The rational design of a pavement to perform this function requires a knowledge of the mechanics of load support. The characteristics of the applied loads, the magnitude and distribution of the forces of subgrade reaction, and the physical behavior of the pavement under these two sets of forces must be determined.

This problem is of outstanding importance. Its complicated nature is indicated by the following brief analysis of some of its details.

The more important variables which must be considered are:

1. The magnitude of the load.
2. The position of the load on the pavement.
3. The area of load application and the distribution of pressure over the loaded area.
4. The time duration of loading.
5. The thickness of the pavement (base course plus wearing course).
6. The internal stability of both base and wearing courses.
7. The distribution of pressure on the subgrade.
8. The supporting power of the subgrade.

The vehicle load, which is important in the design of any pavement, is known to be the maximum wheel load. Within resaonable limits the maximum wheel load likely to operate over a given road can be determined. This, of course, is the maximum static load and must be considered since heavy vehicles may stop on the highway surface for considerable periods of time. The impact forces produced by the wheels of moving vehicles must also be considered since these are greater than the forces due to static wheel loads and may exceed them many times. Researches extending back over the past 15 years make it possible to predict, with a fair degree of accuracy, the magnitude and frequency of the impact reactions that may be expected for specific conditions of wheel load, tire equipment, vehicle speed and road roughness.

The position of the applied load on the pavement is also a factor which must be considered. A load applied near the free edge of the pavement will have a different effect from that of one applied in the interior portion where continuity exists. Rational design requires that there be equal resistance to load in all parts of the structure and this can be obtained only by systematic study of the mechanics of pavement action.

The area of load application and the distribution of pressure over the loaded area are two separate though related factors. The effect of the area of load application has been quite thoroughly investigated with respect to the design of concrete pavement slabs. It seems quite probable that not only the size but the shape of the loaded area may be an even more important factor in its relation to flexible pavements. The effect of variations in intensity of pressure over the loaded area is also a detail which must be investigated.

Between standing or static loads, slowly rolling loads, and suddenly applied impact forces there is a difference in time duration which is probably quite important in flexible-type pavements. For example, under certain conditions it is very probable that a standing vehicle of given wheel load may subject the pavement to a more severe condition than will the same vehicle moving at speed and producing impact reactions greatly exceeding the static wheel load. Certainly the factor of time duration of the load application is one of the important details to be investigated in the development of a rational method of design.

The ultimate object in developing a theory of design is the determination of the required thickness of pavement. The supporting power of the flexible-type pavement is intimately related to its thickness, and researches designed to develop basic principles will necessarily include thickness as one of the variables of major importance.

ONLY FRAGMENTARY INFORMATION AVAILABLE ON LOAD DISTRIBUTION

The stability of the base course and the bituminous wearing course have already been mentioned. Stability in the wearing course is necessary to prevent surface failures such as shoving and rutting. Stability in the base course is necessary for the distribution of load to the subgrade. The combined stability of these two component parts of the road structure is another one of the major variables that will require intensive study. It appears that one of the important problems to be solved is the development of a suitable method for measuring this combined stability in road surfaces.

The distribution of load to the subgrade is doubtless affected by all the variables that have been mentioned as well as by the elastic characteristics of the subgrade itself. Only fragmentary information exists regarding load distribution, and very comprehensive investigations will be required to evaluate the many variables involved.

Assuming that research has solved all the problems that have been enumerated thus far, there is still the problem of determining the supporting power of the subgrade. The supporting power of a soil, or its resistance to distortion under load, is dependent on the resisting forces of internal friction and cohesion. The relative importance of each and the net result of their combined action varies widely, depending upon conditions. Subgrade research has already suggested means for increasing the load-carrying ability of soils. Needed in the development of methods of pavement design is some test which, when applied to a given subgrade, will determine the pressure intensity that can safely be imposed on the soil.

Past investigations of the bearing capacity of soils have related primarily to the foundations of buildings or other structures in which dead load is the principal burden. Therefore, the theories which have been developed from these investigations may not be applicable to pavements, where the conditions differ in two important respects. Under a structure the load is practically constant, while under a pavement the transient live load is the principal burden on the soil. Furthermore, under buildings it is permissible to anticipate foundation settlements which, if they occurred under a wheel load, would cause pavement failure. For these reasons, the requirements of a test to determine the safe bearing capacity of subgrades may be somewhat different from those of a test to determine the bearing capacity of soils in deep foundations.

It is apparent that the flexible-type bituminous road offers a fertile field for future research. The experience of the past few years justifies the expectation that further rapid progress will be made in advancing our knowledge of subgrades, bases and bituminous wearing courses. The most urgent need is for research aimed at the development of a rational method of design of the road structure as a whole.

ROADSIDE PLANTING SURVIVES DROUGHT

By J. M. HALL, Landscape Engineer, Iowa State Highway Commission

ROADSIDE IMPROVEMENT was first initiated on Iowa highways during the spring of 1934, financed with funds provided by the National Recovery Act. The Iowa highway commission selected as the first project a section of Primary Road No. 15 extending north from Ames 32 miles to the junction with U S 20 at Blairsburg. This road had recently been constructed and for the greater part of its length has a 100-foot right-of-way.

The general plan for grading and planting is an informal development tending to restore the natural character of the Iowa countryside. Backslopes and ditches were rounded; unsightly refuse dumps were eliminated; and several varieties of native trees, shrubs, and vines were planted. It is hoped that the final result will be an attractive roadside, blending with the adjacent topography and with existing plants.

Surveys, plans, and estimates were prepared in February and March 1934 and preliminary clearing and grubbing were started early in March prior to the completion of plans.

Planting began about May 1, immediately upon arrival of the nursery material. All stock was inspected in the nursery before contracts were awarded, and checked again upon delivery. Native Iowa peat was used as a fertilizer and mulch on the entire project.

The possibility of a dry spring and summer seemed to warrant the use of a liberal amount of peat. No accurate record was kept of the amount of peat used, but a conservative estimate is that 30 percent of the backfill was peat which was mixed with the existing soil; in addition a 2-inch layer of peat was used for mulching. The shade and flowering trees were given a close pruning to cut down moisture loss by transpiration. These two treatments, together with two complete waterings, were probably the determining factors in saving these plants through the period of drought. It is interesting to note that even after dust storms and extremely hot winds there was a sufficient supply of moisture around the plant roots 2 weeks after watering.

The preliminary survey revealed that the majority of plants would necessarily be located in areas stripped of topsoil. Because of the poor soil, late planting, and possible dry weather it was thought that plant loss might run as high as 25 percent. The spacing between plants was therefore made somewhat smaller than otherwise would have been made. The results show the plant losses to be approximately as estimated with the exception of losses of the shade trees and evergreens. These two kinds of trees survived the adverse conditions better than was expected, contrary to the usual experience in this part of the country. The use of labor unfamiliar with planting work caused some difficulty and probably resulted in some losses that otherwise could have been avoided. Table 1 shows the varieties planted and the percentage of survival at the end of the growing season last fall.

On delivery from the nursery all plants, with the exception of balled and burlapped trees, were puddled in a thick clay loam mixture and then heeled in. Each plant was watered in the temporary nursery and again puddled before being dispatched to the planting forces. A covered truck was used for transportation to the site of planting to prevent drying, as the wind was unusually hot and dry at planting time. An effort was made to order only sufficient material from the heeling in nursery each day for 1 day's planting to avoid carrying unplanted stock over-night. Watering was done with two tank trucks. Each truck was equipped with a hand-operated force pump between tank and hose, and the hose was fitted with a 2-foot length of gas pipe for a nozzle. This nozzle was pushed down to the bottom of the original excavation and water was pumped until it soaked up to the surface. This method prevented the washing of large holes around the plant and made less work in renewing the mulch on top.

TABLE 1.—*Percentage of survival of plants at end of first growing season*

	Number planted	Percentage of survival
Shade trees (1 to 2 inches in diameter at planting):		
Sugar maple (acer saccharum)	82	100
Hackberry (celtis occidentalis)	115	88
White ash (fraxinus americana)	27	96
Black walnut (juglans nigra)	36	72
American sycamore (platanus occidentalis)	66	92
Pin oak (quercus palustris)	78	80
American elm (ulmus americana)	536	91
Evergreens (4 to 5 feet in height at planting):		
Scotch pine (pinus sylvestris) [1]	15	93
White pine (pinus strobus) [1]	3	100
Small flowering trees (2 to 5 feet in height at planting):		
Red bud (cercis canadensis)	190	100
Thicket hawthorn (crataegus coccinea) [2]	89	81
Washington hawthorn (crataegus cordata) [2]	16	100
Cockspur thorn (crataegus crusgalli) [2]	80	89
Red haw (crataegus mollis) [2]	85	80
Sweet crab (malus coronaria)	30	53
Flowering crab (malus floribunda)	50	26
Prairie crab (malus ioensis)	355	48
Wild plum (prunus americana)	40	96
Purple plum (prunus pissardi)	173	74
Pussy willow (salix discolor)	172	41
Laurel leaf willow (salix pentandra)	75	16
Cathay crab (malus . oensis cathay)	15	87
Shrubs:		
Red dogwood (cornus alba sibirica)	590	14
Alternate dogwood (cornus alternifolia)	10	0
Gray dogwood (cornus paniculata)	655	26
Yellow dogwood (cornus stolonifera lutea)	175	7
Wahoo (euonymus atropurpureus)	150	93
Fragrant sumac (rhus canadensis)	730	77
Smooth sumac (rhus glabra) [3]	2, 285	72
Staghorn sumac (rhus typhina) [3]	405	69
Meadow rose (rosa blanda)	215	83
Virginia rose (rosa lucida)	125	78
Jap rose (rosa multiflora)	350	44
Prairie rose (rosa setigera)	145	95
American elder (sambucus canadensis)	185	79
Coralberry (symphoricarpos vulgaris)	2, 647	62
Wayfaring tree (viburnum lantana)	275	56
Nannyberry (viburnum lentago)	215	24
Vines:		
Virginia creeper (ampelopsis quinquefolia)	50	50
Bittersweet (celastrus orbiculatus)	715	78
Matrimony vine (lycium chinense)	480	99

[1] Balled and burlapped.
[2] About half received balled and burlapped.
[3] Collected stock.

In the fall all plants were pruned by an experienced workman. The plants are now in shape to start a directed growth and little maintenance will be required for another year.

Few conclusions can be drawn from the results shown to date. The plant varieties used will, in many instances, serve as experiments which will be helpful in planning future roadside work. This report deals only with experience with new planting during an abnormally dry year and is not indicative of general adaptability to roadside use. However, the care and methods used in planting seem to merit their continued use.

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION

AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

CLASS 1.—PROJECTS ON THE FEDERAL-AID HIGHWAY SYSTEM OUTSIDE OF MUNICIPALITIES

AS OF MARCH 31,1935

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 16, 1933 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	$ 3,947,753	$ 2,129,921	$ 5,788,947	$ 3,137,314	$ 35,889	311.7	$ 2,173,060	$ 733,587	$ 840,130	133.0	$ 57,928	$ 422,187	19.3	$ 18,924	$ 831,715
Arizona	3,878,555	1,338,712	4,371,570	3,697,024	75,187	299.0	1,105,498	159,724	903,326	73.8		249,673	17.8	21,808	110,526
Arkansas	3,334,167	1,714,000	2,994,549	2,388,356	137,100	154.8	1,855,221	798,211	791,679	74.5	39,563	384,472	15.9	108,037	400,748
California	7,912,928	3,713,643	9,264,016	6,955,132		277.5	4,123,249	957,601	1,897,200	122.1		667,585	28.8	195	1,148,857
Colorado	3,437,265	2,424,504	3,950,311	3,332,568	515,300	185.1	1,913,760	67,121	1,736,717	95.3	18,307	172,487	6.7	19,269	
Connecticut	1,404,213	607,500	797,612	795,279		14.5	1,324,901	608,934	453,399	21.7		126,327	1.8		27,774
Delaware	877,566	461,697	1,052,795	868,470	177,572	42.1	287,746		274,891	6.8	8,734			362	9,234
Florida	2,469,370	1,116,600	3,076,359	2,249,668		115.8	972,872	194,891	727,825	35.7		67,730	.4	24,811	321,045
Georgia	5,045,592	2,556,745	3,669,629	3,471,969		252.9	2,603,644	1,407,053	1,161,590	129.1	58,578	385,213	31.0	107,992	1,009,942
Idaho	2,166,858	1,131,910	2,134,554	1,961,230	107,294	186.0	614,395	171,151	425,881	37.0	25,000	86,565	8.8	9,477	512,171
Illinois	4,442,467	3,060,041	1,994,217	1,957,517	19,269	38.2	3,301,037	2,421,646	879,391	51.3	36,045	952,525	18.2	27,259	1,208,855
Indiana	5,018,921	2,816,687	3,261,636	3,220,336		106.1	2,164,158	1,639,608	523,839	52.7	58,760	1,991,746	129.9	100,217	301,103
Iowa	5,027,830	2,217,361	4,814,486	4,597,019	54,420	288.6	2,138,416	390,400	1,634,873	121.9		484,574	25.5	40,411	43,495
Kansas	5,044,802	2,354,131	5,326,052	4,950,741	206,992	577.7	1,838,085	56,400	1,781,320	164.2		365,819	13.0	37,661	
Kentucky	3,751,605	1,527,324	3,621,058	3,349,367	33,571	244.3	762,859	363,396	329,247	58.1	21,000	532,536	37.2	17,842	631,970
Louisiana	2,710,135	1,380,419	1,831,624	1,826,216		75.1	2,072,324	820,107	738,415	15.5	45,353	421,633	15.3	18,459	220,370
Maine	1,617,560	793,644	1,358,189	1,323,504		43.8	802,573	239,455	563,118	13.5	17,142	204,636	6.8	37,459	25,890
Maryland	1,782,263	289,609	808,265	791,495	16,517	15.3	964,455	758,097	206,358	21.5	39,135			193,536	66,735
Massachusetts	1,101,716	1,632,874	1,403,571	1,010,595		37.4	546,799	52,687	442,290	9.2		538,520	10.1	38,434	652,064
Michigan	6,051,532	3,226,284	4,819,084	4,676,672		223.4	3,221,325	1,348,200	1,858,325	126.2		990,550	37.6	26,661	377,409
Minnesota	4,561,011	2,642,244	5,652,988	4,337,933	1,198,010	869.6	913,868	179,056	683,012	125.1		595,121	69.9	44,021	166,100
Mississippi	3,489,337	2,832,182	4,466,193	2,396,927	87,605	230.7	2,534,648	916,171	875,532	136.5	102,503	911,917	61.5	73,735	957,127
Missouri	5,237,532	2,132,426	4,641,195	4,103,568		187.9	2,910,307	1,065,079	1,624,109	77.1		368,429	17.7	68,886	139,888
Montana	4,463,849	2,714,208	5,463,559	4,444,343	473,230	426.3	1,835,098	4,129	1,762,011	173.3		326,627	36.4	15,377	152,340
Nebraska	3,914,481	1,982,182	5,102,140	3,868,837	54,009	366.8	2,069,944	23,149	1,656,146	92.3	11,046	229,004	15.6	11,449	43,022
Nevada	2,909,387	1,350,356	2,878,778	2,689,588	131,852	272.1	677,847	91,948	585,899	97.6	92,734	315,883	42.9	35,117	316,722
New Hampshire	692,119	484,731	638,684	612,389		10.8	524,341	79,730	422,874	12.5		18,673			43,184
New Jersey	3,173,019	951,379	1,711,231	1,691,699		31.6	1,766,328	1,472,042	105,129	18.0		466,246	3.0	9,279	380,004
New Mexico	2,846,648	1,676,769	3,033,052	2,760,948	128,175	297.5	1,258,400	85,700	1,101,806	96.6					446,788
New York	10,465,672	3,748,600	10,438,447	8,528,190	168,930	211.6	7,889,958	1,844,670	2,829,030	136.9		374,950	11.2	92,813	375,690
North Carolina	4,761,147	2,040,068	4,597,102	3,538,534	207,673	578.1	1,388,466	684,321	428,862	150.1	184,337	244,600	25.3	353,955	1,158,932
North Dakota	2,902,224	1,469,484	3,130,825	2,641,961	60,698	1,023.9	370,290	52,853	244,802	138.8	65,172	537,494	291.2	142,239	626,489
Ohio	7,277,758	3,539,256	7,439,668	7,041,589		192.4	2,913,930		2,587,065	59.3	93,600	427,500	11.4	142,569	524,690
Oklahoma	4,608,399	2,342,590	4,050,182	3,893,618	61,708	290.6	2,446,342	706,289	1,557,777	101.8	5,228	151,103	5.7	3,263	572,003
Oregon	3,053,448	1,452,741	3,293,723	3,002,596	8,928	182.8	1,366,101	10,790	1,280,914	60.2		26,403	.9	40,062	136,497
Pennsylvania	6,691,194	4,554,082	5,820,309	5,493,801	100,985	123.2	4,936,181	1,108,705	3,611,625	86.3	2,126	675,357	11.6	86,562	166,115
Rhode Island	979,367	464,572	968,005	899,627		20.5	542,465	46,205	414,131	13.6		25,194	.7	33,535	25,247
South Carolina	2,729,583	1,385,477	2,299,905	2,239,577		198.2	833,606	371,161	462,445	71.1	20,920	1,637	.1	97,925	921,395
South Dakota	3,005,739	1,523,821	2,729,908	2,219,422	46,543	458.5	795,486	588,537	185,542	186.5	125,166	875,077	137.1	72,614	416,659
Tennessee	4,246,309	2,105,453	4,618,926	3,931,870	64,152	182.7	1,416,530	236,562	1,083,566	46.3	48,798	244,625	7.7	29,078	713,111
Texas	11,588,643	6,858,253	11,732,477	11,189,217	27,364	998.1	4,396,559	363,560	3,844,088	348.1		1,329,523	98.4	35,866	1,657,278
Utah	2,367,205	1,066,345	2,768,227	2,277,255	365,500	237.8	797,662	84,632	502,487	61.6		8,000	.2	5,318	190,358
Vermont	928,184	466,042	970,709	909,613	28,464	47.9	277,219	10,670	249,114	13.9		166,538	5.4	7,901	21,926
Virginia	3,708,379	1,882,693	3,600,369	3,342,567	28,568	151.6	1,673,721	153,288	1,423,549	65.7	123,412	193,721	25.7	89,111	236,856
Washington	3,057,934	1,553,206	2,776,537	2,558,858	196,077	99.4	1,630,765	464,108	1,005,609	29.5	1,485	80,535	.8	33,482	270,985
West Virginia	2,013,405	1,140,167	1,930,305	1,851,481	60,892	71.2	554,635	111,669	426,074	20.0		286,931	9.2	50,255	366,271
Wisconsin	4,697,513	1,751,970	4,398,085	4,272,869	3,324	213.1	1,195,677	239,442	856,992	59.0	134,828	615,848	31.1	50,379	275,807
Wyoming	2,250,663	1,686,368	2,435,315	2,038,652	228,127	488.4	1,244,177	209,202	1,008,808	162.0		293,125	62.6	2,809	156,308
District of Columbia															
Hawaii	1,693,344	598,778	344,446	248,384		12.4	1,838,793	1,438,169		27.2				6,791	598,778
TOTALS	185,336,596	94,890,049	180,269,814	155,586,385	5,109,925	11,965.0	87,785,721	25,830,106	50,988,812	4,030.0	1,436,900	18,834,839	1,407.4	2,483,205	19,956,473

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION

AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

CLASS 2.—PROJECTS ON EXTENSIONS OF THE FEDERAL-AID HIGHWAY SYSTEM INTO AND THROUGH MUNICIPALITIES

AS OF MARCH 31, 1935

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 16, 1933 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	$ 2,389,928	$ 1,064,961	$ 1,570,382	$ 1,570,269		38.5	$ 780,472	$ 671,058	$ 109,414	28.2	$ 101,345	$ 170,138	3.6	$ 47,255	$ 785,408
Arizona	807,982	305,191	627,286	613,556	$ 8,996	12.3	58,592	20,500	28,309	1.6	129,322		.2	44,604	267,886
Arkansas	1,964,534	857,025	1,553,688	1,454,881		40.6	472,541	379,392	92,849	6.9	101,076	342,738	8.7	29,185	421,439
California	4,213,986	2,219,360	3,955,814	3,410,067		46.7	2,174,878	789,009	1,072,832	17.9		607,200	6.5	14,909	539,328
Colorado	1,718,633	190,000	1,764,404	1,693,970	13,406	35.9	176,594		176,594	3.2				24,663	
Connecticut	802,407	426,500	809,564	798,075	6,949	10.3	137,740		137,740	1.2		36,796	.4	4,332	245,016
Delaware	460,409	230,849	516,399	460,282	47,610	7.2	6,570		6,570	.1				127	176,668
Florida	1,459,648	501,200	1,676,174	1,398,151	28,077	18.7	74,749		74,749	2.5		39,469	.4	61,498	358,904
Georgia	2,724,620	1,278,373	1,497,427	1,485,638		57.7	1,093,491	977,161	116,330	22.6	80,542	170,980	6.4	181,279	991,063
Idaho	1,197,829	321,126	1,162,117	1,120,140	2,643	19.4	70,593	45,372	25,221	1.7		2,156	.1	32,318	291,106
Illinois	7,476,075	2,515,835	5,922,535	5,771,026		63.1	2,214,505	1,593,239	621,266	10.3	57,163	608,346	4.5	54,647	1,286,224
Indiana	4,287,050	2,136,306	2,943,189	2,878,912		60.6	1,260,877	1,152,876	107,823	11.8	122,991	947,178	23.1	132,271	1,081,306
Iowa	2,614,472	1,311,000	1,926,082	1,839,170	7,085	53.8	976,612	774,302	140,914	11.8	1,000	474,385	10.9		688,616
Kansas	2,522,401	1,432,949	2,227,367	2,203,065	15,901	38.8	1,410,724	275,108	975,460	13.5		441,588	4.6	44,228	
Kentucky	1,927,828	954,578	1,395,790	1,371,099		31.4	709,298	492,577	211,760	6.1	63,000	192,738	5.5	1,153	550,079
Louisiana	1,708,577	744,560	680,143	679,010		17.6	1,058,149	861,500	169,968	15.2	162,272	174,807	4.6	5,795	399,785
Maine	909,878	490,045	839,187	833,094		16.4	47,071	47,071		.4		156,506	1.4	29,713	333,539
Maryland	891,132	452,515	390,127	384,134		4.1	911,650	98,129		.4	170,504		.5	238,365	452,515
Massachusetts	5,007,199	847,600	1,915,107	1,873,562		12.3	3,164,075	3,086,851	52,248	5.4		223,765	2.2	46,786	571,587
Michigan	3,500,638	1,613,142	3,240,199	3,057,771	104,400	38.8	1,520,400	412,750	1,069,750	12.6	14,950	223,700	6.8	15,166	215,292
Minnesota	3,719,143	1,421,494	3,235,674	3,003,452	196,727	108.1	387,831	172,113	207,518	10.1	7,653	146,992	6.6	535,925	870,258
Mississippi	1,744,669	354,022	685,196	644,536	27,695	25.4	884,821	729,905	109,358	23.8	283,775	95,119	11.0	86,453	121,850
Missouri	4,019,501	1,617,451	2,256,778	2,186,421		50.6	1,882,322	1,690,009	146,476	12.0	23,343	65,196	1.2	119,729	1,405,778
Montana	1,115,962	113,092	1,039,847	1,032,075		33.2	90,811	34,716	31,541	4.5	25,051	40,139	3.6	24,120	41,412
Nebraska	1,957,240	991,091	2,101,399	1,945,069	131,080	36.2	367,832	118	367,714	6.3		359,532	7.3	12,053	132,765
Nevada	500,051	100,000	479,965	456,068		9.4	49,331		49,331	.9		1,000		43,983	49,668
New Hampshire	740,335	242,366	726,187	668,776	54,054	15.9	203,382	71,559	131,613	4.8					56,699
New Jersey	3,117,921	1,809,500	2,457,304	2,327,022		21.0	1,260,270	764,347	381,132	6.0		227,303	1.0	26,552	1,201,065
New Mexico	1,674,158	529,506	1,384,181	1,384,181		31.3	373,264	193,167	180,097	8.9	9,237	69,432	2.6	87,574	279,977
New York	8,255,661	3,756,621	7,018,668	6,294,762	299,400	55.9	3,943,331	1,864,756	1,870,240	24.2		1,242,050	5.0	96,143	344,931
North Carolina	2,380,573	1,210,236	2,097,487	2,051,298	38,551	75.3	593,591	184,907	370,289	14.6	96,952	386,851	11.5	47,417	414,546
North Dakota	1,451,112	734,742	1,020,031	1,013,147		43.1	217,425	142,175	75,250	8.2	271,045	210,187	29.0	24,744	449,305
Ohio	4,335,686	2,359,503	4,528,865	4,018,173	15,000	57.8	1,757,010	226,500	1,423,860	17.2		429,390	6.0	91,013	491,254
Oklahoma	2,304,200	1,171,295	1,882,766	1,817,313	18,167	40.6	639,282	456,168	179,928	9.1		530,421	6.8	30,719	442,779
Oregon	1,526,724	867,977	1,496,763	1,459,374	10,281	28.0	442,749	66,635	357,482	7.1	518	281,669	6.1	197	218,546
Pennsylvania	4,854,988	2,397,703	3,512,419	3,277,850	88,130	55.0	1,863,552	1,480,091	294,105	16.6	33,889	1,381,192	13.8	63,158	634,275
Rhode Island	579,625	255,000	519,889	518,991		7.4	141,760		141,760	1.5				60,634	113,240
South Carolina	1,364,791	692,738	1,013,288	1,011,509		33.2	309,469	286,289	23,180	11.5	22,715	103,764	2.9	44,278	565,794
South Dakota	1,502,870	761,911	1,045,688	1,045,519	168	35.2	114,329	113,137	1,192	6.2	95,770	142,044	7.2	248,444	618,506
Tennessee	2,123,155	1,121,790	1,597,471	1,582,459		23.1	657,393	423,730	233,663	6.0	106,005	222,337	3.4	10,960	665,790
Texas	6,642,863	1,795,000	4,630,666	4,522,978		110.1	2,177,881	1,826,520	186,407	26.4	123,176	364,166	18.3	170,189	1,244,427
Utah	778,826	533,173	778,624	649,146	65,900	20.2	321,105	124,000	181,357	4.5	5,130	135,000	4.1	550	150,915
Vermont	500,509	240,611	419,125	401,575		11.9	185,602	97,248	77,285	3.9		108,192	1.7	1,686	55,134
Virginia	2,008,458	941,347	1,331,616	1,233,053	68,823	25.6	961,195	486,618	268,150	7.8	141,036	290,143	5.7	147,751	314,231
Washington	1,977,260	776,603	2,012,160	1,913,253	77,774	34.8	379,739	32,500	347,239	9.2	3,957	191,720	1.6	27,549	159,871
West Virginia	1,342,270	570,085	907,870	886,610	13,293	16.5	467,074	426,725	14,816	4.9	28,935	72,008	2.6		469,968
Wisconsin	2,596,143	1,348,513	2,496,191	2,438,534	15,575	52.3	394,078	113,026	281,052	7.5		712,101	11.6	44,583	339,785
Wyoming	1,125,332	29,416	1,008,227	1,005,262		22.3	127,280	120,070	6,629	2.6		10,287	.7		12,500
District of Columbia	968,235	243,460	922,671	696,281	226,390	6.5	250,164	250,164		.2				21,790	17,070
Hawaii															
TOTALS	115,793,487	48,879,361	91,219,997	86,380,559	1,582,075	1,710.1	39,763,454	24,054,088	13,128,461	439.9	2,282,352	12,630,725	261.7	3,076,488	21,538,100

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION

AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

CLASS 3.—PROJECTS ON SECONDARY OR FEEDER ROADS

AS OF MARCH 31,1935

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 16, 1933 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	$ 2,032,452	$ 1,064,960	$ 1,035,011	$ 1,034,114		77.2	$ 1,389,829	$ 953,441	$ 436,388	96.1		$ 303,770	21.7	$ 44,898	$ 324,803
Arizona	525,423	998,032	592,872	516,393	$ 62,422	51.3	330,329	9,030	279,107	27.6		318,360	27.5		338,143
Arkansas	1,449,634	857,024	1,111,962	1,108,519		140.1	472,332	267,263	204,227	56.8	$ 5,473	179,612	17.4	68,378	473,185
California	3,480,440	1,999,203	3,583,430	2,984,134		164.3	1,284,274	494,605	667,456	37.1		442,178	21.3	1,701	889,569
Colorado	1,718,632	871,502	1,877,058	1,608,632	75,447	189.0	947,720	110,000	505,358	145.2		244,625	8.1		46,072
Connecticut	659,120	420,868	160,282	160,282		3.1	740,403	498,838	235,769	16.4					185,099
Delaware	481,113	230,849	295,307	218,550	72,707	26.7	381,126	262,563	118,329	33.0					39,813
Florida	1,302,816	1,043,543	1,284,205	1,275,634		74.8	458,016		458,016	25.7		493,061	22.4	27,182	92,466
Georgia	2,320,973	1,278,373	1,303,408	1,300,400		97.0	942,004	810,729	131,275	60.1	33,125	113,485	17.6	176,719	1,033,613
Idaho	1,121,562	824,450	1,330,051	1,104,855	56,671	156.1	477,984		459,147	52.5		70,156	7.8	16,707	238,476
Illinois	5,652,228	3,345,525	2,054,913	2,034,422		133.5	5,637,384	3,603,673	2,033,711	298.4	9,848	1,311,814	53.1	4,285	
Indiana	731,872	135,970	395,321	394,018		44.2	310,433	310,433		43.4		121,680	11.5	27,421	14,290
Iowa	2,413,358	1,590,000	2,101,503	1,931,498	109,800	318.2	1,348,910	396,650	787,975	205.1	28,200	679,300	158.9	57,010	12,925
Kansas	2,522,401	1,330,595	2,190,456	2,113,655	67,209	214.0	1,201,110	381,253	819,857	80.9	27,493	443,529	19.6		
Kentucky	1,837,926	1,336,409	1,825,311	1,715,993	16,263	210.0	988,618	107,202	865,149	112.1		454,997	70.8	14,731	
Louisiana	1,409,879	838,953	959,544	957,635		45.3	413,030	319,555	93,475	17.6	128,782	481,555	27.4	3,907	263,923
Maine	842,479	427,897	1,072,024	840,001	147,039	87.4	277,470		256,412	20.9		16,526	.7	2,478	7,920
Maryland	891,132	1,067,934	733,524	692,648		52.1	418,906	172,531	246,375	24.1	25,953	355,208	9.5		466,351
Massachusetts	488,185	870,000	469,741	469,741		15.2						115,370	5.5	18,444	754,630
Michigan	3,184,057	1,613,142	2,877,165	2,825,960	16,400	205.6	1,041,027	341,727	684,400	41.5		899,525	52.7	16,370	12,817
Minnesota	2,376,415	1,361,813	2,318,291	2,203,650	68,916	256.9	1,197,593	155,444	910,050	115.0		116,545	21.1	17,321	266,303
Mississippi	1,744,669	354,023	854,774	854,774		99.5	750,282	750,282		58.2	87,197	101,740	27.1	52,416	252,283
Missouri	2,923,273	2,423,863	2,896,461	2,687,673	133,569	602.8	1,059,762	195,938	818,570	182.3	39,613	914,384	183.8	48	557,340
Montana	1,859,937	942,434	1,829,552	1,782,524	44,554	229.9	490,934		490,934	44.0		327,939	34.6	77,413	79,007
Nebraska	1,957,240	991,091	2,109,659	1,956,988	147,789	402.5	672,110		672,110	74.5		91,040	11.9	252	80,152
Nevada	1,136,479	852,000	1,295,902	1,093,255	151,347	148.6	218,290		218,290	20.4		170,922	28.3	43,224	311,442
New Hampshire	477,385	242,365	571,499	447,963	77,387	28.4	114,607	29,000	82,590	5.9		57,479	3.4	423	24,909
New Jersey	55,099	460,000	56,528	55,099		.5						111,963	1.7		348,037
New Mexico	1,272,129	735,425	1,269,889	1,235,198	34,691	212.9	454,629	36,931	417,698	67.9		184,277	18.4		98,759
New York	3,608,768	3,822,700	3,316,753	2,953,509	28,089	83.8	3,989,410	625,700	2,564,490	186.6		1,039,550	106.1	29,559	190,571
North Carolina	2,380,573	1,590,637	2,138,433	2,137,656		224.2	1,331,929	215,387	1,086,994	143.4		296,409	42.0	27,530	207,234
North Dakota	1,451,112	734,741	913,405	913,168		280.1	330,472	310,175	20,297	85.3	165,596	240,629	130.3	62,173	473,816
Ohio	3,871,148	1,966,253	3,977,797	3,711,559	10,200	298.6	757,760	73,810	678,850	92.3		703,270	13.5	85,778	573,933
Oklahoma	2,304,199	1,171,295	1,823,427	1,718,816		224.8	1,442,619	582,509	695,789	87.2		182,048	8.8	2,874	293,457
Oregon	1,526,724	777,096	1,697,774	1,507,131	29,332	113.2	687,640	19,526	627,732	51.0		119,430	10.4	67	601
Pennsylvania	7,344,822	2,639,003	6,431,620	6,199,801	88,067	544.0	3,222,796	1,145,021	2,014,101	206.4		399,232	14.6		137,603
Rhode Island	439,716	295,000	409,735	399,703		33.2	212,563		212,563	6.7				40,014	82,438
South Carolina	1,364,791	692,739	1,060,256	1,060,256		113.1	941,408	255,654	646,718	120.6		46,021	7.6	48,881	
South Dakota	1,502,870	761,911	1,195,457	1,147,283	48,151	338.0	370,517	320,417	50,100	102.7	35,170	93,820	59.6		569,839
Tennessee	2,123,155	1,075,748	1,369,700	1,313,934		111.8	1,145,785	729,642	416,143	57.0	4,504	139,129	3.9	75,075	520,476
Texas	6,012,518	3,638,000	6,170,005	5,694,644		756.6	1,780,272	270,911	1,509,361	141.6		1,213,663	89.5	46,963	909,975
Utah	1,048,677	533,173	1,194,178	955,732	114,800	185.6	387,521	92,945	218,373	65.5		152,355	20.6		47,645
Vermont	438,880	241,354	474,394	436,802	16,569	37.2	118,931		113,646	8.4		111,102	8.0	2,078	37
Virginia	1,699,920	941,347	1,598,958	1,536,980	8,753	210.8	534,709	123,775	399,751	35.2	8,850	265,289	38.3	30,315	267,554
Washington	1,080,673	776,603	1,075,591	1,044,520	7,095	63.7	389,538	36,153	342,156	40.7		344,673	12.0		82,680
West Virginia	1,118,559	570,083	733,482	701,270		42.0	547,924	386,859	161,065	20.6	25,237	59,141	1.7	5,193	349,876
Wisconsin	2,431,220	1,841,354	2,311,887	2,144,491	48,583	170.4	580,381	202,460	321,763	15.1	68,000	826,770	42.6	16,269	644,237
Wyoming	1,125,332	571,928	1,152,941	1,057,939	74,683	157.2	99,718	27,126	72,591	12.9		207,128	29.9	40,267	217,526
District of Columbia	950,234	730,382	1,080,288	950,234	130,054	10.8	315,899		315,899	3.8		65,390	.4		219,039
Hawaii	177,718	351,000	178,209	177,718		4.9									351,000
TOTALS	92,869,917	56,230,590	80,759,933	75,367,354	1,886,587	8,291.1	43,206,904	15,625,158	25,361,050	3,445.7	693,041	15,631,089	1,523.6	1,184,364	13,351,864

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION

AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

SUMMARY OF CLASSES 1, 2, AND 3.

AS OF MARCH 31,1935

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 16, 1933 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	$ 8,370,133	$ 4,259,842	$ 8,394,340	$ 5,741,697	$ 35,889	427.4	$ 4,343,362	$ 2,358,085	$ 1,385,932	257.4	$ 159,273	$ 896,094	44.7	$ 111,077	$ 1,941,926
Arizona	5,211,960	2,641,935	5,591,728	4,826,973	146,605	362.6	1,494,419	189,254	1,210,742	103.0	129,322	568,033	45.5	66,412	716,555
Arkansas	6,748,335	3,428,049	5,660,198	4,951,756	137,101	335.5	2,800,094	1,444,866	1,088,755	138.2	146,112	906,822	42.0	205,600	1,295,372
California	15,607,354	7,932,206	16,803,261	13,349,334		488.6	7,582,401	2,241,216	3,637,488	177.0		1,716,964	56.5	16,805	2,577,754
Colorado	6,874,530	3,486,006	7,591,774	6,635,170	604,153	410.0	3,038,075	177,121	2,418,670	243.8	18,307	417,112	14.8	43,932	46,072
Connecticut	2,865,740	1,454,868	1,767,458	1,753,636	6,949	27.8	2,203,044	1,107,773	826,908	39.2		163,122	2.2	4,332	457,889
Delaware	1,819,088	923,395	1,864,501	1,547,303	297,889	76.0	675,442	262,563	399,791	39.9	8,734			489	225,715
Florida	5,231,834	2,661,343	6,036,737	4,923,452	28,078	209.4	1,505,637	194,891	1,260,590	63.9		600,260	23.1	113,491	772,415
Georgia	10,091,185	5,113,491	6,470,464	6,258,007		407.6	4,639,138	3,194,943	1,409,195	211.8	172,245	669,678	55.0	465,990	3,034,618
Idaho	4,486,249	2,277,486	4,626,722	4,186,225	166,607	361.5	1,162,972	216,522	910,249	91.2	25,000	158,877	16.8	58,502	1,041,753
Illinois	17,570,770	8,921,401	9,971,665	9,762,965	19,269	234.8	11,152,926	7,618,558	3,534,368	360.1	103,056	2,872,685	75.9	86,191	2,495,079
Indiana	10,037,843	5,088,963	6,600,146	6,493,266		210.9	3,735,468	3,102,917	631,661	107.8	181,751	3,060,603	164.5	259,909	1,396,699
Iowa	10,055,660	5,118,361	8,842,071	8,367,687	171,305	660.5	4,463,938	1,561,352	2,563,762	338.8	29,200	1,638,259	195.3	97,421	745,036
Kansas	10,089,604	5,117,675	9,743,874	9,267,460	290,102	830.6	4,449,920	712,761	3,576,637	258.6	27,493	1,250,936	37.2	81,889	
Kentucky	7,517,359	3,818,311	6,842,159	6,436,458	49,834	485.8	2,460,774	963,175	1,406,156	176.3	84,000	1,180,272	113.5	33,726	1,182,049
Louisiana	5,828,591	2,963,932	3,471,312	3,462,861		138.0	3,543,503	2,001,162	1,001,858	48.3	336,407	1,077,996	47.4	28,161	884,078
Maine	3,369,917	1,711,586	3,269,400	2,996,599	147,039	147.6	1,127,115	286,526	819,530	34.7	17,142	377,668	8.9	69,650	367,349
Maryland	3,564,527	1,810,058	1,931,916	1,868,277	16,517	71.5	2,295,011	1,028,757	452,733	46.0	235,592	355,208	10.0	431,901	985,601
Massachusetts	6,597,100	3,350,474	3,788,419	3,353,899		65.0	3,710,874	3,139,538	494,538	14.6		877,654	17.8	103,664	1,978,281
Michigan	12,736,227	6,452,568	10,936,447	10,560,404	120,800	467.8	5,782,752	2,102,677	3,612,475	180.3	14,950	2,113,775	97.0	58,197	605,518
Minnesota	10,656,569	5,425,551	11,206,953	9,545,036	1,463,653	1,234.6	2,499,292	506,613	1,800,579	250.2	7,653	858,658	97.6	597,267	1,302,661
Mississippi	6,978,675	3,540,227	6,006,163	3,896,237	115,300	355.6	4,169,751	2,396,358	984,890	218.5	473,475	1,108,776	99.5	212,604	1,331,260
Missouri	12,180,306	6,173,740	9,794,434	8,977,662	133,569	841.2	5,852,391	2,951,026	2,589,155	271.4	62,955	1,348,010	202.7	188,663	2,103,006
Montana	7,439,748	3,769,734	8,332,958	7,258,942	517,784	689.4	2,416,842	38,846	2,284,486	221.8	25,051	694,705	74.6	116,910	272,759
Nebraska	7,828,961	3,964,364	9,313,198	7,770,894	332,878	805.5	3,109,886	23,267	2,695,971	173.1	11,046	679,576	34.7	23,754	255,939
Nevada	4,545,917	2,302,356	4,654,645	4,238,911	283,199	430.1	945,468	91,948	853,520	118.9	92,734	487,805	71.2	122,324	677,832
New Hampshire	1,909,839	969,462	1,936,370	1,729,128	131,441	55.2	842,330	180,288	637,077	23.2		76,152	3.4	423	124,792
New Jersey	6,346,039	3,220,879	4,225,064	4,073,819		53.0	3,026,598	2,236,389	486,260	24.0		805,513	5.7	35,831	1,929,106
New Mexico	5,792,935	2,941,700	5,687,122	5,380,327	162,865	541.8	2,086,293	315,798	1,699,602	173.3	9,237	253,709	21.0	87,574	825,524
New York	22,330,101	11,327,921	20,773,868	17,776,460	496,419	351.3	15,822,699	4,335,126	7,263,760	347.7		2,656,550	122.3	218,515	911,192
North Carolina	9,522,293	4,840,941	8,833,022	7,727,488	246,224	877.6	3,313,985	1,084,614	1,886,145	308.2	281,289	927,860	78.7	428,902	1,780,712
North Dakota	5,804,448	2,938,967	5,064,260	4,568,276	60,698	1,347.1	918,186	505,203	340,348	232.3	501,814	988,310	450.5	229,156	1,549,610
Ohio	15,484,592	7,865,012	15,946,330	14,771,322	25,200	548.9	5,428,700	300,310	4,689,775	168.8	93,600	1,560,160	30.9	319,360	1,589,877
Oklahoma	9,216,798	4,685,180	7,756,375	7,429,747	79,875	556.0	4,528,242	1,744,966	2,433,494	198.1	5,228	863,572	21.3	36,856	1,308,239
Oregon	6,106,896	3,097,814	6,488,260	5,969,102	48,540	323.9	2,496,490	96,950	2,266,127	118.3	518	427,503	17.4	40,326	355,644
Pennsylvania	18,891,004	9,590,788	15,764,348	14,971,452	277,183	722.1	10,022,529	3,733,817	5,919,831	309.3	36,015	2,455,781	40.0	149,720	937,993
Rhode Island	1,998,708	1,014,572	1,897,629	1,818,321		61.1	896,788	46,205	768,453	21.8		25,194	.7	134,183	220,925
South Carolina	5,459,165	2,770,954	4,373,449	4,311,341		344.4	2,084,483	913,104	1,132,343	203.3	43,635	151,422	10.6	191,084	1,487,189
South Dakota	6,011,479	3,047,643	4,971,053	4,412,224	94,862	831.8	1,280,332	1,022,090	236,835	295.4	256,106	1,110,941	203.9	321,058	1,605,004
Tennessee	8,492,619	4,302,991	7,586,097	6,828,263	64,152	317.6	3,219,708	1,389,935	1,733,372	109.3	159,308	606,090	15.0	115,113	1,899,377
Texas	24,244,024	12,291,253	22,533,149	21,406,839	27,364	1,864.8	8,354,712	2,460,991	5,539,857	516.1	123,176	2,912,352	206.2	253,018	3,811,680
Utah	4,194,708	2,132,691	4,741,028	3,882,132	546,200	443.6	1,506,289	301,578	902,217	131.6	5,130	295,355	24.9	5,868	388,918
Vermont	1,867,573	948,007	1,864,228	1,747,990	45,033	97.0	581,752	107,918	440,045	26.2		385,832	15.1	11,665	77,097
Virginia	7,416,757	3,765,387	6,530,943	6,112,600	106,144	388.0	3,169,625	763,682	2,091,450	108.7	273,297	749,153	69.7	267,177	818,641
Washington	6,115,867	3,106,412	5,864,289	5,516,631	280,945	197.8	2,400,043	532,762	1,695,004	79.4	5,442	616,927	14.4	61,031	513,536
West Virginia	4,474,234	2,280,335	3,571,657	3,439,361	74,185	129.6	1,569,633	925,253	601,955	45.6	54,172	418,081	13.6	55,448	1,186,115
Wisconsin	9,724,881	4,941,837	9,206,163	8,855,894	67,483	435.8	2,170,135	554,927	1,459,807	81.6	202,828	2,154,718	85.3	111,231	1,259,829
Wyoming	4,501,327	2,287,712	4,596,483	4,101,853	302,810	667.9	1,471,176	356,398	1,088,028	177.5		510,540	93.3	43,076	386,334
District of Columbia	1,918,469	973,842	2,002,959	1,646,515	356,444	17.3	566,063	250,164	315,899	3.9		65,390	.4	21,790	236,109
Hawaii	1,871,062	949,778	522,655	426,102		17.3	1,838,793	1,438,169		27.2				6,791	949,778
TOTALS	394,000,000	200,000,000	352,249,744	317,334,298	8,578,587	21,966.2	170,756,079	65,509,352	89,478,323	7,915.6	4,412,293	47,096,653	3,192.7	6,744,057	54,846,437

U. S. GOVERNMENT PRINTING OFFICE: 1935