Use of Safety Rest Areas

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The improvement of motor vehicles and highways and the increased use of highways by motor vehicles during recent years has presented an increasingly critical safety problem, particularly with respect to handling vehicles parked adjacent to the traveled way of rural arterial highways. To reduce this hazard, many sections of these highways have been posted to limit parking for emergency purposes only. These restrictions and the desire to eliminate parking hazards require that provision be made to assist motorists who need a rest or other type of stop in finding adequate facilities for their needs.

This study was undertaken to provide data on the amount and character of use of the existing rest areas on the traveled route of the Interstate System, so that information would be available to serve as a basis for determining the need and space for rest areas as well as facilities to be provided in rest areas.

The seven rest areas studied in 1960 were all on non-access controlled portions of the traveled route of the Interstate System. Some of the major findings resulting from the studies were:

1. From 2 to 4 percent of the traffic on the adjacent highway used the rest area. (Limited studies on access-controlled sections have shown this relationship to be as high as 10 percent.)
2. The use of rest areas is inversely related to the portion of highway traffic that is local short-haul traffic and directly related to the remoteness of the rest area with respect to other locations providing the same facilities.
3. The major facilities used by motorists are rest rooms, drinking water, and picnic tables.

• RECENT IMPROVEMENTS in automotive and highway design, accompanied by heavy increases in highway traffic and vehicle speeds, have created a need for the control of and planning for emergency and rest stops on rural arterial highways. Freeways are known to encourage the extension of trips beyond customary lengths and create driver fatigue. The importance of breaking long trips by frequent stops is recognized by safety experts (*1*). Leaving the traffic stream on freeways at other than designated access points, however, has been recognized as a cause of accidents. To decrease this hazard, policies of prohibiting parking on freeway shoulders except in emergencies and providing rest areas as safe stopping places have been adopted. It has become evident that highways must be designed not only for the moving vehicle but for the parked vehicle (*2*).

The current major task in this field

has been the planning of facilities for the emergency, rest, and service stops on the hundreds of miles of full-access control freeway on the Interstate and Defense Highway System. A comprehensive statement of rest area policy and design for the Interstate System was published by AASHO in July 1958 (*3*). However, this publication states that reliable estimates of the amount and type of rest area use are not available and emphasizes the need for such data for the intelligent planning and justification of rest areas and their facilities.

The primary purpose of this study* was to provide data on rest area use in Oregon along Interstate routes. These data then would serve as a basis for determining not only the need for safety rest areas on the Interstate System in Oregon but the spacing and facilities to be provided. Secondary purposes of the study were (a) to obtain information on use of existing rest areas that would be helpful in planning and operating the extensive system of roadside rest areas operated on State highways by the Oregon State Highway Department; and (b) to develop and test procedures for conducting studies of rest area use for the "Rest Area Study Procedure Guide."

This paper presents an analysis and summary of data on rest area use and related information at seven roadside rest areas on US 30 and US 99 during the summer of 1960. No safety rest areas were in operation on full-control access sections of the Interstate System in Oregon in 1960; therefore, existing roadside rest areas on non-access controlled sections of the traveled way of the Interstate System were selected for study.

* The study reported here was based on and tested the "Rest Area Use Study Procedure Guide" prepared by the HRB Committee on Shoulders and Medians and to be published in HRB Bulletin 359.

METHODOLOGY

The studies were conducted essentially with the procedures outlined in "Rest Area Use Study Procedure Guide." This guide was prepared at the request of Committee No. 3 on Shoulders and Medians, Department of Traffic and Operations, Highway Research Board. Although some of the data collected and reported herein do not conform in minute detail to the guide, nevertheless, the basic concepts were adhered to. Stated conversely, the procedure guide was prepared based on experience gained in this study.

Study Sites

A total of 19 Oregon rest areas and roadside parks on US 30 and US 99 (the traveled routes of Interstate 80N and 5) were initially considered as potential study sites. These included 13 completed and operational roadside rest areas, 5 roadside State parks, and 1 new rest area site that had parking and access completed but no facilities or rest area signing installed. A field inspection of each potential study site was made before the final selection. The three major factors considered in the selection of study sites were (a) location, (b) suitability of the site for collection of traffic-volume, interview, and observation data, and (c) the manpower and equipment available for the study.

Location was a prime factor for several reasons. First, it was desired that the study sites be distributed geographically throughout the State so that they would be representative of the various terrain, weather, and population characteristics encountered on the Interstate Highway System in Oregon. Second, it was desired to study locations similar to those that would be encountered in new construction on Oregon's Interstate System.

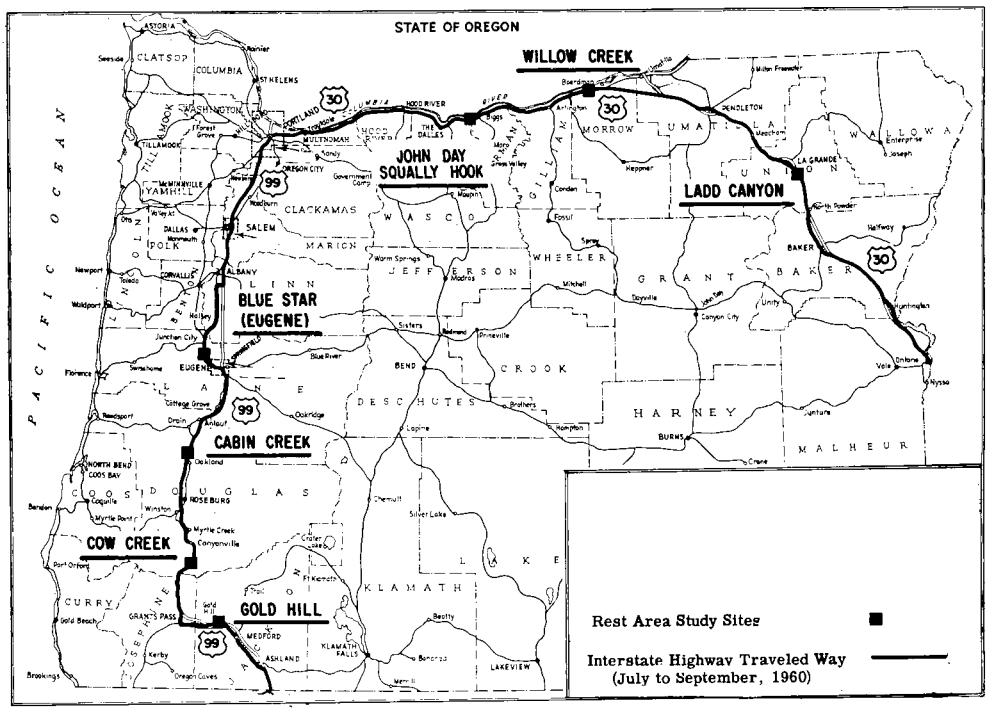

Figure 1. Location of roadside rest area study sites.

The type of access and location of rest area roads were important in determining whether the rest area was suitable for obtaining accurate counts of rest area traffic by traffic recorder equipment. Sites that had highway shoulder access or several exits or entrances were not considered because of the impracticality of the installation of traffic recorder equipment. Rest areas on frontage roads were also considered unsuitable sites.

A limiting factor in sites chosen was the number of automatic traffic recorders and men available for data collection. The physical layout of the rest area was important in determining whether the site was suitable for observation and interviewing by interviewer-observers stationed in the rest area. Figure 1 shows the location of the seven rest area study sites selected. Unfortunately, no completed and operational safety rest area* sites of modern design on completed full-access control sections of the Interstate System were available for study. All study sites available were on non-access control sections of US 99 and US 30, were designed primarily for light vehicle use, were without parking areas and access designed for heavy trucks, had no acceleration or deceleration lanes, and had no signing comparable to Interstate System standards. The sites selected and pertinent data for each are given in Table 1. A case history of a typical site is contained in the Appendix.

* The term "safety rest area" used in this report refers to rest areas of modern design on Interstate Highways as described in "A Policy for Safety Rest Areas for the National System of Interstate and Defense Highways," AASHO, 1958.

TABLE 1
ROADSIDE REST AREA STUDY SITES

Name and Route	1960 ADT	Location	Facilities
John Day-Squally Hook, US 30, M.P. 115.8	2,950	32 mi east of Dalles City, 21 mi west of Arlington in dry, open country in north-central Oregon	5 picnic tables, 2 dry pit restrooms; shoulder parking on rest area road; no drinking water, fireplaces, or artificial lighting
Willow Creek, US 30, M.P. 159.7	2,600	22 mi east of Arlington, 48 mi west of Pendleton in dry, open country in north-central Oregon	4 picnic tables, 4 dry pit restrooms, gravel parking area, piped drinking water, 2 sun shelters, a small creek; no fireplaces or artificial lighting
Ladd Canyon, US 30, M.P. 268.3	1,950	7 mi southeast of LaGrande, 36 mi northwest of Baker in northeast Oregon in Blue Mountains	8 picnic tables, 2 dry pit restrooms, piped drinking water, paved parking area; no fireplaces or artificial lighting
Blue Star (Eugene), US 99, M.P. 114.8	9,500 [1]	8 mi north of Eugene, 5 mi south of Junction City in the Willamette Valley of west Oregon	8 picnic tables, 2 dry pit restrooms, shoulder parking on paved rest area road, small lake; no drinking water, fireplaces, or artificial lighting
Cabin Creek, US 99, M.P. 175.0	4,500	30 mi south of Cottage Grove, 18 mi north of Roseburg in hills of west Oregon	4 picnic tables, 2 dry pit restrooms, 2 gravel parking areas adjacent to paved rest area road; no fireplaces, drinking water or artificial lighting
Cow Creek, US 99, M.P. 234.1	3,800	14 mi south of Canyonville, 28 mi north of Grants Pass in southwest Oregon	5 picnic tables, 2 dry pit restrooms, gravel parking area and circulatory road; no fireplaces, drinking water, or artificial lighting
Gold Hill, US 99, M.P. 297.2	4,700	18 mi south of Grants Pass, 12 mi north of Medford in southwest Oregon and 1 mi west of Gold Hill on spur of State Secondary 271 in Rogue River Valley	6 picnic tables, 2 dry pit restrooms, drinking water, graveled parking area and road; no fireplaces or artificial lighting

[1] Before rerouting of Interstate 5 traffic on new alignment, November 1960.

Sources of Data

The two primary data sources were automatic traffic recorder counts of rest area and adjacent highway traffic volumes and interview and observation data on rest area use collected by study crews during the summer of 1960.

Traffic Volume Data.—Counts of the number of vehicles entering the rest areas were obtained by installing automatic traffic recorders on the rest area access roads for a period of about two months from about July 1 to September 5, 1960. Counts of traffic volumes on the highway adjacent to the rest area, needed for relating rest area and highway traffic, were obtained from permanent automatic traffic recorder installations or automatic traffic recorders temporarily installed on the adjacent highway. Counts from permanent traffic recorders were used when the rest area was located a short distance from the permanent recorder and there was no significant difference in the traffic volume between the rest area and the permanent counter.

All of the study sites, with the exception of Blue Star (Eugene) Rest Area which had a single entrance, had two entrances which also served as exits for two-way traffic on the rest area roads. Where there was no appreciable difference in the amount of use of either of the two rest area entrances, a single traffic recorder was installed on the rest area road near an entrance. When there was a definite tendency for the rest area occupants to use one entrance (or exit) in preference to the other, as at Cow Creek and Gold Hill Rest Areas, a traffic recorder was installed near each entrance, and the counts were averaged.

The counts from the road tube type of traffic recorder were adjusted to compensate for overcounting due to multiple-axle vehicles such as passenger car-trailer coach combinations or truck-trailer combinations. The adjustments were made on the basis of axle overcount factors derived from classification counts of vehicles by number of axles. These adjustment factors ranged from 0.92 to 0.95.

Interview-Observation Data.—The rest area use interview and observation data were collected at all study sites on 7 days (5 weekdays, a Saturday, and a Sunday) from 10:00 AM to 5:00 PM. The days were distributed over a period starting June 14 and ending August 28, 1960. The interview days for each rest area were scheduled on a staggered basis during the summer to avoid possible bias that a specific set of weather conditions, special events, or seasonality may have on data collected during a limited time period.

The data were collected by a vehicle classifier and an observer-interviewer stationed at the rest area during the survey periods. The latter interviewed an occupant (usually the driver) of vehicles stopping and made observations of rest area use, and the former made visual classification counts of highway traffic by vehicle type and direction of travel. These duties were alternated approximately every 1½ hr. The interview form (Fig. 2) shows the questions asked during the interview. In some instances a log of vehicles entering and leaving the rest area was kept by the vehicle classifier to aid the interviewer. A visual count of restroom use was taken at 5 of the 7 study sites. The lack of time and the location of restroom facilities did not permit making accurate counts of restroom use at the two remaining study sites.

It was not possible or necessary to interview all vehicle-parties stopping in the rest area due to the large volume of rest area stops. However, an interview form was prepared for all vehicles entering the rest area, whether the vehicle-party was interviewed or not. In those instances where no interview was possible data on the interview form was obtainable by observation only; such as the times of entry and departure, vehicle type, vehicle registration, number of occupants, facilities used, and often the purpose of stop.

Persons requesting information pertaining to travel routes, parks, and rest areas were furnished copies of the Oregon State Highway Map or the Oregon Outdoor Guide which showed and described rest areas and park locations and facilities. Pertinent comments from rest area occupants on the operation of the immediate rest area or rest areas in general were noted on interview forms.

After the field data were collected, the interview forms were reviewed, coded, and punch cards prepared. These punch cards served as the primary data source for the tabulations and computations in the analysis.

ANALYSIS

Traffic Volumes

Comparison of Traffic Volumes at Study Sites.—The average daily summer rest area and adjacent highway traffic volumes at the 7 sites are given in Table 2. The 24-hr daily summertime rest area traffic averages ranged from a low of 76 vehicles at Gold Hill Rest Area to a high of 186 at Cabin Creek Rest Area. The average number of vehicles entering rest area study sites on US 99 (132) was not appreciably lower than that of rest areas on US 30 (137). However, the rest areas on US 30 had appreciably higher percentages of highway traffic entering (4.1 percent) than did those on US 99 (2.0 percent). The percentage entering the different rest areas on US 30 was also much more consistent, ranging

TABLE 2
COMPARISON OF HIGHWAY AND REST AREA TRAFFIC VOLUMES

Rest Area	Route	Average Daily Summer Traffic		
		Highway	Entering Rest Area (No.)	(%)
John Day-Squally Hook	US 30	3,591	146	4.1
Willow Creek	US 30	3,533	129	3.7
Ladd Canyon	US 30	3,129	137	4.4
Avg.	US 30	3,418	137	4.1
Blue Star (Eugene)	US 99	10,346	175	1.7
Cabin Creek	US 99	5,932	186	3.1
Cow Creek	US 99	5,239	92	1.8
Gold Hill	US 99	5,800	76	1.3
Avg.	US 99	6,829	132	2.0
Avg. (all sites)		—	—	2.9

from 3.7 to 4.4 percent, whereas the range at the four study sites on US 99 was from 1.3 to 3.1 percent.

Rest areas with the largest amounts of traffic in terms of numbers of vehicles entering were not necessarily those with the highest volume of highway traffic.

The factors apparently responsible for the higher rates of rest area use on US 30 were remoteness and the low proportions of local traffic. The three rest areas on US 30 were located in north-central and eastern Oregon where the daytime temperatures usually exceeded 90 F, and there were long stretches of road in open and sparsely populated country with relatively few opportunities for rest or service stops. The proportions of local traffic on US 30 (*i.e.*, traffic with short trip lengths, and origins and destinations in the vicinity) were low, and conversely, the proportions of intercity and interstate traffic high.

These factors of remoteness and local traffic were also a major influence on the percent of highway traffic entering rest areas on US 99. For example, Cabin Creek Rest Area, which had the highest rate of entering traffic (3.1 percent) of all US 99 study sites, was located 30 mi from Cottage Grove and 18 mi from Roseburg, the nearest cities on US 99. Both cities had been bypassed by the new highway location. Also, the highway north of Cabin Creek to Eugene was on the whole full-access control. Study sites other than Cabin Creek on US 99 were located at much less remote distances from alternate facilities and had considerable local traffic.

It was apparent that the substantial differences in the percent of traffic entering the various study sites tended to reflect effects of differences in the physical location, design, and facilities available at the rest area. A χ^2 test on the numbers of vehicles entering the 7 study sites during the 7-day sample period, taking into account differences in highway traffic volumes, showed the differences between study sites to be highly significant.

There were numerous reasons for the differences in the percent and number of vehicles entering the various study sites, the chief of which appears to be the factor of remoteness. It is, however, difficult to isolate them. The extremely low volume of entering vehicles at Gold Hill Rest Area was attributed to the following:

1. The difficulty of access to the rest area encountered by northbound traffic which was required to use the Gold Hill interchange overcrossing.
2. The lack of signing of the rest area for northbound traffic.
3. The considerable amount of local traffic.
4. The numerous alternate places for stopping by southbound traffic which was routed directly through the business district of Grants Pass only 18 mi north. This southbound

OREGON STATE HIGHWAY DEPARTMENT
Traffic Engineering Division
Planning Survey Section

REST AREA INTERVIEW FORM

Identification:

Serial Number ☐☐☐☐

Highway No. ☐☐

Rest Area ☐

Day ☐

Date ☐☐☐☐

A. TIME: Entered rest area ☐☐☐☐

Departed rest area ☐☐☐☐

Stay (minutes) ☐☐☐
(Office Entry)

B. REGISTRATION: ☐
1. Oregon
2. Washington
3. California
4. Idaho
5. Montana
6. Utah
7. Nevada
8. British Columbia
9. Other States & Counties
0. Unknown
Y. Out of state, unidentified

C. DIRECTION: ☐
1. Eastbound
2. Westbound
3. Northbound
4. Southbound

D. NUMBER OF OCCUPANTS: ☐

E. VEHICLE TYPE: ☐
1. Light Vehicle
2. Light Vehicle & Trailer Coach
3. Light Vehicle & Other Trailer
4. Truck or Bus
5. Truck and Trailer Combination

F. LAST STOP:

Time_____ ☐☐☐

Location_____ ☐☐☐

Type: ☐
1. Start of Day's Trip
2. Rest Stop
3. Vehicle Service
4. Eat
5. Shopping
6. Other_____
(Explain)

COMMENTS: ☐

_____

G. TRIP PURPOSE: ☐
1. Business
2. Driving to or from work
3. Vacation
4. Social, recreation
5. Moving
6. Other_____
(Explain)

H. TYPE AND PURPOSE OF STOP: ☐
1. Rest or Nap
2. Checking Map
3. Changing Drivers
4. Eating
5. Car Sickness or Illness
6. Recreation (Picnic, Fishing, etc.)
7. Restroom or Latrine
8. Deposit Litter or Garbage
9. Other_____
(Describe)
0. Drive through (no stop)

I. FACILITY USE:
Drinking Water ☐
Restrooms ☐
Tables and Benches ☐
Fireplace or Cooking Facility ☐
Shelters ☐
Other_____ ☐
(Describe)

J. WAS THIS A STOP ENROUTE?
1. Yes 2. No

K. WHERE WOULD YOU HAVE STOPPED HAD THIS REST AREA NOT BEEN HERE? ☐
1. Shoulder of the Highway
2. Next Service Station Available
3. Next Rest Area or Park
4. City or Town of_____
5. Other_____
(Describe)
6. Do not Know
7. Would not have stopped, no alternative

L. HOW DID YOU LEARN OF OR LOCATE THIS REST AREA? ☐
1. Located from Road Map
2. Located from Road Signs
3. Known from Previous Visits
4. Other_____
(Describe)

Observer
_____

Figure 2.

TABLE 3

REST AREA TRAFFIC VOLUME COUNTS [1]

Rest Area	Week Beginning	Traffic Volume						
		Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.
John Day-Squally Hook	June 26	...	...	...	...	118	183	208
	July 3	153	181	188	167	152	146	149
	July 10	173	145	152	126	121	144	180
	July 17	182	198	136	140	142	152	160
	July 24	151	149	114	149	129	...	...
	July 31	...	...	141	115	125	150	195
	Aug. 7	160	161	156	137	149	140	169
	Aug. 14	170	125	144	145	131	150	152
	Aug. 21	169	125	133	134	123	117	125
	Aug. 28	118	116	96	84	124	143	165
	Sept. 4	123	159	...	...	...	...	...
Ladd Canyon	June 26	...	...	...	...	135	160	179
	July 3	153	174	150	155	163	162	152
	July 10	155	138	128	132	128	124	177
	July 17	174	155	132	162	154	139	131
	July 24	143	138	140	118	141	143	138
	July 31	145	128	149	114	90	131	160
	Aug. 7	140	137	140	130	139	111	169
	Aug. 14	167	124	102	115	149	145	151
	Aug. 21	126	113	135	116	111	94	100
	Aug. 28	127	127	107	86	103	127	139
	Sept. 4	114	153	...	...	...	...	...
Blue Star (Eugene)	June 26	131	156	128	112	136	199	221
	July 3	220	213	207	204	182	203	168
	July 10	177	160	148	159	149	227	188
	July 17	211	194	171	186	224	187	219
	July 24	183	166	173	174	196	181	202
	July 31	213	191	187	181	187	181	194
	Aug. 7	222	196	169	164	136	217	192
	Aug. 14	219	198	178	179	172	178	190
	Aug. 21	189	152	115	153	160	150	169
	Aug. 28	155	129	135	123	131	116	163
	Sept. 4	144	149	...	...	...	...	...
Cabin Creek	June 19	...	...	...	...	...	178	191
	June 26	197	169	186	159	163	207	220
	July 3	209	208	221	249	213	193	231
	July 10	299	213	184	160	157	207	204
	July 17	195	224	176	161	168	172	228
	July 24	181	171	184	147	172	185	168
	July 31	233	199	191	161	182	172	219
	Aug. 7	268	238	177	149	121	191	212
	Aug. 14	204	214	160	160	193	190	186
	Aug. 21	176	125	153	152	157	160	219
	Aug. 28	176	155	124	98	152	230	192
	Sept. 4	159	161	...	...	...	...	...
Cow Creek	June 26	...	...	...	73	87	121	139
	July 3	97	110	102	122	87	102	85
	July 10	111	98	108	85	81	111	125
	July 17	98	94	98	70	79	83	104
	July 24	88	92	92	70	87	100	103
	July 31	83	90	91	64	100	117	115
	Aug. 7	92	100	81	88	99	104	117
	Aug. 14	111	87	94	93	89	69	90
	Aug. 21	90	68	89	78	70	87	98
	Aug. 28	76	75	79	66	52	95	92
	Sept. 4	84	90	...	...	...	...	...
Gold Hill	June 26	...	...	...	65	63	70	94
	July 3	63	68	72	72	59	77	68
	July 10	83	65	76	62	74	81	74
	July 17	69	52	74	74	83	69	67
	July 24	71	64	47	48	65	83	91
	July 31	65	72	79	60	74	78	80
	Aug. 7	89	103	88	105	78	69	109
	Aug. 14	87	92	91	111	70	81	90
	Aug. 21	78	75	81	93	95	62	87
	Aug. 28	63	65	75	64	73	68	76
	Sept. 4	91	78	...	...	...	...	...

[1] Data for Willow Creek Rest Area not available due to traffic recorder trouble.

traffic also had many other opportunities for stopping at private and public service facilities and another rest area and park before reaching this location.

Factors contributing to the comparatively low use of Cow Creek Rest Area were believed to be the nearness of the rest area to Canyon Creek and Packard Creek Rest Areas, located at distances of 11 and 9 mi north of the rest area, respectively. The volume of traffic entering Blue Star (Eugene) Rest Area though substantial in number was low as a percent of highway traffic (1.7 percent). Several elements contributed to the low rate of entry:

1. The rest area was in many instances crowded and operating above normal facility capacity.
2. The high summer traffic volume (10,300) on the adjacent highway included much local traffic that would not require rest area facilities.
3. The rest area was close to many alternate service and eating facilities in nearby cities.

The average daily number of vehicles and percent of highway traffic entering the study sites by day of week were obtained and summarized for each site. This is illustrated for Ladd Canyon Rest Area in the Appendix.

The daily rest area traffic volume counts obtained from automatic traffic recorders are given in Table 3. Saturday was typically the day with the largest amount of rest area traffic. Only at Cabin Creek Rest Area was there a slightly higher number of vehicles entering on Sunday than on Saturday. Small variations were noted in the average percent of daily highway traffic entering the rest areas by day of week. The largest variation occurred at John Day-Squally Hook Rest Area where the weekday average was 3.9 percent compared to 4.4 percent on Saturday and Sunday.

Comparative Traffic Data from Other States.—Limited data on rest area use are available from other States for comparative purposes. Rest area use data compiled by the Bureau of Public Roads from data submitted by 8 States in response to a 1959 questionnaire showed 1 to 12 percent of highway traffic on arterial routes using rest areas (*4*). The percentages of traffic using rest areas reported are given in Table 4.

TABLE 4
TRAFFIC USING REST AREAS IN VARIOUS STATES

State	Traffic Using Rest Areas (%)
South Dakota	1
North Dakota	1.2
California	2.4
Georgia	2.5
Oregon	2.9
North Carolina	3
Virginia	3.8
Tennessee	4
Ohio	12

These data are generally in line with the Oregon data reported in this study (average 2.9 percent), with the exception of that for Ohio. The North Carolina study figure of 10 percent for cars with trailer houses stopping in rest areas (*5*) compares closely with the 10.6 percent for Oregon light vehicles with trailer houses.

More recent surveys made by North Carolina in October 1960 at safety rest areas on the Interstate System show substantially higher usage (*6*). The North Carolina safety rest areas had drinking water, picnic tables, fireplaces, flush toilet restrooms, separate parking spaces for trucks and cars, and were located on 4-lane, divided Interstate Highway sections with full access control. The average percent of highway traffic stopping at the 5 North Carolina rest area survey sites was 5.5 percent for

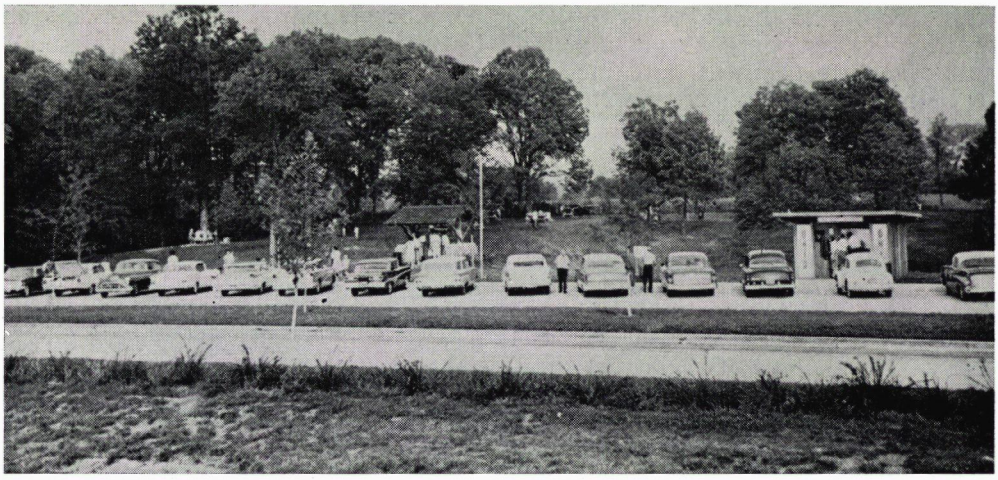

Figure 3. Heavy safety rest area use on Interstate 75, Ohio.

Figure 4. Safety rest area use at night on Interstate 75, Ohio.

cars and 7.6 percent for trucks between 10:30 AM and 4:30 PM. These percentages would have probably been higher during the summer months. Ohio's (*6*) traffic volume data collected in the summer of 1959-60 at modern safety rest areas on the Interstate System consistently showed substantially higher percentages of traffic entering rest areas (6.5 to 17.4) than the 1960 Oregon data.

Heavy use of safety rest areas observed in 1961 on Interstate 75 in Ohio is shown in Figures 3 and 4, with fully occupied parking area and line-up of persons using the well in Figure 3. Heavy usage of restrooms was also reported. Rest area use at night is shown in Figure 3, where

the amount of nighttime highway traffic using the rest area increased from 8 to 12 percent when overhead lighting was turned on. About 75 percent of those interviewed indicated they would not have stopped had there been no lighting (*7*).

On the basis of these comparisons, use of the new Oregon safety rest areas on the Interstate System will be substantially greater than at the existing Oregon roadside rest areas surveyed in this study. This premise has been substantiated by data collected in July, 1961 at a newly opened Oregon safety rest area on Interstate 5 where the percentage of highway traffic entering was approximately 5 percent during its first month of operation, despite temporary facilities in comparison to 2 percent at rest areas on US 99, as shown by this study.

Rest Area Use

The rest area use data that follow are based on interview and observation data collected at each study site from 10 AM to 5 PM (Pacific Standard Time) on 7 summer days in 1960. The interview-observation periods included 5 weekdays, a Saturday, and a Sunday. The weather conditions during the study period were typical of Oregon summers (clear, dry, and warm) and the rest area use observed was not significantly affected by any unusual weather conditions.

Vehicles Entering.—For design of parking, the successful planning and operation of rest areas require knowledge of the number and types of entering vehicles that will be accumulated in the rest area. Relationships between peak vehicle accumulations and daily number of vehicles entering the rest area provide information that in addition to being of value in the analysis of existing rest area use may be used to indicate potential peak use for design of new rest area facilities.

TABLE 5
RELATIONSHIP OF VEHICLES ACCUMULATED TO THOSE ENTERING FOR AN AVERAGE SUMMER DAY

Rest Area	Route	Minimum Accumulation (%)[1]	Accumulation During Peak Moment (%)[1]	Avg. Accumulation During Peak Hour (%)[1]	Avg. Accumulation During Peak Hour For Hour Beginning
John Day-Squally Hook	US 30	1.1	7.4	5.4	1,200
Willow Creek	US 30	1.8	7.3	4.7	1,145
Ladd Canyon	US 30	0.8	7.0	3.4	1,320
Avg.	US 30	1.2	7.1	4.5	—
Blue Star (Eugene)	US 99	2.5	10.1	8.4	1,215
Cabin Creek	US 99	1.2	6.3	4.5	1,155
Cow Creek	US 99	1.2	6.8	3.8	1,405
Gold Hill	US 99	0.9	10.3	6.3	1,205
Avg.	US 99	1.4	8.2	5.8	—
Avg. (all sites)		1.9	7.9	5.2	—

[1] Of daily traffic accumulated during 5-min intervals.

Average Vehicles Accumulated.—The relationship of vehicles accumulated in the rest areas to vehicles entering for an average summer day is shown in Table 5. The vehicle accumulations were computed for 5-min intervals from the entrance and exit times of vehicles stopping in the rest area from 10:00 AM to 5:00 PM. The vehicle accumulations tended to be least near the beginning and end of the 10:00 AM to 5:00 PM study period, and most around or during the noon hour. The minimum vehicle accumulations occurred predominantly in the late afternoon after 4:00 PM and averaged 1.9 percent of the daily rest area traffic. The percentage of daily rest area traffic accumulated during the peak hour ranged from a low 3.4 percent at Ladd Canyon to a high of 8.4 percent at the Blue Star (Eugene) Rest Area, with an all-sites average of 5.2

percent. The average number of vehicles accumulated during the peak hour ranged from a low of 4 at Cow Creek to a high of 15 at Blue Star (Eugene). The peak hour at 5 of the 7 locations occurred during hours from 11:45 AM to 12:15 PM. The other two locations (Cabin Creek and Ladd Canyon) did not have significant peaking of vehicle accumulations, but continuing moderate use from noon throughout the early afternoon.

The differences in the percent of vehicles accumulated at the various study sites reflect varying types of use and lengths of stay. For example, the much sharper peaks and higher percentages of vehicle accumulations observed at Blue Star (Eugene) and Gold Hill Rest Areas reflect the higher proportions of eating stops at these sites and longer durations of stay. Conversely, the lower accumulation percentage shown for Cow Creek reflects the higher proportion of restroom stops observed which were of shorter duration.

Daily Peak-Moment Accumulation.—Knowledge of rest area use under peak conditions is required to provide information for adequate planning of facilities as the amount of use varies considerably during the day and year. Table 5 gives the relationship of the number of vehicles accumulated in the study sites at the peak moment to the average daily number entering. The peak moment was defined as the 5-min interval during which the number of vehicles accumulated in the rest area was maximum. The peak-moment accumulation used in this analysis was the average of the peak moments for the 7 days studied at each rest area.

Nine vehicles, or 7.1 percent of the 24-hr traffic volume entering the rest areas, were accumulated during the peak moment at US 30 study sites and 11 vehicles, or 8.2 percent, at US 99 study sites. The peak-moment accumulation ranged from a low of 6 vehicles at Cow Creek Rest Area to a high of 19 vehicles at the Blue Star (Eugene) Rest Area. The all-sites average was 10 vehicles, or 7.9 percent of the daily rest area traffic. A factor limiting the peak-moment vehicle accumulations was that some rest areas were operating at or above the practical facility capacity during the peak hours.

As to the use of the average peak-moment data for design purposes, the peak-moment accumulation is not an extreme measure. Standard design practices normally preclude the use of extremes for design. An example is the standard highway design practice of designing roadway capacity for the 30th highest hourly volume (*8*). As the peak moment data shown are those for a 7-day period, they will probably be less than the peak moment of the summer because of the absence of holidays and size of the sample. (Statistical analysis of the variability of the daily peak-moment accumulations at the individual study sites indicated the sample means were within 12 to 23 percent of the true mean with a confidence level of 95 percent.)

Vehicle Type.—Nearly all the use of the rest areas was by light vehicles. The rest area traffic was composed of 85.9 percent single light vehicles, 8.0 percent light vehicle-trailer coach combinations, 4.0 percent light vehicle-other trailer combinations, and only 2.1 percent trucks and busses as shown by Table 6. This pattern of rest area use by vehicle type showed only minor variations between the individual study sites and there was no significant difference between the pattern of rest area use by vehicle type of sites grouped by highway. The predominant use by light vehicles was consistent with the design of the rest areas, all of which were of older design, planned primarily for passenger car use.

An analysis of the relationship of

TABLE 6
CLASSIFICATION OF TRAFFIC, ALL STUDY SITES

Vehicle Type	Vehicles Entering Rest Area (No.)	Vehicles Entering Rest Area (%)	Highway Traffic (No.)	Highway Traffic Entering Rest Area (%)
Light vehicle	2,865	85.9	103,955	2.8
Light vehicle and trailer coach	266	8.0	2,508	10.6
Light vehicle and other trailer	135	4.0	2,973	4.5
Bus or single-unit truck	60	1.8	4,867	1.2
Truck-trailer combination	10	0.3	6,756	0.1
All	3,336	100.0	121,059	2.8

the distribution of rest area traffic and the adjacent highway traffic by vehicle type indicated that the light vehicle was proportionately a larger user of rest areas than trucks and busses. Expressed as the percentage of each type of highway traffic entering rest areas during the 10:00 AM to 5:00 PM study period, light vehicle-trailer coaches were the heaviest rest area users (10.6 percent), light vehicle-other trailer next (4.5 percent) and single light vehicles (2.8 percent). Only 1.2 percent of the bus or single unit truck traffic and 0.1 percent of the truck-trailer traffic entered the rest areas.

A considerably larger amount of truck use at new Oregon safety rest areas is anticipated than shown previously, inasmuch as superior access, parking, and other facilities will allow as well as encourage use by trucks. For example, the percent of truck traffic stopping at 4 safety rest areas on North Carolina's Interstate Highways averaged 7.6 percent during 10:30 AM to 4:30 PM study period (*6*). Also a 1-day study of rest area use on the opening day of an Oregon safety rest area on a completed portion of Interstate 5 showed 5 percent of the truck traffic stopping.

Rest areas were especially attractive to light vehicle trailer-coach combinations as they travel at slower speeds, carry their own food supplies, and find parking difficult in cities. A number of comments were received during the survey relative to the need for parking facilities designed for light vehicle-trailer coaches. Trucks transporting large residence type trailers were classified as truck-trailer combinations and there was no use of rest areas observed for this type of vehicle combination.

Vehicle Occupancy.—Data collected during the rest area survey showed an average of 3.0 persons per vehicle entering the rest area study sites (Table 7). The persons per vehicle averages were remarkably stable among the rest area study sites, and ranged from a low of 2.8 persons per vehicle at Gold Hill, to a high of 3.1 persons reported for John Day-Squally Hook, Willow Creek, and Blue Star (Eugene) Rest Areas.

Comparison of these data with other sources indicates the number of persons per vehicle in rest areas is substantially larger than the average passenger car occupancy on Oregon

TABLE 7
VEHICLE OCCUPANCY

Rest Area	Route	No. of Vehicles Entering [1]	No. of Persons [1]	Persons per Vehicle
John Day-Squally Hook	US 30	71	221	3.1
Willow Creek	US 30	63	197	3.1
Ladd Canyon	US 30	56	171	3.0
Avg.	US 30	63	196	3.1
Blue Star (Eugene)	US 99	93	287	3.1
Cabin Creek	US 99	91	269	3.0
Cow Creek	US 99	46	136	3.0
Gold Hill	US 99	36	102	2.8
Avg.	US 99	66	198	3.0
Avg. (all sites)		65	198	3.0

[1] Excludes vehicles entering for which occupancy data were not obtained.

highways. Oregon vehicle occupancy data collected for a special study during July 1960 showed an average of 2.1 persons per passenger car on US 99 near Ashland and 2.4 persons per passenger car 10 mi east of Pendleton on US 30.

The rest area occupancy average of 3.0 persons per vehicle is more comparable to tourist-party vehicle occupancy averages. A comparable average of 3.1 persons per outbound tourist party was reported for Montana in 1958 (*9*). However, it is considerably lower than the size of vehicle-parties using Oregon recreation parks (5.0 persons) (*10*).

The higher persons per vehicle ratio reflects a large amount of family use of rest areas. Comments from rest area occupants verified the advantages of rest areas for family use, particularly for eating and rest stops. The opportunities for children to run and play with freedom during stops, and the fact that rest area stops for eating were easier on budgets were cited as major advantages over private facilities.

Vehicles Stopping.—Analysis of data on vehicles stopping in rest areas revealed that 91 percent of all vehicles entering the rest areas during the study stopped in the rest area and the other 9 percent drove through without stopping (Table 8). Although the percentages of stopping vehicles ranged from a low of 83 percent at Cabin Creek to a high of 96 percent at Gold Hill, there was no significant difference in the average proportions stopping in rest areas on US 30 and US 99.

Although occupants of "drive thru" vehicles were not interviewed, it was evident from observation and passing comments of drivers that there were several common factors contributing to the significant numbers of drivers entering the rest areas but failing to stop. The following are the more apparent and important reasons, based on the observations of interviewer-observers during the survey:

1. Certain facilities, such as drinking water, restrooms and overnight camp sites, were not available at the rest areas or could not be seen, and so the parties desiring to use these facilities did not stop.
2. At certain times of the day the rest area facilities were crowded or at capacity use, thus discouraging vehicle-parties from stopping.
3. The rest area access roads were used as turn-around points to reverse direction of travel.
4. Travelers were curious and/or apparently wish to observe Oregon rest area sites or were looking for recreational parks.

Major factors in the low percentage of entering vehicles stopping at Cabin Creek Rest Area (83 percent) were the dense foliage which obscured rest area facilities from view of entering vehicles, and the lack of drinking water. It is believed particularly significant that the three study sites with the highest percent-

TABLE 8
RELATIONSHIP OF VEHICLES STOPPING TO THOSE ENTERING REST AREAS

Rest Area	Route	Daily Number of Vehicles		Percent Stopping in Rest Area [1]
		Entering	Stopping	
John Day-Squally Hook	US 30	76	68	89
Willow Creek	US 30	65	61	94
Ladd Canyon	US 30	57	52	91
Avg.	US 30	66	60	91
Blue Star (Eugene)	US 99	97	88	90
Cabin Creek	US 99	97	81	83
Cow Creek	US 99	47	43	91
Gold Hill	US 99	36	35	96
Avg.	US 99	69	62	90
Avg. (all sites)		68	61	91

[1] Based on unrounded data.

TABLE 9
PERCENTAGE DISTRIBUTION OF VEHICLES STOPPING IN REST AREAS BY PLACE OF REGISTRATION

Place of Registration	Percent of Total
Oregon	39.8
Washington	15.5
California	21.9
Idaho	3.6
Montana	0.5
Utah	0.9
Nevada	0.1
British Columbia	2.1
Other States and countries	14.4
Out-of-state, unidentified	1.2
All places	100.0

age of entering vehicles stopping were those with drinking water. A minor cause of vehicles driving through the rest areas without stopping was believed to have been the lack of shaded parking on hot days.

State of Registration.—An analysis of the places of registration of vehicles stopping in the rest areas indicated that 39.8 percent of the summer use of Oregon rest areas on US 30 and US 99 (the traveled routes of the Interstate Highway System) was by Oregon residents and 60.2 percent by out-of-state users. Table 9 shows that the States other than Oregon having the largest proportions of rest area use were the adjacent States of California with 21.9 percent, Washington with 15.5 percent, and Idaho with 3.6 percent.

In relation to the volume of light vehicle traffic on the adjacent highway, out-of-state vehicles were proportionately greater users of rest areas than Oregon light vehicles (see Table 10). Out-of-state light vehicles constituted only 47.0 percent of the light vehicle highway traffic adjacent to the rest area, but were 61.1 percent of the light vehicle rest area stops. Conversely, Oregon light vehicles accounted for only 38.9 percent of the rest area stops, but 53.0 percent of the adjacent light vehicle highway traffic. Analysis by study site showed the percent of out-of-

TABLE 10
COMPARATIVE DISTRIBUTION OF LIGHT VEHICLE REST AREA STOPS AND HIGHWAY TRAFFIC BY PLACE OF REGISTRATION

Place of Registration	Rest Area Stops		Highway Traffic	
	No. of Light Vehicles	Percent of Total	No. of Light Vehicles	Percent of Total
State	1,141	38.9	57,955	53.0
Out-of-state	1,790	61.1	51,481	47.0
Total	2,931	100.0	109,436	100.0

state light vehicles using the rest areas was significantly higher at all study sites other than Willow Creek on US 30 and Cow Creek on US 99.

The lowest proportionate use by Oregon-registered light vehicles occurred at the Blue Star (Eugene) and Gold Hill Rest Areas where a large part of the highway traffic was of a local nature. It is apparent that the percent of highway traffic using safety rest areas will be inversely proportionate to the amount of local traffic.

Intervals Between Stops.—Figures 5 and 6 provide data on the time and distance traveled by rest area users since last stop before the rest area stop. The data are indicative of needed spacing of rest areas to satisfy the stopping habits of rest area users. The data shown for US 30 and US 99 are based on the composite data collected at the study sites on the respective routes.

A remarkable consistency was observed in the composite pattern of distances traveled since last stop by rest area users on the two highway routes as shown by Figure 5. This occurred despite the considerable differences in the type of country traversed, distances between cities, rest area locations, and frequency of alternate stopping places near rest areas on US 30 and US 99. At US 30 rest areas, 44, 62 and 76 percent of the vehicle-parties had traveled distances of 60, 45 and 30 mi or more, respectively, since last stop. The corresponding percentages of US 99

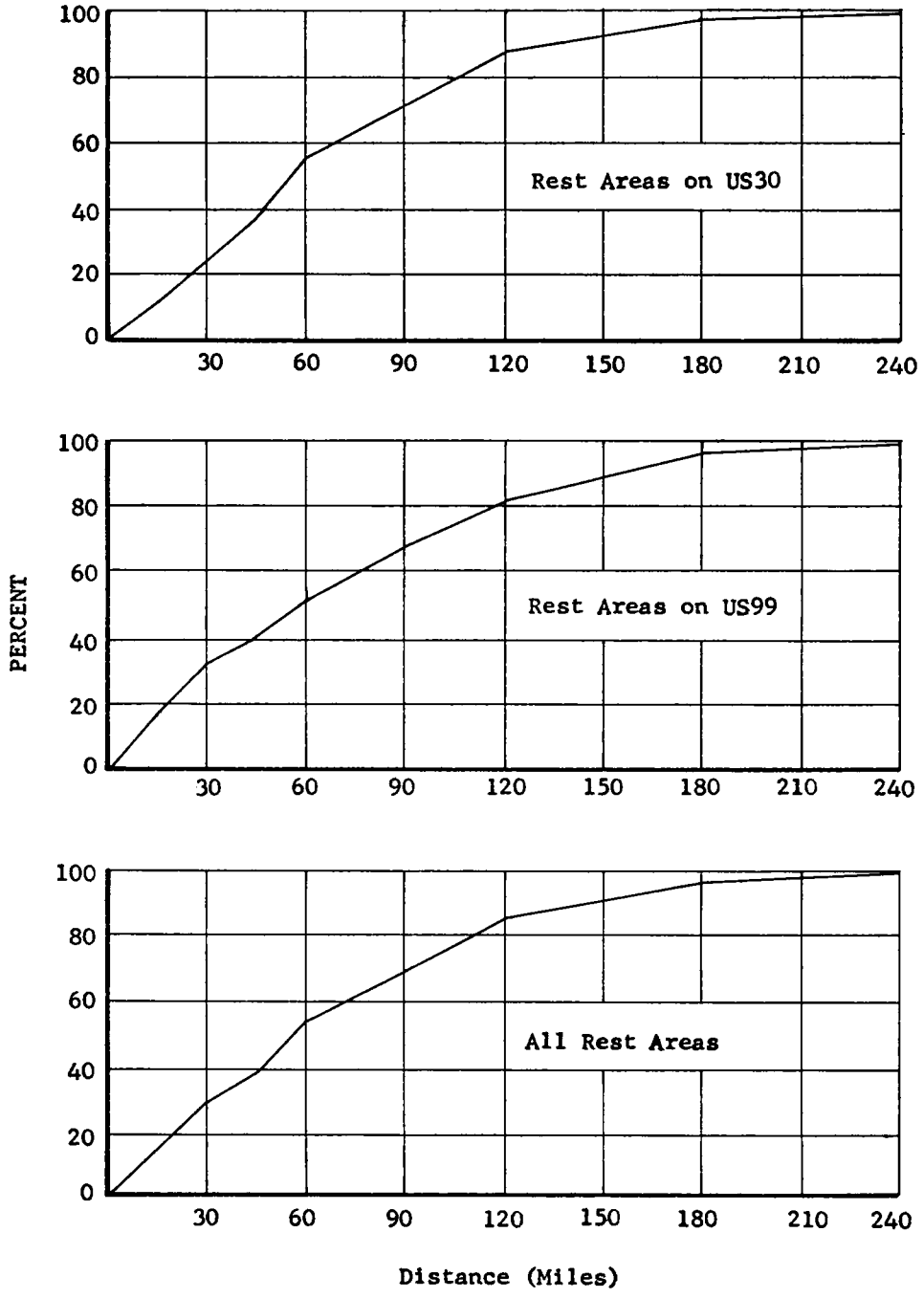

Figure 5. Cumulative percentage of vehicle-parties stopping in rest areas by distance traveled since last stop.

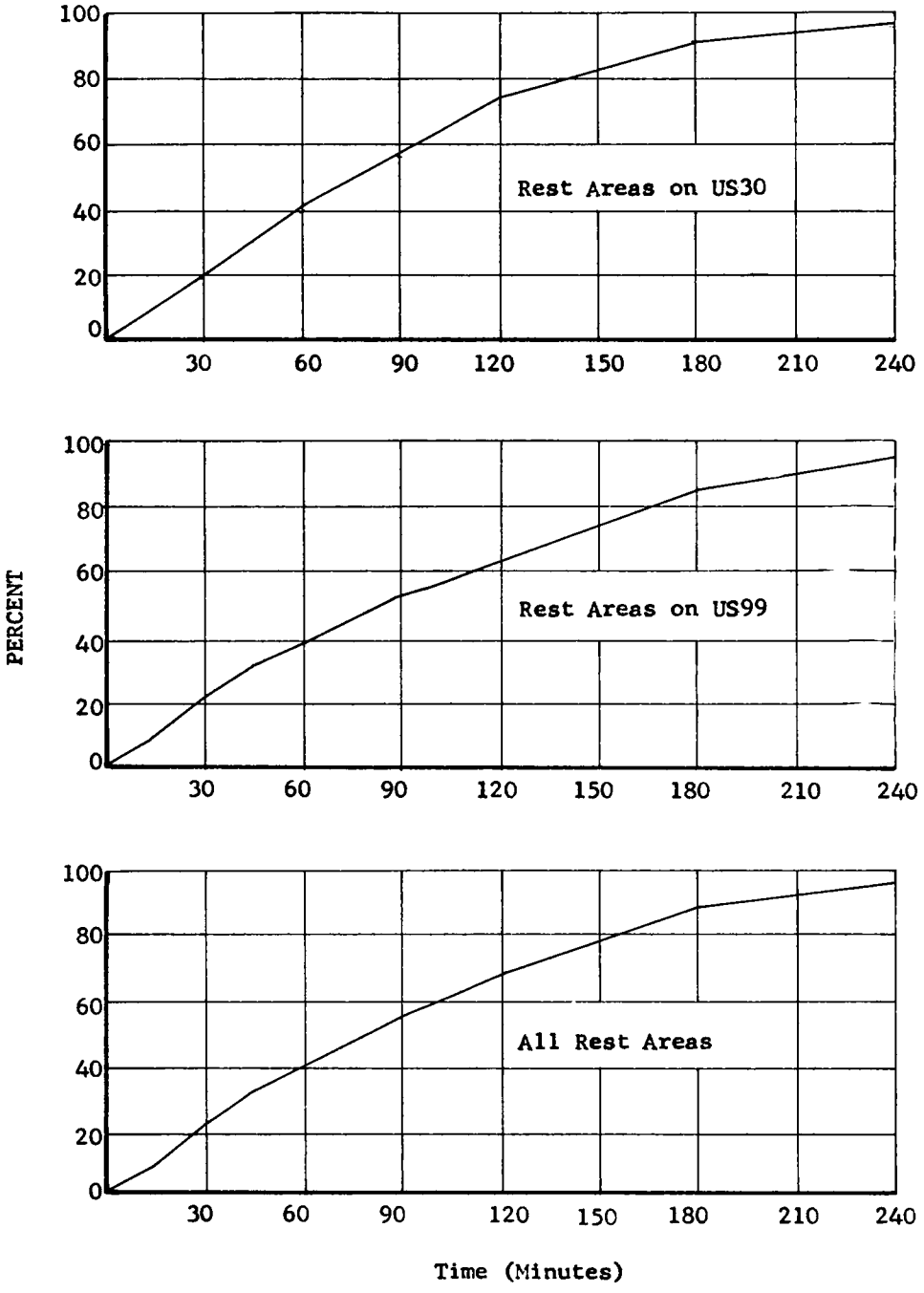

Figure 6. Cumulative percentage of vehicle-parties stopping in rest areas by time traveled since last stop.

rest area users traveling equivalent distances were 46, 60 and 66 percent.

The current policy of the Bureau of Public Roads states that safety rest areas on the Interstate System will be spaced at distances not closer than approximately 45 mi, when gas stations, hotels, restaurants, and other similar facilities are available on roads connecting on interchanges, and at minimum of 30 mi when such facilities are not available (*11*). Rest areas at these distances would make available rest area facilities to satisfy the present stopping practices of 60 and 70 percent of the rest area users, respectively, as shown by Figure 5.

In regard to the spacing of safety rest areas in respect to travel time, the AASHO policy recommends the location of safety rest areas be available approximately every one-half hour of driving time (*3*). As indicated by the time interval data since last stop in Figure 6 for all rest areas, 80 percent of the vehicle-parties have traveled 30 min or more since their last stop. Thus, spacing of rest areas according to the AASHO policy would have made available rest area facilities to accommodate the stopping practices of approximately 80 percent of the Oregon rest area users.

In the analysis of the distribution of rest area stops by mileage and time intervals since last stop, it is significant that the data were determined on the basis of travel on mostly non-access controlled highways. It is reasonable to assume that larger proportions of the highway traffic will stop at greater distance intervals on full access freeways than on non-access control sections due to higher vehicle speeds on freeways. Assuming average freeway speeds of 60 mph, spacing of rest areas at 30 and 45 mi would have made rest facilities available for 70 to 80 percent of the rest area users in terms of travel time between stops (Fig. 6).

Analysis of the individual study data showed the time and distance between stops were influnced significantly by the location of major cities on the highway route and the distance from them to the rest area, as the larger cities serve as major stopping points and trip origins. Small towns, parks, and other rest areas had much less influence on the intervals since last stop. In the combined data for all study sites the effects of the location of certain cities in respect to certain rest areas has been diminished and the composite data portray more accurately the typical intervals between stops of rest area users.

The average distance traveled since last stop was 66 mi on US 30 and 75 mi on US 99. The average time interval since last stop was 90 and 102 min on US 30 and US 99, respectively.

Length of Stop.—Information on the length of rest area stops is of value in the analysis of rest area use as the length of stay affects the accumulation of vehicles in the rest area. It is also indicative of the length of time that certain facilities are occupied, such as parking space and table-bench units. Figure 7 shows the cumulative percentage distribution of rest area stops by length of stop. The average length of stay was 43 min for all stops, 33 min for rest or nap stops, 38 min for eating stops, and 10 min for restroom stops.

The average stop length was influenced by a relatively few stops of long duration, mainly overnight stops. The permissive length of stop in an Oregon rest area was 18 hr. Approximately 49 percent of all stops were less than 20-min duration and 64 percent less than 30 min. Stops of less than 30-min duration accounted for 67 percent of the rest or nap stops, 40 percent of eating stops, and 96 percent of restroom stops.

Among the rest areas there were pronounced differences in the average length of stay. The average length of

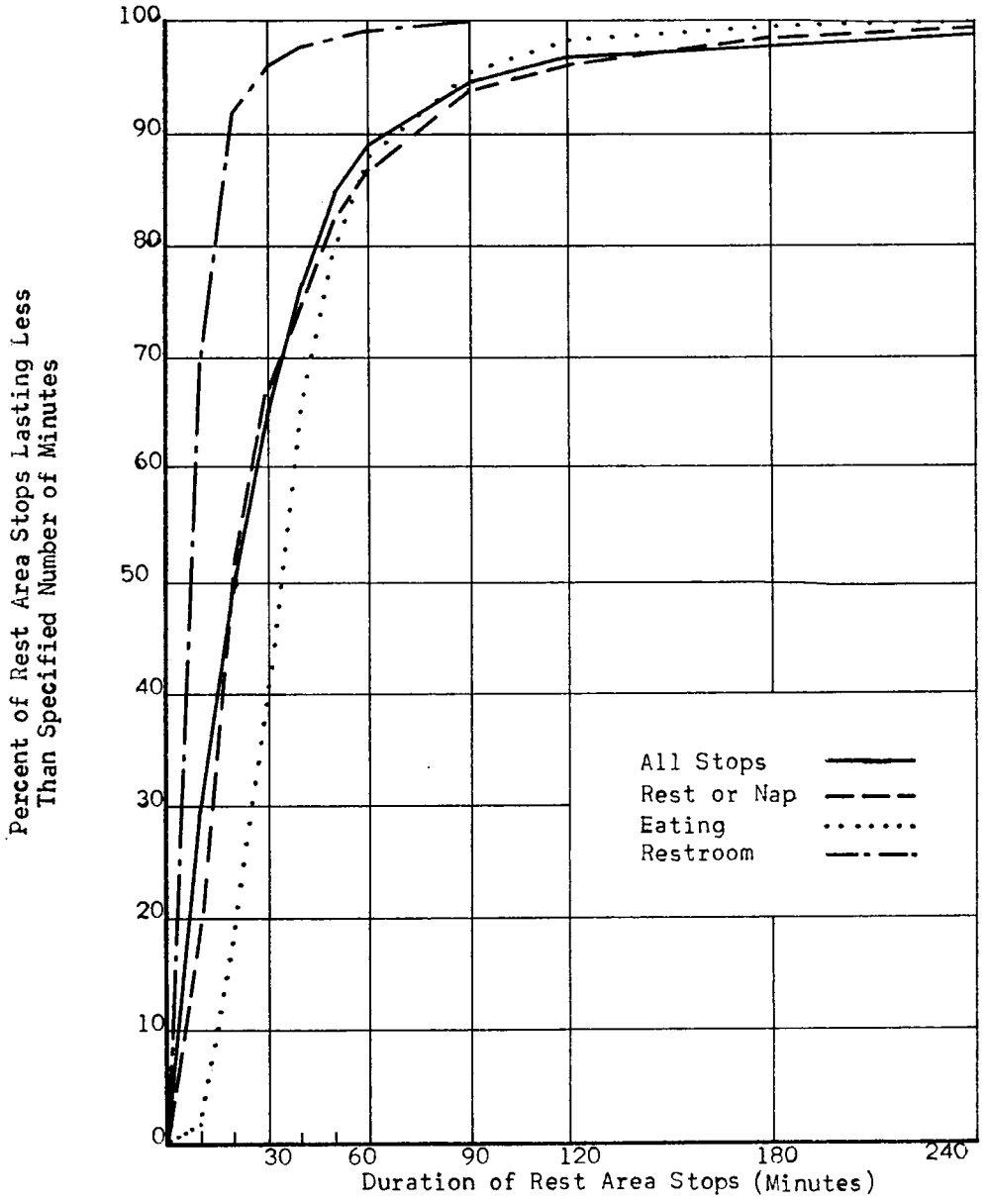

Figure 7. Length of stop, by purpose.

stay at the Gold Hill and Blue Star (Eugene) Rest Areas was significantly longer than at the remaining five rest areas due primarily to the higher proportion of overnight stops. The average stay was 78 and 68 min, respectively, at the Blue Star (Eugene) and Gold Hill Rest Areas. At the five other sites the average stay ranged from 27 to 33 min. Stops

by seasonal workers accounted for much of the overnight use which lengthened the average stay. The Blue Star (Eugene) Rest Area average was also affected by the longer length of recreational stops. It was also apparent that the scenic setting of the Blue Star (Eugene) Rest Area had the effect of prolonging the length of stay for eating and rest stops.

Primary Purpose of Stop.—The percentage distribution of vehicle-parties stopping in the rest area study sites classified by primary purpose of stop is given in Table 11. The largest single purpose of stop was for eating, with an average of 35.5 and 39.9 percent of the vehicle-parties using rest areas on US 30 and US 99 classified in this category. Morning and afternoon lunch or "coffee break" stops were included in the eating stop purpose as well as the regular noontime lunch stops. The three major classes of stops (eating, rest or nap, and restroom) accounted for approximately 84 percent of the rest area stops.

The percentage of stops primarily for drinking water are shown at Ladd Canyon, Willow Creek, and Gold Hill rest areas only, as these were the only sites with drinking water installed. Reliable data on the percentage of vehicle parties stopping primarily for drinking water at other sites are not available. Drinking water was considerably more important to rest area users than indicated by the 8 percent average of drinking-water stops at the three sites with this facility. Heavy use and demand for drinking water was shown by facility use data (Table 12) and the comments of rest area users.

The category "other stops" included miscellaneous stops such as checking vehicle, reading historical markers located in rest areas, changing drivers, litter deposits, checking for campsites, and overnight stops. Overnight stops were permitted although signs in the rest areas limited occupancy to 18 hr.

The incidence of the use of rest areas for recreation was extremely low. Only 1.1 percent of all the rest area stops were classified in this category. Recreational use was defined as use of the rest area for the primary purpose of activities such as fishing, picnicking, swimming, or sunbathing. It did not include lunch

TABLE 11

PERCENTAGE DISTRIBUTION BY PRIMARY PURPOSE OF STOP

Rest Area	Route	Primary Purpose of Stop (%)						
		Rest or Nap	Eating	Rest-room	Drinking Water	Recrea-tion	Other or Unknown	All Stops
John Day-Squally Hook	US 30	21.6	39.5	28.6	—[1]	—	10.3	100.0
Willow Creek	US 30	18.1	36.0	27.1	5.4	0.7	12.7	100.0
Ladd Canyon	US 30	14.8	31.0	27.7	11.0	1.3	14.2	100.0
Avg.	US 30	18.2	35.5	27.8	5.4	0.7	12.4	100.0
Blue Star (Eugene)	US 99	22.0	49.1	8.8	—[1]	4.5	15.6	100.0
Cabin Creek	US 99	22.7	37.4	31.7	—[1]	0.1	8.1	100.0
Cow Creek	US 99	25.6	30.2	34.6	—[1]	1.0	8.6	100.0
Gold Hill	US 99	24.1	40.8	15.1	8.6	—	11.4	100.0
Avg.	US 99	23.6	39.4	22.5	2.2	1.4	10.9	100.0
Avg. (all sites)		21.3	37.7	24.8	3.6	1.1	11.5	100.0

[1] Drinking water not available in rest area.

TABLE 12
PERCENTAGE DISTRIBUTION BY TYPE OF FACILITY USED

Rest Area	Route	Type of Use (%)[1]						
		Drinking Water	Restrooms	Tables and Benches	Shelters	None	Unknown	Total
John Day-Squally Hook	US 30	—[2]	68	25	—[2]	22	1	100
Willow Creek	US 30	51	67	33	19	14	*x*	100
Ladd Canyon	US 30	60	63	28	—[2]	16	*x*	100
Avg.	US 30	56	66	29	19	17	*x*	100
Blue Star (Eugene)	US 99	—[2]	53	45	—[2]	23	8	100
Cabin Creek	US 99	—[2]	60	29	—[2]	28	1	100
Cow Creek	US 99	—[2]	70	27	—[2]	18	—	100
Gold Hill	US 99	67	56	44	—[2]	7	—	100
Avg.	US 99	67	60	36	—	19	2	100
Avg. (all sites)		59	62	33	—	18	2	100

[1] Percent of vehicle-parties stopping that used designated facility. Percentages do not add to 100 percent as party may use more than one facility, percentages less than 0.5 percent indicated by *x*.
[2] Facility not available at rest area.

or refreshment stops made by vacationists en route to another destination. The Blue Star (Eugene) Rest Area had the only significant amount of recreational use (4.5 percent) due to its attractive location around a small lake bordered by trees which invited its use for swimming, fishing, and sunbathing. The attractiveness of the site also had an effect on the proportion of stops for eating (49 percent) which was significantly higher than average (38 percent). Also, the percentage of stops for the primary purpose of restroom use (9 percent) at this rest area was much lower than the average (25 percent). The low rates of recreational use at all study sites conclusively demonstrated that the use of roadside rest areas as parks by local population was extremely low.

Facility Use.—The use of installed rest area facilities related to the vehicle-parties stopping in the rest area is given in Table 12. Extensive use and need for restrooms, water, and table-bench units (in that order) are reflected in the high proportions of vehicle-parties using these facilities. The percentage of parties that used at least one of these three major facilities ranged from 72 to 93 percent at the seven rest areas. Restrooms were the most-used facility in terms of vehicle-parties (62 percent), with drinking water (59 percent) a close second.

Substantially more table use than the 33 percent shown would have occurred had there been more units available for peak-hour use. Numbers of potential users were forced to eat in cars or on the ground, or were turned away during peak hours. These observations are confirmed by Table 11 showing that 37.7 percent of the vehicle-parties stopped to eat.

The use of table-bench units is apparently related to the attractiveness of the rest area site. Gold Hill and the Blue Star (Eugene) Rest Areas, which appeared to be the most attractive rest area sites, had the highest percentages of table use. John Day-Squally Hook had the lowest rate of table-bench use. This rest area was probably the least attractive rest area site and at times there was con-

siderable wind and dust which deterred use of tables for eating.

Despite the very hot, dry location of Willow Creek, the percent of parties using the drinking water facility was the lowest observed at the three sites with water. The inconspicuous location of the Willow Creek drinking water was believed responsible for this lower rate of use. Of particular concern to occupants of rest areas without drinking water was the lack of this facility.

Table Use.—The relationship of the number of vehicle-parties stopping to eat during the noon hour (the typical peak period of table use) to the total number of vehicle-parties stopping during the noon hour is given in Table 13. The percentage of parties stopping to eat during the noon hour did not differ appreciably for the rest area study sites on US 30 (58.9 percent) and US 99 (58.3 percent). There were, however, substantial differences between individual rest areas. Those parties stopping to eat represent potential users of table-bench units, although not all of them used the facilities due to lack of sufficient tables and use of trailer houses for eating. In addition to the use of tables for eating, parties stopping primarily to rest or to use the rest area for overnight stops also occupied tables when available, thus using the tables for a disproportionate period of time.

The average percentage of vehicle-parties stopping to eat during the noon hour may be used as a factor in connection with the "peak-moment" vehicle accumulation data to estimate the table-bench unit requirements.

Number of Persons Using Restrooms.—The number of persons observed using restrooms in relation to the number of vehicle-parties entering the rest area is given in Table 14. These data are based on an average 7-hr observation period. Restroom use of 1.5 persons per vehicle was observed at the three rest areas on US 30 and 1.2 persons per vehicle at two study sites on US 99. The average was 1.4 persons per vehicle for all sites. Factors contributing to the lower restroom use rate (1.3 persons per vehicle) observed at Ladd Canyon were the number of parties stopping only for drinking water or to read the historical marker. Factors attributing to the lower restroom use rate (1.1 persons per vehicle party) observed at Gold Hill were the stops for drinking water only and

TABLE 13
RELATIONSHIP OF VEHICLE-PARTIES STOPPING DURING NOON HOUR TO THOSE STOPPING TO EAT

Rest Area	Route	Vehicle-Parties		Percent of Vehicle-Parties Stopping During Noon Hour to Eat (Potential Peak Table Use)
		Number Stopping	Number Stopping To Eat	
John Day-Squally Hook	US 30	12	8	65.3
Willow Creek	US 30	8	4	55.7
Ladd Canyon	US 30	10	5	55.7
Avg.	US 30	10	6	58.9
Blue Star (Eugene)	US 99	20	15	74.1
Cabin Creek	US 99	13	8	60.2
Cow Creek	US 99	8	3	35.5
Gold Hill	US 99	7	5	63.5
Avg.	US 99	12	8	58.3
Avg. (all sites)		11	7	58.6

TABLE 14
RELATIONSHIP OF PERSONS USING REST ROOMS TO VEHICLE-PARTIES ENTERING

Rest Area	Route	Number of Vehicle Parties Entering [1]	Number of Persons Using Restrooms [1]	Restroom Use Persons per Vehicle-Party
John Day-Squally Hook	US 30	76	122	1.6
Willow Creek	US 30	65	103	1.6
Ladd Canyon	US 30	57	76	1.3
Avg.	US 30	66	100	1.5
Blue Star (Eugene) [2]	US 99	—	—	—
Cabin Creek [2]	US 99	—	—	—
Cow Creek	US 99	47	60	1.3
Gold Hill	US 99	36	42	1.1
Avg.	US 99	42	51	1.2
Avg. (all sites)		56	81	1.4

[1] Daily 7-hr average, 10:00 AM to 5:00 PM.
[2] Data on number of persons using restrooms not collected.

the lower number of persons per vehicle observed entering the rest area.

It was not possible to obtain accurate counts on the number of persons using restrooms at Cabin Creek as dense foliage obscured the restrooms from view of the observer. At the Blue Star (Eugene) Rest Area, the heavy volume of interviews and the location of restrooms did not permit accurate counts of users. Interviewers commented that restroom use was very heavy at the Cabin Creek and Blue Star (Eugene) Rest Areas.

A comparison of the vehicle occupancy ratio (3.0 persons per vehicle) with the restroom use persons per vehicle-party ratio (1.4) indicated that slightly less than one-half of the persons entering the rest areas used restrooms.

Means of Locating Rest Areas.— Answers to the interview question, "How did you learn of or locate this rest area?" provide an indication of the effectiveness of rest area signing, the use of maps, and other means in guiding the motorist to rest areas. The importance of proper rest area signing was shown by the answers. An average of 61.3 percent had located the rest areas by signs, 28.0 percent by previous visits, 1.4 percent by road maps, 1.8 percent by other means (mainly word-of-mouth from service station attendants, store clerks, or friends), with 7.5 percent unknown. More repeat use of the rest areas on US 30 was indicated by the larger percentage of location by previous visits (33. 7 percent) than on US 99 (23.8 percent) (Table 15).

Analysis of the distribution of vehicles stopping at the various rest area sites, classified by the means by which the rest areas were located, showed statistically significant differences between the rest areas. The proportion of vehicles locating the rest areas by signs was much lower than average at Ladd Canyon, US 30, with a corresponding increase in the proportion that stopped because of previous visits. Conversely, the rest areas at Cabin Creek and Cow Creek had substantially less use by vehicles through previous visits.

Analysis of the distribution of vehicle stops at each rest area by direction of travel showed no significant difference in the means by which rest areas were located by travel

TABLE 15
MEANS OF LOCATING REST AREA

Rest Area	Route	Means (%)					All Stops (%)[1]
		Road Map	Road Signs	Previous Visits	Other	Unknown	
John Day-Squally Hook	US 30	1.9	55.9	31.9	1.5	8.8	100.0
Willow Creek	US 30	1.6	61.2	30.1	0.7	6.4	100.0
Ladd Canyon	US 30	0.5	46.6	39.2	3.8	9.9	100.0
Avg.	US 30	1.3	54.6	33.7	2.0	8.4	100.0
Blue Star (Eugene)	US 99	1.8	57.6	28.4	2.9	9.3	100.0
Cabin Creek	US 99	0.4	70.2	21.5	0.5	7.4	100.0
Cow Creek	US 99	2.7	72.1	16.9	1.7	6.6	100.0
Gold Hill	US 99	0.8	65.7	28.2	1.2	4.1	100.0
Avg.		1.4	66.4	23.8	1.6	6.8	100.0
Avg. (all sites)		1.4	61.3	28.0	1.8	7.5	100.0

[1] Percentage of vehicles stopping based on daylight (10:00 AM to 5:00 PM) summertime observations over 7-day period.

direction except at Ladd Canyon and Gold Hill Rest Areas. The absence of northbound signing at Gold Hill Rest Area was responsible for a lower proportion of vehicles locating this rest area by road signs in the northbound lane. As identical signing was used for both traffic lanes at Ladd Canyon, there was no ready explanation for the significant difference in the proportion of vehicles locating the rest area by signs by direction of travel.

The standard method of signing rest areas at the time of study was by the installation of two advance signs for each direction of travel: "Rest Area One Mile" (30 by 18 in.) and "Rest Area Ahead" (30 by 24 in.). In addition, one standard keystone-type sign "Roadside Rest Area" (30 by 30 in.) was usually installed off the shoulder of the highway, midway between the rest area entrances. Unfortunately, from a study viewpoint, there were only slight variations from this standard signing at the various study sites and no conclusions could be made as to most effective type of signing. It can be concluded that the request for more signs is directly attributable to the small size and inconspicuousness of existing signing.

Alternatives to Rest Area Stops.— The interview question, "Where would you have stopped had the rest area not been here?" provides an indication of the alternative locations of rest area stops and an indication of the amount of potential shoulder stops removed from the highway. Table 16 shows an average of 47.9 percent of the vehicle-parties stopping in the rest areas indicated they would have chosen to stop at the next rest area or park. The next largest category was next city or town with 15.0 percent indicating this alternate choice. Next service station was the choice of 9.6 percent and shoulder of highway the choice of 8.2 percent of the vehicle-parties. The 8.2 percent indicating shoulder of highway gives an estimate of the minimum number of potentially hazardous shoulder stops that were avoided by the development of rest areas, as undetermined percentages of vehicle-parties classified in the

TABLE 16
PERCENTAGE DISTRIBUTION BY ALTERNATE STOP LOCATION

Rest Area	Route	Alternate Location (%)							All Stops (%)
		Shoulder of Hwy.	Next Service Station	Next Rest Area or Park	Next City or Town	Would Not Stop	Other or Did Not Know	Data Not Obtained	
John Day-Squally Hook	US 30	10.0	10.7	53.6	12.8	1.7	1.5	9.7	100.0
Willow Creek	US 30	7.1	11.8	51.8	13.4	2.1	4.2	9.6	100.0
Ladd Canyon	US 30	9.6	6.8	32.3	25.4	4.1	12.0	9.8	100.0
Avg.	US 30	8.9	9.8	45.9	17.2	2.6	5.9	9.7	100.0
Blue Star (Eugene)	US 99	4.7	5.2	52.5	14.3	4.7	9.0	9.6	100.0
Cabin Creek	US 99	8.1	8.7	47.2	9.9	2.7	4.6	18.8	100.0
Cow Creek	US 99	10.3	16.6	46.2	12.3	1.4	6.6	6.6	100.0
Gold Hill	US 99	7.3	7.3	58.8	17.2	3.7	7.8	4.9	100.0
Avg.	US 99	7.6	9.5	49.4	13.4	3.1	7.0	10.0	100.0
Avg. (all sites)		8.2	9.6	47.9	15.0	2.9	6.5	9.9	100.0

do not know (6.5 percent) and data not obtained (9.9 percent) categories might also have stopped on the highway shoulders. Also, a substantial number of those desiring to stop in rest areas or parks would have stopped on highway shoulders if rest area facilities were not available.

Substantially the same patterns of stop location alternatives predominated at the various rest areas. The only rest area with any large difference was Ladd Canyon. Here the proportion indicating rest area or park as an alternate was only 32.3 percent, and next city or town was given as an alternate stop by 25.4 percent, apparently due to the nearby location of LaGrande. Despite the nearby location of the Blue Star (Eugene) Rest Area to the city of Eugene (8 mi), 52.5 percent of the parties stopping there indicated the next rest area or park as their alternate choice of stop.

Evaluation of Rest Area Occupant and Observer Comments.—Comments of rest area users provided an important source of information for evaluating the service offered by rest areas in the eyes of the motorists for the summer study periods. Observations of the operation of rest areas by the observer interviewers also afforded a reliable source of data for evaluating rest area service, even though these comments cannot be evaluated quantitatively.

User comments were predominantly favorable and indicated sincere appreciation of Oregon roadside rest areas and their facilities. Due to the large number of out-of-state tourists, many comparative statements expressing appreciation of Oregon roadside parks and rest areas, which were often regarded as superior in quality and quantity to those of home States, were received.

Critical comments usually expressed a desire for more rest areas and improved facilities. Particularly numerous were comments pertaining to the need for drinking water at those rest areas without this facility. The need for overnight camping places was often expressed. The lack of sufficient table-bench units to meet demands was a further source of criticism. Occasional comments indicated the need for better signing of rest areas.

The importance of good rest area maintenance was underscored according to the quality of rest area maintenance at the study sites. Many

favorable comments pertaining to rest area maintenance and condition of facilities were made at the Ladd Canyon and Gold Hill Rest Areas, which were probably the best maintained of the seven study sites. Conversely, complaints were made by occupants of the Blue Star (Eugene) Rest Area regarding the condition of restrooms and grounds. Maintenance at this rest area appeared to be the poorest, apparently due to the large amount of use. It was evident from the complaints and observations that daily, or oftener, maintenance of rest areas with high usage is mandatory. The lack of weekend rest area maintenance, when rest area traffic is highest, presents a major problem. Although weekday maintenance is usually good, high weekend use without maintenance resulted in a poor image to the motorist during this period.

The observations and comments of interviewers confirmed the general appreciation and demand of the public for rest areas and their facilities. The interviewers confirmed that the lack of drinking water was the main public concern at rest areas without this facility, and that the lack of sufficient table-bench units caused many potential users to turn away, particularly at lunch hours.

The need for clean restrooms and adequate paper supplies, particularly over weekends, was a source of concern to interviewers as they received direct criticism and requests for supplies from occupants. The primitive type dry pit restrooms installed at all rest areas were occasionally a source of complaint, particularly by women. The need for additional restrooms at Blue Star (Eugene) Rest Area was noted by observers. If water were available then the presence of flush toilets would eliminate the unpleasantness of pit toilets and at the same time enhance the use of the entire rest area. This is especially true as would relate to the use of tables for eating in a more enjoyable atmosphere.

CONCLUSIONS

1. The average percent of highway traffic using Oregon roadside rest areas on US 30 (4.1 percent) and US 99 (2.0 percent) is substantially below that expected at new safety rest areas, planned or under construction on the Interstate System. With the superior types of access, signing, and facilities that will be provided with safety rest areas built to Interstate System standards on full-access controlled highways, the percentage of traffic ultimately using rest areas, based on experience of other States, will be approximately 10 percent.

2. The two major factors affecting the percent of highway traffic using rest areas of like design and facilities are the remoteness of the rest area from alternate facilities and the amount of total traffic that is local traffic. The percent of use is directly proportional to remoteness and inversely proportional to the amount of local traffic.

3. Rest area location in respect to distance from major cities does not appreciably affect the amount of use, although because of larger proportions of local traffic near cities, the percentage of highway traffic using rest areas at such locations will usually be lower.

4. The spacing of rest areas at distances of 30 to 45 mi would accommodate approximately 70 to 60 percent of rest area users, respectively. Spacing of rest areas at 30-min travel time intervals would serve approximately 80 percent of rest area users. However, the percentages would not be typical of full freeways.

5. The need for providing restroom, drinking water, and table and bench facilities (in that order) is indicated by the heavy demand for

these facilities and the use made of them.

6. The fact that only 1.4 percent of rest area stops were for recreational purposes is indicative that rest areas are being used for the purpose for which they are intended. That is, they are providing services to motorists en route to other destinations and are not being used to any significant extent for park or recreational use.

7. To serve heavy trucks, truck-trailer combinations, and light vehicle-trailer combinations adequately, rest area access and parking should be specifically designed to accommodate these vehicles.

8. The longer length of stay and the higher proportion of eating and rest stops observed at rest areas with scenic aspects are indicative of the need for providing larger than average parking space and additional table and bench units at such rest areas.

9. There is general public acceptance and praise of Oregon rest areas, particularly by out-of-state traffic. Public criticism of rest area operation is minor and mainly concerns the need for more rest areas and additional facilities such as drinking water, table-bench units, and more sanitary restrooms (flush toilets, etc.).

10. Adequate signing of rest areas is very important if rest areas are to provide maximum roadside service to highway traffic.

11. A minimum of daily rest area maintenance is important in rest area operation to keep the services offered up to standards of public approval and acceptance.

SUMMARY OF FINDINGS

1. Average daily summer highway traffic of 4.1 and 2.0 percent entered Oregon roadside rest areas on US 30 and US 99, respectively, in 1960. The average percent of highway traffic entering the 7 rest areas studied on non-access controlled routes ranged from 1.3 to 4.4 percent.

2. Saturday was typically the day of highest use in terms of the numbers of vehicles entering.

3. The peak hour of rest area use occurred between 12:00 NOON and 1:00 PM as shown by data on the average number of vehicles accumulated in the rest areas by hour of day. The average peak-hour vehicle accumulation was 4.5 percent and 5.8 percent of the vehicles entering from US 30 and US 99, respectively, and ranged from 3.4 to 8.4 percent for individual rest areas.

4. The average peak-moment vehicle accumulation was 7.1 and 8.2 percent of traffic entering the study sites on US 30 and US 99, respectively.

5. Light vehicles (passenger cars, panels, and pickups under 6,000 lb) were by far the heaviest rest area users, both as percent of rest area traffic (97.9 percent) and as proportion of the adjacent highway traffic by vehicle type. The proportions of each vehicle type that entered the rest areas were single light vehicle, 2.8 percent; light vehicle-trailer coach, 10.6 percent; light vehicle-other trailer, 4.5 percent; bus and single unit truck, 1.2 percent; and truck-trailers, 0.1 percent.

6. Vehicle occupancy rates of 3.1 and 3.0 persons per vehicle entering rest areas on US 30 and US 99, respectively, were observed. These averages are substantially higher than the occupancy of vehicles traveling on the adjacent highways (2.1 to 2.4 persons per passenger car).

7. The number of vehicles that entered the rest area and stopped was 91 percent.

8. The out-of-state proportion of light vehicles using rest areas (61 percent) was significantly higher than the proportion of out-of-state light vehicle traffic on the adjacent highways (47 percent).

9. The average distance from last stop was 66 mi at rest areas on US 30 and 75 mi on US 99.

10. The average time interval since last stop was 90 and 102 min at rest areas on US 30 and US 99, respectively.

11. The average length of stop was 43 min for all stops, with 49 percent of all stops, less than 20 min, and 64 percent less than 30 min. The average stay was 73 min at two rest areas with scenic attractions and ranged from 27 to 33 min at the five other sites.

12. Three primary purposes of rest area stops (rest or nap, eating, and restroom) accounted for 84 percent of the use. The average distribution of stops by primary purpose in rest areas on US 30 was rest or nap, 18 percent; eating, 36 percent; restroom, 28 percent. On US 99 the average distribution was rest or nap, 24 percent; eating, 39 percent; restrooms, 23 percent.

13. Sixty-two percent of the vehicle-parties stopping at the rest area percent table-bench units—18 percent used drinking water, and 33 percent table-bench units—18 per cent used no facilities.

14. The typical hour of peak table use occurred between 12 NOON and 1 PM during which 58.6 percent of the vehicle-parties stopping in the study sites stopped to eat. During periods of peak usage, available table-bench units did not always satisfy the demand.

15. The rate of restroom use was 1.5 persons per entering vehicle-party for three rest areas on US 30 and 1.2 persons per vehicle-party at two rest areas on US 99. Slightly less than one-half of the persons entering the rest area used the restrooms.

16. The primary means by which vehicle-parties located rest areas was by road signs (61.3 percent) with knowledge through previous visits the next most frequent means (28.0 percent). Location by road map and other sources, mainly word-of-mouth, was small (3.2 percent).

17. A large majority of user comments were favorable and expressed sincere appreciation for Oregon rest areas and facilities. Critical comments mainly expressed a desire for more rest areas and improved facilities. Of particular concern was the need for drinking water at those rest areas not having it. The need for additional tables at crowded rest areas and for weekend maintenance, particularly of restrooms not equipped with flush toilets, was apparent by critical comments of users and observations at rest areas with high usage.

ACKNOWLEDGMENT

William J. Byars, Statistical Supervisor, Planning Survey Section of the Oregon State Highway Department's Traffic Engineering Division was in direct charge of preparing study procedures, and collecting and analyzing the data contained in this paper.

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APPENDIX

A TYPICAL CASE HISTORY—LADD CANYON REST AREA

The Ladd Canyon data are typical of the data collected and analyzed at the seven Oregon study sites in the summer of 1960. Comparable data for each study site have been compiled and analyzed as the basis for this report on safety rest area use and are a matter of record in the files of the Oregon State Highway Department, Traffic Engineering Division.

DESCRIPTION

Location

Ladd Canyon Rest Area was located adjacent to the eastbound lane of a 2-lane section of US 30 (the traveled route of Interstate 80N) 7 mi southeast of LaGrande in northeast Oregon, at milepoint 268.3. Although the highway design was not up to ultimate Interstate design standards, the existing highway was adequate for present traffic. The highway at this location has two 14-ft asphaltic pavement traffic lanes and 8-ft paved shoulders. Highway shoulder parking was not restricted. A 2-lane highway extended from LaGrande, 36 mi southeast to Baker, US 30, with the exception of two 4-lane sections, each approximately 2 mi long, southeast of the rest area. There was partial control of access on this section from LaGrande to North Powder, and no access control from there on to Baker. West of LaGrande to Pendleton where parts of the Interstate Highway were under construction to ultimate design standards, there was a combination of 4- and 2-lane highways with full and partial access control.

The nearest city to Ladd Canyon Rest Area on US 30 was LaGrande (population 9,014). Southeast on US 30 were North Powder (population 399), Haines (population 331), and Baker (population 9,986), at distances of 16, 24, and 36 mi, respectively. These cities provided the only food, lodging, and auto service facilities in this sparsely settled area on US 30 other than a service station and cafe with showers and bunks that was located approximately 5 mi northwest of the rest area and catered to trucks. About 8 mi southeast on US 30 two large turnouts with drinking water fountains provided opportunity for stopping on both sides of the highway. The nearest roadside rest areas on US 30 were Rattlesnake Springs, 63 mi southeast, and Willow Creek, 100 mi northwest.

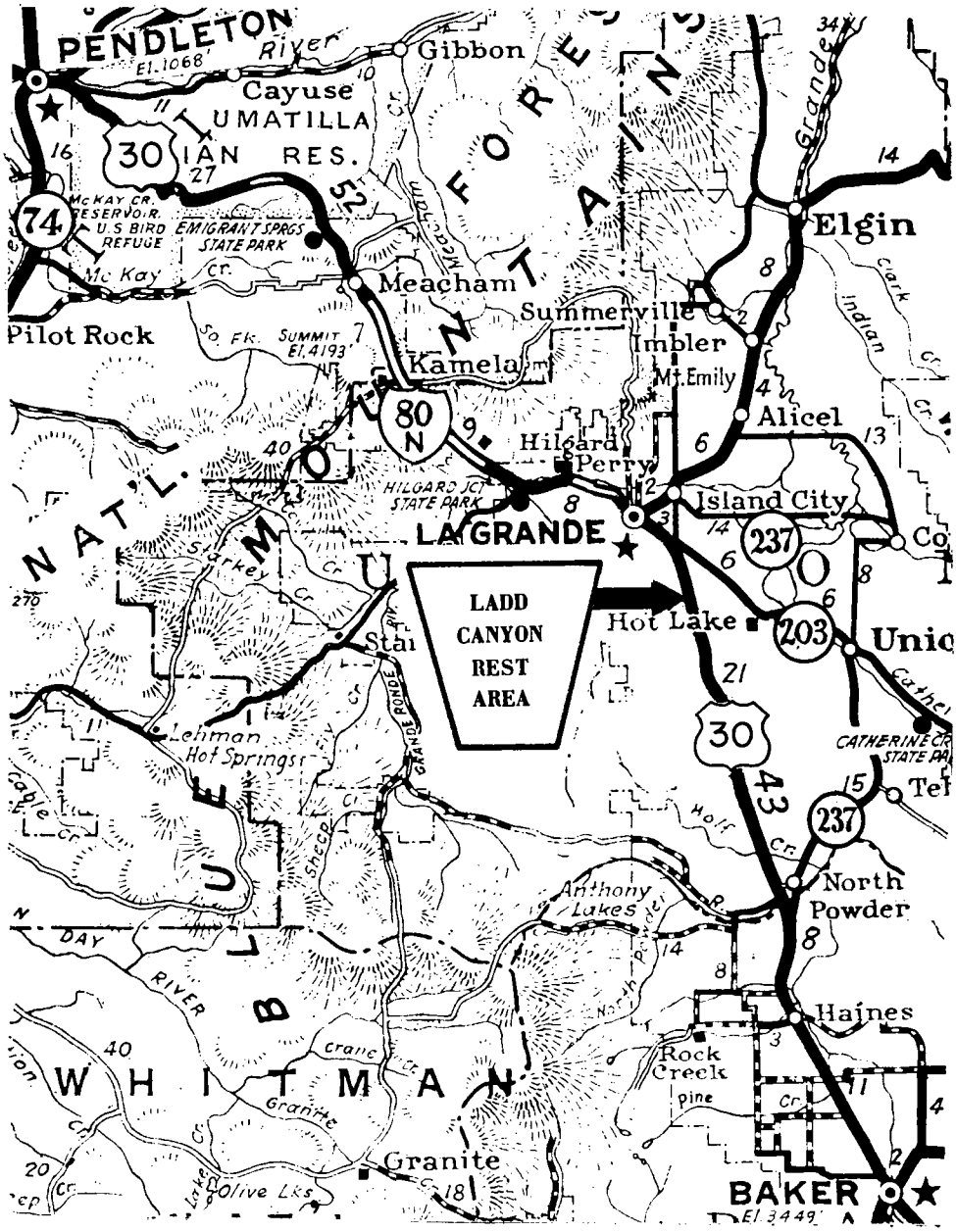

Figure 8. Vicinity map, Ladd Canyon Rest Area.

Hilgard and Emigrant Springs State Parks, approximately 16 and 37 mi northwest on US 30, respectively, in the Blue Mountains, furnished extensive facilities for rest and recreational stops as well as camping. The location of Ladd Canyon Rest Area in relation to the surrounding country and highway system is shown in Figure 8.

Figure 9. Ladd Canyon Rest Area, looking northwest from highway.

Physical Description

Ladd Canyon Rest Area was situated at the extreme southeast end of the Grand Ronde Valley where US 30 begins its climb up Ladd Canyon in the foothills of the Blue Mountains. A view of Ladd Canyon Rest Area looking northwest across the valley floor towards LaGrande is shown in Figure 9. The rest area was apparently the location of an old farm orchard with prune, apple, poplar, and willow trees, and a small creek forming an attractive rest area site. Ladd Creek, a small stream offering trout fishing, ran near the shoulder of the highway opposite the rest area. The area bordering US 30 southwest of Ladd Canyon Rest Area was mountainous, sparsely-settled land used mainly for grazing, whereas flat farm pasture and crop lands bordered the highway northwest into LaGrande.

The rest area was signed in each direction of travel by four signs: "Rest Area One Mile" (30 by 18 in.), "Deposit Litter Bags ¼ Mile" (24 by 18 in.), "Rest Area Ahead" (30 by 24 in.), "Historical Marker Ahead" (30 by 24 in.). In addition, one standard keystone-type roadside rest area sign (30 by 30 in.) was installed off the highway shoulder near the front center of the rest area. A large Oregon historical marker fronting the parking area attracted some rest area stops. The rest area was readily visible from the highway, with direct access to eastbound traffic. It was necessary for westbound traffic to cross the eastbound traffic lane in entering and leaving the rest area.

Eight tables with benches were placed among the trees in the rest area. Paths led to two dry pit restrooms located across a rivulet, apart from the picnic area. The restrooms were not readily observed from the highway. Drinking water was piped into a fountain and faucet in the center of the rest area next to the parking area. Rest area occupancy in excess of 18 hr and making of fires were prohibited by signs. No artificial lighting or cooking facilities were installed in the rest area. A few informal campfire spots had been made by picnic parties using creek bed rocks. Asphalt-surfaced parking space was provided by a parking area approximately 16 by 120 ft and supplemental parking space was provided by the gravel shoulders of the rest area access road. The parking space was not marked.

TRAFFIC VOLUMES

Traffic Counting Equipment

Daily 24-hr counts of the number of vehicles entering the rest area were obtained from traffic recorders from June 30 to September 5, 1960. A road tube type of hourly traffic recorder was installed on the rest area access road near the southeast entrance. The traffic recorder data from the North Powder permanent traffic recorder, located approximately 17 mi southeast on US 30, furnished data necessary to relate rest area traffic to highway traffic. The daily rest area access road traffic counts adjusted for axle overcounting are given in Table 3. Adjustment of the rest area traffic recorder data was necessary to compensate for overcounting due to multiple-axle vehicles such as passenger car-trailer coach combinations and multiple-axle trucks. The overcount correction factor developed from the study's traffic classification data was 0.9446. No correction factor was required for the US 30 highway traffic counts obtained from the permanent traffic recorder.

Rest Area Traffic

The average daily number of vehicles and percent of highway traffic entering the rest area by day of week are given in Table 17. Average weekday rest area traffic was considerably less than weekend traffic as a percent of highway traffic by day of week but was not appreciably different from the average day (4.4 percent).

TABLE 17
COMPARISON OF HIGHWAY AND REST AREA TRAFFIC AT LADD CANYON

Day	Average Daily Summer Traffic		
	Highway (No.)	Entering Rest Area (No.)	(%)
Weekday	3,049	132	4.3
Saturday	3,469	150	4.3
Sunday	3,165	144	4.5
Avg.	3,129	137	4.4

REST AREA USE

The data are based on interview and observation data collected from 10:00 AM to 5:00 PM on 7 days during the summer of 1960 (June 14-15, July 14-15, and August 26, 27, 28). The study period included five weekdays, one Saturday, and one Sunday.

Vehicles Entering

Average Vehicles Accumulated.—The average number of vehicles accumulated in Ladd Canyon Rest Area by time of day is shown in Figure 10. Although there was a large daily variation in the number of vehicle accumulations, there was a definite hourly trend with maximum rest area use usually occurring between 12:00 NOON and 2:00 PM. During the study period an average of five vehicles accumulated in the rest area during the peak hour. The irregular, random movements of the trend line partially reflect the transitory nature of rest area use. For example, during the course of an hour, the number of vehicles in the rest area may shift from a low of 1 or 2 to a maximum of 7 or 8 vehicles.

Daily Peak Moment Accumulation.—Data on the amount of summertime use are given in Table 18, in terms of the number of vehicles accumulated during the peak moment. The peak moment was defined as the 5-min interval of the day during which the number of vehicles accumulated in (occupying) the rest area was a maximum.

The daily peak-moment vehicle accumulations ranged from 5 to 10 vehicles during the 7 days of the study period, and averaged 8 vehicles. The average accumulation was 7.1 percent of the average daily 24-hr summertime rest area traffic. It

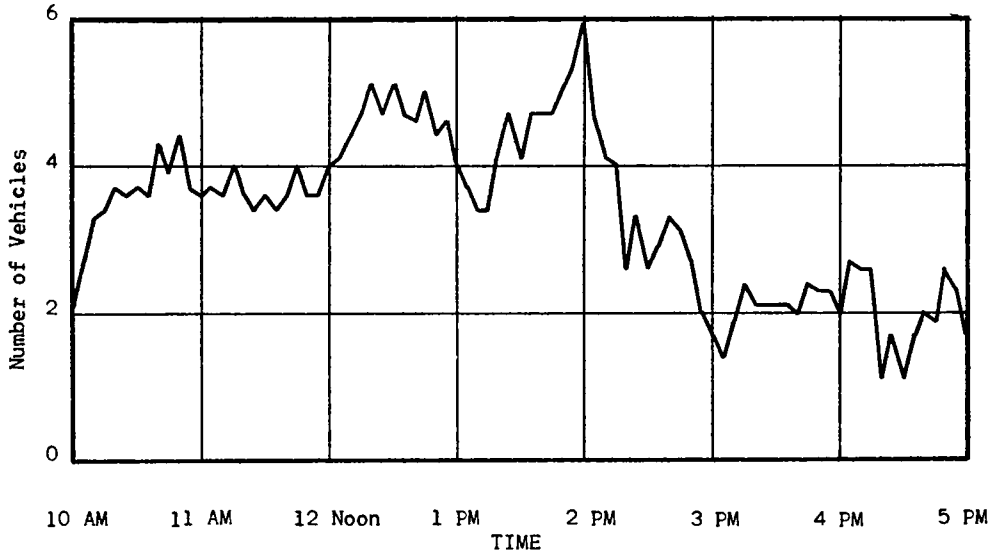

Figure 10. Average number of vehicles accumulated in Ladd Canyon Rest Area.

should be recognized that the peak moment data may be less than the maximum peak moment of the summer because of the absence of holidays from the study periods as well as the sample size. (An analysis of the peak-moment sample variability indicated that the true average daily peak-moment vehicle accumulation will lie between 5.8 and 9.3 vehicles 95 percent of the time.)

Vehicle Type.—Table 19 shows the classification of the rest area and adjacent highway traffic observed during the seven-day, 10:00 AM to 5:00 PM period. Data on the type of vehicles using the rest area are particularly useful in relation to access road and parking facility design. The use

TABLE 18

RELATIONSHIP OF VEHICLES ACCUMULATED DURING PEAK MOMENT TO THOSE ENTERING, LADD CANYON

Day	Number of Vehicles		Percent Accumulated During Peak Moment [1]
	Entering in 24 Hr	Accumulated During Peak Moment	
Tuesday	100	10	10.0
Wednesday	88	5	5.7
Thursday	128	8	6.2
Friday	124	9	7.3
	94	8	8.5
Weekday avg.	107	8	7.5
Saturday	100	8	8.0
Sunday	127	5	3.9
Avg.	109	8	7.1

[1] Based on unrounded data.

TABLE 19

CLASSIFICATION OF TRAFFIC, LADD CANYON

Vehicle Type	Vehicles Entering Rest Area		Highway Traffic	
	No.	%	No. Observed	Percent Entering Rest Area
Light vehicle	353	88.2	7,469	4.7
Light vehicle and trailer coach	18	4.5	116	15.5
Light vehicle and other trailer	14	3.5	242	5.8
All light vehicles	385	96.2	7,827	4.9
Bus or single-unit trick	13	3.3	353	3.7
Truck-trailer combinations	2	0.5	569	0.4
All vehicles	400	100.0	8,749	4.6

of the rest area was almost entirely by single light vehicles (88.2 percent). The lack of appreciable heavy truck use of the rest area was anticipated as the rest area access and parking were of an older design, primarily for light vehicle use. The fact that a cafe and service station with showers and bunks which catered primarily to trucks was located only 5 mi away may also have had an effect in reducing truck use.

An analysis of the relationship of the rest area and highway traffic by vehicle type indicated that, although the adjacent highway traffic was predominantly light vehicles, the light vehicle was a larger proportion of the rest area users. A substantially higher percentage of light vehicle-trailer coach highway traffic (15.5 percent) entered the rest area than other light vehicle classifications (single light vehicles, 4.7 percent; light vehicle and other trailer, 5.8 percent). Only 0.4 percent of the truck-trailer highway traffic entered the rest area.

Vehicle Occupancy.—Data on the average number of persons occupying vehicles entering Ladd Canyon Rest Area are given in Table 20 by day of week. An average of 3.0 persons per vehicle was observed entering the rest area. Although the weekday average was 3.0 persons as compared to 2.9 and 3.3 persons for Saturday and Sunday, there appeared to be no significant differences in the persons per vehicle ratios by day of week as the weekday occupancy ratios ranged from 2.7 to 3.4 persons per vehicle. The number of vehicle occupants ranged from the single driver to 9 persons in family cars.

TABLE 20

VEHICLE OCCUPANCY, LADD CANYON

Day	No. of Vehicles Entering [1]	No. of Persons	Persons Per Vehicle
Weekday	58	174	3.0
Saturday	55	159	2.9
Sunday	50	166	3.3
Avg.	56	171	3.0

[1] Excludes vehicles entering for which occupancy data not obtained.

TABLE 21

RELATIONSHIP OF VEHICLES STOPPING TO THOSE ENTERING REST AREA, LADD CANYON

Day	Number of Vehicles		Percent Stopping in Rest Area
	Entering	Stopping	
Weekday Avg.	59	54	92
Saturday	55	47	85
Sunday	50	46	92
Avg.	57	52	91

The rest area average of 3.0 persons per vehicle compares with the average of 2.4 persons per passenger car observed during another study in July 1960 on US 30, 10 mi east of Pendleton. The higher rest area vehicle occupancy average is representative of a large amount of family rest area use, particularly by tourist parties.

Vehicles Stopping

The relationship of the average daily number of vehicles stopping in the rest area to the number of observed entering the rest area by day of week (10:00 AM to 5:00 PM) is given in Table 21. A daily average of 52, or 91 percent of the 57 vehicles entering, stopped in the rest area. The remaining 9 percent represented vehicles driving through the rest area without stopping.

Although occupants of vehicles driving through were not interviewed, it was evident from observation and passing comments of drivers, that the following were the more frequent reasons for the failure of entering drivers to stop:

1. The rest area road was used as a turn around point for traffic.

TABLE 22
VEHICLE REGISTRATION OF REST AREA USERS, LADD CANYON

Place of Registration	Number of Vehicles Stopping	Percent of Total
Oregon	121	33.1
Washington	88	24.1
California	20	5.5
Idaho	43	11.8
Montana	3	0.8
Utah	8	2.2
British Columbia	4	1.1
Other States and countries	73	20.0
Out-of-state, unidentified	5	1.4
All places	365	100.0

2. The drivers of vehicles failed to notice the restrooms and drove on.

3. Vehicle-parties were looking for parks or camp grounds (no fires were permitted in the rest area nor were camp sites available).

State of Registration.—The distribution of vehicles stopping by place of vehicle registration given in Table 22 provides a measure of the amount of resident and out-of-state use of the rest area. Approximately one-third were Oregon residents, and two-thirds were out-of-state residents. Of the out-of-state users, Washington residents accounted for the highest amount (24.1 percent) with Idaho next (11.8 percent) followed by California (5.5 percent). The remaining users (25.5 percent) were scattered among residents from various parts of the United States and Canada. The 1.4 percent classified as out-of-state, unidentified, mainly represented vehicles making short stops for which there was no direct interview made and which had unfamiliar out-of-state license plates. Most of the out-of-state users were tourists and vacationists.

Comparisons of the proportions of Oregon and out-of-state light vehicle traffic traveling the highway and stopping in the rest area indicate that a significantly higher proportion of

TABLE 23
COMPARATIVE DISTRIBUTION OF LIGHT VEHICLE REST AREA STOPS AND HIGHWAY TRAFFIC BY PLACE OF REGISTRATION, LADD CANYON

Place of Registration	Rest Area Stops		Highway Traffic	
	Number of Light Vehicles	Percent of Total	Number of Light Vehicles	Percent of Total
State	114	32	3,555	45
Out-of-state	240	68	4,272	55
Total	354	100	7,827	100

out-of-state traffic used the rest area than Oregon (Table 23). Out-of-state registered light vehicles constituted 55 percent of the light vehicle traffic on the highway in comparison to 68 percent of the rest area light vehicle stops.

Interval Between Stops.—Figures 11 and 12 show the distance and travel time, respectively, since last stop for rest area occupants in the form of a cumulative percentage distribution. The stopping habits of rest area occupants were influenced by the distance of major stopping points and trip origins from the rest area. In Figure 5 the sharp increases in the percent of stops at 30 to 45 and 0 to 15 mi distant were due to the location of the cities of Baker and LaGrande at distances of 36 and 7 mi, respectively, from the rest area. In the time traveled curve, these sharp changes were smoothed by differences in driving habits and estimates of driving time. The average distance since last stop was 54 mi, and the average time was 75 min.

Length of Stop.—The percentage distribution of stops in the rest area by length of stay is given in Table 24. Approximately 40 percent of the stops were less than 10 min, and 21 percent from 10 to 19 min. Those of less than an hour accounted for 92 percent of all stops. The average length of stay was 32 min for rest or nap, 37 min for eating, 12 min for restroom use, and 48 min for other purposes.

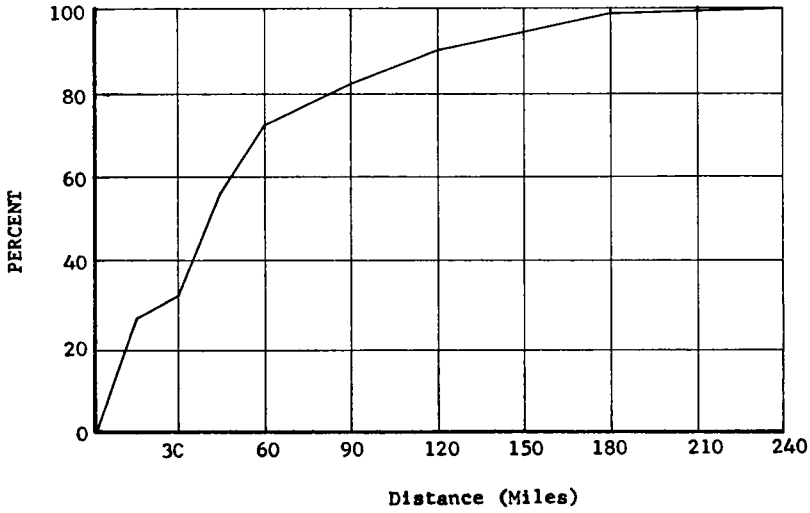

Figure 11. Cumulative percentage of vehicle-parties stopping in Ladd Canyon Rest Area by distance traveled since last stop.

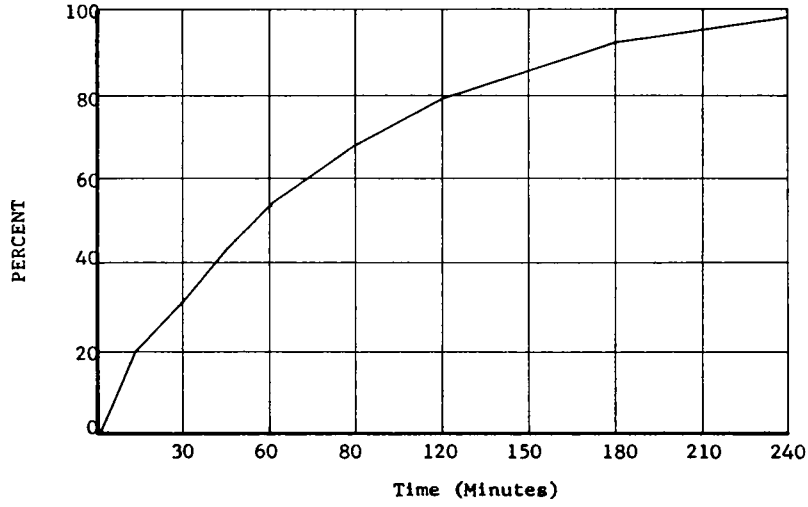

Figure 12. Cumulative percentage of vehicle-parties stopping in Ladd Canyon Rest Area by time traveled since last stop.

Purpose of Stop.—The percentage distribution of stops classified by primary purpose is given in Table 25. The data show that four categories (rest or nap, eating, restroom, and drinking water) account for the great bulk of rest area stops (approximately 84 percent). Although stops primarily for rest accounted for only 15 percent of the rest area stops, other stop purposes (such as eating, restroom, and drinking water) also incorporated many of the attributes of rest stops necessary for safety and relief from driving tension. The drinking water stops were

TABLE 24

PERCENTAGE DISTRIBUTION BY LENGTH OF STAY AND STOP PURPOSE, LADD CANYON

Length of Stay	Primary Purpose of Stop (%)				All Stops
	Rest or Nap	Eating	Rest-room	Other	
Less than 10 min	27.8	0.9	61.3	68.8	39.6
10-19 min	25.9	20.3	28.7	9.4	20.6
20-29 min	12.9	24.8	4.0	8.3	12.9
30-39 min	7.4	23.0	1.0	4.2	9.6
40-49 min	3.7	13.3	—	2.1	5.2
50-59 min	5.6	7.1	1.0	2.1	3.8
1-1½ hr	7.4	7.9	4.0	1.0	5.0
1½-2 hr	5.6	0.9	—	—	1.1
2-3 hr	—	0.9	—	1.0	0.6
3-4 hr	3.7	0.0	—	—	0.8
Over 4 hr	—	—	—	3.1	0.8
Total	100.0	100.0	100.0	100.0	100.0
Avg. (min)	33	37	12	48	32

TABLE 25

PERCENTAGE DISTRIBUTION BY PRIMARY PURPOSE OF STOP, LADD CANYON

Day	Primary Purpose of Stop (%)								Total
	Rest or Nap	Change Drivers	Eating	Recrea-tion	Rest-room	Drink of Water	Litter Deposit	Other or Unknown	
Weekday	14.0	1.1	32.4	1.1	24.3	13.2	2.2	11.7	100.0
Saturday	19.1	4.3	29.8	—	31.9	—	—	14.9	100.0
Sunday	15.2	—	23.9	4.3	43.6	8.7	—	4.3	100.0
Avg.	14.8	1.4	31.0	1.3	27.7	11.0	1.6	11.2	100.0

primarily short stops in which the use of drinking water facility was the major reason for stopping. The use of the rest area for litterbag or refuse deposits only was very low, with an average of only one stop a day reported despite the advance signing of the rest area by the signs "Deposit Litter Bags ¼ Mile."

The more frequent types of stops included in the other stop classification were those for reading the Oregon historical marker, checking vehicle, asking for information, or checking for park or overnight camping facilities and overnight stops. Recreational use of the rest area was very low (less than 1 stop per day) and consisted of a few local parties coming out to the rest area to picnic or to fish in Ladd Creek.

Facility Use

The use of the vehicle-party as a measure of facility use is most significant for planning purposes in respect to table-bench units, cooking facilities, or shelters as a vehicle-party will usually occupy a single unit regardless of the number of persons in the party.

The use of facilities in terms of the percentage of vehicle-parties using specified facilities during the study period are given in Table 26. Restrooms and drinking water were the facilities with the highest proportions of vehicle-party use (62.8 and 60.1 percent, respectively). On the basis of the study period, it appears there was proportionally greater use by vehicle-parties of restrooms on weekends than on weekdays (77 vs

TABLE 26
PERCENTAGE DISTRIBUTION BY TYPE OF FACILITY USED, LADD CANYON

Day	Type of Use (%)						Total [2]
	Drinking Water	Rest-rooms	Table and Bench Units	Shel-ters [1]	None	Unknown	
Weekday	59.6	57.7	28.3	—	17.3	0	100.0
Saturday	61.7	80.9	34.0	—	14.9	2.1	100.0
Sunday	60.9	73.9	19.6	—	10.9	—	100.0
Avg.	60.1	62.8	28.0	—	16.1	0.2	100.0

[1] Facility not available.
[2] Percentage of vehicle-parties using specified facilities does not add to total as party may use more than one facility.

58 percent). On the average day, 28.0 percent of the vehicle-parties reported table-bench unit use. The percent of vehicle-parties using the tables (28.0 percent) was slightly lower than the use of the rest area for the primary purpose of eating (31.0 percent) as some parties ate in their cars and trailer coaches.

Only 16 percent of the parties stopping did not use any of the specified facilities. Among the more common types of stops not involving use of facilities were those for checking vehicle, reading the historical marker, rest stops, and obtaining information.

Table Use.—The data on the potential peak use of table-bench units for eating purposes are an important consideration in the design of rest area table facilities. Table 27 shows the potential use of tables in terms of the percentage of vehicle-parties stopping to eat during the noon hour (the typical peak hour of table use). At Ladd Canyon, an average of 5 vehicle-parties (56.7 percent) stopping in the rest area during the noon hour stopped to eat. The percentage stopping to eat during the noon hour on weekdays was substantially higher (60.7 percent) than on the Saturday (37.5 percent) and Sunday (25.0 percent). However, the lower Saturday and Sunday rates were primarily because these days (August 27 and 28) were near the end of the summer season and the weather was cool. The proportion of rest area vehicle-parties eating during the noon hour (55.7 percent) was just double the 10:00 AM to 5:00 PM average daily proportion of vehicle-party use of tables (28 percent).

TABLE 27
RELATIONSHIP OF VEHICLE-PARTIES STOPPING DURING NOON HOUR TO THOSE STOPPING TO EAT, LADD CANYON

Day	Vehicle-Parties		Percent of Vehicle-Parties Stopping During Noon Hour to Eat (Potential Users of Tables) [1]
	Number Stopping	Number Stopping to Eat	
Weekday	11	7	60.7
Saturday	8	3	37.5
Sunday	4	1	25.0
Avg.	10	5	55.7

[1] Based on unrounded data.

In addition to the potential table use given in Table 27, other tables were used when available by parties resting or using the rest area for overnight stops. Observation indicated that the 8 table-bench units were ordinarily sufficient to satisfy demand.

Restroom Use.—The number of persons using restrooms is useful in determining restroom facility requirements for design purposes. Table 28 gives the average daily use of the two restrooms at Ladd Canyon during the observation periods in

TABLE 28

RELATIONSHIP OF PERSONS USING REST-ROOMS TO VEHICLE-PARTIES ENTERING, LADD CANYON

Day	Number of Vehicle-Parties Entering Rest Area	Number of Persons Using Rest Room	Restroom Use (Person per Vehicle-Party)
Weekday	59	76	1.3
Saturday	55	62	1.1
Sunday	50	90	1.8
Avg.	57	76	1.3

terms of the daily number of persons observed using the restrooms, and as a ratio of persons per vehicle-party entering the rest area. An average of 76 persons, or 1.3 persons per vehicle-party, used the restrooms during the study period.

Observer comments indicated the two restrooms were ordinarily adequate to serve rest area occupants, although there was some waiting at times. The number of persons per vehicle-party using restrooms (1.3) compares with the rest area vehicle occupancy average of 3.0 persons, indicating that approximately 43 percent of the persons entering the rest area used the restroom facilities.

Means of Locating Rest Areas

The distribution of vehicle-party answers to the question, "How did you learn of or locate this rest area?" is given in Table 29. This question was asked as a means of determining the effectiveness of signing and other means in routing highway traffic to the rest area. It is evident that the road signs were the predominant means of locating the rest area, with a 46.6 percent of the parties using signs. There was a substantial amount of repeated use of the rest area as indicated by the large proportion (39.2 percent) of parties who located the rest area by previous visits. Road maps were little used, with less than 1 percent locating the rest area by this means. Other means consisted mainly of information relayed by word-of-mouth—principally by friends, or service station attendants and store clerks in nearby towns. The undetermined classification mainly represented vehicle-parties that were not interviewed due to the lack of sufficient interview time during peak periods of use or short duration stops.

TABLE 29

MEANS OF LOCATING REST AREA, LADD CANYON

Means	Number of Vehicles Stopping	Percent of Total
Road map	2	0.5
Road signs	170	46.6
Previous visits	143	39.2
Other	14	3.8
Undetermined	36	9.9
Total	365	100.0

Alternate Stop Location

The distribution of answers to the question, "Where would you have stopped had this rest area not been here?" is given in Table 30. This question was asked to determine probable alternative locations of rest area stops and provide an indication of the proportion of potential shoulder stops that are removed from the highway by rest areas. The predominant alternate stop location was the

TABLE 30

ALTERNATE LOCATION OF STOP IF REST AREA DID NOT EXIST, LADD CANYON

Alternate Location	Number of Vehicles Stopping	Percent of Total
Shoulder of highway	35	9.6
Next service station	25	6.8
Next rest area or park	118	32.3
Next city or town	93	25.4
Would not have stopped	15	4.1
Did not know, and other	44	12.0
Data not obtained	36	9.8
Total	366	100.0

next rest area or roadside park, with 32.3 percent of the vehicle-parties classified in this category. The next largest categories were next city or town, 25.4 percent; shoulder of highway, 9.6 percent; and next service station, 6.8 percent, while 4.1 percent indicated they would not have stopped. Additional undetermined proportions of those parties classified as did not know or from which data were not obtainable would, of course, in actual circumstances have fallen within the above alternate stop locations. The did not know category typically included parties that planned to stop at the rest area and had considered no alternative stop locations.

General Comments

Voluntary comments of Ladd Canyon Rest Area users during the survey period furnish a useful means of evaluating the service provided by the rest area in the eyes of the motorist. Observations of the rest area operation during the study by the observer-interviewers furnished additional information for appraising the rest area service.

Comments from users were usually very favorable and indicated the motorist's appreciation of rest areas. Typical favorable comments were as follows:

"Like to stop in rest areas—believe they are necessary for safety."
"Especially good for families."
"Wish more States had rest areas."
"Makes trip cheaper."
"Wonderful."
"We enjoy these rest areas."

The comments classified as critical expressed a desire for more and better rest area facilities. Some of these comments were as follows:

"Need more information on where rest areas are located—need one about every 20 to 30 miles."
"Need signs to show on which side of road rest area is located."
"Build more."
"Not enough road signs for parks."

Interviewers indicated that the public was very much in favor of rest areas, particularly in hot, dry regions. The drinking water and shade were especially important to rest area users. The maintenance at this rest area was very good and the restrooms were generally clean with adequate supplies. The interviewers also indicated that although the restrooms were well placed at a distance away from the eating and resting area, a restroom sign would have been helpful to indicate the existence and location of the restroom facilities to entering traffic. There was a tendency for fast-moving vehicles to overrun the first entrance and use the second rest area entrance. It was also pointed out to interviewers that the rest area was used extensively during the winter as a place to change tire chains.