

Michigan University and College Student Home Location Study

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The home locations of students attending 26 of Michigan's largest 4-year universities and colleges are examined to determine potential weekend intercity bus service. The objectives of the study were to (a) assess the extent of Michigan intercity bus services that accommodate weekend student trips, (b) provide enrollment data for individual schools, (c) develop a process to identify potential special weekend intercity bus service corridors, (d) determine potential service corridors, and (e) create or nurture a cooperative climate between schools and carriers. Five items were developed for each school: student distribution map identifying student home location concentrations; time-distance map indicating driving times between the school and various parts of the state; state trunk line assignment plot portraying simulated student travel patterns; description of existing service accommodating these patterns; and identification of potential service schools and corridors. Six findings evolved. These pertained to schools and routes with strong potential, schools and routes with moderate potential, trip length factors, school-urbanized area relationships, school size threshold regarding weekend service, and need for a user's guide.

Michigan is the home of a myriad of fine public and private universities and colleges attended by more than 1/2 million students. These schools serve the state's 9 million residents (Figure 1) plus students from other states and many countries. Some of the resident Michigan students and those living in neighboring states and Ontario make trips home, or to other schools, on weekends and holidays (1). Sometimes they make the trip by intercity bus. Often, however, no convenient service is available and students must use other means of travel or not make the trip at all.

OVERVIEW

Reasons for Study

Additional special weekend service is a likely area for successful route expansion because of favorable ridership levels on existing special university and college routes and the transportation benefits to the students involved. The purpose of the Michigan University and College Student Home Location Study was to identify potential corridors for intercity bus service to better accommodate student weekend trips. Five objectives were established to achieve this purpose:

- Assess the extent of intercity bus service in Michigan that accommodates weekend student trips,

- Provide enrollment data aggregated at the traffic analysis zone or local governmental unit level,
- Develop a process to determine potential special weekend intercity bus service corridors,
- Identify potential weekend home travel corridors, and
- Create or nurture a cooperative climate between the university or college community and the intercity bus carriers.

Universities and Colleges in Michigan

Michigan is the home of some seventy 4-year universities and colleges with a total enrollment of more than 300,000. These schools vary in size from a few hundred to more than 40,000 students. Their offerings vary from specialized curricula that serve a relatively small market area to a wide-ranging spectrum that attracts students from all over the world. The 4-year schools are supplemented by another approximately 30 community colleges with a combined enrollment of 255,000 students.

School Selection Criteria

Twenty-six schools were included in the study (Figure 2). These schools represent 4-year institutions with enrollment levels of 1,000 or more that provided the requested data. Initially, information was requested from all 2- and 4-year schools in the state. A preliminary review of the data from these schools indicated that, in general, the student population of all 2- and 4-year schools with fewer than 1,000 students is either primarily commuters or too small for successful intercity bus service.

Twelve schools met the criteria but did not provide the student home residence information requested. Some of the schools chose not to participate because they thought that a majority of their students were commuters and would not benefit from the study. Others were unable to easily provide a distribution of student home locations.

Existing Intercity Bus Service

Michigan's intercity bus service is concentrated in the southern one-half of the Lower Peninsula (Figure 3). Fifteen urbanized areas located wholly or partly in Michigan are served with at least five daily round trips with two exceptions (Niles/South Bend and Port Huron). Three-fourths (74 percent) of all county seats, including all county seats in the southern half of the Lower Peninsula, have daily intercity bus service (Figure 4).

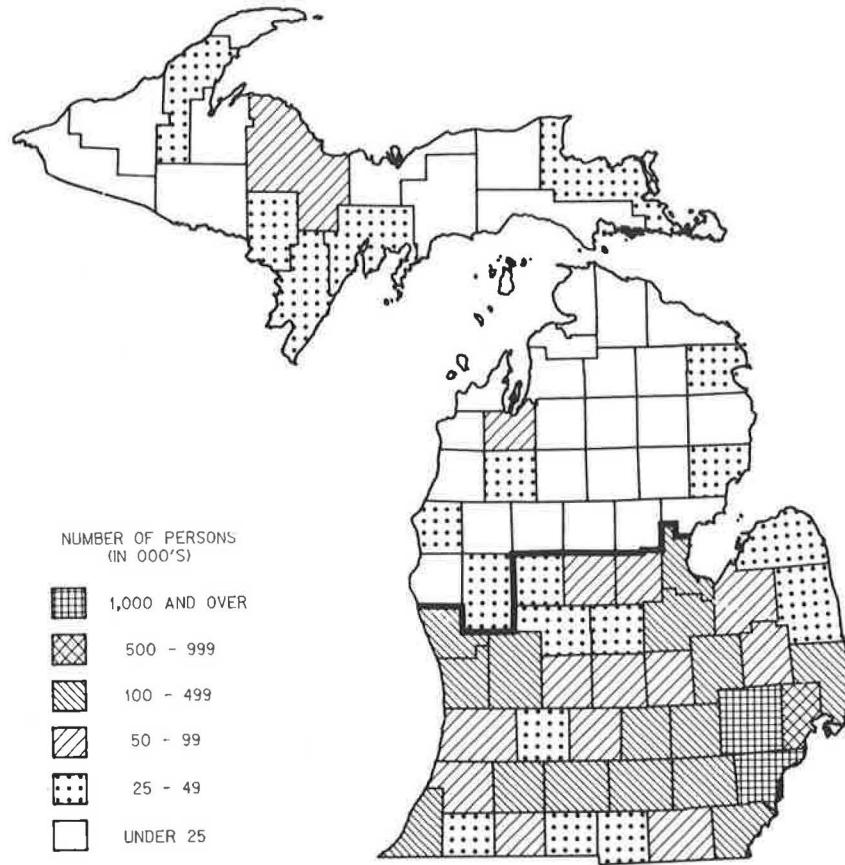


FIGURE 1 1980 population (number of persons).

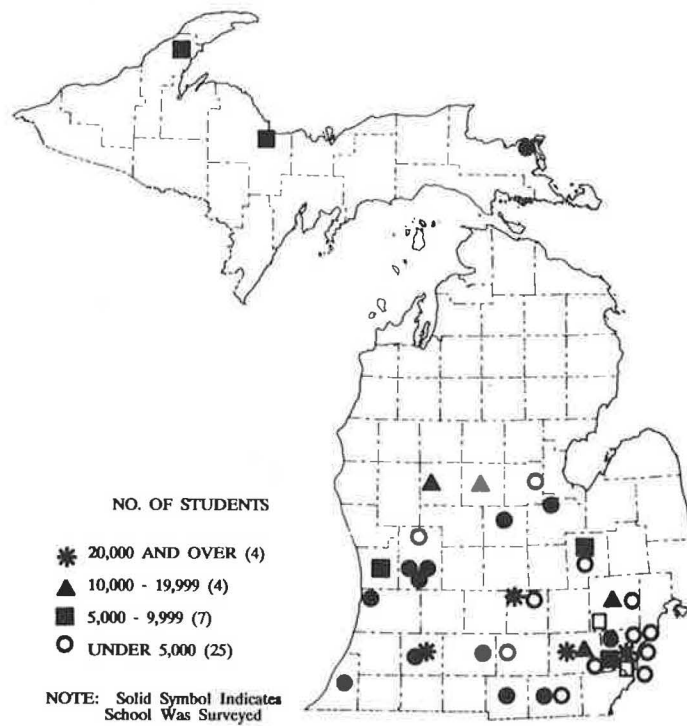


FIGURE 2 Four-year universities and colleges in Michigan with 1,000 or more students, 1984.

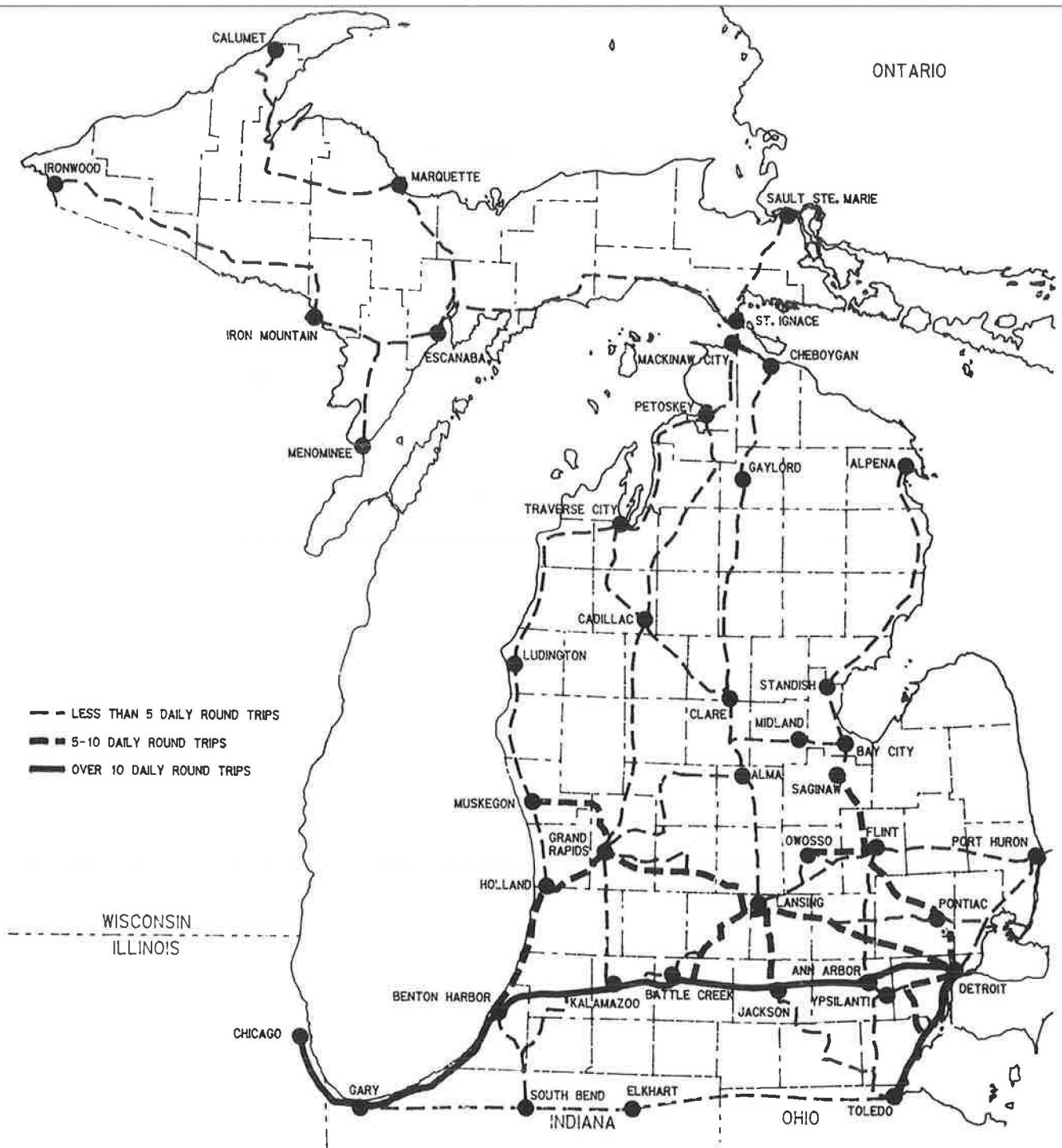


FIGURE 3 Intercity bus system, 1986.

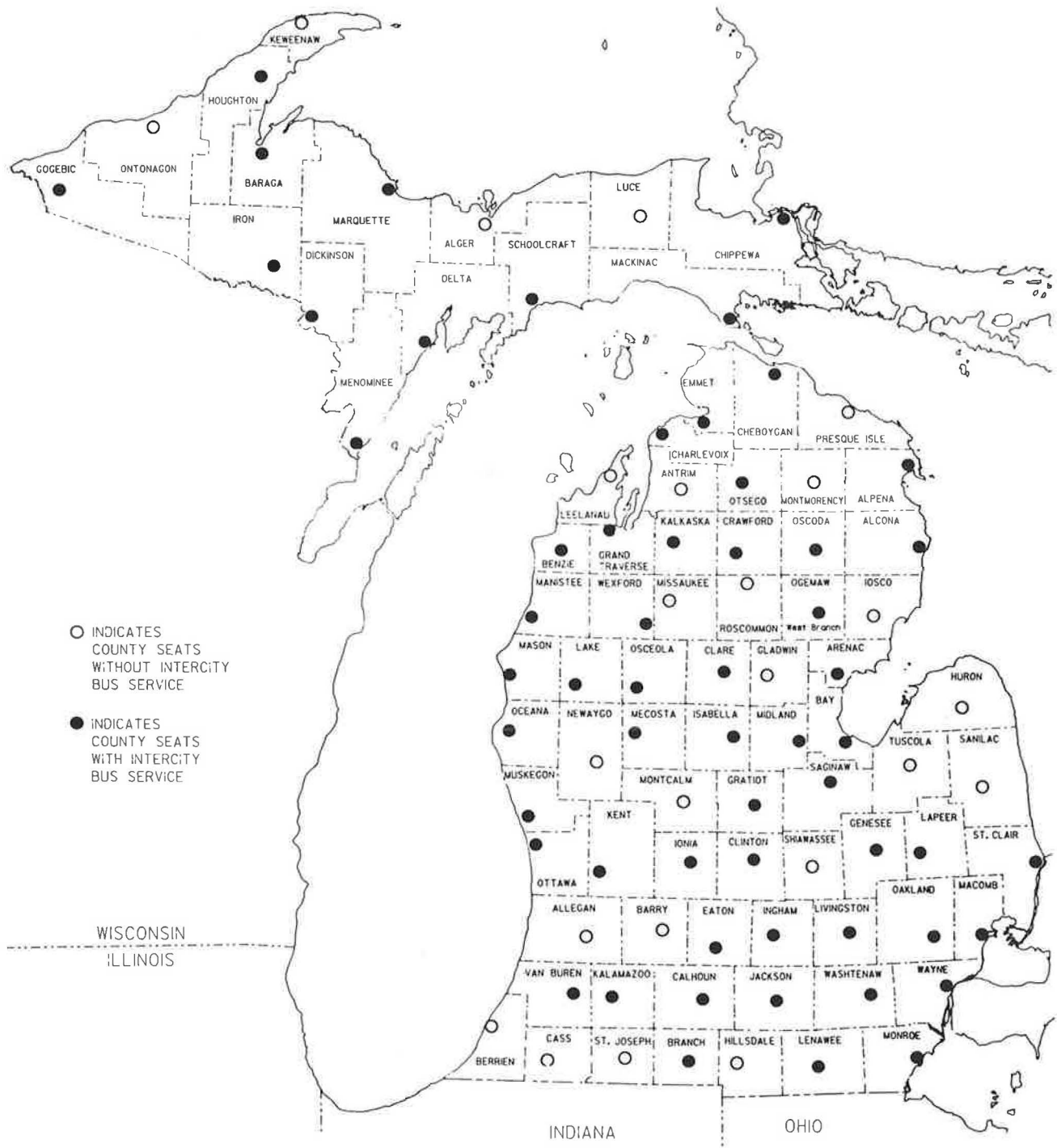


FIGURE 4 Michigan county seats and bus service, 1986.

All but two of the communities in which the 26 surveyed schools are located have at least one daily round trip.

Some existing intercity bus services are tailored to accommodate student weekend travel. These range from daily service with departure and arrival times convenient for weekend student travel, to special weekend schedules, to extra sections on existing routes. Some examples follow.

1. Michigan State University (East Lansing). Special service to Bay City, Flint, Owosso, and Saginaw (one Friday); from Chicago, South Bend, Benton Harbor, Kalamazoo, and Battle Creek (one Sunday); from Big Rapids, Detroit, Grand Rapids, and Reed City (daily service that will stop to discharge passengers only on request); special service to Southfield and Detroit (four Friday); from Lincoln Park, Detroit, Ypsilanti, Ann Arbor (one Sunday); and from Detroit, Royal Oak, Southfield (one Sunday).

2. Michigan Technological University (Houghton). Special Friday and Monday service to Marquette, Escanaba, Green Bay, and Milwaukee (one Friday, one Monday).

3. Northern Michigan University (Marquette). Daily service that stops to discharge passengers only on request from Escanaba, Green Bay, and Milwaukee.

4. Oakland University (Rochester). Daily service that stops to discharge passengers only on request to Mt. Clemens and Utica (one daily), and Ann Arbor, Farmington, and Pontiac (twice daily).

5. University of Michigan (Ann Arbor). Special Friday and Saturday service to Detroit (two Friday, three Sunday).

6. Western Michigan University (Kalamazoo). Special service to Chicago (one Friday, one Sunday), Detroit (one Friday, three Sunday), Flint (one Friday, three Sunday), and Lansing (one Friday, three Sunday).

Potential Service Criteria

Successful intercity bus service was defined as a route expected to regularly carry at least 25 persons. This is assumed to be the minimum number of riders needed to recover the cost of operating a 47-seat intercity bus. For instance, 2.5 percent of the total enrollment of a school with 1,000 students would have to use the special service at any one time to make it successful. This means substantially more than 2.5 percent would have to live in a single corridor to achieve the 25-person ridership level on a given weekend.

A second criterion was that the presence of at least one student home location concentration (SHLC) was necessary to warrant weekend intercity bus service consideration. SHLCs were defined as counties with at least 100 student residents attending the school being considered.

One limitation was placed on these two criteria. No SHLC greater than 3 hr distance from the school was eligible because this was considered the outside time-distance threshold for weekend student travel. This is not to say that no student would travel farther to go home, but it was assumed that not many would do this on a regular basis using intercity bus service.

School Characteristics

Some general characteristics of the schools included in the study follow.

- All are 4-year universities or colleges with fall 1984 enrollments of 1,000 or more students according to the Michigan Department of Education (Table 1).

- Twenty-three (85 percent) of the 26 schools are located in the southern half of Michigan's Lower Peninsula (as defined by an imaginary line drawn from Muskegon to Bay City). This corresponds to the population concentrations in the state; 85 percent of the population also resides in the southern half of the Lower Peninsula according to the 1980 census (Figure 1).

- Fifteen (58 percent) of the 26 schools are located near at least one of the state's 15 urbanized areas (all of which are located in the southern half of the Lower Peninsula). However, the 15 schools are not evenly distributed among the urbanized areas.

- All 11 schools not in urbanized areas are located in county seat communities; 12 of the 15 urbanized-area schools are also located in county seats.

- Slightly more than one-half (58 percent) of the schools are public (state affiliated).

- Most (84 percent) of the schools have convenient access to an Interstate highway. Each school is served by an Interstate or other state trunk line.

- Eighty-eight percent of all students enrolled in Michigan's 4-year institutions during 1984 are included in this study.

- Most of the communities in which the schools are located have at least one regularly scheduled daily intercity bus round trip: two (8 percent) school communities have no service; ten (38 percent) school communities have at least one but fewer than five daily round trips; seven (27 percent) school communities have 5 to 10 daily round trips; and seven (27 percent) school communities have more than 10 daily round trips.

STUDY METHODOLOGY

Carrier Cooperation

The concept of the study was presented at a meeting of the Michigan Intercity Bus Task Force before and again early in the study to obtain carrier input. The universities and colleges to include in the study and the timing and format of the study products were among the items of interest to the carriers. Because of their comments, an early release of data and concomitant analysis for Michigan's six largest universities was made.

Initial Contact

Initially, each 2- and 4-year university and college in Michigan was contacted by letter to the registrar's office. The study was described and each school was requested to provide home residence information by class and zip code for their 1984 fall term student population.

TABLE 1 FALL ENROLLMENT, 1977-1985

University/College	1977	1978	1979	1980	1981	1982	1983	1984	1985	Change 1985-84	Percent Change
20,000 & Over											
Michigan State	47,383	46,567	47,350	47,316	44,887	42,730	41,765	42,193	42,746	553	1.3
U of M, Ann Arbor	35,954	36,577	36,158	37,117	35,677	34,907	34,593	34,467	34,456	-11	0.0
Wayne State	34,389	34,514	34,337	33,408	31,522	29,775	29,639	29,070	28,424	-646	-2.2
Western Michigan	22,496	22,447	22,842	22,641	21,999	20,580	20,296	20,233	20,963	730	3.6
Total	140222	140105	140687	140482	134085	127992	126293	125963	126589	626	0.5
10,000-19,999											
Central Michigan	17,973	17,802	17,779	18,269	17,653	17,132	17,259	16,882	17070	188	1.1
Eastern Michigan	19,104	18,655	18,865	19,323	18,766	18,078	18,880	19,210	20166	956	5.0
Ferris State	9,965	10,208	10,596	11,112	11,261	11,008	10,767	10,540	10909	369	3.5
Oakland University	11,051	11,220	11,729	12,006	11,644	11,721	12,084	11,971	12586	615	5.1
Total	58093	57885	58969	60710	59324	57939	58990	58603	60731	2128	3.6
5,000-9,999											
Grand Valley State	7,469	7,065	7,142	6,984	6,699	6,366	6,710	7,153	7667	514	7.2
Michigan Tech	6,807	7,130	7,690	7,865	7,779	7,640	7,414	6,935	6537	-398	-5.7
Northern Michigan	8,844	8,995	9,452	9,379	9,073	8,377	8,054	7,824	7599	-225	-2.9
U of M, Dearborn	5,480	5,955	6,406	6,291	6,575	6,390	6,399	6,321	6597	276	4.4
U of M, Flint	3,801	3,884	4,122	4,410	4,609	5,025	5,707	5,596	5672	76	1.4
Total	28600	29145	30690	30519	30126	28773	28577	28233	28400	167	0.6
Under 5,000											
Adrian College	912	824	945	1,116	1,242	1,222	1,192	1,220	1139	-81	-6.6
Albion College	1,705	1,784	1,781	1,860	1,876	1,742	1,662	1,569	1571	2	0.1
Alma College	1,170	1,183	1,201	1,198	1,110	1,059	1,004	1,016	1012	-4	0.4
Andrews University	2,837	2,924	2,983	3,018	3,083	2,851	2,878	3,034	3032	-2	-0.1
Aquinas College	1,684	1,918	2,163	2,529	2,753	2,743	2,787	2,831	2724	-107	-3.8
Calvin College	4,075	3,977	3,988	4,058	3,919	3,806	3,938	3,973	4012	39	1.0
Grand Rapids Baptist	1,048	1,137	1,144	1,216	1,132	1,077	1,029	951	910	-41	-4.3
Hillsdale College	1,048	989	1,035	1,035	1,043	1,044	992	1,032	1006	-26	-2.5
Hope College	2,330	2,371	2,355	2,464	2,458	2,530	2,519	2,550	2522	-28	-1.1
Kalamazoo College	1,534	1,444	1,438	1,452	1,367	1,234	1,126	1,106	1115	9	0.8
Lake Superior State	2,261	2,401	2,309	2,501	2,559	2,425	2,820	2,783	2692	-91	-3.3
Mercy College	2,226	2,272	2,281	2,484	2,119	2,106	2,204	2,465	2402	-63	-2.6
Saginaw Valley State	3,529	3,706	3,818	4,285	4,324	4,370	4,612	4,833	4936	103	2.1
Total	26359	26930	27441	29216	28985	28209	28763	29363	29073	-290	-1.0

Source: MDOT, Bureau of Transportation Planning, Passenger Transportation Planning Section, Surface Systems Unit.

Response Screening

Data received from the various schools were reviewed to assure that they were in usable form. This included comparing enrollment figures with those reported by the Michigan Department of Education and assessing the logic of student distribution patterns portrayed by the data. Any inconsistencies or omissions were corrected through discussions with the individual providing the information. In most instances this was the school registrar.

Analysis of the data for 2-year schools during this screening process indicated that

1. Student residence patterns were highly concentrated in the immediate vicinity of the schools and
2. Student residences outside the general area of the school were widely scattered.

These observations were supported by discussions with the registrar's office of these schools. Most students attending

2-year schools generally commute daily to and from school. Screening of the data for 4-year schools with fewer than 1,000 students revealed a similar pattern. Although the 4-year schools were often less commuter oriented, their student home location distribution was generally either localized in a tight cluster, near the school, or thinly scattered. Neither condition would be likely to support special intercity bus service.

This discovery dictated some filtering criteria to determine which schools would most likely benefit from the study. Two criteria were established. Only schools that could meet criteria were included in the final analysis. The two criteria were that

1. The school must have 1,000 or more students enrolled and
2. The school must be a 4-year institution.

These criteria were applied to 1984 enrollment data, provided by the Michigan Department of Education, and classification information from the *1984 Higher Education Directory (2)*. Some schools were excluded by a fine margin; they were just below the 1,000 enrollment mark. On the other hand, two

schools that met the enrollment criterion in 1983, but not in 1984, were included (Table 1).

The results of the study tended to support the legitimacy of these two criteria. Schools with lower enrollments, including the two exceptions, that were included tended to be less likely candidates for special intercity bus service unless combined with other schools. Consideration of combined service for the excluded schools, although not part of this study, might be a successful venture for intercity bus companies.

Follow-Up Contacts

After the data were screened and criteria were established, renewed efforts were made to contact those 4-year schools with 1,000 or more students that had not responded to the initial contact. Some schools indicated that retrieval of the information was impossible. In one instance an on-site visit was necessary to manually compile the data. Eventually, data were collected for all but two schools with 5,000 or more enrolled students and for half of those with enrollments between 1,000 and 5,000. Although several schools are excluded, the data collected included nearly 90 percent of all students enrolled in Michigan's 4-year universities and colleges that had a 1984 fall term enrollment of 1,000 or more (Table 2).

No additional efforts were made to obtain information from schools not responding. Information provided by schools that responded but did not meet the criteria was not included in the analysis.

Data Processing

The 26 schools provided a substantial amount of information that needed to be processed in order to analyze patterns and develop conclusions. All student home data had been requested by zip code. A new program was written to match each student's home zip code with one of the 2,300 zones into which Michigan has been divided for analysis purposes. Out-of-state and provincial zip codes and postal codes were matched with special state and provincial codes. Information on students living outside the United States and Canada was excluded. It is unlikely that such students would use intercity bus services for weekend trips home because of the nature or distance of the trip.

Most of the information was provided in a standard format that could be directly entered into the computer (Table 3). Some data needed to be rewritten into a consistent format for accurate entry into the data base. Rewriting was done by hand on standard coding forms. The information was transferred from these sheets and from the printouts provided by the schools into the mainframe computer data base. The entered data were manually checked for accuracy. Selected parts of the final data base were compared with the original data sheets as a secondary check. After the data were entered into the computer, the new "zip-to-zone" program, which entered the 547 and 2,300 zone numbers on each record, was run.

Graphics

Five maps were generated for each school:

1. Student home location distribution in Michigan by county (83 counties).
2. Student home location distribution in Michigan by traffic zone (547 zones).
3. Student home location distribution in the Midwest by county in Michigan and by state for other states. In addition, a state-by-state map of the United States was generated for schools with a nationwide distribution of students.
4. Time-distance (minutes) access in Michigan by traffic zone (547 zones).
5. Simulated student travel patterns in Michigan obtained by assigning trips between home and school to Michigan's trunk line system.

Preliminary Analysis

A preliminary analysis was prepared before the technical report was published. The preliminary report contained an analysis for Michigan's six 4-year universities with enrollments of 15,000 or more. It was distributed to major intercity bus carriers, both regular route and charter, that serve the state in an effort to (a) provide a product for use by the intercity bus companies in time for the fall school season and (b) obtain input from the carriers about the content of the report.

One result of the preliminary analysis was the interest of one intercity bus carrier in establishing new weekend service to three of the six universities included in the preliminary analysis. Difficulty in obtaining student addresses from the schools for direct marketing has delayed provision of service to

TABLE 2 FOUR-YEAR UNIVERSITIES AND COLLEGES IN MICHIGAN, 1984

Enrollment	No. of Schools			Enrollment (fall 1984)		
	Surveyed	Total	Percentage	Surveyed	Total	Percentage
20,000 and more	4	4	100.0	125,963	125,963	100.0
10,500-20,000	4	4	100.0	58,603	58,603	100.0
5,000-10,000	5	7	71.4	33,829	45,778	73.9
1,000-5,000	13	25	52.0	29,363	52,069	56.4
Total	26	40	65.0	247,758	282,413	87.7

SOURCE: Michigan Department of Transportation, Bureau of Transportation Planning, Passenger Transportation Planning Section, Surface Systems Unit.

TABLE 3 SAMPLE DATA FOR STUDENT COUNTS BY ZIP CODE (typical example of how data were provided)

Zip Code	Freshman	Sophomore	Junior	Senior	Graduate	Total
48087	6	12	5	11	4	38
48088	2	11	4	6	12	35
48089	3	3	7	5	0	18
48091	5	5	3	6	1	20
48092	13	4	9	10	5	41
48093	8	18	15	27	9	77
48094	6	2	2	4	0	14
48095	1	2	1	4	1	9
48906	0	5	2	9	13	29
48097	1	2	2	1	0	6

these schools. Another carrier suggested that the data in the state map be presented by county instead of by the 547 zones to make it easier to understand the information portrayed. This suggestion was adopted, and data were presented by county on state maps when possible.

ANALYSIS OF INDIVIDUAL SCHOOLS

Three items were addressed for each school: (a) student distribution patterns, (b) existing service accommodating student distribution patterns, and (c) potential service communities and corridors.

Student Distribution Patterns

Student distribution patterns were described using two different

features. These are student home location concentrations (SHLCs) and proximity analysis, which uses the time-distance distribution from the school to the students' homes.

The SHLCs describe where significant concentrations of students reside (Figure 5). A "significant concentration of students" is defined as 100 or more students whose home residences are in the same urbanized area or related county and who attend the same school.

Nonurbanized area-related counties and other states and provinces with more than 100 student residences are noted, but urbanized areas are stressed because of their natural potential for special intercity bus service. They have (a) a greater population, (b) a higher population density, (c) more existing intercity bus service and facilities, and (d) a majority of the students and schools located in or near them.

The proximity analysis included the location of each school, the total enrolled student population for the study period, and

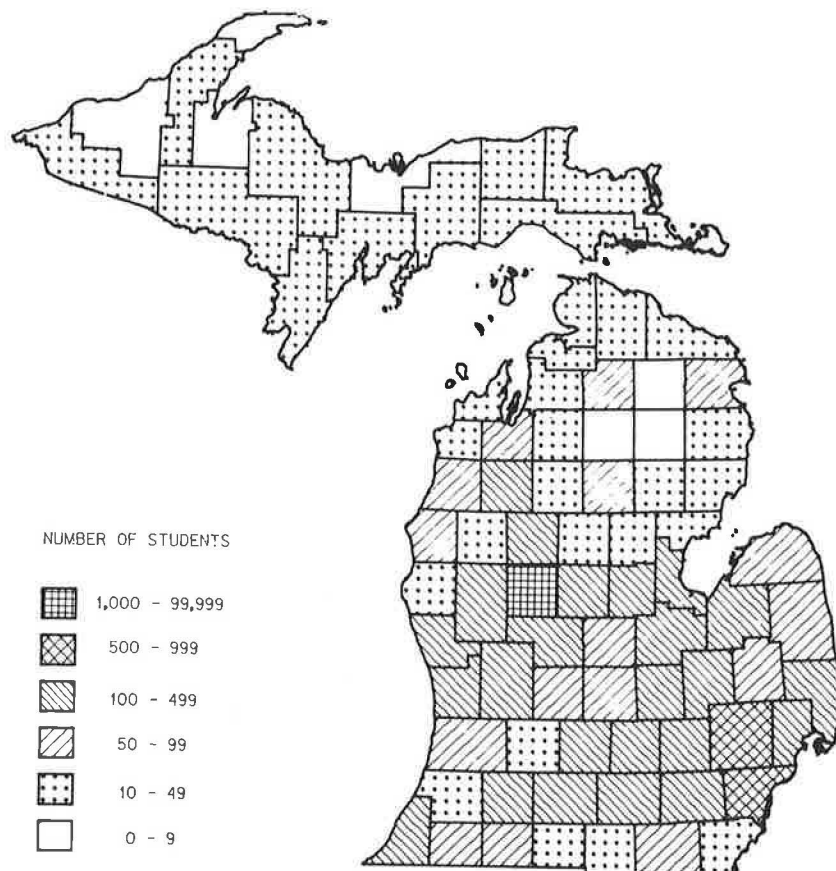


FIGURE 5 Student home locations, Ferris State College.

the percentage of students living within 60, 90, 120, 180, and 181+ min of the school. All students with similar times were grouped together to obtain the total percentage for each distance category.

The percentages in these groups are cumulative except for the 181+-min group. Students reported in the 60-min group are included in the 90-min group; students from both groups are included in the 120-min group; and students in the 60-, 90-, and 120-min groups are included in the 180-min group. The 181+ group contains all students not listed in the previous groups. Care should be taken not to double-count students from previous percentiles when using this information.

Time-distance is a significant determinant for weekend intercity bus service. A very short or long time-distance would be impractical for regular weekend trips home. In this study, a 180-min trip length was used as the maximum time-distance a student could live from school and still have regular weekend travel home as a practical option. This is equivalent to 150 mi assuming an average speed of 50 mph. There are, of course, some students who travel farther, but this study assumed that most students would not make extended trips regularly. Consequently, areas farther than 180 min from the schools are considered to have limited potential for special weekend home service.

Time-distances were delineated for each school using a proximity analysis map (Figure 6) with 547 zones. Analysis of the proximity maps showed that fewer than 5 percent of the students included in this study resided more than 180 min from

their school. Seventeen (65 percent) of the 26 schools have fewer than 10 percent of their students living beyond the 180-min distance. All schools except one have fewer than 50 percent of their students in this category (Table 4). This supports the use of a 3-hr time-distance limitation for weekend home travel because a majority of the students included live within this range.

Trunk Line Assignment Plot

A state trunk line assignment plot was used to portray the total number of students traveling to a school from each home location (Figure 7). These plots represent the most optimistic situation because it is unlikely that all students would be traveling at the same time. The routes shown are the minimum time-path trunk line routes from the home location to the school and are cumulative. This graphic provides an opportunity to determine where new intercity bus service might best be established because both direction and student volume are shown.

Existing Service Accommodating Student Distribution Patterns

Existing published bus routes and scheduled time (3) that could accommodate student weekend home travel were matched with

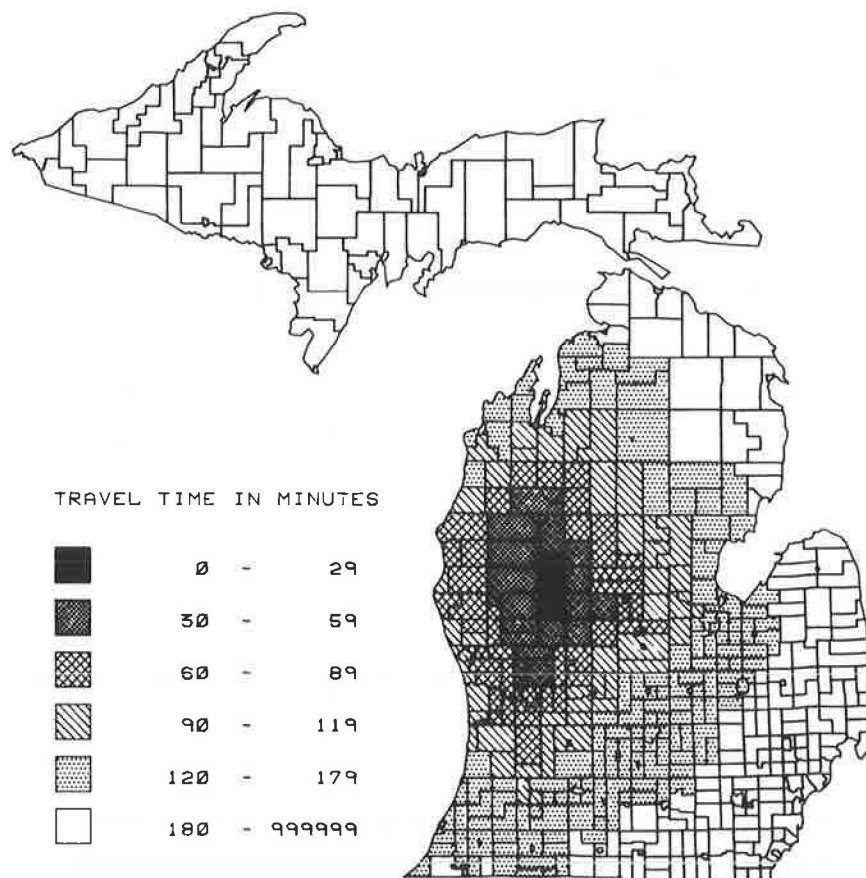


FIGURE 6 Access times to Ferris State College.

TABLE 4 FALL ENROLLMENT BY TIME-DISTANCE, 1984

University or College	Percentage of Students Who Reside at			
	0-60 min	0-120 min	0-180 min	More Than 180 min
20,000 and more				
Michigan State	32.5	89.6	95.1	4.9
U of M, Ann Arbor	59.3	84.1	94.8	5.2
Wayne State	99.0	99.9	100.0	0.0
Western Michigan	49.4	72.2	92.9	7.1
10,000-19,999				
Central Michigan	21.2	42.7	90.5	9.5
Eastern Michigan	91.2	99.2	99.6	0.4
Ferris State	23.6	43.9	64.1	35.9
Oakland University	97.6	99.9	100.0	0.0
5,000-9,999				
Grand Valley State	80.9	89.0	94.6	5.4
Michigan Tech	21.7	24.2	30.9	69.1
Northern Michigan	56.4	68.0	78.7	21.3
U of M, Dearborn	100.0	100.0	100.0	0.0
U of M, Flint	98.7	100.0	100.0	0.0
1,000-4,999				
Adrian College	26.9	98.1	100.0	0.0
Albion College	17.6	71.4	93.4	6.6
Alma College	31.8	45.5	100.0	0.0
Andrews University	95.5	97.7	97.7	2.3
Aquinas College	82.1	83.6	89.6	10.4
Calvin College	74.9	79.4	82.5	17.5
Grand Rapids Baptist	79.5	81.8	86.4	13.6
Hillsdale College	21.6	23.5	94.1	5.9
Hope College	61.8	71.5	76.4	23.6
Kalamazoo College	32.7	44.9	84.7	15.3
Lake Superior State	41.0	51.7	63.5	36.5
Mercy College	96.0	98.5	100.0	0.0
Saginaw Valley State	90.0	95.0	100.0	0.0

SOURCE: MDOT, Bureau of Transportation Planning, Passenger Transportation Planning Section, Surface Systems Unit.

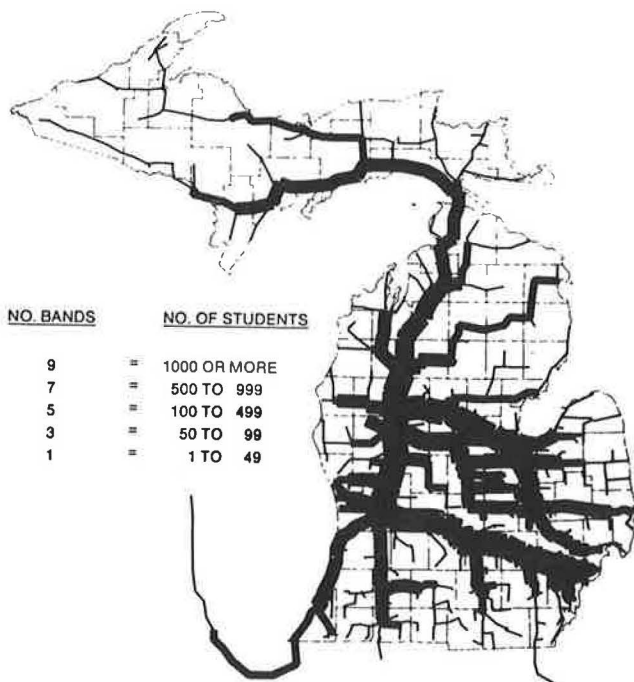


FIGURE 7 Simulated student travel patterns for Ferris State College.

the SHLC and trunkline assignment patterns. These included existing services requiring (a) no alteration in routing or departure times, (b) some alteration in routing or departure times, and (c) supplemental departures to augment the existing schedule.

Potential Service Schools and Corridors

Possible student home travel patterns were identified from the proximity analysis and SHLC. There were instances in which no existing regular or special weekend service was meeting the needs of student travel home. Areas with a high SHLC but with limited, oddly scheduled, or no service to the school were identified.

Analysis of Selected Schools

Each school was analyzed using the tools described previously to identify student distribution patterns, existing service accommodating these student distribution patterns, and potential service communities and corridors for new service. For example, a set of statements (Figure 8) was developed for Ferris State College based on student home locations, access times, and simulated student travel patterns portrayed in Figures 5, 6,

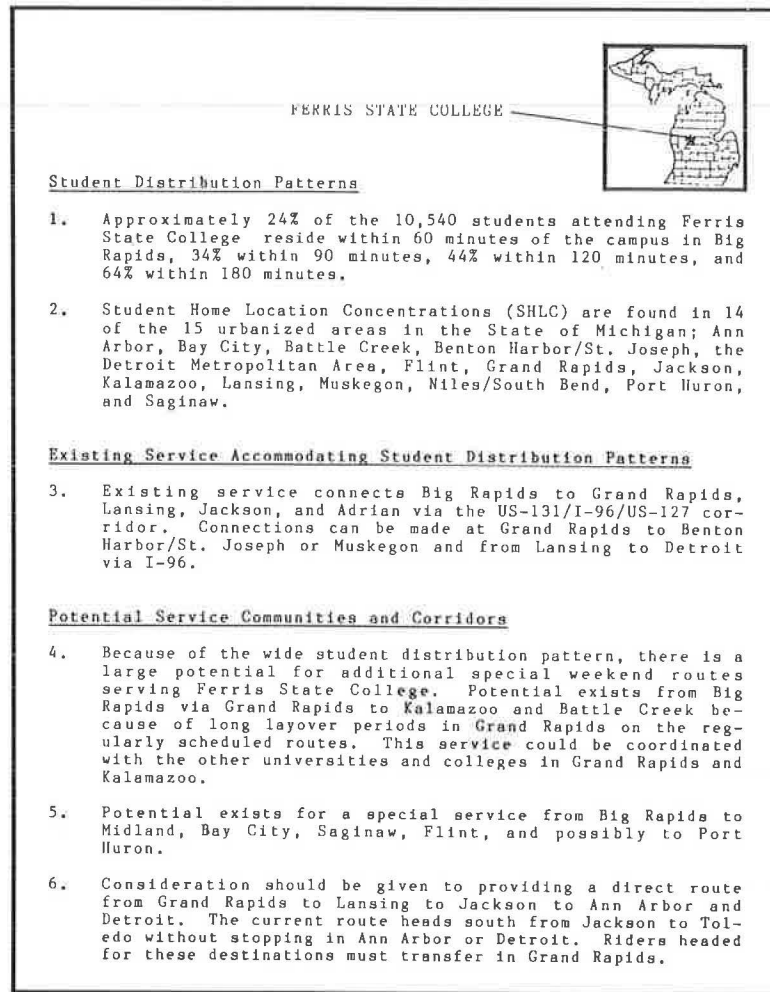


FIGURE 8 Statements describing Ferris State College.

and 7, respectively. The statements indicate that the college has a wide distribution pattern and that several routes have potential. One is an express route from Big Rapids to Kalamazoo and Battle Creek via Grand Rapids. Currently, layovers in Grand Rapids make travel to Kalamazoo and Battle Creek tedious. This route could be scheduled to connect with the bus arriving in Grand Rapids from Central Michigan providing service connections for both schools. A second is service between Big Rapids and Midland, Bay City, Saginaw, Flint, and possibly Port Huron. A third is a direct route from Big Rapids to the Detroit metropolitan area. Current routes head south in Jackson to Toledo, omitting Ann Arbor, Ypsilanti, and Detroit.

FINDINGS

The data obtained from the 26 universities and colleges led to several findings. These include strong and moderate potential routes, trip-length factors, school-urbanized area relationships, school size threshold, and need for a user's guide.

1. Schools and routes with strong potential. Routes with no weekend intercity bus service convenient to student travel but with strong potential were identified for four schools (Adrian College, Central Michigan University, Ferris State College, and

Hillsdale College). These routes connect the schools with SHLCs of 500 or more students. These schools and their associated routes are shown in Figure 9.

2. Schools and routes with moderate potential. Routes with moderate potential were determined for 12 schools and one combination of schools. These routes connect the schools with SHLCs of 100 to 499 students where no convenient weekend intercity bus service is available. Schools in the moderate category are generally candidates for routes that serve more than one location. These schools and their related routes are shown in Figure 10.

The remaining 10 schools have limited potential for new or additional special weekend service for a variety of reasons. These include (a) a school was rated as having sufficient existing service to meet student weekend home travel needs, (b) the student distribution pattern was extremely concentrated (fewer than 100 students residing in an area), or (c) there was an excessive time-distance (more than 180 min or 150 mi) between the school and the SHLC.

3. Trip-length factors. The home-school trip length of university and college students is affected by a number of school characteristics. Some of these surfaced in this study.

- Distance from urbanized areas. The Detroit urbanized area is a stronger influence than the others. Nineteen of the 26

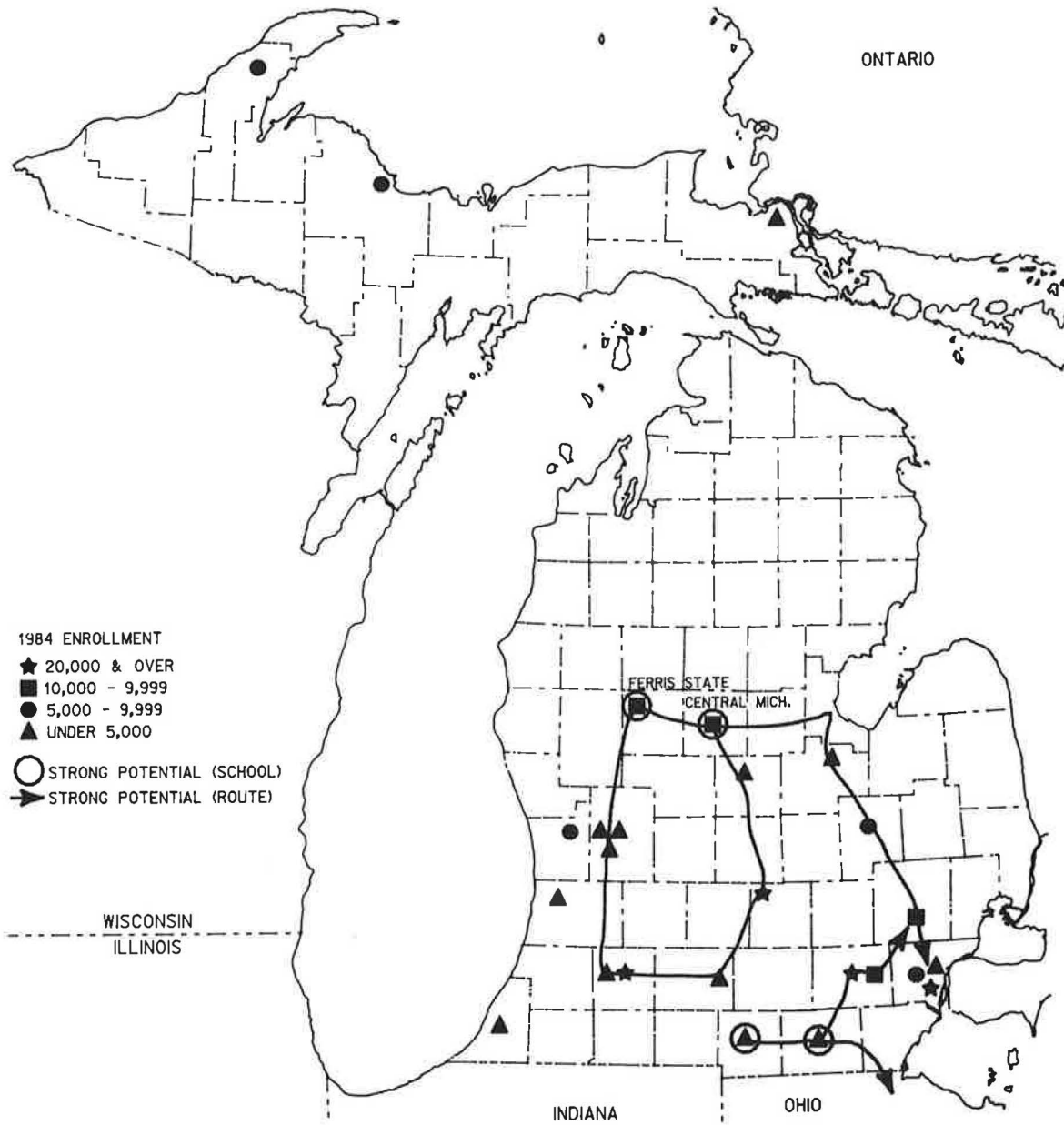


FIGURE 9 Routes with strong service potential.

schools have an SHLC in the Detroit area. In general, a sizable segment of a school's enrollment will come from urbanized areas regardless of how far the school is from these areas.

- Religious affiliation. These schools tend to draw from greater distances than similar-sized public schools. Examples are Aquinas, Calvin, Grand Rapids Baptist, and Hope Colleges (Table 4).

- Reliance on branch campuses. Schools with branch campuses have shorter trip lengths than schools of similar size without branch campuses. The branch schools themselves have a tight distribution of their student population, usually less than 60 min trip length from the school. One example of this is the University of Michigan with branch schools in Dearborn and Flint (Table 4).

- Total enrollment. The largest schools tend to have a greater dispersal of their students' home locations than smaller

schools. This means a longer average trip length. Additional factors probably affect trip length but were not identified in this study. These include such items as curriculum and faculty reputation.

4. Relationships between schools and urbanized areas. There are 118 different combinations in which the 26 schools have SHLCs in the 15 urbanized areas. Of these, 7 of 10 have existing intercity bus service that meets student weekend travel needs. More than 90 percent of the 500 or more student concentrations and nearly 60 percent of the 100 to 499 concentrations are served (Figure 11). The 3 of 10 without suitable intercity bus service offer the best opportunities for additional weekend service.

5. School size threshold for weekend service. Schools with an enrollment of 10,000 or more generally have a high number of SHLCs, usually 10 or more. These concentrations are

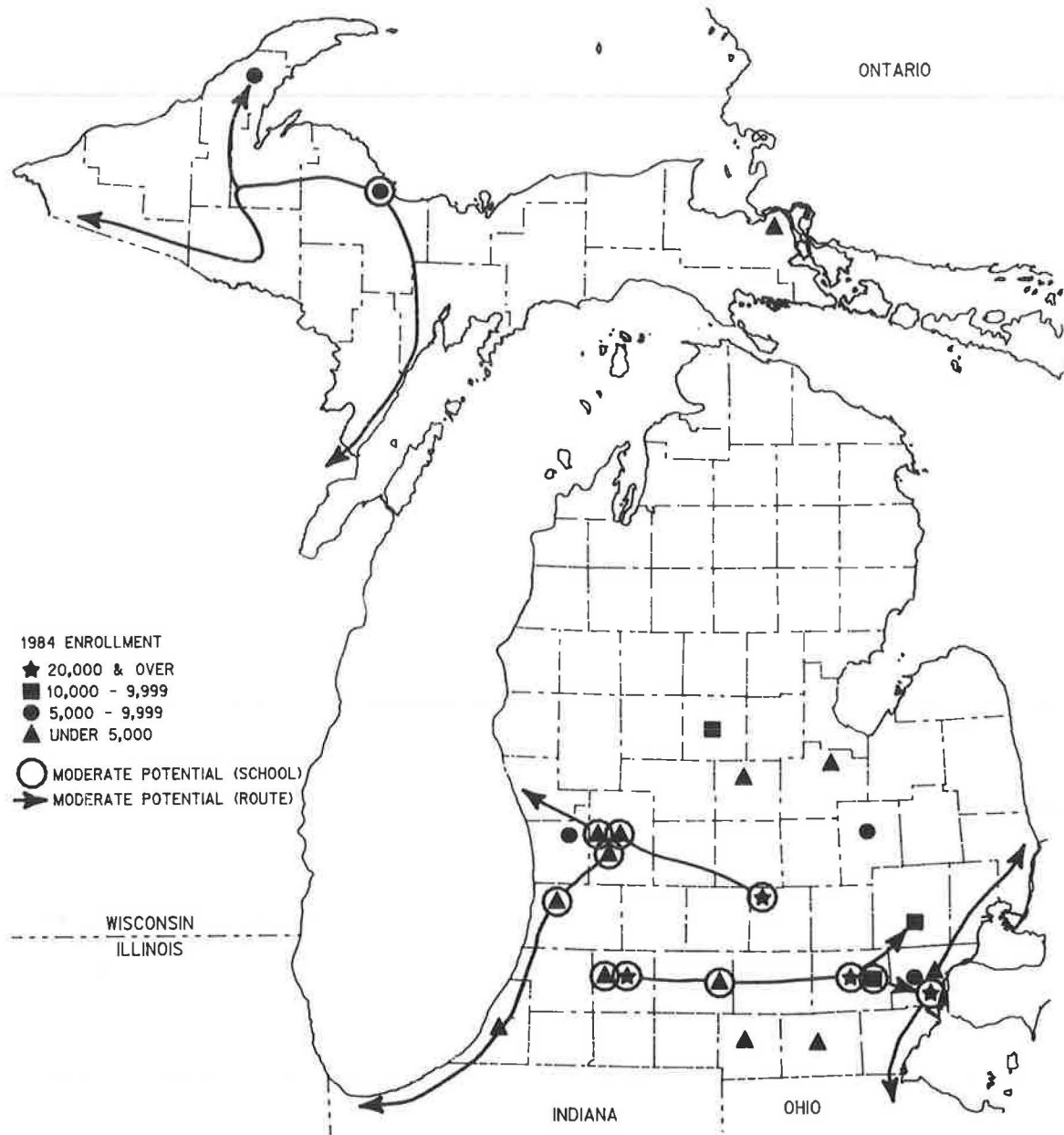


FIGURE 10 Routes with moderate service potential

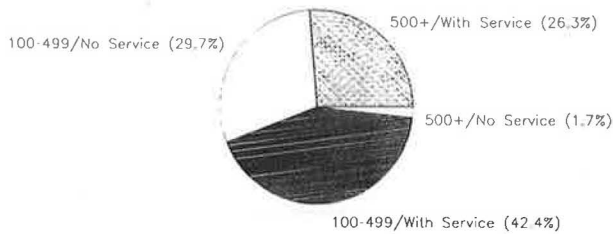


FIGURE 11 Linkage of schools and urbanized areas (student concentration/service).

well served by intercity bus service when the school is located in an urbanized area but not particularly well served when located at a distance from an urbanized area. Schools with enrollments of from 5,000 to 9,999 usually have five or more

SHLCs. Schools in the 1,000 to 4,999 range have one or two concentrations and usually have to be combined to justify home-school weekend intercity bus service. Schools with enrollment under 1,000 will rarely justify service unless they can be conveniently served along a route for which service is otherwise justified. The thresholds for five enrollment groups are given in Table 5.

6. Need for user's guide. During the study it became apparent that a user's guide, describing how to use the data and the tools developed in the study, would be helpful. Consequently, a user's guide was developed. Written in nontechnical language, it provides a suggested methodology for using the data and study findings to establish new or improved service to Michigan university and college students.

TABLE 5 SERVICE POTENTIAL BASED ON SCHOOL ENROLLMENT CATEGORIES (Michigan universities and colleges)

Enrollment	Service Potential		
	Strong	Moderate	Limited
20,000 or more	X	X	X
10,000-19,999	X	X	X
5,000-9,999		X	X
1,000-4,000			X
Fewer than 1,000			X

SOURCE: MDOT, Bureau of Transportation Planning, Passenger Transportation Planning Section, Surface Systems Unit.

LIMITATIONS

Some of the limitations of this study, for both the data and the results follow.

- The study uses 1984 enrollment data. Student distribution patterns change. No attempt has been made to determine an average student residence pattern over an extended period of time.

- Some schools that met criteria for inclusion in the study did not furnish data. This could have excluded significant potential routes from consideration.

- The maps and data used to determine potential routes are based not on the actual desires of students of each school for weekend transportation home but on the number of students residing in an area and generalized student ridership figures collected in previous intercity bus surveys. The actual demand by students at each school may be different.

- The study does not consider student needs. There is no way of knowing from the data used in this report how many students at each of the schools have an automobile or alternate arrangement for transportation home on weekends, which would eliminate these students from consideration for intercity bus trips.

- Intercity bus companies may find it difficult to promote new services through direct, targeted mailings. Most universities and colleges in Michigan are sensitive about releasing student residence information to for-profit businesses. Without this information, intercity bus companies may be required to find alternative marketing methods, which may be less successful and more expensive.

FOLLOW-UP ACTIVITIES AND FUTURE DIRECTIONS

The technical report was transmitted via meetings and mailings to (a) 83 carriers providing, or with the potential of providing, weekend intercity bus service to Michigan's university students; (b) 26 Michigan universities and colleges participating in the study; (c) 14 Michigan planning and development regions plus separate metropolitan planning organizations and comprehensive, coordinated, cooperative (3-C) planning areas; (d) about one-third of the nation's state departments of transportation; (e) Transportation Research Board annual meeting attendees; and (f) other interested parties.

Several inquiries have been received from potential service providers. These were requests by intercity bus and limousine service providers for more detailed home location data on specific potential routes. The general reaction among carriers is that this is the type of activity that state DOTs should be undertaking. Although no new services can be traced directly to the work presented in the technical report, two new services accommodating weekend student travel were initiated in early 1987. These were between two of Michigan's largest universities and communities in southeast Michigan.

Future directions include at least three items. One is to transmit a follow-up letter to carriers to determine whether, and how, the report has been useful. A second is to obtain student car availability data in any future undertaking of this kind. This would include determining the number of students with on-campus automobiles and assessing school policies regarding on-campus automobile possession and use by students. The third is to update the data base every 4 years if the usefulness of the study results so warrants.

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