

**Best Practices on Football Game Days:
A Review of Transit Planning and Operations Strategies in College Towns**

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ABSTRACT

Football game day in college towns can overwhelm a local transportation system as thousands of people travel to and from the sports venue. This paper conducts a multiple case study analysis to quantitatively compare game day transit planning and operations strategies at 32 universities (and their corresponding local transit agencies) using publicly available documents. The strategies were categorized into seven main approaches by adapting a special events framework from prior FHWA research, and key findings for each strategy are as follows: [1] 21 schools provided incentives to use special transit services, [2] 20 schools had express bus services, [3] 17 schools created special purpose routes, [4] 15 implemented roadway/parking restrictions, [5] six schools provided additional vehicle hours, [6] four schools implemented charter bus services, and [7] only three schools deviated existing routes. The seven strategies were then compared by both university size (enrollment) and football stadium size, and only one of the seven categories was substantially different: 88% of large stadium schools provided express bus services on game days, while only 38% of small stadium schools did. In addition to this quantitative comparison, qualitative summaries were compiled for six innovative or unique case studies. For example, Florida State University manages travel demand by closing a road entirely to vehicle traffic and turning it over to an express bus serviced called the Spirit Express. The practice-ready findings of this paper serve as an important resource for transit agencies and university transportation departments in college towns to improve game day transportation options.

Keywords: Public transit, special events, football, university transportation

INTRODUCTION

In many parts of the United States, home football games are a key part of a university's culture, tradition, and energy. Students, alumni, and other fans flock to stadiums that can hold tens of thousands of people to cheer on their teams before they depart at approximately the same time after the game. With so many individuals traveling to/from college football games, the travel time and reliability of the public transportation network can be affected, sometimes to the point of gridlock (1). To combat gridlock, many universities and transit agencies have implemented special event policies to provide increased or modified transit service. This paper serves to document different strategies employed by schools and agencies throughout the country and provide case studies of novel or unique services.

This categorization is done through the lens of how the Federal Highway Administration (FHWA) characterizes planned special events. A planned special event is an infrequent public event with known locations and scheduled time of occurrence that creates an increase in travel demand in all corridors servicing the venue (2). College football games are prime examples of this because they do not occur every day, have a defined start and end times, and attract thousands of people to a single location.

This paper proceeds as follows. First, prior literature pertaining to college football and transportation services is reviewed. Then, four research questions are presented. Next, the case study method is described. This is followed by the quantitative results of the multiple case study analysis and the qualitative results of in-depth case studies highlighting innovative and/or unique game day strategies. Finally, conclusions and areas for future research are discussed.

LITERATURE REVIEW

This review of the literature is divided into five sections, beginning with a brief summary of prior studies on the impact of college football on transit. It concludes by identifying key gaps in the literature.

Prior Research on the Impact of College Football Events on Transit Service

While there have been numerous prior studies on the impacts of planned special events on transit in general, there has only been limited research on how college football games specifically affect transit operations. One relevant study looked at the resilience and accessibility of transit during Ohio State football games in Columbus, Ohio. Using the scheduled and actual arrival times of Central Ohio Transit Authority (COTA) buses, an unreliability measure was calculated throughout the day for home football games at Ohio State. The study found that the unreliability measurements peaked both before the game (2.2 hours) and after the game (1.1 hours) (1). A second relevant study in Morgantown, West Virginia found that travel times on two bus routes increased by over five minutes during University of West Virginia football games (3).

Prior Research on the Impact of Transit Service on Football

Little to no research has been done to quantify the benefits of transit on college football. One study used a regression model of demographic data and determined that National Football League (NFL) teams are more likely to benefit financially from mass transit services than other major league sports because NFL games occur on the weekends when transit demand may be at its lowest and those who are transit dependent can attend games (4). College football may also benefit from transit as their games are also primarily played on weekends when excess transit capacity may exist.

Prior Research on Football-related and Other Factors Affecting Campus Transit Ridership

Cronin et al. performed intercept surveys of college football game day shuttles and found that the most important factors for users to expand their use of transit are safety, organization, and convenience. Individual satisfaction with the service was affected by safety, cleanliness, quickness, convenient parking availability and minimal wait time (5).

Another prior study examined the factors that can influence transit ridership more generally on college campuses. Variables that directly or indirectly measure automobile access, such as auto ownership and parking availability, explain more of the variation in transit ridership than other factors (6). This prior study concluded that ridership is influenced by many factors outside of the control of transit managers. Among the most effective internal factors that can be controlled are the quality of the transit service, pricing, and information aimed at a particular target travel market (6).

A study of the University of Minnesota investigated ways to improve ridership on the transit services provided there. Improvements to transit amenities and maintenance schedules was shown to incentivize riders to use the transit service. Also, the study recommends providing incentives for transit use, co-locating transit and shared mobility devices, bundling transportation memberships, implementing information campaigns and marketing, and improving the partnership between university and local transit agencies (7).

Prior Research on Transit Planning and TDM in College Towns

There is also related prior research on planning practices for campus transit systems. For example, one study considered best practices for general university transit programs in four categories: operations, funding, scope of service, and environmental responsiveness (8). This study examined the University of Texas at Austin's shuttle bus program and concluded that it is one of the most effective transit programs in the U.S, largely because the system has a dedicated shuttle fleet that brings students directly to campus from where they live and provides frequent service (8).

Similarly, prior research has also considered the use of various transportation demand management (TDM) strategies on college campuses. For example, at the University of Florida, ridership gains were made possible through a comprehensive campus TDM system that included parking restrictions, parking pricing, and transit service improvements (9). Additionally, according to research conducted by the Transit Cooperative Research Program, survey respondents from colleges and universities, public transit operators, and private transit operators indicated a goal to shift mode-share away from single-occupant vehicle trips to other modes (10).

Prior Research on Transit Planning and Operations Strategies for Special Events

There is also a related body of literature that considers how transit agencies plan for and manage large special events, such as recent studies of transit to attend baseball games in Chicago (11) and the Rodeo in Houston (12). College football events, and sport events in general, may be relatively straightforward to plan for because spectators typically converge on a specific site to attend an event scheduled at a predetermined time, the duration and schedule of games is known with a good deal of accuracy, and the overall demand is limited by the capacity of the stadium (11).

The Federal Highway Administration (FHWA)'s report on Managing Travel for Planned Special Event "*presents and recommends policies, regulations, planning and operation processes, impact mitigation strategies, equipment and personnel resources and technology applications used in advance planning, management and monitoring of travel for planning special events*" (2). As part of a broader planning effort, the handbook sets forth various transit strategies for agencies to

1 accommodate increased travel demand, including [1] service expansion, [2] express bus service,
2 [3] charter service, and [4] service marketing (2). This FHWA framework will be adapted and
3 applied to college football games in the study that follows.
4

5 **Gaps in the literature**

6 As can be seen from this literature review, there are numerous prior studies that consider transit
7 management for special events and transit planning on college campuses, but a comprehensive
8 review of transit planning practices on college game days is missing. Moreover, many of the prior
9 studies typically focus on a single college campus (e.g., Ohio State University, University of
10 Minnesota, University of Texas at Austin), many of which have very large enrollment levels and/or
11 are located in large metropolitan areas. Therefore, additional research on transit planning practices
12 at smaller universities in a variety of locations may be beneficial to assess what strategies are used.
13

14 **RESEARCH QUESTIONS**

15 This study seeks to explore the following research questions regarding game day transit practices:

- 16 1) What type of planning, management, and operations strategies do universities and transit
17 agencies typically implement when providing transit on game days?
- 18 2) Is there a difference between strategies employed by universities with large enrollments
19 compared to small enrollments?
- 20 3) Is there a difference between strategies employed by universities with large stadiums versus
21 small stadiums?
- 22 4) What universities provide unique or innovative strategies for their game day service?
23

24 **METHODOLOGY**

25 The method is a multiple case study analysis to quantitatively compare game day transit planning
26 and operations strategies. Information for each case study was compiled in the spring of 2024 from
27 publicly available sources found on the internet, such as transit agency websites, university
28 websites, and local news articles.
29

30 **School Selection and Categorization**

31 This section summarizes the process for selecting case studies and categorizing them based on
32 both university size and stadium size. Football Bowl Series (FBS) eligible schools were considered
33 for inclusion in this study because these are largest schools in the National College Athletic
34 Association and have a national following that would attract not only students but also regional
35 and national fans to the games. FBS schools were also considered in part because they were
36 assumed to have easy to gather information that was publicly available. As of the fall of 2023,
37 there were 130 FBS schools divided into ten conferences, with three schools being independent.
38 The conferences are diverse in terms of geography, school size, national profiles, and stadium sizes.
39 To account for this diversity, three schools from each conference and one independent school were
40 randomly selected to be included in the study. An additional school was included in the American
41 Athletic Conference. In total, 32 schools were selected for analysis, or approximately one-quarter
42 of all FBS schools.

43 The selected universities were then divided into small and large schools based on
44 enrollment. Schools with enrollments larger than the sample's average fall 2023 enrollment
45 (31,830 students) were considered large schools, while schools with enrollments less than the
46 average fall 2023 enrollment were considered small schools. The universities were also divided

based on the sample's stadium sizes. Schools with stadiums larger than the median stadium capacity (45,070 attendees) were considered schools with large stadiums, while those smaller than the median capacity were considered schools with small stadiums. Not all large schools had large stadiums. For example, the University of Notre Dame had an enrollment of 13,174 students, but a stadium capacity of 80,795 attendees. This means Notre Dame was classified as a small school with a large stadium. Figure 1 below shows the categorization by enrollment and stadium size.

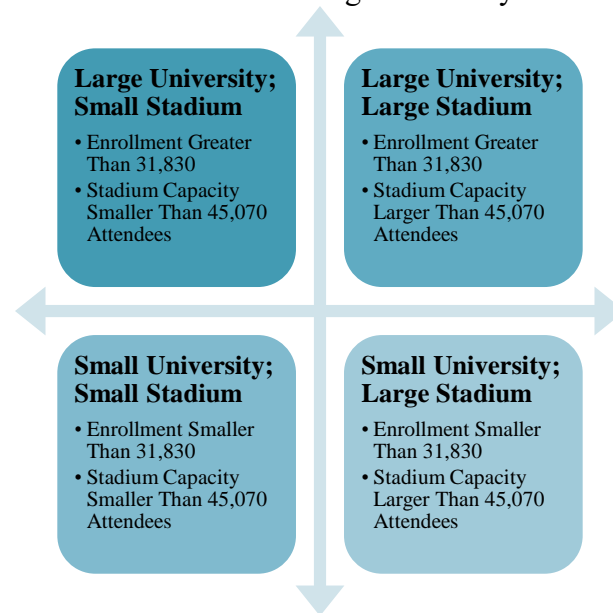


Figure 1: Classification of University Size (enrollment) and Stadium Size

Classification of Transit Strategies

An online review of transit agencies websites, school websites and news articles was conducted to gather information about the strategies used on game days at each university. Then, the transit planning, management and operations strategies used at each university were classified in groups loosely based on the previously mentioned FHWA report on *Managing Travel for Planned Special Events* (2). The FHWA's framework was expanded to include transportation demand management strategies because the literature review revealed that TDM is used on university campuses (University of Florida (11)). TDM is represented in this study by modifications to roadway operations or parking policies. In summary, the transit planning, management and operations strategies from each university were categorized into the groups described below and shown in Figure 2:

- **Service Expansion:**
 - **Additional vehicle hours:** taking an existing service and adding additional vehicle hours
 - **Route deviation:** adding a new transit stop or routing transit around planned closures
 - **Special purpose routes:** new routes added that operate only on game day
- **Express Bus Service:** providing an express bus service from a park and ride lot on campus or from lots that intercept travelers going to and from the venue
- **Charter Service:** a contracted service provider to add transit options from outlying areas
- **Incentives:** Transit marketing strategies such as reduced fees or free fares to encourage transit use. Although other marketing strategies are listed in the FHWA guide, incentives were the focus of this study because information was readily available for most schools.

- **Roadway or Parking Restrictions:** Either a decrease in roadway capacity through intersection movement restrictions; a decrease in the number of travel lanes or converting streets to one-way operations; or implementing parking restrictions.

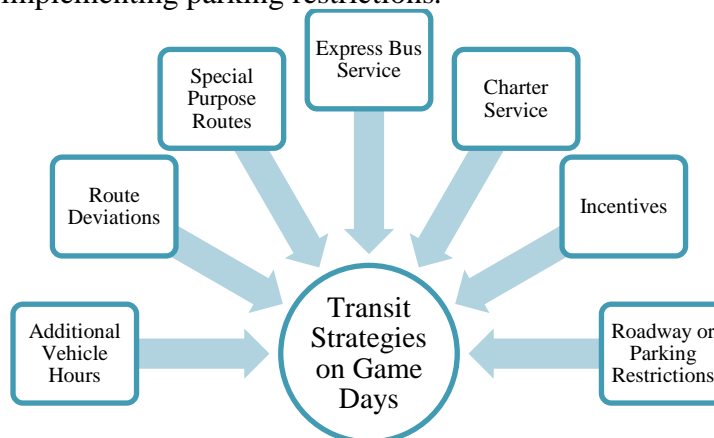


Figure 2: Classification of Transit Planning, Management and Operations Strategies

Last, some overlap does exist between categories. For example, a local transit agency can set up park and ride lots along a loop and add a special purpose route that stops at each lot. In this case, both a special purpose route and express bus service were considered strategies in the case studies that follow.

RESULTS

Each school was first analyzed to see what, if any, transit service served the campus regularly. All 32 schools have some sort of transit service. This transit service could be provided by the school itself like in the case with Auburn University (14), or by a local transit agency, or both, as is the case with Ohio State University (15). All 32 schools have bus transit service but some, like the University of Wyoming, do not run the bus on Saturdays, which is when most college football games occur (16). Additionally, six schools are in urban areas with light rail systems.

Tables 1 through 4 summarize the information gathered for each of the 32 schools. University enrollment and stadium capacity numbers were taken directly from official university websites and are not directly cited here for the purpose of brevity. The highlights for each university are provided in the rightmost column of the tables based on available information on agency or university websites, local news reports, or university game day guides. Overall, the most common strategies were as follows: [1] 21 schools provided incentives to use special transit services, [2] 20 schools implemented express bus service, [3] 17 schools created special purpose routes, [4] 15 implemented roadway or parking restrictions, [5] six schools provided additional vehicle hours, [6] four schools implemented charter bus services, and [7] only three schools deviated existing routes.

Big Schools with Big Stadiums

Twelve schools were classified as big schools with big stadiums, as shown in Table 1. All schools except Brigham Young University (BYU) provide special transit services during game days. BYU instead relies on regular rapid transit from the Utah Transit Authority. Florida State and Penn State are two of the largest stadiums and enrollments and correspondingly provide the largest amount of services. Only four of the big schools offered incentives to ride transit; the most generous incentive offered to patrons is University of Utah's game day ticket, which doubles as the transit fare.

1 **Table 1 Special Transit Strategies of Big Schools with Big Stadiums**

University City, State	Fall 2023 Enrollment	Stadium Size	Special Event Strategies	Key Highlights
Auburn University Auburn, AL	33,015	88,043	Express Bus Service	Park and ride lots on campus, or near campus to intercept travelers going to the game. Several express bus service routes are located off campus at locations around the town with large parking lots to pick people up and take them to the stadium. Routes in operation during weekdays not in operation. Service begins 4 hours prior to the game and ends 2 hours after the game. Bus location tracking services are provided. (14) (17)
Brigham Young University Provo, UT	34,937	63,470	N/A	No special services identified; however free bus rapid transit service with 15-minute headways is available to public and connects to local commuter rail stations, runs most of day weekdays and Saturday. A limited shuttle service runs only from parking lots near the stadium for ADA. (22)(23)(24)
Florida State University Tallahassee, FL	43,701	79,560	Special Purpose Routes, Express Bus Service, Roadway or Parking Restrictions	Purchase transit tickets on the mobile app. Some converted from two way to one way traffic, with one street being closed entirely to through traffic for the "Spirit Express." Only the spirit express can operate on that roadway and it runs from one specific park and ride to the stadium. (27)(28)(29)
Michigan State University East Lansing, MI	51,316	74,866	Special Purpose Routes, Express Bus Service, Incentive	The MSU Game Day info lists parking lots that individuals can park in depending on their route to the game. The cost of the express shuttle is included in the parking. (34)(35)(36)
Ohio State University Columbus, OH	60,046	102,780	Special Purpose Routes, Roadway or Parking Restrictions	CABS ends service 6 hours before the game until 1.5 hours after the game. Regular service on the COTA system is available and is free to students. (15)(44)
Pennsylvania State University University Park, PA	87,903	106,572	Additional Vehicle Hours, Route Deviation, Special Purpose Routes, Express Bus Service, Charter Service, Roadway or Parking Restrictions	Blue Loop, White Loop and Red Link are deviated to maintain level of service on rest of campus. CATA also operates Game Day Shuttles. Shuttle service after the game is one way. Two express shuttle loops, downtown near parking garages, and South Atherton near hotels. The Fullington bus company provides charter bus service to parking lots around the greater area. (45)(46)(47)
University of Alabama Tuscaloosa, AL	39,623	100,077	Special Purpose Route, Express Bus Service, Incentives, Roadway or Parking Restrictions	Special game day route that drops individuals about 0.15 miles from the stadium. Crimson Ride shuttle is free for all fans parked in east campus lots. Begins extra shuttle service at 7am and runs until 1.5 hours post-game. Parking is free, and rideshare vehicles are not allowed in the campus core during the game. Free shuttles provide service through university lots while others from around the town cost a nominal fee. There also exists a regional shuttle from Birmingham. (55)(56)
University of Pittsburgh Pittsburgh, PA	33,771	68,400	Special Purpose Route, Express Bus Service	The university offers a shuttle service from campus to games and back. There is also a Bus and Light rail available with Pittsburgh Regional Transit. With the stadium being close to a river, there is a riverboat available as well. Buses are available to take students back to campus starting at halftime, no end to the return service is found on the website. (71)(72)

University City, State	Fall 2023 Enrollment	Stadium Size	Special Event Strategies	Key Highlights
University of South Carolina Columbia, SC	36,548	77,559	Express Bus Service, Incentives	Shuttles are free for students but cost between \$5-15 for the general public. Includes 3 pickup/drop-off locations that meet at the fairgrounds next to the stadium. (73)(74)(75)
University of Southern Cal Los Angeles, CA	47,000	77,500	Additional Vehicle Hours	The Los Angeles Metro runs expanded train service on its E line during game days. They run a three-car service with 8 minute headways. There are several rapid bus routes and two standard rail lines near the stadium. (76)
University of Utah Salt Lake City, UT	35,236	51,444	Additional Vehicle Hours, Express Bus Service, Incentives	Shuttle buses run from the Salt Lake Central Station and the Court House station to Rice-Eccles Stadium. Special trains run from town center to stadium station. Game tickets double as transit tickets. (79)(80)
University of Washington Seattle, WA	50,097	70,138	Express Bus Service, Incentives	King County Metro manages five park and ride lots with special express service to the game. Passes cost \$16 per game and parking is free. Season ticket holders only need to purchase a pass for \$70, a significant discount. There is a light rail station nearby for Sound Transit and attendees can also ride the regular Metro Bus Route Service. (83)(84)

Big Schools with Small Stadiums

Four schools had a large enrollment but a small stadium size, as shown in Table 2. The University of Buffalo did not appear to provide any special strategies during football games. The other three schools provided some form of shuttle service. Like the large schools with large stadiums, shuttle services from park and ride lots were the main strategy employed by this group of schools.

Table 2. Special Transit Strategies of Big Schools with Small Stadiums

University City, State	Fall 2023 Enrollment	Stadium Size	Special Event Strategies	Key Highlights
Florida International University Miami, FL	49,130	20,000	Special Purpose Routes, Express Bus Service, Roadway or Parking Restrictions	Shuttles run from parking lots around campus, some earlier in the day and others closer to the game kickoff and continue until an hour after the game. Freebee rideshare service is also available for free upon request for transportation to a drop-off point where the shuttles can bring fans to the stadium. (25)(26)
University at Buffalo Buffalo, NY	32,099	31,500	N/A	The university offers some transit for students to go shopping and get around the campus during the week. No transit service during the football games was identified except for an accessible shuttle. (52)(53)(54)
University of North Texas Denton, TX	46,940	30,850	Additional Vehicle Hours, Special Purpose Routes, Incentives, Roadway or Parking Restrictions	Shuttle service runs from downtown Denton transit center to the stadium with stops near local businesses and historic district. Shuttle is open to everyone. The North Texas athletic department coordinated with local businesses, convention centers, and Visitors Bureau to make getting to the game easier. ADA drop-off points available. Shuttles do not continue after kickoff but resume at the end of the game. The Mean Green Route takes students from dorms to the stadium starting 3 hours before the game until 1 hour after. (68)(69)(70)
University of Texas at San Antonio San Antonio, TX	34,864	36,582	Special Purpose Route, Express Bus Service, Incentives	Shuttle service runs from the main campus to the stadium before the game and resumes at the start of the fourth quarter. The public must pay \$2.60 per adult for a round trip from a park and ride lot to the stadium, or \$1.30 for children aged 5-13 or seniors over age 62. The public transit option begins to run 3 hours before the game starts. (77)(78)

Small Schools with Big Stadiums

Of the four schools with small enrollments but big stadiums, shown in Table 3, the University of Notre Dame is an outlier with size. Its stadium size is over 30,000 more seats than the next university in this category. Unlike the other universities, it features regional transit options; a train runs directly from the airport to the shuttle lots. This expands the reach of the transit service beyond the immediate vicinity of the campus.

1 **Table 3 Special Transit Strategies of Small Schools with Big Stadiums**

University City, State	Fall 2023 Enrollment	Stadium Size	Special Event Strategies	Key Highlights
Baylor University Waco, TX	20,824	45,140	Special Purpose Routes, Express Bus Service, Roadway or Parking Restrictions	Shuttle services operate in collaboration between the university and the Waco transit system from four major locations including park and ride lots and downtown where people can find free parking. Shuttles also run during the game. (18) (19)
Kansas State University Manhattan, KS	19,745	50,000	Additional Vehicle Hours, Special Purpose Routes, Incentives	Shuttle service is a Park and Ride service to the stadium, rides resume near the end of the 3rd quarter. Service is free to students and staff. (31) (32)
University of Notre Dame South Bend, IN	13,174	80,795	Route Deviation, Special Purpose Routes, Express Bus Service, Incentives	The game day express picks up riders at three hotels and drops off on campus at McKenna Hall. It is free to the public and runs on Notre Dame home game Saturdays. Three routes have detours and adjustments, but unavailable details. The South Shore train offers special trains for each game which transport individuals from the airport to shuttle lots, then individuals get on the shuttle bus to the game. (61)(62)(63)
University of Virginia Charlottesville, VA	23,721	60,000	Special Purpose Routes, Express Bus Service, Incentives, Roadway or Parking Restrictions	The university runs shuttle services from park and ride lots. They also have a special service for students that makes a round near student housing. A special shuttle is available for fans who want to attend a pregame event to greet the players. (81)(82)

2

3 **Small Schools with Small Stadiums**

4 Twelve schools were small schools with small stadiums, which are summarized in Table 4. Even

5 though all provide regular transit operations, two do not provide any special transit during football

6 games. Three schools advertise roadway or parking restrictions, and five schools implement

7 special service routes. Even though it is a small school, Middle Tennessee State advertises charter

8 service as part of its special transit offerings.

1 **Table 4 Special Transit Strategies of Small Schools with Small Stadiums**

University City, State	Fall 2023 Enrollment	Stadium Size	Special Event Strategies	Key Highlights
Boise State University Boise, ID	26,727	36,363	Special Purpose Routes, Incentives	10-to-15-minute headways on a special route to various parking garages downtown; has been discontinued beginning in 2024. (20)(21)
Georgia Southern University Statesboro, GA	26,106	25,000	Special Purpose Routes, Express Bus Service	Bus routes go to various parking lots around campus and to the stadium in loops. Two routes provided. (30)
Marshall University Huntington, WV	11,269	38,016	N/A	No specific transit information was found for game days, but there are normal routes for campus provided by the local transit agency. (33)
Middle Tennessee State University Murfreesboro, TN	20,183	30,788	Express Bus Service, Charter Service	MTSU advertises a golf cart shuttle for those needing help getting to the stadium from nearby parking lots. Campus shuttles are available for students to take to the game from campus, so they don't need to move their cars. Raider Xpress buses are also available to rent. Discounted rideshare options with Lyft are also advertised. (37)(38)(39)
New Mexico State University Las Cruces, NM	14,779	28,853	Express Bus Service, Incentives, Roadway or Parking Restrictions	The University offers park and ride services on game day from one lot for \$5 per person. Shuttles are available for free at several parking lots for students. Left turns are restricted near the park and ride lots to control access. (40)(41)(42)
Northern Illinois University Dekalb, IL	15,504	30,998	Express Bus Service	The local transit agency did not specify any special services. The university has two express bus service routes to take people two and from four different lots around the campus and bring fans to the stadium entrance. (43)
San Diego State University San Diego, CA	15,692	35,000	Additional Vehicle Hours, Incentives	Increases in bus frequency to handle crowds along existing routes that stop at the stadium. No special considerations for students even though the stadium is far from campus. (48)(49)
Troy University Troy, AL	14,679	30,000	Special Purpose Routes, Incentives	University shuttle buses run to local hotels and provide free service with 15-minute headways. The bus drivers provide users with a coupon for the return trip. The local transit agency only has dial-a-ride services. (50)(51)
University of Alabama at Birmingham Birmingham, AL	21,160	45,000	Special Purpose Route, Express Bus Service, Incentives, Roadway or Parking Restrictions	Free shuttle service on gameday is open to public, departs from UAB campus as well as another free shuttle service running from nearby parking garages to the stadium. There is also a designated rideshare pickup/drop-off location during games. (57)(58)(59)(60)
University of North Carolina at Charlotte Charlotte, NC	30,298	15,300	Route Deviation, Express Bus Routes, Incentives, Roadway or Parking Restrictions	Campus transit suspends regular service and changes to football shuttles close to game time. Light rail is available to the public and has several stations including 11 park-and-ride locations. Niner Transit shuttles also pick up from nearby light rail stations and drop off near the stadium gate. Rideshare drop off location near stadium. (64)(65)(66)(67)
University of Wyoming Laramie, WY	10,913	29,181	N/A	No special transit planning was found. Transit is offered during the weekdays but not offered on weekends. (16)
Western Michigan University Kalamazoo, Michigan	17,559	30,200	Special Purpose Route	The local transit agency provides a new route from the Lawson Arena Shuttle Stop to the Stadium Shuttle Stop with an extra stop at the Rec Center. Lawson is an ice hockey arena with a large parking lot away from the campus. (85)(86)

Comparison of Big versus Small Universities

This section presents a numerical summary of the key findings by school size. As shown in Figure 3, there was not much variation in transit strategies used by big or small schools. Of the 16 large schools, 13 were using some form of park and ride lots, while eight of the 16 small schools were doing the same. This accounts for nearly half of all schools. Few schools from either large or small schools provided additional vehicle hours, deviated routes, or provided parking restrictions. About an equal number of large and small schools offered some sort of incentive to use transit services including free fares for students or free fares for ticket holders.

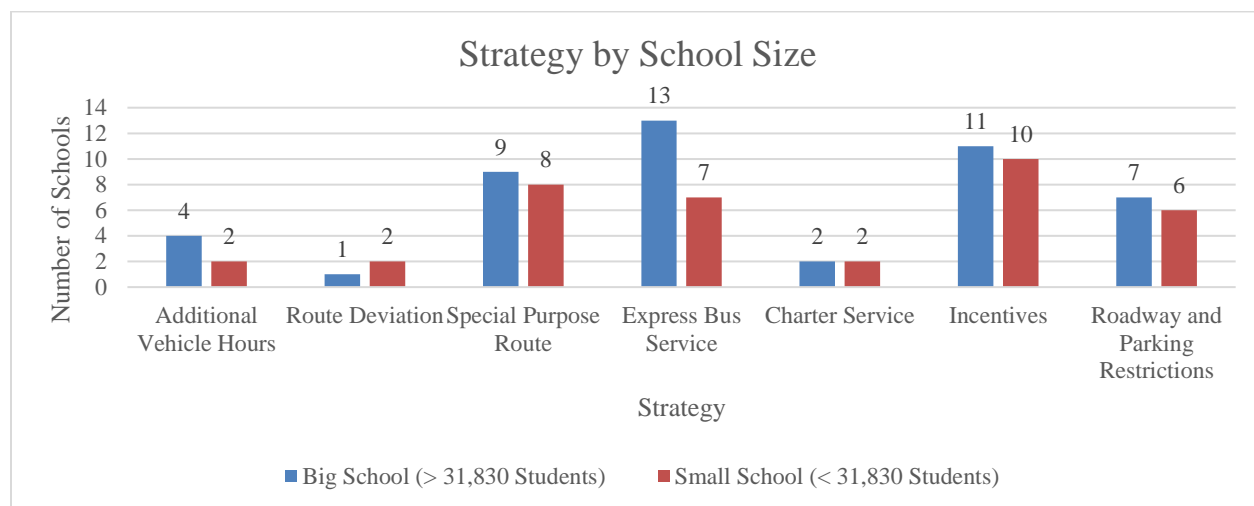


Figure 3 Strategy by School Size

Comparison of Big versus Small Stadiums

Considering stadium capacity, again there were few differences between the number of strategies employed. As shown in Figure 4, the one exception was the park and ride option: 14 of the 16 high-capacity stadiums provided park and ride lots, while only seven of the smaller stadium schools did. Again, the incentives and roadway or parking restrictions were offered at about the same rates as in the big versus small school comparison.

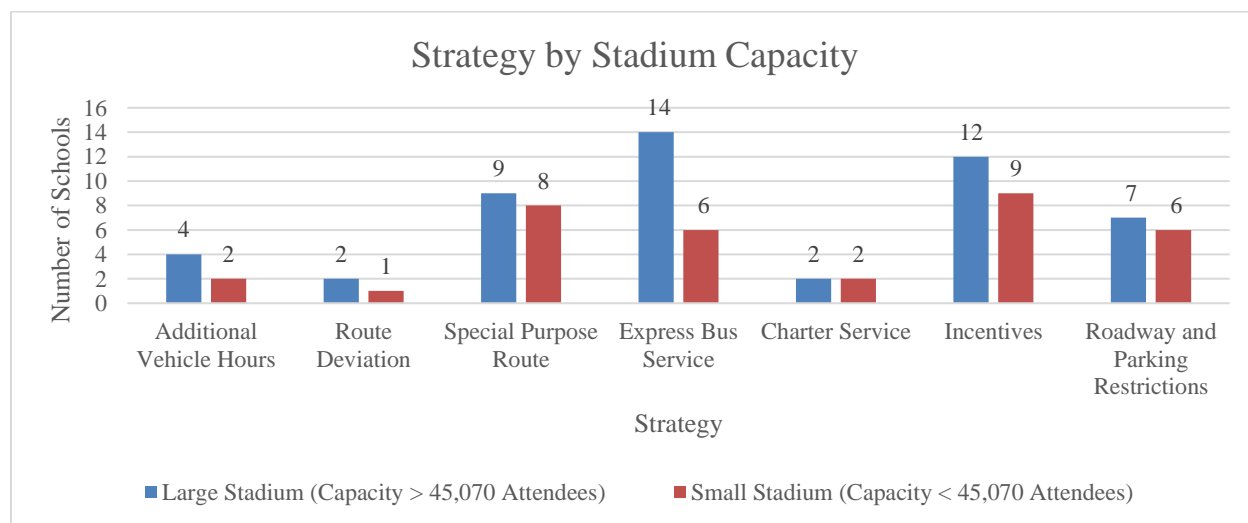


FIGURE 4 Strategy by Stadium Capacity

When looking at Figure 3 and Figure 4, most larger schools and schools with larger stadiums implemented express bus service, whereas the other strategies were implemented at about the same rate between large and small schools and stadiums. Therefore, future research should focus less on stadium or school size and instead considering the existing transit network and other urban environment factors such as land use.

CASE STUDIES

The results from the previous analysis highlight key trends in how often universities use particular strategies to handle the influx of fans. While the numerical results shed light on the frequency of use, descriptions of real-world policies can help illustrate how the strategies are actually work and how they differ between schools. A selection of strategies is presented below to highlight unique or interesting approaches being implemented by different universities.

Roadway and Parking Restrictions and Express Bus Service - Florida State University

Florida State University (FSU) is a large school (43,701 students) with a large stadium (79,560) and uses TDM strategies in three ways on game days. First, FSU has a two-tier structure to their parking system. Athletic boosters are allowed to park in reserved spots closest to the stadium and students are required to move their vehicles out of the lots prior to game day. General parking is available for the public in outlying areas; however, game attendees desiring to park must compete with student parking (27). Second, several roadways surrounding and through campus are converted from two-way traffic to one-way traffic. This primarily serves traffic inbound traffic before the game, then the flow is reversed and after the game. This increases the efficiency of not only the entering vehicle traffic, but also the park-and-ride buses servicing the general parking lots (28). Third, and most unique, is that one entire roadway, Jefferson Street, is shut down to traffic and turned entirely over to an express transit service called the “Spirit Express”. The Spirit Express is operated by Star Metro and provides direct service from the nearby Donald Tucker Civic Center to a stop near Doak S. Campbell Stadium. The shuttle costs \$5 per rider and each rider is given an arm band for proof of payment for a return trip. Special services begin two hours prior to the game and end one hour after the game (29).

Route Deviation, Additional Routes and Charter Service – Penn State

The Pennsylvania State University (Penn State) is unique for its considerations of transit, both in the local shuttles and larger regional based shuttles service. Penn State is a large school located in University Park, Pennsylvania with an enrollment of 87,903 students and a very large stadium capacity of 106,572. The university is served by the Centre Area Transportation Authority (CATA) and uses numerous special event strategies on game day, including converting streets from two-way traffic to one-way traffic, implementing parking restrictions on campus and special park-and-ride routes.

In terms of transit service expansion, CATA provides two new shuttle routes on game day: the Downtown Shuttle, which serves primarily the downtown hotels and three downtown parking garages, and the South Atherton route, which serves the many hotels on Atherton Street (45). Each stop is clearly branded with a special sign to highlight that the stop is on a special route for game attendees. Additionally, three routes that typically service the stadium area are diverted away from the stadium (46).

In addition to the local transit service expansion, Penn State markets charter buses for long distance travelers. The Fullington Bus Company provides shuttle services from three locations

1 around the University Park area: the North Atherton Shuttle, Banner Pike Wal-Mart, and the
2 University Airport. These shuttles operate beginning three hours before the game time until kickoff,
3 then begin again at the start of the third quarter, lasting up to 90 minutes after the game ends. Two
4 other charter services are offered to the larger surrounding areas including the Blair County Shuttle
5 and the Clearfield County Shuttle. For a fee, these two routes bring travelers from much farther
6 away than other stops and make only one or two trips before and after the game (47).

7 8 **Incentives - University of Utah and the Utah Transit Authority**

9 The University of Utah and the Utah Transit Authority's (UTA) partnership provides a robust
10 expansion of service on game days to efficiently move people to and from Rice-Eccles stadium,
11 which has a capacity of over 51,000. UTA provides special light rail trains from the Draper town
12 center to the stadium stop with 15-minute headways, and there are direct bus shuttles running
13 between two other locations in Salt Lake City. The service expansion begins 90 minutes prior to
14 kickoff and ends roughly an hour after the game. UTA also provides special ambassadors at station
15 locations to help answer questions and give directions at each stop location (80).

16 What is unique about the University of Utah and the UTA's partnership is that they have a
17 "Ticket As Fare" agreement, meaning that a football game attendees' ticket is the fare for the transit
18 system for the entire day regardless of mode choice (except ski bus and paratransit). The UTA also
19 services Weber State University and Brigham Young University (BYU), but interestingly does not
20 have this type of arrangement with either school despite BYU's stadium being larger than the
21 University of Utah's. Both Weber State and BYU are already serviced by new regular UTA routes
22 that are free for the first three years; however, some routes around BYU do have a fare (80).

23 24 **Transit Service Coordination & Special Purpose Routes – University of North Texas**

25 The University of North Texas (UNT) has an enrollment of about 46,940 students and a stadium
26 capacity of 30,850 seats. The UNT athletics department coordinates with the local Denton County
27 Transportation Authority, Denton Convention and Visitor's Bureau, and local businesses to plan
28 out a complementary shuttle service that runs from the Downtown Denton Transit Center to the
29 football stadium (68). The shuttle also makes stops near local businesses and its historic downtown
30 square. This coordination allows for consistent and convenient services that offer an experience to
31 incentivize use. Regular university transit will have a modified route for home games on Saturdays
32 to help students on campus get to the stadium (70). ADA drop-off points are also available.

33 34 **Park & Ride – Baylor University**

35 Baylor University in Waco Texas has a total enrollment of 20,824 students and a stadium capacity
36 of 45,140 people. Shuttle services operate in collaboration between the university and the Waco
37 Transit System to provide free and convenient transportation to football games. The city of Waco
38 also advertises shuttles to Baylor University basketball games. On football game days, shuttles
39 operate from four major locations including park and ride lots and downtown where people can
40 find free parking. Unlike many other schools where shuttles stop operations during the game before
41 resuming at the end, shuttles for Baylor run during the game as well (18). This is good for fans
42 who know they may want to leave the stadium early.

43 44 **CONCLUSIONS**

45 Public transit plays an important role in mitigating the unusual demand for planned special events
46 such as college football games. This study conducted a multiple case study analysis to

quantitatively compare game day transit planning, management, and operations strategies at universities (and their corresponding local transit agencies). The strategies were categorized into seven main approaches by adapting a special events framework from prior FHWA research. The quantitative analysis revealed that the most common strategy (at 21 schools) was to provide incentives, information and/or marketing of transit. School size and stadium size did not appear to have a substantial impact on what type of incentive was offered; for example, only five of the large schools with large stadiums were found to advertise incentives, while three of the four small schools with big stadiums used this strategy.

The second most common strategy (at twenty schools) was to provide some sort of express bus service to park-and-ride lots. Express bus service was more common in schools with large stadiums (14 out of 16) than in smaller stadiums (6 out of 16). Since college football games occur mostly on the weekends, transit agencies may have available capacity in out-of-service buses that could be utilized to provide expanded services such as express service to/from games. These park-and-ride lots can either be close to the stadium or placed around town.

Another common strategy (fifteen schools) was transportation demand management strategies such as changing traffic patterns or limiting parking to encourage transit use and decrease single occupancy vehicle trips. The strategy was implemented by about the same rate at both large (7 out of 16) and small (6 out of 16) schools.

Interestingly, the quantitative analysis revealed that the least common strategy was chartered bus service. Only four schools utilized chartered bus services, and these were primarily schools with large national followings in which the chartered buses were used to intercept regional attendees.

Finally, qualitative case studies were presented to highlight unique strategies, as well as provide a more nuanced look at some of the practices. One interesting finding was Florida State University manages travel demand by closing a road entirely to vehicle traffic and turning it over to an express bus serviced called the Spirit Express.

AREAS FOR IMPROVEMENT AND FUTURE RESEARCH

There are numerous areas for future research and improvement of this study. First, the case studies were compiled by reviewing publicly available information during the college football off season (i.e., springtime). It is likely that some information was removed from the websites during the off season and would likely be posted again during the fall; therefore, this research could be improved in the future by gathering additional data during the football season. Second, the research in this paper was limited by what type of information was available online. Some data like bus capacity, operational performance, or costs was not readily available online, and therefore, future research should consider other data collection methods. Similarly, interviews with university or transit agency staff may provide insights into why certain strategies were implemented and how stakeholder involvement influenced decisions. Last, future research could also conduct before and after studies to quantify the benefits of each strategy and compare them to costs.

AUTHOR CONTRIBUTION STATEMENT

The authors confirm contribution to the paper as follows: study conception and design: Kohring, Leppold, Brakewood; data collection: Kohring, Leppold; analysis and interpretation of results: Kohring, Leppold; draft manuscript preparation: Kohring, Leppold, Brakewood. All authors reviewed the results and approved the final version of the manuscript.

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