

**Greater Yellowstone Regional Traveler and Weather Information System
U.S. Highway 89 Project**

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Abstract

The transportation network that serves Yellowstone National Park has some operational challenges, including changing weather conditions, alternate routes that are separated by great distances, and animal–vehicle conflicts. The purpose of this project was to develop, implement and evaluate a system to accurately provide necessary information to those who managed and utilized the transportation system along the U.S. Highway 89 corridor and other routes in and around the park. The project installed highway advisory radio stations at four of the five entrances to the park, and purchased the following portable equipment used to provide enhanced traveler information within the park as well as on roadways leading to the park:

- four portable dynamic message signs,
- two portable dynamic message signs with highway advisory radio transmitters,
- one portable highway advisory radio transmitter.

Further, the park integrated its traveler information into the 511 traveler information phone systems operated by the Idaho, Montana and Wyoming Departments of Transportation to provide road condition and related information for travelers.

In addition, through the project, fifteen National Weather Service receivers tied to low-powered AM transmitters were purchased. While not yet installed, these systems will service as a low-cost alternative to a HAR system, and provide weather and traveler information in the park’s campgrounds.

A survey of park visitors that was conducted to evaluate the traveler information systems indicated the implemented technologies provide useful traveler information to the public. The project demonstrated the value of using these advanced technologies to improve the distribution of traveler information.

Finally, a pilot shuttle service was implemented to determine the use of alternative modes between the park and gateway communities. Ridership data indicates that such an alternative may be feasible.

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1. Introduction

The safety and efficiency of any transportation system depends upon many factors. The transportation system that serves Yellowstone National Park ("park") faces operational challenges such as high traffic levels, changing road conditions, weather-related factors, alternate routes that are separated by great distances, and animal-vehicle interactions. The ability to monitor these conditions and provide useful information to travelers can be critical to providing a safe and efficient transportation experience.

The purpose of this project was to develop, implement and evaluate a system that would provide accurate and necessary information to those who manage and utilize the transportation system along the US Highway 89 (US 89) corridor and on other roads in and around the park. The project, called the Greater Yellowstone Regional Traveler and Weather Information System Project—US 89, was intended to demonstrate the use of Intelligent Transportation System (ITS) technologies and the coordination of transportation providers to (1) improve mobility, (2) increase access to the park, (3) relieve congestion on roadways and at parking facilities, and (4) monitor road and weather conditions. To achieve these goals, researchers developed and implemented an advanced technology system on US 89 that can serve as a prototype at other federal lands throughout the country.

The US 89 project included improvements to provide information to motorists at key decision points in their routes, to monitor road-weather conditions and forecasts, and to coordinate traffic management strategies. The project also studied options for coordinating existing transit and transportation providers on the US 89 corridor and investigated opportunities to launch a pilot transit system between Mammoth, WY, and Gardiner, MT, for park and concessionaire employees.

While the project focused on the US 89 corridor, it was understood that the corridor may be used to exit the park, as well as be used to enter the park. Therefore, traveler information would not only need to be provided on US 89, but within the park and at the other park entrances. Highway advisory radios stations (HAR) were installed at four of the park's five entrances. These systems provide information on conditions within the park, and roadways leading to and from the park. This information should reduce the time staff at the entrance gates spend with visitors, answering questions about detours, road conditions, and other traveler information. Further, four portable dynamic message signs (DMS), two portable dynamic message signs plus highway advisory radio (DMS+HAR) and one portable highway advisory radio (HAR) were purchased for use on US 89, within the park, or on other entrance roads. These portable systems allow for the park to provide traveler information (such as road closure or detour information) at roadway intersections, or other points where motorists would need to make decisions about alternate routes. In addition, fifteen National Weather Service (NWS) receivers tied to low-power AM transmitters were purchased for installation at the park's major campgrounds. This system acts as a low-cost alternative to a HAR, and even though it does not have the transmitting power (or distance) of a typical HAR, it provides adequate coverage to disburse traveler information at the parks campgrounds. Finally, the park's traveler information was incorporated into the Idaho, Montana and Wyoming 511 traveler information systems. By having the park's information available at a further distance, travelers can make route choices and other decisions while options (such as using an alternative entrance) are available to them.

The first phase of the project consisted of the development of a technology coordination plan, a concept of operations and specifications for the proposed technologies. The second phase saw the procurement and installation of the technologies, including the fixed and portable equipment. The third phase of the project focused on operations and evaluation. The evaluation component of the project included a user survey and a review of user counts numbers, which are included in this final report.

This report provides a brief description of each component of the implemented traveler and weather information system (Chapter 2). While the focus of the project was on traveler information, there was a desire to research alternative transportation options. Therefore, a pilot transit program (shuttle service) was implemented, and is noted in Chapter 2, as well. Chapter 3 provides information on the project evaluation, and conclusions are noted in Chapter 4.

2. ITS Equipment Installation, 511 Phone System and Pilot Transit Program

This chapter provides information about the installed ITS equipment, the 511 traveler information system, and the pilot transit program, which together make up the regional traveler and weather information system envisioned for this project. The ITS equipment used for the project included portable DMS, fixed HAR stations, DMS that also broadcast information on HAR frequencies (DMS+HAR), and NWS radio transmitters and receivers. The pilot transit program provided a bus service between Gardiner, MT, and park headquarters at Mammoth, WY. The transit system was operated by the Streamline transit system of Bozeman, MT. The park’s traveler information was added to the Idaho 511 system in the spring of 2009, and was added to the Montana and Wyoming 511 systems in December 2009. Figure 1 shows the approximate locations of installed ITS equipment and the transit route.

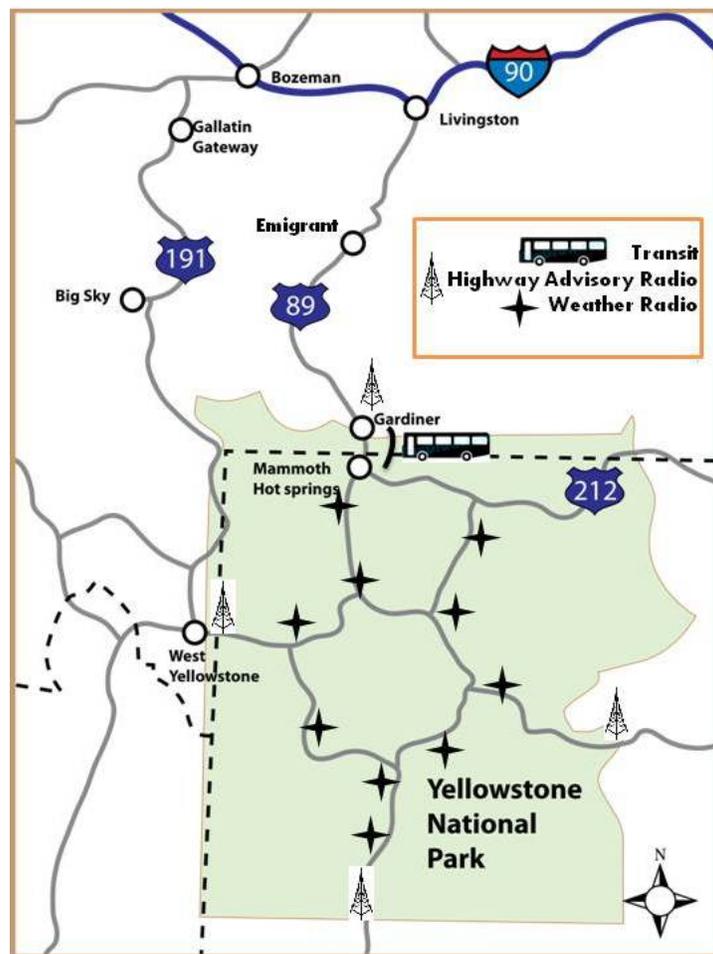


Figure 1: ITS equipment and transit route

Note: Portable equipment is not shown as it can be deployed at various locations.

2.1. Dynamic Message Signs (DMS)

Wildfire, wildlife–vehicle collisions, roadway construction and maintenance, and road closures are regular occurrences during the summer tourist season in the park. A portable, trailer-mounted

DMS can be transported to and set up at various locations to warn drivers of situations and conditions that can impact their safety. For critical situations, the portable DMS can be deployed to a desired area of operation and set up in less than 10 minutes.

Four portable DMS manufactured by American Signal Company (AMSIG) were ordered for this project. They have been in use in the park since August 2009. Each deployed DMS is a full-size, all light-emitting diode (LED), solar charged, programmable, three-line changeable message sign. It features a continuous matrix format for each line, thus accommodating three font sizes and up to 12 alphanumeric characters per line (Figure 2).



Figure 2: Portable Dynamic Message Signs

Source: American Signal Company

The sign is capable of displaying messages with legibility distances of approximately 1,000 feet. Even though roadways within the park have a posted speed limit of 45 mph, the sign is suited for work-zone applications on high-capacity, high-speed roadways requiring extended visibility and legibility distances, therefore the DMS can be used on the roadways leading to the park.

2.2. Dynamic Message Signs and Highway Advisory Radios (DMS+HAR)

Dynamic message signs can only provide a certain amount of information to motorists. The park's road network traverses rough terrain, much of it bordered by thick vegetation, which can obscure drivers' visibility of roadside features, including DMS. This situation led to a discussion on how to provide more robust traveler information within the park. A DMS+HAR station co-located on a single trailer would be appropriate to deploy in areas with limited roadside visibility, or where more complex traveler information dissemination is necessary. The combined unit can be set up in a few minutes to broadcast up-to-the-minute emergency and traffic advisories to motorists. The combined voice and text messages can be used to make drivers aware of work zones, wildfire, accidents, AMBER Alerts, weather emergencies, etc. (Figure 3).



Figure 3: Portable Dynamic Message Signs with Highway Advisory Radio

Source: American Signal Company

The DMS+HAR unit is battery powered with both solar and 110 VAC charging systems. The DMS has the same capabilities as described in Section 2.1. The on-board HAR station is equipped with an AM transmitter, digital message player and quick-erect antenna system. The park has secured the FCC-licensed 1610 kHz AM frequency, and it is being used for all HAR in the park. Radios signals from HAR can be received through radios within a three- to five-mile range, depending upon the topography. The digital message player of the HAR is capable of recording and storing up to 1,000 messages for re-broadcast without degradation. Messages of the DMS and HAR can be quickly changed through a remote access as conditions warrant (AMSIG, 2010).

2.3. Portable Highway Advisory Radio

One portable HAR was purchased for use within the park, or to be used as a substitute for one of the fixed HAR if necessary. The portable HAR contains two small signs that can be placed on the roadside to advise drivers to tune into the AM frequency (Figure 4).



Figure 4: Pop-up signs for Portable HAR

Source: Information Station Specialists

The portable HAR has the same capabilities as the HAR on the combined DMS+HAR units.

2.4. Fixed Highway Advisory Radios

To provide information to travelers prior to entering the park, HAR stations were installed at four of the five park entrances. The entrance without a fixed HAR is the northeast entrance, which is the least used of the park's five entrances.



Figure 5: Highway Advisory Radio Station

Source: Information Station Specialists

The installed HAR stations are manufactured by Information Station Specialists (ISS). Each HAR station is able to record 1,000 high quality digital messages in 50 playlists for a total play time of up to three hours. It is also equipped to broadcast automatic “all-hazards” alerts (significant weather or safety information) from the National Weather Service. The HAR station has two-way redundant control, and uses push-to-talk style transceivers with familiar broadcasting protocols and voice prompts for input. The HAR has a computerized audio control system, and can operate up to four days with battery backup operation if AC power is lost (Figure 5).

2.5. National Weather Service Receiver and AM Transmitters

Campgrounds in the park are often located away from main park destinations. Weather can impact the activities of visitors, and can have a significant impact on those who are camping in the park. To provide weather and safety-related information to campers, fifteen NWS receivers and low-power AM transmitters were purchased to be installed at eight campgrounds and three popular locations:

Campgrounds: Bridge Bay, Canyon Village, Grant Village, Indian Creek, Lewis Lake, Madison, Norris and Tower Fall.

Other Locations: Old Faithful and Fishing Bridge.

Four NWS receivers and AM transmitters were purchased as spare units, or could be installed at other locations, as the park staff determines the usefulness of these technologies. While this system doesn't allow the recording of messages, and doesn't have the range of a fixed or portable HAR, the “package price” for this equipment is a fraction of the cost of a fixed or portable HAR. This equipment provides the park with an affordable way to disburse weather and safety information to visitors. The equipment is rather small, as shown in Figure 6.



Figure 6: National Weather Service Receiver and Transmitters

Source: Western Transportation Institute

2.6. 511 Traveler Information Service

The 511 traveler information service is a national system for dissemination of weather and travel/traffic-related information, with the goal of improving mobility and safety. Along with closure notices, congestion advisories and weather information, travelers use this service to seek tourism information. A wide variety of information is provided by the park via telephone and the Internet and through contact with park employees at the park entrances. The early stages of the 511 efforts focused on interviews of park employees and a review of the park's website to learn what information was being provided to travelers and the practices employed in maintaining and updating that information.

Based on the information collected from the review of current practices, a number of alternatives were developed to address the needs of the park in providing traveler information such as closure notices, congestion advisories, and weather information via 511. Through this project, the operational concept that was adopted was that staff from the park would call into Meridian Environmental Technologies (the 511 vendor in Montana and Wyoming) and record current park information. This current park information would then be updated in the Meridian system so people in Montana and Wyoming could call the 511 traveler information number in those states and receive current park information.

In Idaho, where Castle Rock is the 511 vendor, a different approach was used to get the park's information on the state's 511 system. If a traveler calls the 511 traveler information number in Idaho and requests park information, the 511 system simply forwards the call to the park's traveler information number (307-344-2117). While this approach does allow access to the park's information, it has the potential to place a higher burden on the park's telephone system if

a significant number of people request information through the Idaho 511 system. This could be an issue, as the park’s traveler information number has the ability to link people to the park’s emergency call center. For example, if someone calls the park’s traveler information number and dials “0” (zero), their call is sent to emergency call center. A person at the call center must answer the phone to determine if its is an emergency call or not.

Yellowstone National Park traveler information was added to the Idaho 511 system in the spring of 2009, and to the Montana and Wyoming 511 systems in December 2009. Although the US 89 project officially ended on December 12, 2010, the park’s traveler information continues to be accessible through the Idaho, Montana and Wyoming 511 traveler information systems. The call volume data provided by Meridian indicates that 2,316 calls received by the Montana 511 system requested traveler information for the park. May, April and June had the highest call volume per day with an average of fourteen, nine and seven calls, respectively (Figure 7).

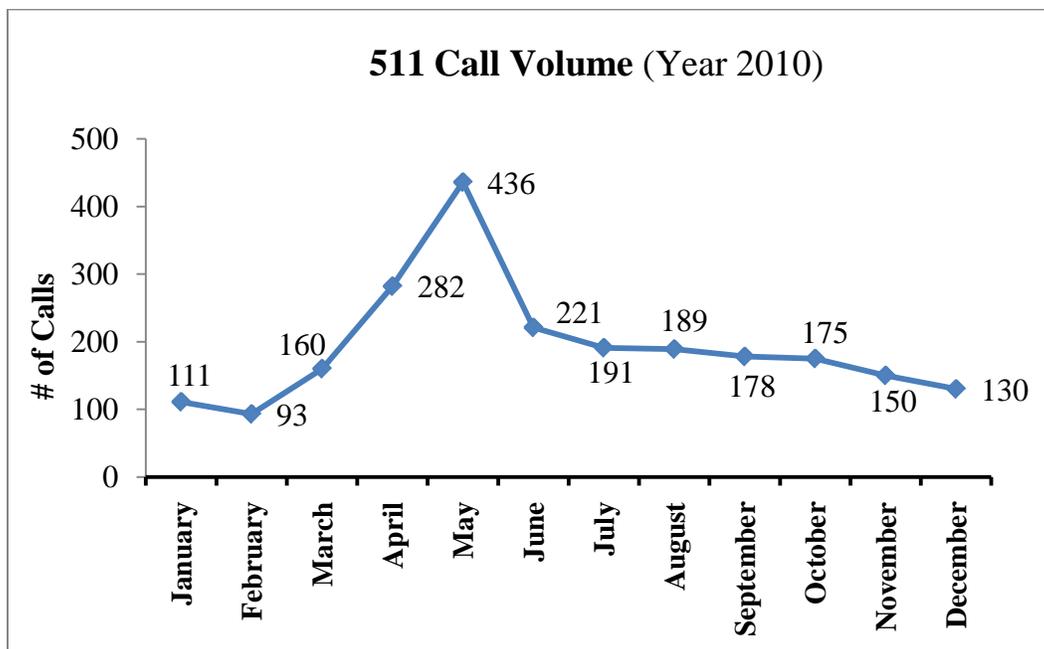


Figure 7: Montana 511 Call Volume Data

Data Source: Meridian Environmental Technology Inc.

It should be noted that the park has its highest visitation during the summer months, and that from November through April, the majority of the roads in the park are closed to wheeled-vehicle traffic (with access by snowmobile and snowcoach).

2.7. Pilot Transit Program

During the peak summer visitation months, the park and its concessionaires have nearly 4,400 employees working in the park. Many of the concessionaire employees do not have personal vehicles for transportation. Further, some employees who have a second job in a gateway community will resort to hitchhiking to get between jobs. To determine if a shuttle/transit system

would be feasible to move concessionaire and park employees to gateway communities, a pilot transit program at the park was launched on August 9, 2010.

The purpose of the shuttle bus was to provide rides between Gardiner, MT, and park headquarters in Mammoth, WY, a one-way distance of approximately seven miles. The service was open to all park and concessionaire employees and their families but was not available to the general public. The transit schedule was designed to provide mobility during the major shift changes at the various employers. As shown in the schedule (Table 1), the shuttle operated from 7:30 am to 5:25 pm, with several breaks in the schedule. The shuttle operated Monday through Friday from August 9 to December 10, 2010.

Table 1: Transit Schedule

1. Gardiner to Mammoth	Tourist Info Turnaround (Westernaire Motel)	7:35 AM	8:35 AM	10:28 AM	11:28 AM	12:28 PM	1:28 PM	4:28 PM
	Cenex (US 89 & 4th St.)	7:37 AM	8:37 AM	10:30 AM	11:30 AM	12:30 PM	1:30 PM	4:30 PM
	Town Cafe (2nd St. & Park)	7:39 AM	8:39 AM	10:32 AM	11:32 AM	12:32 PM	1:32 PM	4:32 PM
	Justice Center - Post Office	7:53 AM	8:53 AM	10:46 AM	11:46 AM	12:46 PM	1:46 PM	4:46 PM
	Hot Springs Hotel	7:55 AM	8:55 AM	10:48 AM	11:48 AM	12:48 PM	1:48 PM	4:48 PM
	YCC Camp (near gas pumps)	8:00 AM	9:00 AM	10:53 AM	11:53 AM	12:53 PM	1:53 PM	4:53 PM
2. Mammoth to Gardiner	YCC Camp (near gas pumps)	8:05 AM	9:05 AM	10:58 AM	11:58 AM	12:58 PM	1:58 PM	4:58 PM
	Hot Springs Hotel	8:10 AM	9:10 AM	11:03 AM	12:03 PM	1:03 PM	2:03 PM	5:03 PM
	Justice Center - Post Office	8:12 AM	9:12 AM	11:05 AM	12:05 PM	1:05 PM	2:05 PM	5:05 PM
	Town Cafe (2nd St. & Park)	8:26 AM	9:26 AM	11:19 AM	12:19 PM	1:19 PM	2:19 PM	5:19 PM
	Cenex (US 89 & 4th St.)	8:28 AM	9:28 AM	11:21 AM	12:21 PM	1:21 PM	2:21 PM	5:21 PM
	Tourist Info Turnaround (Westernaire Motel)	8:30 AM	9:30 AM	11:23 AM	12:23 PM	1:23 PM	2:23 PM	5:23 PM

Monthly ridership statistics (Figure 8) indicate that there was a demand for the service between Gardiner and Mammoth. It is important to note that peak visitation (and employment) in the park is during the summer months, with visitation trailing off between September and October.

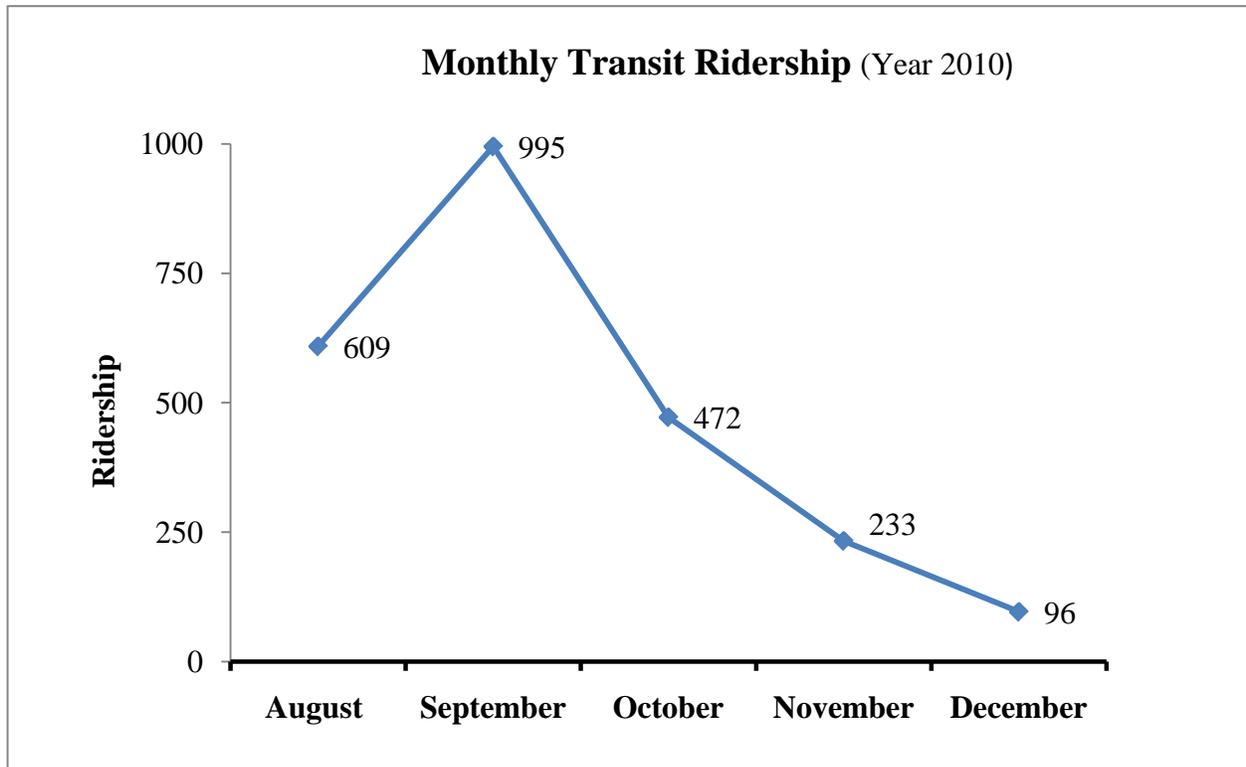


Figure 8: Transit Ridership from August to December 2010

Note: The transit service was launched on August 9 and ended on December 10, 2010.

While there was no funding identified to continue shuttle operations, the park is exploring the possibility of operating the shuttle during the peak summer season.

3. Project Evaluation

This chapter presents the results of the survey that was conducted to evaluate the implemented traveler information systems, and to gauge the interest in public transportation in and around Yellowstone National Park. A copy of the survey results is included in Appendix A.

The survey consisted of ten questions relating to park traveler information and public transportation options. The survey took approximately three minutes to complete. The survey was administered by staff from the Western Transportation Institute. Visitors arriving by vehicle were asked to participate in the survey. Surveys were distributed near the Roosevelt Arch at the northern (Gardiner) entrance, the entrance served by U.S. 89. If a participant agreed to take the survey, they were handed a clipboard with the survey and a pen attached. The surveys were collected by staff that were positioned close to the entrance gate. Surveys were only distributed to vehicles that contained more than one occupant so that the driver did not need to complete the survey, while maintaining their position in the queue for the entrance gate. Visitors entering the park by motorcycles or tour buses were excluded. A total of 475 partially or totally completed responses were received. Surveys were distributed on July 15 (Thursday), July 16 (Friday), July 20 (Tuesday), and July 21 (Wednesday) between 9:00 am and 11:00 am, with 87, 112, 162, and 115 surveys received on those days, respectively.

The first question used a Likert scale that allowed respondents to rank the importance (very important, important, somewhat important, neutral, somewhat unimportant, unimportant, and very unimportant) of four traveler information items: road/weather conditions; occurrence of hazard/accident; road construction; and campground/lodging availability. The majority of respondents, 40.1 percent, noted that information regarding road/weather conditions is “very important” when determining travel routes and sites to visit within the park, 31.5 percent described this information as “important,” 13.9 percent ranked it as “somewhat important,” and 9.1 percent were neutral. The remaining 5.3 percent of respondents rated road/weather condition information as either somewhat unimportant, unimportant, or very unimportant.

Information explaining the occurrence of hazards or accidents within the park was ranked as “very important” by 34.7 percent of survey respondents, while 28.0 percent listed it as “important” and 16.7 percent answered “somewhat important.” Another 12.7 percent of respondents were neutral with regard to the importance of hazard/accident information, 3.1 percent of surveyed visitors said this information was “somewhat unimportant,” 4.0 percent listed it as “unimportant,” and 0.9 percent described it as “very unimportant.”

Traveler information detailing road construction was listed as “very important” by 38.9 percent and “important” by 34.7 percent of respondents. It was described as “somewhat important” by 15.5 percent of surveyed visitors, “somewhat unimportant” by 2.2 percent, and “unimportant” by 2.0 percent of respondents. Just 5.1 percent of respondents were neutral, and 1.5 percent ranked road construction information as “very unimportant.”

Information regarding campground or lodging availability within the park was ranked somewhat lower in importance by survey respondents, possibly due to the fact that some visitors do not stay overnight within the park. Campground/lodging availability updates were ranked as “very important” by 28.2 percent of survey respondents and 19.9 percent noted it was “important.” This information was judged “somewhat important” by 12.8 percent, while a similar number (12.1 percent) described it as “unimportant,” 15.2 percent of respondents were neutral, 3.6

percent found campground/lodging availability information “somewhat unimportant,” and 8.3 percent listed it as “very unimportant.” The results for the first survey question indicate that weather and road information is the most important to travelers.

The second survey question sought to determine the direction visitors were traveling from prior to merging onto U.S. 89 South at Livingston. Out of 456 respondents, 47.1 percent were traveling from the west (Bozeman/Butte), 24.1 percent were coming from the east (Big Timber/Billings), and 28.7 percent were traveling from another direction. In total, more than 70 percent of visitors reported traveling on I-90 before turning on to U.S. 89. The third question was designed to obtain the perceived usefulness (extremely useful, very useful, moderately useful, somewhat useful, or not at all useful) of receiving park information via the 511 traveler information number at a range of distances from the Gardiner (north) park entrance. Overall, the percentage of respondents who felt 511 contact would be extremely or very useful decreased as the distance/traveling times increased. For a distance of 30 miles or 25 minutes from the entrance, 21.7 percent of visitors ranked 511 information as “extremely useful,” 20.8 percent said it would be “very useful,” 23.4 percent said information at that distance would be “moderately useful,” and 13.3 percent described it as “somewhat useful.” “Not at all useful” was the response of 20.8 percent.

Only 14.0 percent noted the 511 traveler information would be “very useful” and 20.1 percent said it would be “useful” from a 60-mile (50-minute) distance at Livingston. Another 26.3 percent of respondents noted the information at this distance would be “moderately useful,” 14.5 percent reported it as “somewhat useful,” and 25.1 percent said “not at all useful.”

As the distance increased to 90 miles (1.5 hours at Bozeman or Big Timber), 13.1 percent listed information at that distance as “extremely useful,” 11.6 percent said it would be “very useful,” 27.1 percent ranked it as “moderately useful,” 19.6 percent said it would be “somewhat useful,” and 28.6 percent of respondents said 511 traveler information would be “not at all useful.”

Receiving park information by calling 511 from a distance of 170 miles from the park entrance (three hours at Butte or Billings) was ranked as “extremely useful” by only 12.0 percent and “very useful” by 8.4 percent of respondents. The majority of respondents, 35.5 percent, said information at that distance would be “not at all useful,” while 22.7 percent and 21.4 percent of respondents described the distance as “moderately useful” and “somewhat useful,” respectively.

While states are urging travelers to call 511 before beginning a trip, and there is a national focus on safety issues concerning cell phone use while driving, cell phones have become a prime mode of communication. Results of the fourth question indicate that out of 455 respondents, 92.7 percent had a working cell phone in their vehicle.

The fifth question asked what sources of traveler information respondents have used. The majority (287 out of 742 multiple responses) reported the use of brochures and maps. Travelers listed the computer as another popular source of information, with 185 responses. Ninety-nine respondents reported using both highway advisory radio and the telephone to obtain traveler information, and 46 listed touch screen technology as an information source. Only 26 responses noted use of the 511 traveler information number.

The sixth question asked respondents the usefulness of public transportation if it were available on the following routes: from Livingston to Gardiner; from the Bozeman airport to Gardiner; and within the park. In general, survey participants reported limited usefulness of public

transportation in the area. A public transportation system from Livingston to Gardiner was ranked as “not at all useful” by 51.3 percent of respondents; similarly, 51.1 percent ranked public transportation from the Bozeman airport to Gardiner as “not at all useful.” Only 9.4 percent reported transit from Livingston to Gardiner as being “extremely useful,” 11.7 percent ranked it as “very useful,” 18.3 percent said it would be “moderately useful,” and 9.4 percent listed it as “somewhat useful.” Transit from the Bozeman airport to Gardiner had similar ratings, with 9.3 percent of respondents saying it would be “extremely useful,” 10.6 percent listing it as “very useful,” 16.4 percent as “moderately useful,” and 12.7 percent as “somewhat useful.” However, 24.6 percent of respondents noted that public transit within the park would be “extremely useful,” 17.4 percent said it would be “very useful,” and 15.9 percent ranked transit in the park as “moderately useful.”

Out of 335 respondents, 68.7 percent observed the sign prior to Gardiner noting “Visitor Information Tune to 1610 AM” (Question 7). Out of 294 respondents, 32.7 percent indicated that they tuned into the radio station (Question 8). When asked to rank the usefulness of the information on the broadcast (Question 9), 16.2 percent of respondents described it as “extremely useful,” 24.6 percent said it was “very useful,” and the highest percentage, 32.3 percent, said the information was “moderately useful.” Only 10.8 percent of respondents found the information to be “somewhat useful” and 16.2 percent listed it as “not at all useful.”

The final survey question asked respondents to offer comments about traveler information issues in the park, and/or between Livingston and Gardiner on U.S. 89. Seventy-three comments were received. All comments are listed in Appendix A.

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4. Conclusions

In 2010, Yellowstone National Park had just over 3.64 million visitors. Approximately 15 percent of those visitors came through the Gardiner (north) entrance, making it the third busiest of the park's five entrances. Access to that entrance is provided through the U.S. 89 corridor from Livingston to Gardiner. The lack of alternate routes to the park has a substantial impact on the mobility of visitors. For travelers on I-90 coming from the east, if U.S. 89 were closed, visitors would likely travel on and use U.S. 191 to access the West Yellowstone entrance. The U.S. 191/I-90 junction is approximately 34 miles from the U.S. 89/I-90 junction. Further, depending upon a traveler's origin and destination, the closure of a segment of either of the loop roads (main roads) within the park may lead to a detour of more than 80 miles. Therefore, providing traveler information to visitors/motorists as soon as practical is important. By providing traveler information on alternative routes, road and weather conditions, travel time and other items, visitors can make informed decisions about their routing and the locations within the park they would like to visit.

A major focus of this project was to implement improved traveler information systems within, and the corridors leading to the park. After reviewing alternative technologies, a combination of portable and fixed technologies were procured and implemented. Through the project the park was able to install fixed highway advisory radios at four of its five entrances. In addition, the park was able to share its traveler information through the 511 systems in Idaho, Montana and Wyoming, the three states that surround and include the park. Further, the park was able to procure four portable DMS, two portable DMS with HAR, and one portable HAR. Finally, the park was able to procure fifteen National Weather Service radio receivers connected to low-power AM transmitters to create a low-cost solution similar to a HAR.

The purpose of all of the technologies that were implemented for this project was to provide timely and accurate traveler information to the millions of visitors who come to the park each year. As indicated by the survey results, people have cell phones in their cars and can access the 511 traveler information number. The survey also indicated that while over two-thirds (68.7 percent) of respondents saw a sign to tune into an AM radio station to hear the park's information, only one-third (32.7 percent) did so. It may require additional marketing to get more travelers to tune in to the highway advisory radio to get park information.

This project was also able to institute a pilot program of employee transportation between the park's headquarters at Mammoth and the gateway community of Gardiner, Montana. Even though it was implemented toward the end of the main tourist (and employee) season, the ridership results indicate that there may be need for a shuttle during the main (summer) season. Management at the park has indicated that they may implement a shuttle during the summer of 2011.

This project was successful in procuring and implementing improved traveler information systems and employee transportation in the park. The survey results and ridership figures indicated positive results; however, long-term results will likely provide a better sense of the benefits of the implemented systems. Hopefully, within the next few years, funding can be obtained to analyze the traveler information systems within Yellowstone National Park.

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6. APPENDIX

The percentages shown are based on the total number of responses to each question. The number of responses (n) is shown for each question. A total of 475 surveys were partially or totally completed.

1. How important are the following traveler information items for determining your route and the sites you plan to visit in Yellowstone National Park? (n-1a=461; n-1b=450; n-1c=452, n-1d=447)

	Very Important	Important	Somewhat Important	Neutral	Somewhat Unimportant	Unimportant	Very Unimportant
Road/Weather Conditions	40.1%	31.5%	13.9%	9.1%	1.5%	2.6%	1.3%
Occurrence of Hazard/Accident	34.7%	28.0%	16.7%	12.7%	3.1%	4.0%	0.9%
Road Construction	38.9%	34.7%	15.5%	5.1%	2.2%	2.0%	1.5%
Campground/Lodging Availability	28.2%	19.9%	12.8%	15.2%	3.6%	12.1%	8.3%

2. Which direction were you traveling from prior to merging onto US 89 South at Livingston? (n=456)

West (Bozeman/Butte) 47.1%	East (Big Timber/Billings) 24.1%	Other (specify) 28.7%
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3. How useful would it be if you could receive information related to Yellowstone National Park by calling 511 from the following distances (times) from Gardiner (the Park Entrance)? (n-3a=428; n-3b=399; n-3c=398; n-3d=392)

	Extremely Useful	Very Useful	Moderately Useful	Somewhat Useful	Not at all Useful
30 miles (25 minutes)	21.7%	20.8%	23.4%	13.3%	20.8%
60 miles (50 minutes) at Livingston	14.0%	20.1%	26.3%	14.5%	25.1%
90 miles (1.5 hours) at Bozeman or Big Timber	13.1%	11.6%	27.1%	19.6%	28.6%
170 miles (3 hours) at Butte or Billings	12.0%	8.4%	22.7%	21.4%	35.5%

4. Is there a working cell phone in your vehicle? (n=455)

Yes 92.7% No 7.3%

5. Have you ever used any of the following traveler information systems through cell-phone or radio, or at Traveler Information Kiosks? (traveler information kiosks may be located at rest areas, local businesses, local chambers of commerce, etc.) – 742 multiple responses

511 traveler information number	Highway advisory radio	Computer	Touch Screen	Telephone	Brochure & Maps
26	99	185	46	99	287

6. How useful would it be if public transportation (transit) were available. (n-6a=394; n-6b=378; n-6c=403)

	Extremely Useful	Very Useful	Moderately Useful	Somewhat Useful	Not at all Useful
From Livingston to Gardiner	9.4%	11.7%	18.3%	9.4%	51.3%
From the Bozeman Airport to Gardiner	9.3%	10.6%	16.4%	12.7%	51.1%
Within Yellowstone National Park	24.6%	17.4%	15.9%	8.4%	33.7%

7. Did you see the sign prior to Gardiner which noted, “Visitor Information Tune to 1610 AM”? (n=335)

Yes 68.7%	No 31.3%
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8. Did you tune into 1610 AM (the Yellowstone Park Information broadcast)? (n=294)

Yes 32.7%	No 67.3%
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9. How useful did you find the information on the broadcast? (n=130)

Extremely Useful	Very Useful	Moderately Useful	Somewhat Useful	Not at all Useful
16.2%	24.6%	32.3%	10.8%	16.2%

10. Please provide any other comments you may have about traveler information issues in Yellowstone National Park, and/or between Livingston and Gardiner on US 89.

Traveler Information:

1. All campgrounds should know what availability is in all campgrounds private and state.
2. More animal-ranger info
3. Advertise park emergency number.
4. Change the camping reservation system to an internet system.
5. It would be nice to get traffic updates at every entrance
6. Info about delays or crowds on the internet or at park entrances
7. At the entrance they should have signs about Old Faithful times
8. Inform and enforce large RVs to use pullouts to allow for better traffic flow
9. Need to be FM
10. Approximate transit times with construction

Road Comments:

11. I'm fed-up with the construction delays of 30 minutes or more
12. Road lines need repainted
13. Make road wider so people can pull over
14. Expand north gate entry
15. Need better entrance at Gardiner. Better traffic control at major intersections
16. If there is going to be road construction there should be bike lanes as well

Signage:

17. Road closures and weather info helpful. More pullout signage
18. More signs prior to rest areas and restrooms so you have time to decide to stop.
19. Do road construction not during tourist season
20. Provide signs at Roosevelt gate for pictures or pullout
21. Camp info on two signs near freeway
22. Mark isle numbers in large parking lots
23. More signs – directional – larger type

Map:

24. The blow-up maps on the park map are not useful.
25. Map?
26. The map only shows one gas station so we went 45 minutes out of our way to get gas and later discovered at least two other gas stations. All camps should have reservations. Need to know if campsites are full
27. The roads were easy to follow using AAA maps and GPS. Roads were a bit narrow and animal sightings made conditions unsafe. Would like to see more rangers inside Park

Cell phone Coverage:

28. No AT&T reception in Park.
29. Better cell coverage
30. Getting by iphone I hope
31. Cell phone service and traffic flow improvements
32. Cell signal
33. Cell service

Public Transportation System:

34. Too many vehicles in park, clearly disturbing the wildlife. Introducing public transportation and limiting entry number would help.
35. Trolley or bus with frequent stops, easy on off loading throughout the park with info and commentary
36. Glacier has good transit system YNP need a similar one
37. Trains with audio info available and more employees to speed up entry into park

General Comments:

38. Need guard rails for places of higher elevation in Park.
39. Too busy and hectic. Get rid of automobiles. Bikes and Horses only. Let kayakers run the rivers.
40. We have entered park twice in a week and both times there has been a motorcycle wreck
41. Quicker entrance into park especially with permit from previous day
42. Motels and restaurants fail to provide useful information. Flyers would be nice. Inadequate lodging
43. We like the hand sanitizer in the bathrooms

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44. We appreciate the thoughts to make travel in YNP easier and more traveler friendly.
Thank you
 45. Too long of wait to get in
 46. Delay on entering park
 47. Look out spots need to be more clear
 48. More motels needed. Competition not enough. Entry wait too long
 49. Post park entrance wait times on board outside Gardiner
 50. Speed up entry
 51. Tree stairs
 52. Quicker entrance
 53. Make campsite available know earlier
 54. Not enough pull over spots
 55. Need more campgrounds
 56. Great park info
 57. Campsites are too busy