Congestion Management Toolkit

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National Park Service
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Introduction

Congestion is not a new issue for national parks or the National Park Service (NPS). Many national parks experience a level of visitation that often exceeds the capacity of the parks' facilities and resources. While congestion can result from too many people at a trailhead or on a trail, a crowded visitor center with a waiting line for a film about the park, or even too many bicyclists using a pathway, this Congestion Management Toolkit focuses on motor vehicle congestion (cars, trucks, buses, etc.).

Congestion can occur at individual or multiple locations including: gateway communities, on roadways leading to the park, at entrance stations, on roadways within the park, in parking at visitor centers, trailheads, and other attractions. Causes of congestion vary, from bottlenecks to visitors congregating at an attraction, or from normal traffic fluctuations and commuter traffic. In short, congestion occurs when (and where) there is more demand than supply. Parks may experience mild, moderate or severe congestion. Some parks see visitation spikes on holiday weekends, special events, or throughout their peak season. Other parks may experience congestion all year long from commuter traffic. The most common issues impacted by congestion are visitor experience, safety and park operations.

This Toolkit provides a list of congestion mitigation solutions or tools that can be applied to address specific congestion problems and issues in NPS settings. Key features include implementation considerations, cost and financial information as well as examples of where these tools have been used and expected outcomes based on previous applications. Finding the right tool involves a "diagnosis" of the problem(s), so they can be matched with the best solutions.

The Congestion Management System/Process uses a step-by-step process to solve congestion, based on adaptive management. The steps are as follows:

- **Step 1:** Identify the congestion problem(s)
- **Step 2:** Determine the location(s), frequency, and impacts of congestion
- **Step 3:** Consult the Toolkit to identify potential solutions
- **Step 4:** Analyze alternatives and select preferred solution(s)
- **Step 5:** Implement solution(s)
- **Step 6:** Test/monitor effectiveness of solution(s)
- **Step 7:** Revisit Toolkit if problems are not adequately resolved

It is important to remember that this Toolkit is to be used as part of a problem-first approach to dealing with congestion. If you are using the Toolkit, you should have already identified if your unit has congestion issues, and analyzed factors such as: where congestion is occurring, how frequently it occurs, how long

the congestion lasts, etc. The Toolkit should not be used (reviewing potential solutions) Steps 1 and 2 in the above list have been completed.

Finally, while each individual park unit may have congestion issues to address, implementing solutions must take into account broader issues such as the NPS mission, national Environmental Policy Act provisions, other Federal requirements and Director's Orders, regional priorities and the Capital Investment Strategy.

> *A common mistake has been to apply for and to accept highway program funding, but to be unprepared to complete the project, and/or operate and maintain the project after its completion. Sufficient staffing resources are required for the design, on-the-ground work, administrative assistance, maintenance, and the determination of sources for matching funds. The FLMA should understand the level of commitment required and be fully prepared to commit the resources necessary to implement, operate, and maintain a project prior to beginning the first phase of the transportation planning process. Partners can, and often do, assume responsibility for operating or maintaining a project or service after they are implemented.*[1]

Understanding Congestion and the Congestion Management Process

The Congestion Management Process is linear, and the order of the seven step process is important (Figure 1). In the process of evaluating and selecting the right solutions for addressing congestion issues, each park needs to:

- Focus on a defined-problem approach
- Explore the full range of potential tools and alternatives
- Explore realistic outcomes
- Work with their regional transportation coordinator in order to ensure that resources and the latest technologies are available

Step 1: Identify the congestion problem. This step defines the basic question; is there congestion? From there, determine the type of congestion and where it manifests itself. Where is congestion occurring? Does staff notice long lines at the entrance gates? Are there cars always driving around looking for parking spots in the parking lots? Does it seem that traffic is always backed up on certain roads?

Step 2: Determine the location(s), frequency, and impacts of the congestion. This step identifies the specific location, measures the frequency, and detects the effects of congestion. Where is the congestion occurring? How often is the congestion occurring? Is it only a couple of days per year, or is it more frequent? How many cars may be parking along a roadside or driving around looking for a parking spot? Is it only a few cars, or a significant number of vehicles? Are there resource impacts related to the congestion? How does it affect the visitor experience? After this step, the park should be able to determine if the congestion is significant enough to warrant action.

Step 3: Consult the Toolkit to identify potential solutions. In this step the Congestion Management Toolkit is used to characterize the findings in Steps 1 and 2, and to develop solutions. After completing Steps 1 & 2, if you believe there is a congestion issue to be addressed, then alternatives should be developed, reviewed and analyzed for measures to address the congestion issue(s). This Toolkit is designed specifically for this step. It lists specific congestion solutions, and provides information that can help in selecting the most appropriate solution(s).

Step 4: Analyze alternatives and select preferred solutions(s). In this step, the information provided for each solution in the Toolkit can be reviewed associated with the specific congestion issues in the park. Some of the solutions may have higher capital costs, while others may require more manpower. A benefit/cost analysis is one tool that can be used to determine which solution is preferred. Make sure to utilize all available resources from the NPS, and perhaps even consultants, when determining the best solution(s) to implement, and identify potential secondary impacts.

Step 5: Implement solutions. This step seeks to implement the solutions from Step 4. Once the appropriate solution(s) has been selected and funded as part of an identified project, it is time to move forward with implementation. The Toolkit provides information on the timing and other factors to consider when implementing the project/solution(s).

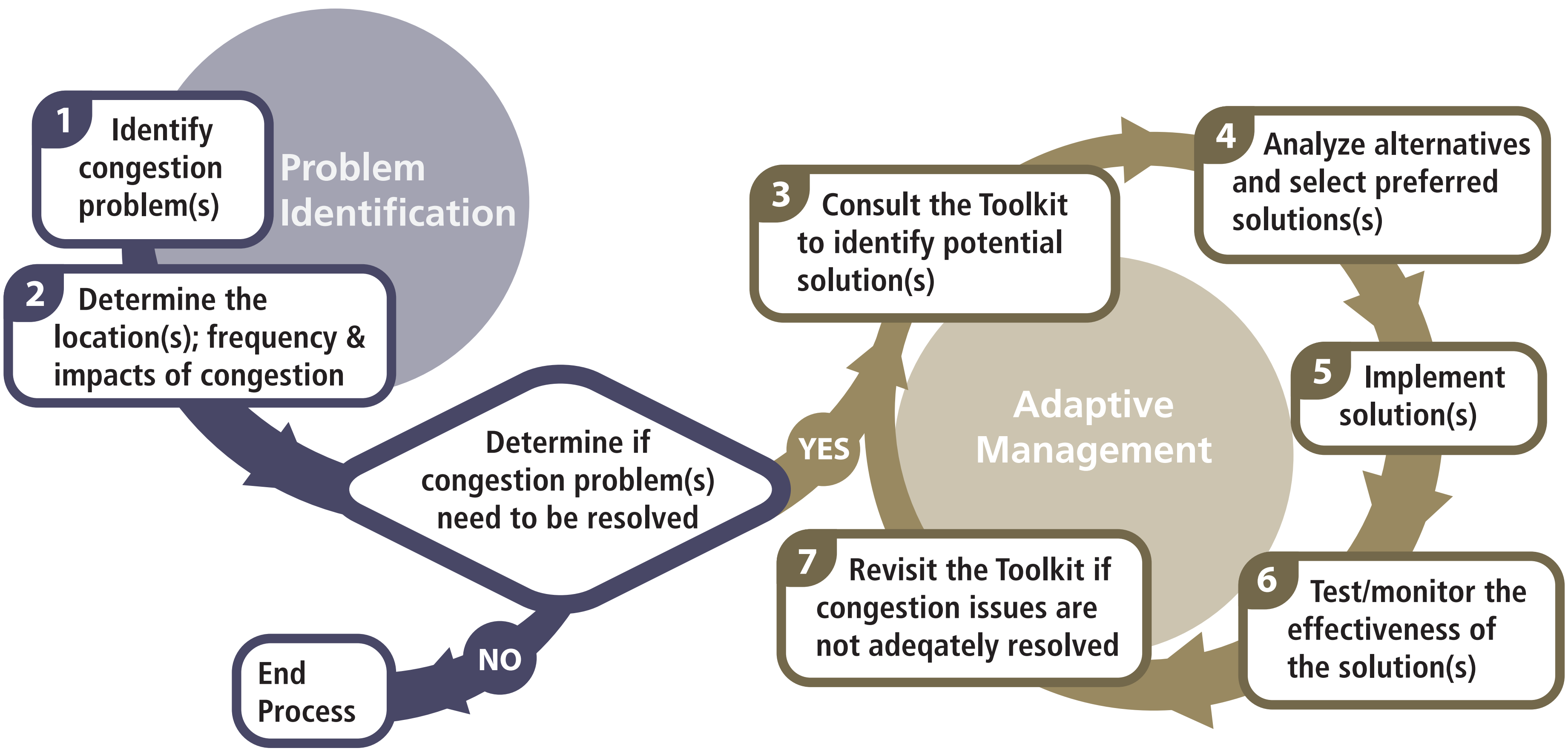
Step 6: Test/Monitor effectiveness of solution(s). Once the solution(s) has been implemented, there must be a monitoring plan to determine if the solution(s) have had the desired effect. Monitoring does not have to be complex and expensive, and can often be based on personal observation (e.g., "there never is a line at the entrance gate now"). There does need to be some level of monitoring, however, to determine if the implemented solution(s) are having an effect in reducing congestion. A suggestion would be periodic monitoring for three years.

Step 7: Revisit Toolkit if problems are not adequately resolved. Sometimes solutions may have an immediate impact, but their effectiveness can be reduced over time. Therefore, there needs to be long-term monitoring to make sure that the solutions are still reducing the congestion. The monitoring may be periodic, which means that data collection such as parking lot counts or wait times at entrance stations can be done on an infrequent basis (such as once per week, or even once or twice per season). Continuous monitoring means that there is on-going monitoring, which can often involve automatic data gathering, such as gathering roadway speeds through "road tubes" or gathering parking lot usage through an automated parking monitoring system.

If the implemented solution does not appear to be adequately addressing congestion, the park can then apply an adaptive management approach, adjusting aspects of the solution implemented or trying new solutions/tools as may be appropriate. In many cases, a progressive level of intensity can be applied in addressing congestion problems, piloting and testing various measures to determine those that are most effective. An adaptive approach involves analyzing feedback from implementation of a solution, and then exploring alternative ways to meet objectives. There can be many reasons why a particular solution may not have a desired outcome, and adaptive management is the process of analyzing the situation, determining if changes need to be made to the implemented solution (or if a different solution needs to be implemented), and then using the "feedback loop" to again analyze the situation and then using the results to update knowledge and adjust management actions/solutions as necessary.

If the park has questions, they should contact either the regional FLHP Coordinator or the DSC Transportation Division for assistance.

FIGURE 1: NPS CONGESTION MANAGEMENT PROCESS



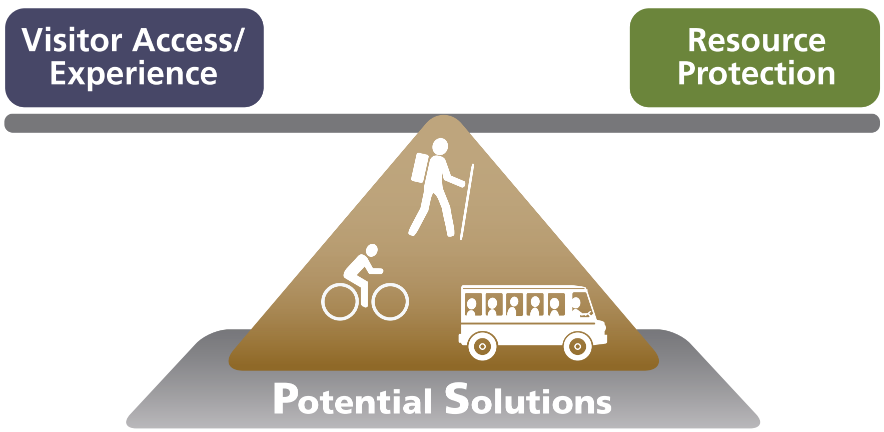
How Congestion Relates to Other Issues

Unlike solving congestion on county roads, state highways, or the national interstate system, addressing congestion in national parks must consider the enabling legislation and mission of the NPS:

> *"The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations."*

Solving congestion issues in a park is a part of a much larger process. As shown in Figure 2, the right types of transportation and congestion solutions often can help to address the demands of visitor access, while also preserving and enhancing visitor experience and protecting natural and cultural resources.

FIGURE 1: NPS CONGESTION MANAGEMENT PROCESS



To an extent, a transportation system can be thought of somewhat like an ecosystem, whereby the "health" of the system depends on the interrelationship between elements such as air, water, soil, flora and fauna. The elements of the transportation system that need to be balanced include entrance roads and entrance gates/stations, roads within the unit, parking spaces/lots and the interaction between vehicular traffic and other modes such as bicycles and pedestrians.

To find an effective congestion management tool, parks must consider management of the entire transportation system (roads, parking, safety, visitor use patterns). Eliminating congestion at one location can create congestion problems elsewhere; therefore a system approach is needed. For example, using dynamic (or variable) message signs to send visitors to one attraction because another area is "full" may create congestion at the second location. Use of transit can relieve parking demand at specific destinations, but will likely create heavy visitor pulses, and can increase overall parking demand. Potential impacts on visitor experience, safety, and natural and cultural resources in the park will be primary concerns.

Using the Toolkit

In addition to this Introduction, this Toolkit provides the following:

Congestion Management Toolkit Summary Table

The summary table provides a "snap-shot" view of the solutions/tools available, with the following information:

- Solution type/category
- Solution name and brief description
- Strategies achieved/effects of the solution when implemented (abbreviated)
- Location/emphasis areas for implementation (abbreviated)
- Relative costs—both capital and operating
  - Low = $0 to $50,000
  - Med = $50,000 to $100,000
  - High = $100,000 to $250,000
  - Higher = $250,000 +
- Time to implement
  - Immediate = Less than 1 year
  - Near Term = 1 to 3 years
  - Longer Term = 3 to 6 years
  - Beyond 6 years
- Examples (places where the solution has been implemented or other information)

Solution/Tool Fact Sheets

More specific information is provided for each solution/tool to help park staff evaluate those that might best address their congestion problem. Each fact sheet contains:

- Solution Type; Solution Number; and Solution/Tool Name
- Photographic example of the solution, and a General Description
- Location/Emphasis Area: locations that should benefit from the implemented solution/tool
- Strategies Achieved/Effects of Solution (when implemented)
- Implementation Considerations (including pros and cons)
- Coordination/Partnerships: other parties that may have a role in implementation
- Time to Implement (how long it typically takes to implement the solution/tool)
- Cost/Financial Information: includes estimated capital costs as well as estimated operating and maintenance costs
- Examples of Implementation: where the solution/tool has been implemented
- Performance Standard/Measure: how the solution/tool is monitored/measured
- Additional Resources: additional information pertinent to the solution/tool

Appendices

- Acronyms and frequently used terms/glossary
- Links to related documents, resources, etc.
- References

Categories of Tools

This Toolkit provides a comprehensive set of potential solutions/tools for addressing congestion in national park settings. These solutions are categorized by the five types of congestion management approaches listed below. The solutions are presented first in a summary format in the Congestion Management Toolkit Summary Tables, and then described in more detail in the fact sheets.

Types of Congestion Management Approaches(types/categories):

Additional Capacity (AC): These solutions focus on creating more capacity in the system (creating more parking spaces or adding additional travel lanes). **Note that this approach includes some of the most costly, lengthy, and difficult solutions to implement.**

Electronic Systems (ES): These solutions are often referred to as "intelligent" system (or intelligent transportation system "ITS"). These solutions include systems that can both collect information (such as how many parking spots may be available in a parking lot), and present information to travelers, through dynamic message signs or other visitor notification methods.

Public Transportation (PT): Often referred to as a "shuttle" or "bus" service, public transportation solutions include putting multiple carloads of people on a van, bus, tram, or other higher capacity vehicle to get them to a destination or destinations. Public transportation solutions can often reduce the number of vehicles on a roadway or parking area, but can be costly to operate and maintain and can have unintended consequences which could simply move crowding and reduced visitor experience downstream.

Traffic Operational Improvements (TOI): These solutions may include static signage that improves "wayfinding" so that visitors find their destinations more quickly, adding a turn lane to reduce traffic conflicts, or other improvements, such as reducing or increasing speed limits on roadways.

Visitor Demand Management (VDM): These solutions influence the choices that visitors make about how, when, where, whether, and which way they travel to their destinations. As used within this Toolkit, which focuses on vehicular congestion, the VDM solutions are "traffic" or "transportation" focused. These solutions include tools such as reservation systems to try and influence when people may enter a park, or may include Electronic Systems (ES) that may provide information to travelers that a certain location/feature may be crowded.

How to Evaluate Tools

As you review the potential solutions, remember to compare them to the problems occurring at your park, and in the context of the park's entire transportation system. Review potential solutions to determine which may be the most cost-effective. Remember that congestion can occur at various locations, and for various reasons. According to a 2010 park survey, the common areas where congestion occurs include:

1. Parking lots
2. Roadways providing access to the park and within gateway communities
3. Visitor centers/trailheads/major attractions
4. Park entrance stations
5. Vehicle tour routes in parks/internal roadways

Typical issues affected by congestion include the visitor experience, visitor and employee safety, and overall park operations. When reviewing the tools (potential solutions), keep in mind that there are some common reasons for congestion in parks. Further, some causes of congestion are easier to remedy than others. Physical or "system" issues, which are generally easier to define and address, can include:

- Limited capacity at entrance gates which leads to queues (a significant number of visitors try to enter the park at the same time, such as "the peak entrance time");
- Exceeding capacity of parking lots (a significant number of visitors want to see the same attraction at the same time, such as "the main attraction" at the park);
- Under-designed or improperly controlled intersections (visitors who want to travel straight through an intersection may be delayed behind visitors who want to make a left-hand turn to another roadway, or having a type of intersection control that is inappropriate for the traffic volume); and
- The number of vehicles exceeding capacity on roadways leading to the park or in gateway communities (there are simply more vehicles on the roadway than there is capacity within the roadway network).

Non-recurring or "behavioral" issues may be more difficult to define, are generally more fluid, and may be more difficult to address. These issues include:

- "Animal Jams" (visitors pull over on a roadside, or stop in the middle of the road to look at a bear, moose, etc., and reduce or eliminate the ability of vehicles to move through the area);
- Sightseeing from vehicles (visitors may stop unexpectedly to view and photograph sights and features in the park); and

- Speed, not in terms of excessive speed, but that visitors may travel slowly within the park or along a more scenic part of a route.

While there are various locations and reasons for congestion occurring within and approaching parks, planning for congestion mitigation is part of a holistic 'transportation system' approach. There are numerous factors to consider such as safety; circulation; up-front costs and available funding; total cost of ownership; visitor experience; and public perceptions.

Managing Expectations

When considering congestion management tools, realistic expectations of the amount of "shift" in visitor use patterns needs to be modest. Unless a tool like a reservation system is deployed, parks can typically expect a shift of about 5-15% of visitors by using the solutions noted in this Toolkit. Using multiple solutions can increase these percentages. However, using multiple tools raises complexity and can affect the amount of park staff time needed to manage the transportation system.

Managing congestion, at least some causes of congestion, is often difficult as the cause of the congestion is human behavior. As noted earlier, sometime congestion can be caused when drivers stop suddenly on a roadway to take a picture of a site or animal, or drive more slowly to enjoy the scenery. "Animal jams" occur suddenly and without notice. It is difficult to address some of these issues, although solutions such as quickly dispatching a Park Ranger or other personnel to control traffic are tools that can be used.

In addition, some of the solutions have unintended consequences. As noted earlier in this document, while a shuttle (or transit) system may alleviate the number of vehicles from a roadway or parking lot, the bus has the ability to disembark a large number of visitors at one location (a visitor center, trailhead, etc.) at one time.

Finally, congestion in the National Parks is often the result of simply too many people wanting to visit a park, or see a particular site or feature, at the same time. Our National Parks have been created to protect specific sites, features and natural landscapes. As noted in this document, parks must strike a balance between the visitor experience, and the protection of resources. While the tools herein can provide solutions to congestion issues, parks must remember that simply solving congestion isn't the only issue, and is part of a broader context and planning effort.

As noted herein, the Toolkit should be used as part of a process to determine if there are congestion issues and if so, the extent of the congestion issues. The information herein should help in the process to determine the most cost-effective solutions to be implemented. As noted earlier in the document:

> *A common mistake has been to apply for and to accept highway program funding, but to be unprepared to complete the project, and/or operate and maintain the project after its completion. Sufficient staffing resources are required for the design, on-the-ground work, administrative assistance, maintenance, and the determination of sources for matching funds. The FLMA should understand the level of commitment required and be fully prepared to commit the resources necessary to implement, operate, and maintain a project prior to beginning the first phase of the transportation planning process. Partners can, and often do, assume responsibility for operating or maintaining a project or service after they are implemented.*[2]

Important Considerations/Cautions

The information contained in the Summary Table and more importantly in each tool/solution "fact sheet" is the most current information available from public sources. It is important to remember three components of the process and information noted herein:

Planning and Implementation Timelines

The information provided on planning and implementing the various tools does not necessarily include the time for the overall planning and implementation process. The information provided in the fact sheets focuses more on the time to implement the specific tool/solution, and may not include the time to plan, design, obtain funding, procure and implement the solution.

Also, when coordinating with other agencies, remember that the Regional Federal Lands Highway Office (FHWA) often provides design and construction project management, however, they do not own the roads within a park (their role is spelled out in an interagency agreement), and the Park Service typically doesn't consult them on routine operational and maintenance issues or in minor road/parking lot projects.

Costs

The cost information provided for each tool/solution is based on the most current and publicly available data. **It is important to realize that costs can vary significantly based on location, terrain, the number of units to be ordered and other factors, such as the cost of staff to manage or implement a solution.** Therefore, while the fact sheets for the tools may contain what appears to be "detailed" cost estimates understand the variability that may exist between parks.

It is also important to consider the operational costs of implementing a tool overtime (the long-term or life-cycle costs of the solution). For example, operating a bus/shuttle system over a number of years can cost a significant amount of money, and operating costs such as fuel, maintenance, etc., tend to increase annually. When calculating costs, remember the lifecycle of the transportation components as follows:

Lifecycle of Transportation Components

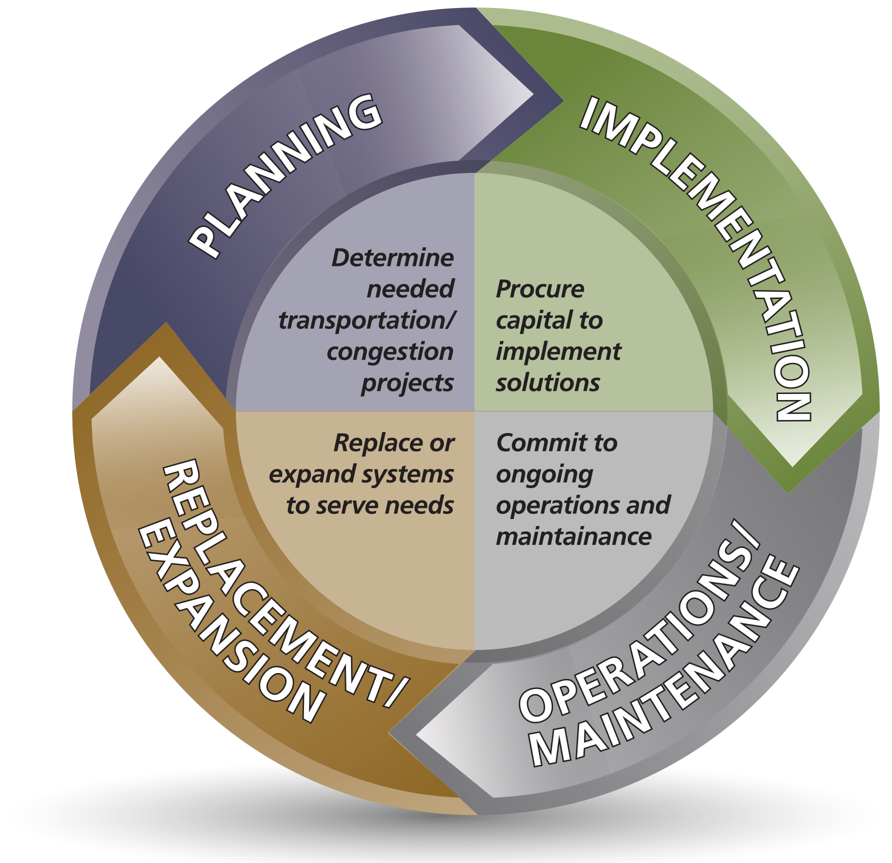
As shown in Figure 3 and described below, there are four primary stages that affect consideration, implementation, and ongoing management of various transportation solutions.

- **PLANNING**
  Utilizing the planning process and congestion management process to determine if transportation/congestion projects need to be implemented
- **IMPLEMENTATION**
  Initial capital expenses associated with construction and/or procurement
- **OPERATIONS/MAINTENANCE**
  Annual costs of operating and maintaining the systems, such as shuttle systems, trails, roadways, etc.
- **REPLACEMENT/EXPANSION**
  Expanding the system (adding capacity), or replacing vehicles (shuttles/buses) or rehabilitation of trails, roadways, etc.

Performance Measures

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit should have quantified the level of congestion to determine

FIGURE 3: LIFECYCLE OF TRANSPORTATION COMPONENTS



if mitigation is needed. In order to quantify the effectiveness of a particular tool on reducing (improving) that congestion, the original data collection from tier 2 and/or 3 should be repeated, and analyzed to determine the effectiveness of the tool. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself, but may not necessarily correlate to a reduction in congestion. For example, a transit/shuttle service may have increasing ridership each year, but congestion may not be reduced, due to an overall increase in visitation to the park.

Ultimately, each tool/solution that is implemented should be judged on how well it reduces congestion.

Conclusion

Many parks, and areas surrounding the parks, experience congestion. Further, many parks have already implemented solutions to try and manage the congestion that is occurring. In understanding and managing congestion, it is important to go through the seven-step congestion management process. By going through the first few steps of the process, a park will be able to determine if the congestion that may be occurring should be addressed.

From there, this Toolkit will help the park in understanding what potential solutions/ tools exist. The process then provides a roadmap for the evaluation of alternatives, which may lead to the implementation of a particular solution or solutions. A park should monitor the solutions that are implemented to determine if they are having an effect on congestion. If not, the Toolkit should be revisited to determine if additional tools/solutions should be implemented.

Solution/Tool Summary

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
			ADDITIONAL CAPACITY (AC) ALTERNATIVE MODES (AM) DEMAND MANAGEMENT (DM) INCREASE THROUGHPUT (IT)	GATEWAY COMMUNITIES (GC) PARK ENTRANCES/ ENTRANCE STATIONS (PE) PARKING AREAS (PA) ROADWAYS WITHIN THE PARK (RWP) ROADWAYS PROVIDING ACCESS TO THE PARK (RPA) VISITOR CENTERS (VC)	LOW ($0 TO $50,000) MEDIUM ($50,000 TO $100,000) HIGH ($100,000 TO $250,000) HIGHER (ABOVE $250,000)	IMMEDIATE (LESS THAN 1 YEAR) NEAR TERM (1 TO 3 YEARS) LONGER TERM (3 TO 6 YEARS) BEYOND 6 YEARS
AC-1	**ADD ENTRANCE LANES/STATIONS/BOOTHS** If tools for more efficiently operating the entrance stations do not reduce congestion to an acceptable level, then adding entrance lanes/stations/booths may be necessary to increase throughput and decrease congestion and delay time.	19	AC, IT	PE, RPA	Medium to High	Near Term
AC-2	**LIMITED ACCESS ONLY LANES AT ENTRANCES** A limited access lane is a lane that can only be used by a certain portion of the vehicle traffic (employees, concessionaires, delivery trucks, passholder, etc.). By removing this portion of vehicle traffic from the normal flow, visitors will have decreased delay, shorter queues, and possibly an increased visitor experience.	21	AC, IT	PE, RPA	Medium to High	Near Term
AC-3	**EXPAND PARKING SUPPLY** Trying to find parking at a popular attraction within a park can be a source of congestion as vehicles drive around looking for parking, perhaps even leading to parking on roadway shoulders and other “no parking” areas. In some cases, parking management/parking area improvements or promoting the use of park and ride facilities can lessen this impact, but in others, the best option may be to increase the parking supply.	23	AC	PA, RWP	Higher	Longer Term
AC-4	**EXPAND OR IMPROVE BICYCLE/PEDESTRIAN FACILITIES** Providing additional pedestrian and bicycle facilities allow visitors to travel to these major destinations by an alternate mode. Facilities could include widened road shoulders, a separated multi-use/non-motorized paved pathway, and unpaved trails.	25	AC, AM	RWP, RPA	Higher	Longer Term to Beyond 6 years

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
AC-5	**INCREASE ROAD CAPACITY** Increasing roadway capacity can reduce congestion by increasing the available space for vehicles, increasing throughput, and allowing space for vehicles to pass slow moving or turning vehicles. However, this tool should not be utilized purely for congestion management; it should be considered only when the improvement would also improve safety.	28	AC, IT	RWP	Higher	Longer Term to Beyond 6 years
ES-1	**511 TRAVELER INFORMATION PHONE NUMBER** 511 is America's Traveler Information Phone Number. 511 systems provide local traveler information such as traffic congestion, maintenance, construction, tourism, road conditions, and public transportation.	30	AM, DM	GC, PE, RWP, RPA	Low to Medium	Immediate to Near Term
ES-2	**AUTOMATED GATE ACCESS** Automated gates can be installed at entrance stations in conjunction with limited access only lanes to allow staff and concessionaires (or others who enter regularly) to more quickly pass through entrance points and bypass the congested entrance lines by using a similar to how "EZ Pass" works on a tollway.	33	IT	PE, RPA	High to Higher	Near Term
ES-3	**PREPAYMENT OF ENTRANCE FEES AND TRANSIT FEES** Prepayment of entrance fees and transit fees allows visitors to pay for entrance or transit fees prior to entering the bus or the park. Generally prepayment is done online or at an automated fee machine (kiosk for self-paying fees) in the gateway community.	35	AM, IT	GC, PE, RPA, VC	Low to Medium to High	Near Term
ES-4	**CLOSED CIRCUIT TELEVISION** Closed circuit television allows information to be gathered that can be utilized in visitor demand management such as monitoring traffic congestion, length of lines at entrance lanes, and parking lot capacity. Cameras can also be used to view weather and road conditions, both of which can influence traffic speeds and perhaps lead to congestion issues.	38	DM	PE, PA, RWP	Low to Medium	Immediate to Near Term
ES-5	**DYNAMIC/VARIABLE MESSAGE SIGN** Dynamic/Variable message signs (both portable and permanent) are used to provide en-route information to travelers.	40	AM, DM	GC, PE, RWP, RPA	Low to Medium to High	Immediate to Near Term
ES-6	**ELECTRONIC FARE PAYMENT SYSTEMS** Electronic fare payment systems are available onboard transit to allow visitors to quickly pay when boarding.	43	AM, IT	GC, PE	Low to Medium	Near Term

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
ES-7	**HIGHWAY ADVISORY RADIO** Highway advisory radio is a low-powered radio broadcast on AM stations. It can be obtained in both permanent and portable form and communications to update the repeated message can be either cellular or satellite. Motorists are alerted to tune to an AM station to listen to the radio broadcast via a sign with flashing beacons.	45	AM, DM	GC, PE, RWP, RPA	Low to Medium	Immediate to Near Term
ES-8	**KIOSKS** Kiosks are an interactive, computerized way of providing traveler information such as less crowded attractions/destinations to visit, parking conditions, status of transit. Kiosks can also be used for prepayment of entrance fees and transit fees.	48	AM, DM	GC, PE, PA, RWP	Low to Medium	Near Term
ES-9	**ROAD WEATHER INFORMATION SYSTEMS** Road weather information systems use sensors located within or alongside the roadway to measure weather's effect on the roadway so motorists and maintenance staff can be warned; however, they must be used in conjunction with a traveler information tool such as 511, dynamic/variable message signs and/or media/social media/mobile device apps.	50	DM	RWP, RPA	Medium	Near Term
ES-10	**TRANSIT SIGNAL PRIORITIZATION** Transit signal prioritization is a traffic signal that provides prioritization for transit vehicles (over private automobiles) through intersections and is generally utilized in highly urbanized areas.	52	AM, IT	PE, RWP, RPA	Low to Medium	Immediate to Near Term
PT-1	**IMPLEMENT TRANSIT/SHUTTLE SERVICES/OPERATIONS** Transit/shuttle services is a method to transport visitors to and around the park/unit without the use of a private automobile.	54	AM, DM, IT	RWP, RPA	High to Higher	Longer Term to Beyond 6 years
PT-2	**ADDING CAPACITY TO THE TRANSIT SYSTEM** Addint capacity to the transit system can be completed by adding more shuttles, by decreasing time between the shuttles arriving at a destination, or by adding additional routes.	57	AM, DM, IT	GC, RWP, RPA, VC	High to Higher	Immediate to Near Term
PT-3	**FERRY SERVICE/WATER TAXI** Unlike a bus that typically uses the same roadways as visitors' vehicles, ferries and water taxis provide visitors an alternative route that they would not experience in their personal automobiles.	60	AC, AM, DM, IT	GC, PE, PA, RWP, RPA, VC	Higher	Longer Term to Beyond 6 years

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
PT-4	**NEW OR EXPANDED MULTIMODAL FACILITIES** New or expanded multimodal facilities include those facilities necessary for transit, ferries (or water taxis), bicycling, and walking. Examples of these facilities may include bus stops, bus shelters, ferry docks, bike racks, shared use paths, canoe launches/landings, intermodal centers, and other types of improvements.	63	AM, DM, IT	GC, PE, PA, RWP, RPA, VC	Low to Medium to High to Higher	Immediate to Near Term to Longer Term
PT-5	**NEW OR EXPANDED PARK-AND-RIDE FACILITIES (INCLUDING PROMOTION)** Park-and-ride facilities allow visitors to leave their car and travel through the national park via transit. "	65	AC, AM, DM, IT	PA, RWP, RPA	Higher	Longer Term
PT-6	**RAIL** In a national park setting, rail is generally utilized in two ways (1) for visitors to access the park/unit such as with commuter rail, subways, or Amtrak service, and (2) as part of the visitor experience of moving within the park/unit on a tour.	69	AM, DM, IT	GC, PE, PA, RWP, RPA	Higher	Longer Term to Beyond 6 years
PT-7	**RESERVED TRAVEL LANES FOR TRANSIT OPERATION** Travel lanes on the roadway or at entrance stations reserved specifically for use by transit.	72	AC, AM, DM, IT	PE, RWP, RPA	Higher	Near Term to Longer Term
PT-8	**RIDESHARING/VANPOOLS** Carpools (or carpooling) are typically connected with ridesharing using cars/ privately owned automobiles, whereas vanpools are ridesharing in vans (often 13-15 passenger vans) that are purchased, leased, or rented specifically for ridesharing.	74	AM, DM, IT	GC, PE, PA, RWP, RPA	Medium to High	Immediate to Near Term
PT-9	**TRANSIT TECHNOLOGY APPLICATIONS** Transit technology applications can include automated vehicle location systems (AVL), which are electronic systems that focus on tracking buses through GPS; automated passenger counting (boarding) systems; systems that automatically track maintenance issues; in-vehicle electronic information such as stop annunciation and electronic display boards; and transit status signs to provide users with bus arrival times (often referred to as "next bus" signs).	76	AM, IT	GC, PE, PA, RWP, RPA, VC	Medium to High	Near Term
TOI-1	**ACCELERATION/DECELERATION LANES** Acceleration/deceleration traffic lanes, also known as "climbing" or "passing" lanes allow faster moving vehicles to use a separate lane to pass slower vehicles.	79	AC, IT	RWP, RPA	Higher	Longer Term to Beyond 6 years

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
TOI-2	**ACCESS MANAGEMENT** Access management includes a set of techniques that a park/unit, as well as state and local governments can use to control access (closing or moving some, etc.) to and along highways, major arterials, and other roadways to improve traffic flow.	81	DM, IT	GC, PA, RWP, RPA	Medium to High	Near Term
TOI-3	**ANIMAL VEHICLE CROSSINGS** Wildlife crossing structures can be overpasses or underpasses and can vary in width (roadway length) from a few meters (such as a box culvert) to 50 meters or wider.	84	IT	RWP, RPA	Higher	Near Term to Longer Term
TOI-4	**COMPLETE STREETS (POLICY AND FACILITIES)** A "complete street" is a street that is a safe, comfortable, integrated transportation network for all users (and modes), regardless of age, ability, income, ethnicity, or mode of transportation. Complete streets are achieved both by having a policy (or policies) that encourage them, as well as having the infrastructure/facilities that serve all modes of transportation.	87	AC, AM, DM	GC, PE, RWP, RPA	High to Higher	Near Term
TOI-5	**ENFORCEMENT/TRAFFIC MANAGEMENT** Specifying the road shoulder as a no-parking area through clear signing, striping, and/or additional enforcement will improve traffic flow and safety of the roadway.	90	DM, IT	PA, RWP	Low	Near Term
TOI-6	**GEOMETRIC IMPROVEMENTS** Geometric improvements include alternative intersection designs, right/left turn lanes, and passing lanes.	92	AC	GC, RWP, RPA	Low to Medium to High to Higher	Near Term to Longer Term
TOI-7	**GRADE SEPARATION FOR BICYCLE/PEDESTRIAN CROSSINGS** Providing a bridge or underpass for pedestrians and bicyclists to cross roadways or highways not only can improve the safety, comfort, and visitor experience for non-motorized visitors, but also can reduce congestion on the roadway.	95	AC, AM, IT	RWP, RPA	High to Higher	Near Term to Longer Term
TOI-8	**INTERSECTION IMPROVEMENTS (GEOMETRIC AND TRAFFIC CONTROL DEVICES)** Intersection improvements include two-way or yield control, multi-way stop control, roundabout, and signalization.	98	AC, IT	GC, RWP, RPA	Low to Medium to High to Higher	Near Term to Longer Term
TOI-9	**INCIDENT MANAGEMENT** Traffic incident management is about developing and implementing an incident management plan. This solution does not directly involve tangible hardware or infrastructure improvements, but is highly related to other tools that speed up detection of incidents.	101	DM, IT	GC, PE, RWP, RPA	Medium to High	Near Term

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
TOI-10	**LANE SEPARATION/DELINEATION** Lane separation and delineation techniques focus on clearly defining travel lanes (through striping or other methods), so that visitors/motorists know where to travel.	103	AM, DM, IT	GC, PE, PA, RWP, RPA	Medium to High	Immediate to Near Term to Longer Term
TOI-11	**TRAFFIC CIRCULATION CHANGES (INCLUDING ONE-WAY AND REVERSIBLE LANES)** This tool involves management techniques such as one-way or reversible lanes for changing traffic flow patterns and circulation to reduce congestion.	105	AC, DM, IT	GC, PE, PA, RWP, RPA	Low to Medium to High	Near Term
TOI-12	**PARKING MANAGEMENT AND PARKING AREA IMPROVEMENTS** Parking management is a solution whereby visitors are informed either by a person/staff or by signage that a parking lot is full, and that they need to proceed to another lot. Parking area improvements may include modifying the lot to decrease traffic conflicts and limiting the number of access points (entrances and exits) to a parking area.	109	AC, DM, IT	GC, PA, RWP	Medium to High	Immediate to Near Term
TOI-13	**ROADWAY PULL-OUTS** Roadway pull-outs can be used for slower traffic to move out of the travel lane and allow faster traffic to pass by, as additional parking for visitor attractions, as shuttle stops, as locations to repair breakdowns, and as wayside areas that may provide visitors with limited bathroom facilities (if provided) and information.	112	AC, IT	PA, RWP, RPA	Medium to High	Near Term to Longer Term
TOI-14	**ROAD WEATHER MANAGEMENT** Managing park/unit roadways for these types of weather events can cause safer conditions and less congestion. Management techniques include road closures (temporary or seasonal), providing traveler information about road closures and weather advisories, and roadway weather related maintenance and management.	114	DM	RWP, RPA	Medium to High	Immediate to Near Term
TOI-15	**SERVICE/COURTESY PATROLS** Examples of assistance provided by a service/courtesy patrol include servicing disabled vehicles, removing stranded or disabled vehicles, removing debris from the roadway, transporting stranded motorists, assisting motorists locked out of their vehicles, providing traffic control, and providing directions or a cell phone.	117	IT	PA, RWP, RPA	Low to Medium	Immediate to Near Term
TOI-16	**SIGNAGE AND WAYFINDING** Signage and wayfinding techniques guide visitors to their destinations and are particularly helpful in an unfamiliar environment.	120	AM, DM, IT	GC, PE, PA, RWP, RPA, VC	Medium to High	Immediate to Near Term

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
TOI-17	**SPEED MANAGEMENT** This tool has three variations of implementation (1) increase compliance of existing posted speed limits, (2) reduce the maximum posted speed limit, and (3) implement a variable speed limit.	123	IT	RWP, RPA	Medium to High to Higher	Near Term
TOI-18	**TRAFFIC CALMING** Traffic calming is used to slow traffic down primarily for safety reasons, such as slowing vehicles down in high pedestrian areas. Some common traffic calming measures include traffic humps, narrower travel lanes and islands and medians.	126	DM, IT	RWP, RPA	Low to Medium	Near Term
TOI-19	**TRAFFIC MONITORING/DATA COLLECTION AND ANALYSIS** Data is a tool that can be used to help a park/unit understand their existing conditions and determine their transportation issues (help define the frequency and magnitude of congestion issues).	129	AC, AM, DM, IT	GC, PE, PA, RWP, RPA, VC	Higher	Immediate to Near Term
TOI-20	**TURN PROHIBITIONS/RESTRICTIONS** Prohibiting or restricting turning movements at intersections, parking lots, and/or visitor centers can improve traffic flow by eliminating the slower/stopped traffic attempting to turn left which improves efficiency.	132	IT	PA, RWP, RPA, VC	Medium	Near Term
TOI-21	**VEHICLE USE RESTRICTIONS** Prohibiting or restricting certain vehicles (or certain sized vehicles) from areas in a park/unit can help improve traffic flow (reduce congestion), enhance visitor experience, and protect resources.	134	AC, AM, DM, IT	GC, PE, PA, RWP, RPA	Medium to High	Immediate to Near Term
TOI-22	**IMPROVE WORK ZONE MANAGEMENT** Proper management of a work zone can decrease the impact the work zone will have on congestion. Work zone management includes monitoring traffic and providing traveler information.	137	AM, DM, IT	GC, PE, PA, RWP, RPA, VC	Medium to High	Immediate to Near Term
VDM-1	**AVOID PEAK TRAVEL TIMES** Electronic systems can be used to warn visitors of busy times and potential delays, and to encourage them to travel to the park during non-peak seasons, such as, shoulder seasons, which may be from March through June and September through November in some areas, or non-peak travel times.	140	DM, IT	GC, PE, PA, RWP, RPA, VC	Low to Medium to High	Immediate to Near Term

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
VDM-2	**CONDUCT TOURS** Tours can be offered to 'undiscovered gems' as well as popular park destinations. They can be used to (1) shift visitors to a different mode of travel by offering tours via foot, bicycle, and transit; (2) encourage visitors to avoid of peak travel times by offering tours before and after peak times and (3) encourage visitors to visit less congested areas by adding these locations to the tour route.	143	AM, DM, IT	GC, PE, PA, RWP, RPA	Low to Medium	Immediate to Near Term
VDM-3	**CONGESTION PRICING/FINANCIAL INCENTIVES** Congestion pricing adjusts the cost of transportation facilities, such as roads and parking lots. Increasing costs during congested or peak visitation periods and decreasing costs during off-peak periods can encourage visitors to visit a park during off-peak periods (hours, days, seasons) or to use alternative modes.	146	AM, DM	GC, PE, PA, RWP, RPA, VC	Medium to High to Higher	Near Term
VDM-4	**ENCOURAGE VISITATION TO LESS CONGESTED AREAS** Encouraging visitors to go to attractions in less congested areas can decrease congestion and increase visitor experiences.	149	DM, IT	PE, PA, RWP	Low to Medium to High	Immediate to Near Term
VDM-5	**MEDIA/SOCIAL MEDIA/MOBILE DEVICE APPS** With smart phones rising in popularity, the use of social media (e.g., Facebook, YouTube, Twitter, Flickr, Tumblr, Instagram, blogs, and other programs) and mobile device apps have also become acceptable low cost ways to provide information to an abundance of people.	152	AM, DM	GC, PE, PA, RWP, RPA, VC	Low to Medium	Immediate to Near Term
VDM-6	**PARKING FEES** Adjusting parking fees by increasing costs at congested/high-utilization times or decreasing costs during non-congested times can encourage visitors to visit the parks during off-peak periods, adjust their visitation times, or to use alternative modes.	155	AM, DM	PA, RWP, RPA, VC	Medium to High to Higher	Immediate to Near Term
VDM-7	**PARTNERSHIPS, COLLABORATION, PUBLIC INVOLVEMENT, AND OUTREACH** There are many potential partners that parks/units can engage/outreach to in helping to solve transportation congestion problems.	158	AC, AM, DM, IT	GC, PE, PA, RWP, RPA, VC	Low to Medium to High to Higher	Immediate to Near Term
VDM-8	**PROMOTE BICYCLE AND PEDESTRIAN ACCESS (INCLUDING BIKE SHARING)** Promoting bicycle and pedestrian access can be done by (1) marketing, (2) providing necessary facilities, (3) providing incentives/promotions, and (4) through national programs.	161	AM, DM, IT	GC, PE, PA, RWP, RPA, VC	Medium to High	Immediate to Near Term to Longer Term

TOOL #	TOOL NAME/DESCRIPTION	PAGE #	STRATEGIES ACHIEVED	LOCATION/ EMPHASIS AREA	CAPTIAL COSTS	TIME TO IMPLEMENT
VDM-9	**PROMOTE NO-CAR PARK ACCESS OPTIONS** Implementing transit or ridesharing for access to/from and within a park or unit will help improve congestion issues only if visitors know about these systems and utilize them. A marketing campaign can help with getting the word out to visitors and incentives can help to encourage transit use.	164	AM, DM, IT	GC, PE, RWP, RPA	Low	Immediate to Near Term
VDM-10	**PROMOTE TOUR BUS USE** Visitation via tour buses rather than private automobiles can assist the unit in decreasing congestion related to automobiles and can also provide an opportunity to enhance the visitor experience.	167	AM, DM, IT	GC, PE, RWP, RPA	Medium to High	Immediate to Near Term
VDM-11	**RESERVATION SYSTEMS** Reservations systems are a great way to manage the demand placed on a destination within a unit that has limited capacity by allowing the number of visitors entering a location to be capped/limited to a maximum number.	170	DM, IT	PE, PA, RWP	Medium to High to Higher	Immediate to Near Term
VDM-12	**MODIFY VISITOR CENTER OPERATIONS** A simple and inexpensive way to help manage congestion would be to take advantage of the existing visitor centers and their role within the park and gateway community to provide information to visitors related to congestion management.	173	AM, DM	PA, RWP, VC	Low to Medium	Immediate
VDM-13	**TRAVELER INFORMATION (VIA WEBSITE, HOTELS, AND GATEWAY COMMUNITIES)** A simple, low-cost technique to utilize existing services (e.g., website, hotels, and gateway communities) to provide traveler information about congestion management to visitors.	175	AM, DM	GC, PE, PA, RWP, RPA, VC	Low to Medium	Immediate

SOLUTION/TOOL: Add Entrance Station/ Booths and/or Lanes

TYPE: Additional Capacity

AC 1

General Description

If tools for more efficiently operating the entrance stations do not reduce congestion to an acceptable level, then adding entrance lanes/ stations/booths may be necessary. Additional capacity allows for more throughput which decreases congestion and delay time.

In conjunction with adding capacity at entrance stations, other operational efficiencies can be considered such as changing geometric configurations for locating booths in tandem so two cars can be assisted at once similar to toll booths and border crossings; adding separate limited access only lanes for a portion of the traffic such as pass holders, employees, concessionaires, and transit (see AC-2); or adding technology such as automated gate access (see ES-2) or automated fee machines (see ES-3).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☐ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Consideration

PROS

- Adding entrance stations/booths can allow for increased throughput.
- Additional capacity can allow for geometric reconfigurations.
- This can be accomplished in conjunction with adding limited access only lanes for pass holders, employees, and/or concessionaires (see AC-2) potentially by automated gate access (see ES-2).
- Staffing of the additional booth(s) may only be necessary during times of congestion.

CONS

- Environmental analysis will be needed to ensure that additional entrance lanes/ stations/booths can be constructed without impacting natural and cultural resources that the park may be trying to protect.
- Additional entrance lanes/stations/booths can increase the number of vehicles entering the park/unit at a time which can raise the parking demand downstream in the park/unit.
- Additional staffing would be needed for additional booths.
- Tandem booths would not increase capacity as much as an additional lane because a vehicle at the first booth would sometimes block the second booth.

- Although there may be adequate space in a rural park/unit to consider adding entrance lanes/stations/booths, an urban park/unit is generally limited on available space for these types of improvements.

Coordination/Partnerships

Coordination/Partnerships The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years). The construction portion of this project will take less time if the existing roadway has sufficient width for the planned improvements as opposed to if additional roadway must be constructed.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years). The construction portion of this project will take less time if the existing roadway has sufficient width for the planned improvements as opposed to if additional roadway must be constructed.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2005 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital cost, the construction portion only typically ranges from $25,000 for a basic structure up to $100,000 or more for a more detailed design (expanded apron, booth, and technology improvements)1. The costs associated with an automated gate are provided in tool ES-2.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include the cost to staff the additional booth(s) and maintenance such as upkeep on the entrance booth; repaving and restriping the entrance lane; and plowing/sanding the additional lane. The costs associated with an automated gate are provided in tool ES-2.

Examples of Implementation

- Grand Canyon National Park increased the number of entrance booths at the South Rim entrance to reduce congestion.
  - *http://ntl.bts.gov/lib/44000/44200/44253/Visitor_Access_and_Transportation_Guide.pdf*
- Arches National Park created a new entrance in 2004 with an additional entrance booth and additional space for queuing.
  - *http://moabtimes.com/pages/full_story/push?article-Arches+National+Park+opens+new+entrance-+fee+booth%20&id=67467*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Reduction in process time.
- Reduction in queue length.

Additional Resources

- Service Times and Capacity at National Park Entrance Stations - *http://www.nps.gov/transportation/pdfs/NP_Entrance_Stations_Study.pdf*

SOLUTION/TOOL: Limited Access Only Lanes at Entrances

TYPE: Additional Capacity

AC 2

General Description

A limited access lane is a lane that can only be used by a certain portion of the vehicle traffic. By removing this portion of vehicle traffic from the normal flow, visitors will have decreased delay, shorter queues, and possibly an increased visitor experience. In a park/unit, a limited access lane is typically available to those that do not need to pay entrance fees or ask questions such as employees, concessionaires, delivery trucks, and transit (see PT-7). This lane can also be used by pass holders if used in conjunction with an automated gate (see ES-2) or visitors who prepay the entrance fees (see ES-3).

This tool provides benefits to those using the limited access lane, by increasing efficiency, decreasing delay, and increasing their ability to stay on schedule. This tool is essentially identical to the add entrance lanes/stations/booths tool (see AC-1) except that it is for a particular portion of the vehicle traffic.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☐ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Additional capacity can allow for increased throughput.
- Limited access only lanes can decrease delay time for those using the lanes as well as visitors.

CONS

- Repurposing an existing entrance lane as a limited access only lane can reduce the overall entrance station capacity; therefore increasing congestion. A limited access only lane should only be considered when adding another lane (see AC-1)[2].
- While taking some traffic out of the congestion stream will have positive impacts, in some cases, a greater impact may be seen by adding additional entrances for visitors (see AC-1).
- If geometric constraints exist at the entrance, those using the limited access only lanes may still get stuck in visitor congestion.
- Environmental analysis will be needed to ensure that limited access only lanes can be constructed without impacting natural and cultural resources that the park may be trying to protect.

- Although there may be adequate space in a rural park/unit to consider adding entrance lanes/stations/booths, an urban park/unit is generally limited on available space for these types of improvements.

Coordination/Partnerships

The park may need to coordinate or partner with the gateway community or a jurisdiction that owns or operates the roadway where the limited access only lanes will be added.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years). The construction portion of this project will take less time if the existing roadway has sufficient width for the planned improvements as opposed to if additional roadway must be constructed.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2005 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital cost, the construction portion only typically ranges from $25,000 for a basic structure up to $100,000 or more for a more detailed design (expanded apron, booth, and technology improvements)1. The costs associated with an automated gate are provided in tool ES-2.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include the cost to staff the additional booth (if necessary) and maintenance such as upkeep on the entrance booth; repaving and restriping the entrance lane; and plowing/sanding the additional lane. The costs associated with an automated gate are provided in tool ES-2.

Examples of Implementation

- Grand Teton National Park has one entrance lane dedicated for season pass holders and employees.
- Yellowstone National Park also has an entrance lane dedicated to employees.
- Beaver Meadows entrance station at Rocky Mountain National Park has automated entry for annual pass holders, employees, and vendors.
- Zion National Park has an automated lane for employees.
- Bryce Canyon National Park has an automated lane for employees, vendors, and transit vehicles[2].

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Reduction in average flow time.
- Reduction in queue length.

Additional Resources

- AVI at Yellowstone National Park - ***http://www.coe.montana.edu/ce/patm/pubs/gyrits/Work%20Order%20II-2D%20AVI%20final.pdf***

SOLUTION/TOOL: **Expand Parking Supply**
TYPE: **Additional Capacity**

AC 3

General Description

Trying to find parking at a popular attraction within a park can be a source of congestion as vehicles drive around looking for parking, perhaps even leading to parking on roadway shoulders and other "no parking" areas. A lack of parking can also be a major source of frustration for visitors. In some cases, parking management/parking area improvements (see TOI-12) or promoting the use of park and ride facilities (see PT-5) can lessen this impact, but in others, the best option may be to increase the parking supply.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Additional parking can reduce circling/idling of vehicles waiting for parking.
- Expanding the parking supply can reduce parking lot congestion.
- The need for staffing to manage parking can be reduced by providing more parking.

CONS

- Environmental analysis will be needed to ensure that additional parking can be constructed without impacting natural and cultural resources that the park may be trying to protect.
- Additional parking can increase the number of people able to visit an attraction at any given time, which can increase crowding.
- Parking expansion may help in the short-term, but if visitation increases in the long-term, the issue may occur again[3].
- Although there may be adequate space in a rural park/unit to consider adding parking, an urban park/unit is generally limited on available space for these types of improvements.
- If the parking will be located outside the park/unit, it should be noted that land acquisition in an urban area will cost significantly more than in a rural area.

Coordination/Partnerships

Coordination with the gateway community would be necessary if the parking lot will be constructed in the gateway community. Coordination would also be necessary with the transit provider if the new lot will be a park-and-ride lot (see PT-5).

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is longer term (3 to 6 years).

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2005 and 2010 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation would be higher (above $250,000).

Of the total capital cost, the average developmental cost per parking space for a surface lot is around $4,000 to $5,000 per space4. This was corroborated as the Grand Canyon National Park park-and-ride cost around $4,700 per parking space[5].

Costs vary by type of facility. Multi-level, above grade, or below grade facilities will cost significantly more than a surface lot.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include $400 per space annually for items such as cleaning, lighting, maintenance, repairs, security services, landscaping, snow removal, fee collection, enforcement, insurance, labor and administration[6].

Examples of Implementation

- Grand Canyon National Park added new parking lots in 2009.
  - *http://www.examiner.com/article/grand-canyon-national-park-new-visitor-center-parking-should-be-open-for-thanksgiving*
- Haleakala National Park improved parking lots for handicapped visitors in 2013.
  - *http://www.nps.gov/hale/parknews/haleakala-national-park-parking-lot-improvements-continue.htm*
- National Park Service staff are proposing adding a parking lot to help with parking for Muir Woods National Monument.
  - *http://millvalley.patch.com/groups/politics-and-elections/p/parks-service-proposes-180vehicle-parking-lot--shuttle-at-muir-woods-some-residents-oppose*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Calculation of parking lot occupancy.
- Reduction in number of vehicle circling the parking and/or idling lot per hour.

Additional Resources

- Contact the park/unit's National Park Service region's transportation coordinator or the Denver Service Center as an additional resource.

SOLUTION/TOOL: Expand or Improve Bicycle/ Pedestrian Facilities

TYPE: Additional Capacity

AC 4

General Description

Many parks have trails that allow visitors, who drive to and park at trailheads, to enjoy walking and biking at major destinations. Providing additional pedestrian and bicycle facilities allow visitors to travel to these major destinations by an alternate mode. Facilities could include widened road shoulders, a separated multi-use/non-motorized paved pathway, and unpaved trails.

Even with minimal facilities (only a narrow paved shoulder on the roadway) most national parks have some visitation by bicycle and pedestrian modes. National parks in northern climates will often have a short period when roads are closed to traffic, but snow has been removed. During these times, often there is significant bicycle use of the major roadways when they are closed to traffic. Additional facilities can increase the use of bicycle and pedestrian modes of travel into and through the park.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☐ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Provides an alternative visitor experience to auto-touring.
- Bicycle/pedestrian facilities can shift auto traffic to alternative modes.
- Offers opportunity to expand access to outdoor activities (Healthy Parks, Healthy People).

CONS

- A shared use pathway can create parking lot congestion if there is a tendency for visitors to park at a specific location (i.e., say near park entrance or at the top of a hill) to begin the bicycle/pedestrian portion of the trip.
- Additional bicycle/pedestrian facilities will typically widen the footprint of the transportation corridor and can negatively impact wildlife.
- Non-motorized facilities can create opportunities for closer interaction with wildlife creating hazards to visitors and animals.

GENERAL

When considering a pedestrian/bicycle facility to connect major destinations consider the following:

- Provide bicycle parking and evaluate need for additional visitor comfort stations at major destinations.
- Plan for a connected non-motorized network.
- Consider the need for entrance fee collection of non-motorized visitors.
- Compare a widened road shoulder to a separated pathway. A bike lane utilizing a widened road shoulder may be less expensive, while a separated pathway can be safer and provides an improved visitor experience.
- Consider aesthetics of a pathway from the perspective of non-motorized and motorized users.
- Consider extra treatments (i.e., warning signs, pavement markings) at locations where non-motorized facilities cross vehicle paths (i.e., approach roads and parking lots).
- Consider the sight distance for pathway users as there can be a wide range of speeds from high speed cyclists to walking visitors.
- Consider distance to destinations. Serous cyclists may travel 50 miles or more, where recreational visitors will typically not travel much more than 10 miles.
- Provide way-finding specific to non-motorized visitors.
- Provide bicycle rental or bike sharing facilities to increase the use of the pathways/trails.

Coordination/Partnerships

Coordination for new or expanded bicycle and pedestrian facilities should include local bicycle advocacy groups, local bicycle rentals companies, and gateway communities.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool (assuming a separate multi-use/non-motorized paved trail or pathway) ranges from longer term (3 to 6 years) to beyond 6 years.

Separated multi-use/non-motorized paved trails or pathways are generally designed and constructed in segments or portions due to the cost and time to implement an entire trail or pathway at one time. The design and construction portion of the first segment of pathways in Grand Teton National Park took two years after initially proposed in the transportation plan. If there are no complicated grades or water crossings, construction can be accomplished within a few months.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 1997 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

Capital costs for a separated multi-use/non-motorized paved pathway vary considerably depending on many factors such as type of materials (such as natural surface, asphalt, concrete, and/or if materials are available locally) and topography, which affects the amount of earthwork and cut/fill, the need for drainage structures, etc.) In general, a 10 foot-wide asphalt trail ranges in cost from approximately $50 to $100 per linear foot7 for the design and construction portion or some practitioners use $500,000 to $1,000,000 per mile for cost estimates[8].

Facilities including bicycle lanes and signed bicycle routes are generally less expensive than a multi-use/non-motorized separated pathway. On average a bicycle lane costs around $90,000 while a signed bicycle route costs around $27,000 without improvements and $240,000 with improvements[9].

Bicycle racks range in cost from approximately $500 to $1,000 or more including installation and materials for traditional or wave bicycle racks10.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include maintenance of the bicycle/pedestrian facility such as debris cleaning, soil mitigation, removing wildlife droppings, lawn mowing, and snow removal. Maintenance of the facilities may improve visitor satisfaction with the facility, particularly for road shoulders. Consideration should be given to the additional entrance fee collection needs that a pathway may create.

Examples of Implementation

- Grand Teton National Park has more than 100 miles of paves roads and multi-use pathways for bicycling.
  - *http://www.nps.gov/grte/planyourvisit/upload/Bike_12.pdf*
- Valley Forge National Historical Park has more than 20 miles of bicycling trails including the Joseph Plumb martin Trail and the Schuylkill River Trail.
  - *http://www.nps.gov/vafo/planyourvisit/hikingtrails.htm*
- Cape Cod National Seashore provides miles of bicycling trails as well as a bike shuttle available on weekends during the summer season to/from shuttle bicyclists to nearby towns.
  - *http://www.nps.gov/caco/planyourvisit/upload/2012biketraillweb.pdf*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Increase in number of non-motorized users.
- Increase in number of bicycle rentals.

Additional Resources

- AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities - *https://bookstore.transportation.org/item_details.aspx?id=119*
- AASHTO Guide for the Development of Bicycle Facilities - *http://safety.fhwa.dot.gov/ped_bike/docs/b_aashtobik.pdf*
- Exploring Bicycling Options for Federal Lands: Bike Sharing, Rentals and Employee Fleets - *http://www.triptac.org/Documents/RepositoryDocuments/Exp_Bike_Opt_Fed_Land.pdf*
- Guide to Promoting Bicycling on Federal Lands - *http://www.triptac.org/Documents/RepositoryDocuments/Exp_Bike_Opt_Fed_Land.pdf*
- Costs for Pedestrian and Bicyclist Infrastructure Improvements - *http://katana.hsrc.unc.edu/cms/downloads/Countermeasure%20Costs_Report_Nov2013.pdf*

SOLUTION/TOOL: **Increase Road Capacity**
TYPE: **Additional Capacity**

AC 5

General Description

Increasing roadway capacity can reduce congestion by increasing the available space for vehicles, increasing throughput, and allowing space for vehicles to pass slow moving or turning vehicles. However, this tool should not be utilized purely for congestion management; it should be considered only when the improvement would also improve safety.

Increasing the roadway capacity can be accomplished in several ways: (1) using shoulders as lanes during peak hours and in peak directions, (2) reducing lane width to allow for additional lanes on existing pavement width, and (3) increasing the number of lanes through reconstruction.

Reconstruction of a roadway, especially in a national park, is a large undertaking and very complex. The types of challenges that would need to be overcome include complex terrain (including grades, curves, and rivers), lack of alternative routes for detours due to reconstruction, lack of funding, environmental challenges, and the timing of construction season (generally during peak visitation).

This is a highly expensive tool and should only be used in rare circumstances.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

- Reconstruction of a roadway will require an environmental assessment or environmental impact statement.

PROS

- Adding capacity through additional lanes can reduce congestion while increasing throughput.

CONS

- While using shoulders or decreasing current lane widths allow additional lanes to be added without reconstruction, these methods may decrease safety and increase accidents[8].
- Additional lanes will typically widen the footprint of the transportation corridor and can negatively impact wildlife and the resources the park is protecting.
- Many national parks do not have enough width near roadways to increase road capacity due to terrain constraints.
- Construction of a roadway in a national park has many challenges including complex terrain (including grades, curves, and rivers), lack of alternative routes for detours

due to reconstruction, lack of funding, environmental challenges, and the timing of construction season (generally during peak visitation).

- Very expensive and complicated tool to implement.

Coordination/Partnerships

Coordination will be needed with National Park Service regional staff and/or the Denver Service Center, the local transportation departments, and the appropriate regional federal lands highway office.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from longer term (3 to 6 years) to beyond 6 years.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

Of the total capital cost, the design and construction of a lane in a rural setting is $1.6 million to $3.1 million per lane-mile; however, in an environmentally sensitive area the costs could be larger and range from $5.8 to $9.9 million per lane-mile[11]. The cost is significantly less if only utilizing a shoulder, or adding a lane by narrowing the existing lanes through re-striping.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications include restriping roads; repaving or resurfacing; patching potholes; snow removal; sand application and removal; and other maintenance.

Examples of Implementation

- Massachusetts Department of Transportation allows for shoulder travel during peak hours in the peak direction on I-95/Route 128 traveling into Boston.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Traffic counts.
- Average hourly volume per lane.

Additional Resources

- Contact the park/unit's National Park Service region's transportation coordinator or the Denver Service Center as an additional resource.
- Park road standards - *http://www.wfl.fhwa.dot.gov/resources/design/library/park-road-std.pdf*
- A policy on geometric design of highways and streets - *https://bookstore.transportation.org/collection_detail.aspx?ID=110*
- State roadway design manuals - *http://www.fhwa.dot.gov/programadmin/statemanuals.cfm*
- Project development and design manual - *http://flh.fhwa.dot.gov/resources/manuals/pddm/*

SOLUTION/TOOL: 511 Traveler Information Phone Number

TYPE: Electronic Systems

ES 1

General Description

511 is America's Traveler Information Phone Number. 511 systems provide local traveler information such as traffic congestion, maintenance, construction, tourism, road conditions, and public transportation. Travelers typically access this information by dialing 511 on any phone and using a voice activated menu. 511 phone systems generally also have corresponding websites and mobile apps. Currently there are 45 systems across the nation[12] and at least 16 national park units with information available via 511[3].

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☐ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- With better information visitors can make more informed decisions about alternative modes, travel times, or locations to avoid congestion.

CONS

- Adding a national park to a 511 system may require (1) the existing main menu that callers hear to be reconfigured to allow for national park information, (2) restructuring of the current 511 database used to push information to the phone system to accommodate new information, and (3) discussion of how to get the information from the national park and through the firewalls into the database.
- There are ongoing costs for maintenance, database upgrades, and per call charges that need to be negotiated.
- Static signing informing motorists of 511 may need to be installed.

GENERAL

- The information must be timely, reliable, and accurate as it is a direct reflection of the owner of the 511 systems (i.e., usually the state department of transportation).

- 511 systems are structured differently so typically there are three different ways for national park information to be included on an existing state department of transportation system (1) updating information in a database, (2) recording a message on the system, and (3) transferring the call to a national park phone number/operator.
- 511 systems are typically oriented towards commuters and freight users; therefore, using the system for recreational congestion management may be new to a state department of transportation.

Coordination/Partnerships

This tool will require close coordination with the owner of the 511 system. In most cases the owner is the state department of transportation.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, coordination/partnership outreach, design, equipment purchase, and implementation) for this tool ranges from immediate to near term (1 to 3 years).

The time to implement depends on the desired system attributes and capabilities of the existing system. The design and implementation portion could be as simple as a few weeks of discussion followed by immediate implementation or 6 to 12 months to design and build the database structure and system components.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, coordination/partnership outreach, design, equipment purchase, and implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital costs, if the current capability of the statewide 511 system can handle additional park information, there is no design/implementation cost to the national park. However, in some states an upgrade to the system may be needed that can range from $1,500 to 30,000[13] for design/implementation.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include a $0.25 to $2.00 charge per call[13] that the 511 system receives. Typically this is paid by the state department of transportation even for the national park calls, but this will need to be negotiated prior to implementation. Other ancillary costs are park staff time to provide information updates and installing static signs.

Some states have investigated including the national parks on 511, but chose not to due to the cost (e.g., Utah, Washington, etc.).

Examples of Implementation

- 511 Montana is operated by the Montana Department of Transportation and includes information for Yellowstone National Park and Glacier National Park.
  - *1-800-226-7623*
- 511 Maine is operated by the Maine Department of Transportation and includes information for Acadia National Park.
  - *1-866-282-7578*
- 511 Arizona is operated by the Arizona Department of Transportation and includes information for Grand Canyon National Park.
  - *1-888-411-ROAD*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Calls per month.
- Percentage category (includes tourism and transfers).

Additional Resources

- 511 Deployment Coalition – *www.deploy511.org*
- Federal Highway Administration (FHWA) - *http://www.ops.fhwa.dot.gov/511/*

SOLUTION/TOOL: Automated Gate Access
TYPE: Electronic Systems

ES 2

General Description

Automated gates can be installed at entrance stations in conjunction with limited access only lanes (see AC-2) to allow staff and concessionaires (or others who enter regularly) to more quickly pass through entrance points and bypass the congested entrance lines by using a similar to how "EZ Pass" works on a tollway. Automated gates can also be used in conjunction with automated fee machines (see ES-3) to collect entrance fees from visitors at smaller units. Several methods exist including a credit card key, remote control, radio frequency identification transponders, smart-card technology, and automatic vehicle identification.

In a national park setting the easiest use of this tool would be for an "employee only" system so the proper equipment for opening the gate can be provided. However, if this was allowed for visitors, it could be combined with the prepayment of entrance fees tool (see ES-3).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☐ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Automated gate access manages vehicle flow in and out of the unit.
- In conjunction with a limited access only lane (see AC-2) this can remove pass holders, employees, transit, and/or concessionaires from the main traffic stream.
- Automated gate access can collect accurate and automated usage data[3].

CONS

- Automated gate access manages vehicle flow in and out of the unit.
- In conjunction with a limited access only lane (see AC-2) this can remove pass holders, employees, transit, and/or concessionaires from the main traffic stream.
- Automated gate access can collect accurate and automated usage data3.

Coordination/Partnerships

This tool would require internal coordination to provide employees and concessionaires with the necessary equipment to utilize the automated gate. If this service was being provided to visitors, coordination would be necessary with communications staff for advertising this service as well as those responsible for prepayment of entrance fees.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years). The implementation time depends on the method and gate type selected, as well as the infrastructure (lanes, geometry, etc.) at the entrance area.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2004, 2005, and 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from high ($100,000 to $250,000) to higher (above $250,000).

Of the total capital cost, the procurement and installation portion will vary depending upon the method chosen for the system. Typically gates cost more than $100,000 per location[3]. The cost for gate systems begins around $1,000 for a simple swinging gate and controllers. Systems capable of accommodating multiple users will be significantly more expensive[1]. The system at Yellowstone National Park was estimated to cost approximately $315,000 for two entrances[14].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include additional tags which cost approximately $20[14] each, a monthly electricity charge, potential repair and replacement parts (for example if a vehicle drives through the gate breaking the lever or if the opening mechanism needs to be replaced). The costs associated with a limited access only lane are provided in tool AC-2.

Examples of Implementation

- Little River Canyon National Preserve uses an automated gate for visitors to access the Canyon Mouth Picnic Area.
  - *http://www.nps.gov/liri/planyourvisit/canyon-mouth-day-use-area.htm*
- Grand Canyon National Park has a separate entrance lane for visitors who have pre-paid. They also have some residents that live within the park boundaries. These residents have a sticker with an RFID tag to allow them to travel through a "fast lane." At the entrance station.
  - *http://ntl.bts.gov/lib/44000/44200/44253/Visitor_Access_and_Transportation_Guide.pdf*
- Yellowstone National Park installed automated gates in 2003 for permanent employees and concessionaires.
  - *http://www.coe.montana.edu/ce/patm/pubs/gyrits/Work%20Order%20II-2D%20AVI%20final.pdf*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Decrease in processing time.
- Reduction in queue length.

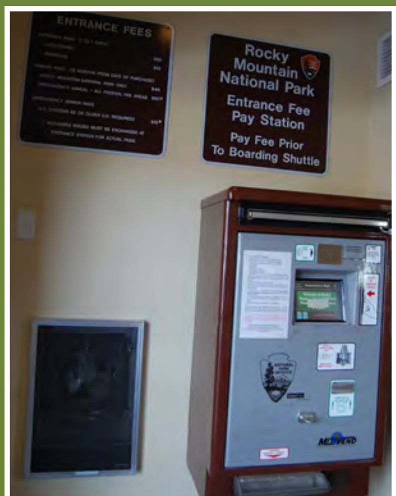
Additional Resources

- Automated Gate Access - *http://www.cflhd.gov/TTOOLKIT/FLT/FactSheets/Infrastructure/AUTOMATED%20GATE%20ACCESS.htm*
- Reducing Congestion at Banff National Park's East Gate - *http://www.ite.org/Membersonly/annualmeeting/2010/AB10H3904.pdf*
- Service Times and Capacity at National Park Entrance Stations - *http://www.nps.gov/transportation/pdfs/NP_Entrance_Stations_Study.pdf*

SOLUTION/TOOL: Prepayment of Entrance and Transit Fees

TYPE: Electronic Systems

ES 3



General Description

Prepayment of entrance fees and transit fees allows visitors to pay these fees prior to entering the bus or the park/unit. (It should be noted that the National Park Service is not permitted to 'layer' fees, so visitors do not have to pay a separate fee from the entrance fee to ride internal transit systems or access other park services.) Prepayment of fees can reduce (or eliminate) the transaction time at the entrance station therefore potentially reducing congestion and queue lengths. There is also a potential to have visitors who have prepaid enter through a limited access only lane at entrances (see AC-2).

There are multiple approaches available for prepayment of fees. These include with staff at hotels and visitor centers in the gateway community, online through park/unit websites, or at an automated fee machine (kiosk for self-paying fees) in the gateway community.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Prepayment can reduce congestion at entrance stations, as park staff does not have to process payments for entrance fees, therefore reducing transaction times.
- If fees are prepaid then buses bringing visitors to the park can quickly move through the entrance station due to the combination of entrance and transit fees.

CONS

- If visitors prepay at an automated fee machine or online, they may lose their first contact with a park/unit staff member for interpretation or questions.
- If visitors prepay but the entrance does not have a separate lane for these visitors then they may still have to wait in line behind others who did not prepay. While this will still decrease the wait times overall, visitors may be frustrated.
- May need bus driver to verify that people have paid their entrance fee to the park.
- If an automated fee machine is used for prepayment, repairs to machines may be costly and difficult, but necessary due to susceptibility to damage from environmental conditions and vandalism[15].
- Transaction processing by the visitor at an automated fee machine or online may be slower than transactions processed by fee collection staff resulting in delay and long wait times prior to getting to the park/unit[2].

GENERAL

- Promotion of prepayment methods (including signage) will be needed.
- If automated fee machines will be installed in the park/unit, an environmental assessment and ADA compliance survey will be necessary.
- Consideration when locating an automated fee machine include sun glare, lighting needs, drive-up versus walk-up machine, adequate shelter from weather, response time for repairs, and potential for vandalism[15].
- If the automated fee machine is located at an entrance station, integration with an automated gate may be considered.

Coordination/Partnerships

This tool will require close coordination with visitor centers, hotels, and stores in the gateway communities where prepayment may be accepter (manually or through an automated fee machine), transit operators if the transit fee is to be prepaid, and the park facility management team if the automated fee machine will be installed in the park/unit.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

The implementation time will be dependent upon the methods chosen for prepayment. It will take less time to implement a manual prepayment system with hotels and visitor centers in the gateway community or an online prepayment system then it will to install automated fee machines in the gateway community and/or in the park/unit.

The procurement process for automated fee machines is a minimum of 3 to 6 months assuming the park has funding for the purchase when the solicitation is released and the park site preparation (including NEPA clearance; adherence with ADA standards; and installation of power and network cables) will take significant time[15].

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000) depending on the approach taken.

If an automated fee machine is chosen, of the total cost, the procurement and installation portion is around $25,000 to $35,000 per machine[15]. There may also be a cost associated with the infrastructure such as power, communications, and potentially a shelter to house the machine.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include coordinating with the hotels, stores, and visitor centers in the gateway community (if using manual collection); software updates (if using website); repairs and replacing parts on machines (if using automated fee machines); collecting monies (all options); and monitoring use (all options).

Examples of Implementation

- Rocky Mountain National Park has prepayment fare machines available at the visitor center in Estes Park as well as the visitor center before entering the park.
- Jefferson National Expansion Memorial recommends that visitors purchase their tickets online prior to the day of arrival due to long lines and the possibility of selling out. The cost for riding the tram includes a $3 National Park Service entrance fee.
  - *http://www.nps.gov/jeff/planyourvisit/feesandreservations.htm*
  - *http://ticketsforthearch.com/eStore/Content/Commerce/Products/DisplayProducts.aspx?ActivityGroupCode=10&ActivityCategoryCode=100*
- Grand Canyon National Park
  - *http://explorethecanyon.com/tour-types/national-parks-info-passes/*

- Yosemite National Park – passes are available at several visitor centers in the gateway communities
    - *http://www.nps.gov/yose/planyourvisit/feesandreservations.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

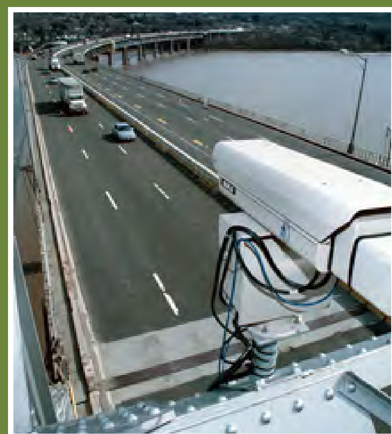
- Increase in number of fees prepaid.

Additional Resources

- RM22 Recreation Fee Guidelines, Appendix M, Fee Collection Equipment and Software Options - *inside.nps.gov/waso/custommenu.cfm?lv=3&prg=819&id=5211*
- Fee Collection Solutions Sharepoint site- *http://share.inside.nps.gov/sites/WASO/fee/POS%20Equipment/default.aspx*
- Cost of Collection Automated Fee Machine Guidelines - *inside.nps.gov/waso/custommenu.cfm?lv=3&prg=497&id=738*
- Service Times, Capacity, and operating Characteristics of Automated Lanes at National Park Entrance Stations by Jonathan Upchurch (Transportation Scholar) July 2006
- Service Times and Capacity at National Park Entrance Stations - *http://www.nps.gov/transportation/pdfs/NP_Entrance_Stations_Study.pdf*
- A Toolkit for Self-Service, Barrier-Free Fare Collection (TCRP Report 80) - *http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_80.pdf*

SOLUTION/TOOL: **Closed Circuit Television**
TYPE: **Electronic Systems**

ES
4



General Description

Closed circuit television allows information to be gathered that can be utilized in visitor demand management such as monitoring traffic congestion, length of lines at entrance lanes, and parking lot capacity. Cameras can also be used to view weather and road conditions, both of which can influence traffic speeds and perhaps lead to congestion issues.

Closed circuit television would need to be paired with other solutions as it is data gathering tool. Therefore, reducing congestion and improving safety can be accomplished by providing visitors with the information gathered through the use of cameras, but also through using this information to implement management techniques at the appropriate times. Examples include staffing additional entrance booths (see AC-1), promoting no-car park access options (see VDM-9), promoting bicycle and pedestrian access (see VDM-8), encouraging visitation to less congested areas (VDM-4), promoting use of park-and-ride facilities (see PT-5), and parking management (see TOI-12).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Cameras can also be used to monitor for motorists safety purposes.
- There is also a potential for visitors to have access to the camera images via the website.

CONS

- Data analysis can be costly if automated, and time consuming if done manually.

GENERAL

- National Park Service Policy requires a unit to notify the public if closed circuit television is used for the purpose of security monitoring.
- This tool must be used in conjunction with other tools to address congestion issues as this is solely a data collection tool.
- Cameras should be located in optimal areas for collecting transportation data such as near entrance lanes, parking lots, and on sections of road with known weather issues.

Coordination/Partnerships

This tool requires coordination with the park service law enforcement for security purposes.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than a year) to near term (1 to 3 years). Time to implement closed circuit television will vary based on the design (size and automation) of the system, but will be quicker than some tools because this is an "off-the-shelf" technology.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total cost, the typical procurement portion for a traffic monitoring camera (color video camera with pan, tilt, zoom, and installation) ranges from $8,000 to $16,000 per camera. The higher cost cameras would be needed for extreme weather conditions. The tower for a camera costs $5,000 to $14,000 depending on the height of the tower (35 feet to 90 feet)[16].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time for analyzing data and implementing management techniques based on this data, power and communications costs (typically ranging from 1,000 to $2,300[1] per year), software updates, and technology repairs/replacement parts.

Examples of Implementation

- Shenandoah National Park has webcams, one of which is located at Rockfish Gap for traffic information.
  - *http://www.nps.gov/shen/photosmultimedia/webcams.htm*
- Mount Rainier has webcams, some of which show parking lot capacity.
  - *http://www.nps.gov/mora/photosmultimedia/webcams.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring ongoing effectiveness include:

- Decrease in queue length.
- Number of available parking spaces.

Additional Resources

- Transportation Toolkit - *http://www.cflhd.gov/TTOOLKIT/FLT/FactSheets/ITS/CCTV.htm*
- Public notice for closed circuit television use - *http://www.nps.gov/jela/parkmgmt/upload/Closed-circuit-TV-announcement-for-web.pdf*
- Closed circuit television policy - *http://epic.org/privacy/surveillance/uspp-cctv_policy-070903.pdf*
- Gateway National Recreation Area – Sandy Hook Unit Parking Management Study - *http://www.volpe.dot.gov/nps/docs/gateway-sh.pdf*

SOLUTION/TOOL: **Dynamic/Variable Message Sign**

TYPE: **Electronic Systems**

ES 5

General Description

Dynamic/Variable message signs are used to provide en-route information to travelers. Dynamic/Variable message signs can be both permanent (large signs which are not movable and have power and communications hard wired) and portable (trailer-mounted, small sign which can be deployed to multiple locations and typically are solar powered and either cell phone or satellite enabled).

Dynamic/Variable message signs in national parks or their gateway communities can be used for informing visitors about road closures, road construction, congestion at entrance stations, parking lot status, arrival of transit, alternative entrances, alternative hours of travel, and park and ride lots.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- With better information visitors can make more informed decisions about alternative modes, travel times, alternative parking locations, or locations to avoid congestion.

CONS

- Limited cellular coverage will require that the portable dynamic/variable message signs either (1) only be located in areas of service, (2) be manually updated by national park staff who would need to drive to the sign for every update, or (3) be equipped with satellite communications or radio relay.
- Only a small amount of information can be displayed. It is recommended that only two frames be used. Each frame equals three lines with generally 8-10 characters per line.
- Locating a rental company for portable dynamic/variable message signs may be harder in rural areas than urban areas. This may also increase the rental cost in a rural area due to demand as well as increase the delivery charges due to distance travelled for delivery.

GENERAL

- As with any traveler information dissemination piece, the information must be accurate, timely and reliable for travelers to continue to utilize the technology.
- The location and message should be chosen to allow the driver to make a decision. For example, it should be placed upstream of a junction allowing for an alternate route or where there are several destination options. Note that if signs are placed in locations where there is no alternative, there may still be a benefit in reduced driver stress by knowing what congestion delays to expect.
- The messages and sign placement must follow the rules provided in the Manual of Uniform Traffic Control Devices.
- Considerations are needed for maintenance and for portable units' storage and transportation.
- The potential for hazard impact, which may require additional protection such as concrete barriers or impact attenuators depending on the location chosen, must be considered. The state department of transportation could be consulted for local guidelines.
- Although the state department of transportation has requirements for the appearance of the dynamic/variable message signs, in some cases there may be an opportunity to consider some design exemptions to better fit the aesthetics and landscape of a national park.

Coordination/Partnerships

Close coordination will be needed with the state department of transportation. If the portable dynamic/variable message sign will be placed on state highways, the department of transportation will need to approve an application for placement of the signs as well as approve the messages used.

In some cases, the state department of transportation may be willing to allow the national park to borrow portable dynamic/variable message signs for a short amount of time.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year) to near term (1 to 3 years).

The process for purchasing signs would require more time than renting signs from a local vendor. However, regardless of the method, requirements, message sets, and location applications with the state department of transportation would need to be completed. Permanent signs will also require design of posts, power, communication and impact protection.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2008 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital cost, the procurement portion ranges from $15,900 to $21,000 for a portable, trailer mounted dynamic/variable message sign to over $41,000 to $101,000 for a permanent sign16. Rental prices for a portable sign range from $1900-2500 per month per device but may not include the costs for maintenance, trainings, and delivery of signs[17].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time for information updates and training of staff, power and communications costs, software updates, and technology repair/replacement parts (typically $500 to $1,600 per year for labor and replacement parts for a portable sign and $2,000 to $5,000 per year for a permanent sign).

Examples of Implementation

- Muir Woods National Monument utilized a dynamic/variable message sign to promote a park-and-ride lot.

- *https://trb.metapress.com/content/w127xn22061813m3/resource-secured/?target=fulltext.pdf*

- Grand Canyon National Park utilized a dynamic/variable message sign to promote a park-and-ride lot.
  - *http://www.westerntransportationinstitute.org/documents/reports/4W2106_Ops_Plan_Final.pdf*

- Rocky Mountain National Park utilized a dynamic/variable message sign to promote a park-and-ride lot.
  - *http://www.triptac.org/Documents/RepositoryDocuments/ROMO_Ops_Plan_08192011.pdf*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Shuttle ridership counts with and without dynamic/variable message signs.
- Calculation of the park-and-ride lot occupancy, with and without dynamic/variable message signs.

Additional Resources

- Chapter 2I of the Manual of Uniform Traffic Control Devices - *http://mutcd.fhwa.dot.gov/*
- Guidelines for dynamic/variable message sign messages - *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_383.pdf and http://ntl.bts.gov/lib/jpodocs/repts_te/8583.pdf*

SOLUTION/TOOL: Electronic Fare Payment Systems

TYPE: Electronic Systems

ES 6

General Description

Electronic fare payment systems are available onboard transit to allow visitors to quickly pay when boarding. Onboard fare payment systems range from simple (fareboxes accepting coins, tokens, tickets, and dollar bills) to complex (contactless smart card readers) and in-between (fareboxes that automatically count the fare, magnetic stripe fareboxes, and smart card fareboxes).

Systems with card readers such as smart cards and magnetic strips can also allow visitors to prepay their transit fare via season passes, tickets, or stored value cards (see ES-3). It should be noted that the National Park Service is not permitted to 'layer' fees, so visitors do not have to pay a separate fee (from the entrance fee) to ride internal transit systems or access other park services.

This tool should only be utilized in specialized circumstances due to the fee structure of the National Park Service.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☐ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Fareboxes can be used to collect ridership data.
- Onboard electronic fare systems are quicker than cash payments to the driver and more convenient for riders then policies requiring exact change.

CONS

- The payment method with the least boarding delay/dwell time would be prepayment of transit fares.
- Driver is responsible for customer service, safety, and monitoring for fare evasion onboard.

GENERAL

- Signage and a fare card will need to be designed.
- Partnership agreements will need to be completed with the transit agency and for any installations of farecard purchasing machines located in areas outside the park/unit.

Coordination/Partnerships

Coordination with the transit provider would be necessary to implement this tool.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

The time to implement this tool will depend on the type of farebox (simple, magnetic stripe, smart card.), the number of transit vehicles, and whether prepayment systems are needed at the transit stop. Implementation will also include considerations such as signage, fare card design, agreements with outside entities, procurement and installation of equipment.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital cost, the procurement and installation portion for electronic fareboxes can cost from $4,000 to nearly $15,000, depending upon exactly what types of payments (payment methods) are included[16]. In general, the costs have been declining as the technology for the fareboxes has matured.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include communications costs, staff time, software updates, and technology repairs/replacement parts (ranging from $30 to $50 per year[16]).

Examples of Implementation

- King County Metro Transit (Seattle, WA) has a smart card for bus fares in the region.
  - *http://metro.kingcounty.gov/fares/orca/index.html*
- TriMet (Portland, OR) uses a cash farebox.
  - *http://www.trimet.org/fares/howtopay.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Number of users.
- Number of riders found evading payment.

Additional Resources

- Federal Transit Administration's Fare Payment Fact Sheet - *http://www.fta.dot.gov/printer_friendly/12351_4362.html*
- TCRP Synthesis 26 Bus Transit Fare Collection Processes – *http://www3.cutr.usf.edu/security/documents%5CTCRP%5CTSYN26farecollection.pdf*

SOLUTION/TOOL: **Highway Advisory Radio**
TYPE: **Electronic Systems**

ES 7

General Description

Highway advisory radio is a low-powered radio broadcast on AM stations. It can be obtained in both permanent and portable form and communications to update the repeated message can be either cellular or satellite. Motorists are alerted to tune to an AM station to listen to the radio broadcast via a sign with flashing beacons.

Highway advisory radio is generally found on state highways for traveler and emergency information such as road closures due to weather conditions, road construction, and AMBER alerts. National parks typically include information about current roadway conditions and closures, hours of operations, entrance fee costs, road construction, public transportation and alternative routes and entrances. Currently, more than 20 national park units are using highway advisory radio[3]; however, this is an outdated technology due to smart phones and mobile apps and therefore should only be utilized in specialized circumstances.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- With better information visitors can make more informed decisions about alternative modes, travel times, alternative parking locations, or locations to avoid congestion.

CONS

- Because the highway advisory radio requires motorists to take an action (i.e., tune their radio to the AM station) to hear the information, many motorists will not make this effort and therefore will not receive the information.
- In rural and mountainous terrain sometimes the radio station signal is weak making it hard to hear the available information and sometimes crosses with other radio stations.
- If cellular service is nonexistent or spotty, the highway advisory radio broadcast message may need to be changed on location. In this case, national park staff would need to drive to the transmitters and manually change it for every update.
- With the increase in smartphone usage, this technology may be becoming obsolete.

GENERAL

- As with any traveler information dissemination piece, the information must be accurate, timely and reliable for travelers to continue to utilize the technology.
- In order to obtain an AM radio station, a Federal Communications Commission License must be obtained.
- Highway signage will need to be installed for effective implementation.

Coordination/Partnerships

This tool will require close coordination with the Federal Communications Commission to obtain a license; the state department of transportation to obtain permits if the highway advisory radio or signs will be placed on state highways; and the vendor if a portable highway advisory radio will be rented.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year) to near term (1 to 3 years).

The time to implement depends on the method for obtaining the highway advisory radio. The process for purchasing a highway advisory radio would require more time than a rental from a local vendor. Regardless of the method the system requires, defined message sets/content, a Federal Communications Commission license, location permits with the state department of transportation, and installation of signage.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital cost, the procurement portion ranges in cost from $15,000 to $36,000 for a 10-watt powered system and up to $46,000 for a highway advisory radio with a larger antennae and stronger signal. One reference found that rental of a portable highway advisory radio costs around $1600 per month per device. Static signs with flashing beacons to accompany the highway advisory radio range in cost from $5000 to $9000[16].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to provide information updates (which may include driving to the transmitters to update the broadcast message), power and communications costs (between $600 and $1,000 per year), and technology repair/replacement parts.

Examples of Implementation

- Grand Canyon National Park utilized highway advisory radio to promote a park-and-ride.
  - *http://www.itscosts.its.dot.gov/its/benecost.nsf/ID/AC4B3EEEE1277C9E852578550053AB97?OpenDocument&Query=Home*
  - *http://www.westerntransportationinstitute.org/documents/reports/4W2106_Ops_Plan_Final.pdf*
  - *http://www.westerntransportationinstitute.org/documents/reports/4W2106_Final_Report.pdf*
- Yellowstone National Park, US 89 Project utilized highway advisory radio to provide traveler information to tourists.
  - *Shenandoah National Park utilized highway advisory radio to provide traveler information to tourists.*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

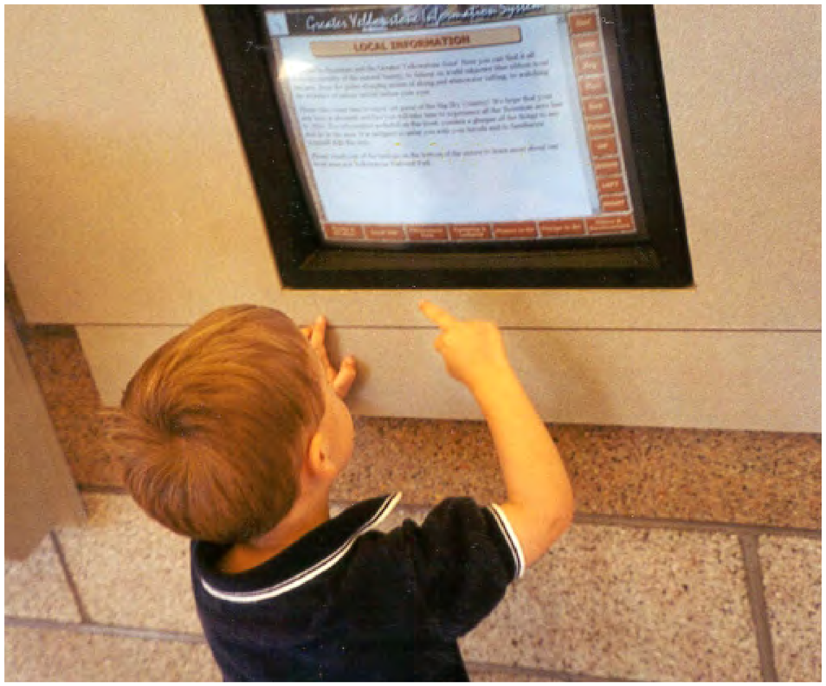
- Shuttle ridership counts with and without highway advisory radio.
- Calculation of the park-and-ride lot occupancy, with and without highway advisory radio.

Additional Resources

- ITS in National Parks and Other Public Lands – 2011 Update - *http://ntl.bts.gov/lib/44000/44200/44256/ITSinParks2011_update.pdf*

SOLUTION/TOOL: **Kiosks**
TYPE: **Electronic Systems**

ES 8



General Description

Kiosks are an interactive, computerized way of providing traveler information such as less crowded attractions/destinations to visit, parking conditions, status of transit. Kiosks can also be used for prepayment of entrance fees and transit fees (see ES-3). Kiosks can be stationed near airports, in visitor centers, at welcome centers, or at unit's entrance stations.

This is becoming an outdated technology due to smart phones and mobile apps and therefore should only be utilized in specialized circumstances.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Kiosks allow traveler information to be provided without staffing a location.

CONS

- With the increase in smartphone usage, this technology may be becoming obsolete.

GENERAL

- The information must be timely, reliable, and accurate for visitors to keep using this tool.
- If the kiosk is placed outside the park/unit, rental of space may be necessary and agreements will need to be created.
- Implementation will include designing and creating the content/pages for the kiosk.
- A cabinet to house the kiosk will need to be designed, built, and installed.

Coordination/Partnerships

Coordination with outside entities (i.e., airports, visitor centers, welcome centers, etc.) would be necessary if the kiosk was located outside the national park unit. Coordination would also be necessary with staff in charge of the information that may be available on the kiosk (i.e., transit agency, staff in charge of road conditions/closures, etc.).

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

The time to implement will depend on locating/renting space for the kiosk, the services provided through the kiosk (information only, or ability to make reservations and/or pay entrance fees), whether communications are available or need to be installed, design of the content, design and construction of the cabinet, and purchase of the equipment and software.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital cost, the procurement portion including hardware, enclosure, installation a modem server, and map software typically ranges in cost from $9,000 to $20,000[16].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include power and communications (ranging from $1,000 to $3,800 per year[16]), staff time to keep the traveler information up to date, location rental costs (if necessary), software upgrades, and technology repair/replacement part costs.

Examples of Implementation

- Sequoia National Forest kiosk implemented by Service First.
  - *http://www.blm.gov/ca/st/en/info/newsbytes/2010/44xtra_servicefirst_kiosk.html*
- Chiricahua National Monument has an interactive touch screen kiosk in their visitor center.
  - *http://www.chronosinteractive.com/work/national-park-service*
- Sleeping Bear Dunes has an interactive touch screen kiosk at the Philip A. Hart visitor center in Empire, MI.
  - *http://www.nps.gov/slbe/planyourvisit/hours.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring ongoing effectiveness include:

- Number of users.
- Amount of time a user spends at the kiosk.

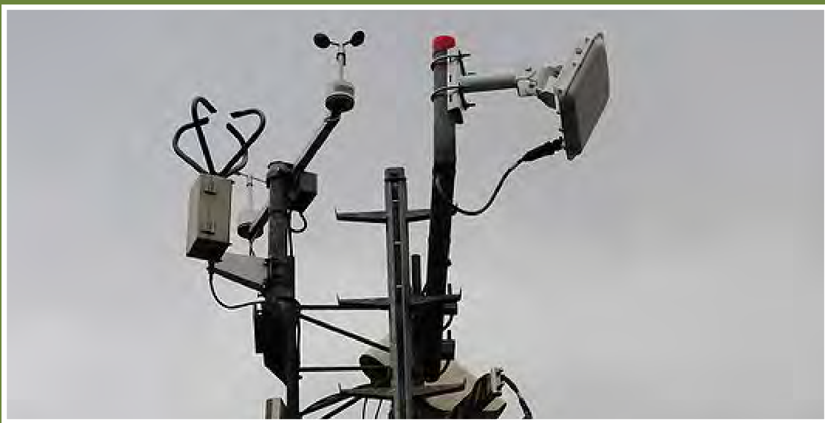
Additional Resources

- Evaluation of Touch Screen Traveler Information Kiosks - *http://www.coe.montana.edu/ce/patm/pubs/gyrits/EvaluationReport%20kiosks%20Final.pdf*

SOLUTION/TOOL: Road Weather Information System

TYPE: Electronic Systems

ES 9



General Description

Even in a national park unit, weather events can cause unsafe driving conditions which leads to congestion and maintenance challenges such as roadway damage and snow removal. Road closures and adverse driving conditions due to weather can cause congestion which can be decreased if motorists are warned of these closures/conditions beforehand.

Road weather information systems use sensors located within or alongside the roadway to measure weather's effect on the roadway (such as ice, snow accumulation, rain and flooding, wind speed, temperatures, and fog) so motorists and maintenance staff can be warned; however, they must be used in conjunction with a traveler information tool such as 511 (see ES-1), dynamic/variable message signs (see ES-5) and/or media/social media/mobile device apps (see VDM-5).

This may be becoming an outdated technology due to smart phones and mobile apps and therefore should only be utilized only in specialized circumstances.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Road weather information systems collect road condition information to be used for treatment strategies and road closures.
- Information provided from system can be used to improve safety and increase mobility.

CONS

- Meteorology/forecasting services are provided at an additional cost.
- Some sensors require being placed in the pavement.
- Some of the equipment is unattractive.
- With the increase in smartphone usage, this technology may be becoming obsolete.

GENERAL

- Environmental compliance would be necessary prior to the installation of a road weather information system.

Coordination/Partnerships

Coordination would be needed with the maintenance staff as well as those responsible for traveler information. If meteorological/forecasting services are to be provided, coordination with the vendor would be necessary.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

The time to implement will depend on the sensors chosen and whether communications are available or need to be installed.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is medium ($50,000 to $100,000).

Of the total capital cost, the procurement portion for a road weather information system including a CPU, workstation with software, and communications equipment costs around $9,000 plus the cost of an environmental sensing station ($25,000 to $42,000 depending on the sensors chosen[16]).

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include communication costs, optional weather forecasts (ranging from $200 to $1,000), environmental sensing station operating costs (ranging from $1,600 to $3,000), software upgrades, CPU replacement every 5 years (around $4,000[16]), and technology repair/replacement parts. Note that some sensors are buried in the ground and to replace them would require patching that section of roadway.

Examples of Implementation

- Denali National Park has a road weather information system at Raws Wonder Lake.
  - ***http://www.wunderground.com/weather-forecast/US/AK/Denali_National_Park.html***
- Glacier National Park has weather sensors located at St. Mary's and West Glacier.
  - ***http://www.nps.gov/glac/planyourvisit/weather.htm***

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Number of times road weather system information is used to inform motorists of road conditions or closures.
- Number of times road weather system information is used for applying treatment strategies to roadway.

Additional Resources

- Federal Land Managers Transportation Toolkit - ***http://www.cflhd.gov/TTOOLKIT/FLT/FactSheets/ITS/RWIS.htm***

SOLUTION/TOOL: **Transit Signal Prioritization**
TYPE: **Electronic Systems**

ES 10

General Description

Transit signal prioritization is a traffic signal that provides prioritization for transit vehicles (over private automobiles) through intersections and is generally utilized in highly urbanized areas. Transit signal prioritization is a modification of the normal traffic signal process by increasing green time, reducing red time, reordering the signal phases, or adding a priority signal phase for transit when needed to allow transit vehicles to pass through.

This tool decreases the amount of congestion, and therefore delay, that transit riders must endure. This is a benefit that may help promote transit use (VDM-9) and promote the use of park-and-ride facilities (VDM-11).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Transit signal prioritization can decrease travel times and increase reliability.
- Transit signal prioritization can improve schedule adherence.

CONS

- Could potentially cause delays for non-transit vehicles.
- Can possibly cause challenges with traffic signal synchronization.
- Potentially negative visual impacts in a national park setting.

Coordination/Partnerships

This tool will require coordination with the gateway community, transit agency as well as the traffic engineers that oversee the intersections (i.e., park staff, state department of transportation staff, or gateway community transportation staff).

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year) to near term (1 to 3 years).

The time to implement depends on the number of signalized intersections that need to be modified, as well as the number of transit vehicles (buses) that need to be equipped.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital cost, the procurement portion for a transit vehicle on-board signal transit signal priority emitter ranges from $400 to $1,800, the roadside transit signal priority system ranges from $4,000 to $5,000 (includes infrared detector, detector cable, phase selector, system software, and installation for two directions), and if traffic control equipment or systems at the intersection need to be replaced it could cost up to $30,000 per intersection[16].

OPERATION AND MAINTENANCE COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital cost, the procurement portion for a transit vehicle on-board signal transit signal priority emitter ranges from $400 to $1,800, the roadside transit signal priority system ranges from $4,000 to $5,000 (includes infrared detector, detector cable, phase selector, system software, and installation for two directions), and if traffic control equipment or systems at the intersection need to be replaced it could cost up to $30,000 per intersection[16].

Examples of Implementation

- Metropolitan Washington Council of Governments uses traffic signal prioritization in the National Capital Region.
  - *http://www.mwcog.org/uploads/pub-documents/ql5eXl020110505140547.pdf*
- Pioneer Valley Transit Authority worked with the city of Springfield Massachusetts to install in-vehicle transit signal priority on buses.
  - *http://www.vhb.com/SiteObjects/published//4FCC5B454FF7253000FE9B66206DA365/59A4CE7B0FEB89ED0083C04A90F1E598/file/APTA%20Paper%20Chase%20Doherty%20Herr%20Narriagan%2002-05-06.pdf*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Reduced travel time for transit.
- Reduced variability in operations or schedule adherence for transit.

Additional Resources

- Transit Signal Priority: A Planning and Implementation Handbook - *http://www.fta.dot.gov/documents/TSPHandbook10-20-05.pdf*
- Planning and Deploying Transit Signal Priority in Small and Medium-Sized Cities: Burlington, Vermont Case Study - *http://www.nctr.usf.edu/jpt/pdf/JPT13-3Vlachou.pdf*

SOLUTION/TOOL: Implement Transit/Shuttle Services/Operations

TYPE: Public Transportation

PT 1

General Description

Transit/shuttle services is a method to transport visitors to and around the park/unit without the use of a private automobile.

Transit/shuttle services can reduce automobile congestion at popular destinations that lack parking capacity; however, there is the potential that the same service can increase pedestrian congestion at key sites and trailheads due to the transit/shuttle service allowing the number of people at the location to increase beyond the capacity of the parking lot.

Transit/shuttle services may be most successful when the park/unit has a loop road or specific destinations where most visitors start and end their visit, has the ability to close the road to private automobiles on peak weekends or has destinations that are not currently accessible to private automobiles.

Transit/shuttle services within the park/unit can also be linked/coordinated with transit services provided in the gateway communities. This allows visitors to arrive at the park/unit without a personal automobile or to utilize park-and-ride facilities within the gateway community (see PT-5).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Increasing the occupancy (number of visitors) per vehicle can help decrease congestion by removing personal vehicles from roadways. This can be accomplished by having visitors switch to transit, which has higher occupancy than personal vehicles.
- Transit use can decrease environmental impacts and save visitors money.
- Transit use is a great option for non-drivers and those who do not own a car.
- Mandatory shuttle services, even if only on weekends, can prove the most beneficial for alleviating traffic congestion and can open the roadway to bicycles and pedestrians.
- Having a shuttle within the park/unit can make it more feasible for visitors to arrive at the park/unit via public transportation because then they have a way to continue their visit within the unit without a private automobile.

CONS

- The objective of a shuttle is to get people out of their personal automobiles and into the shuttle (change their mode of transportation). However, sometimes if both the parking lot and the destination are overcrowded, a shuttle can just add additional people at a destination that is already at capacity[20].

- In one park, managers believe that people are riding the shuttle first to "scout" where they want to go in their cars and therefore they believe the shuttle has had a minimal effect on congestion[21].
- Although the goal of the shuttle is to alleviate traffic congestion, sometimes the shuttle can get stuck in this same traffic congestion it is trying to prevent, which can affect the efficiency and effectiveness of the service[21].
- Consider total cost of ownership over a 20 year term, transit is expensive to operate and maintain on an annual basis, and recapitalization cost are high[22].
- A shuttle that provides access to and from the park/unit may be different from the shuttle used to get around within the park/unit. If the park and ride lots within the park/unit are full, then visitors may need to park outside the park/unit and take one shuttle to transfer to yet another[19]."
- Shuttles sometimes cause a "pulsing effect" where everyone gets dropped off at one destination on a frequent basis. This can affect the resources and the visitor experience at these locations by causing crowding. One park is currently conducting a study to determine techniques for leveling out the flow of visitors[19].
- Adding transit within a park/unit does not reduce parking demand unless visitors can easily get to the park/unit via bus, bike, rail, etc. Many of the big parks with transit have added or will add hundreds of parking spaces (GRCA, ZION, ROMO, etc.).

GENERAL

- When choosing a shuttle, ensure that the vehicle selected is appropriate for the park/unit, and if choosing a sustainable technology, that it is proven and mature. For example, if considering electric vehicle technology, you need to factor in how long an electric vehicle can run, and if the vehicle can handle the park infrastructure such as grade of roads. For any transit vehicles, it is important to consider overhangs, tree height, and turning radii along the proposed transit route. You may need to make changes to accommodate the vehicles. Other considerations include if there are maintenance and fueling facilities for the type of fuel selected, and if the vehicle can withstand high or low temperatures.
- Unless the shuttle system is mandatory, incentives should be provided for visitors to use the shuttle, or the system may wind up with low ridership. One unit found that "although there was a 95% positive reaction to the shuttle, it was not well used[18]".
- Promotion of the shuttle (see VDM-9) will be needed. One promotional tool includes a signage plan detailing where to best locate signs to communicate to visitors where to catch the shuttle as well as which parking areas have availability[19].

Coordination/Partnerships

Transit/shuttle services are complex operations requiring a significant amount of coordination. Coordination can be required well beyond the park boundary and gateway community, and can involve local transit agencies, regional federal lands highway office, regional federal transit administration office, other land management agencies, and/or the state. Coordination will also be needed with owners of potential bus stop and park and ride locations outside the park/unit. Depending on who will operate and maintain the shuttle service, partnerships may be necessary with a concessionaire, local friends group, and others.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from longer term (3 to 6 years) to beyond 6 years.

An example outline for a transit launch from start to finish include developing a PMIS statement (1 month); conducting a transit feasibility study; creating a financial pro forma and funding plan (12 to 18 months); securing approval from regional office and WASO (1 to 2 years); conducting public outreach for transportation fee (optional, 1 year); securing funding for buses and visitor facilities (signs, shelters, etc.) (1 to 5+ years); purchasing or leasing buses; building/installing visitor facilities; creating schedules and routes; promoting the transit service; hiring and training drivers; and operating a pilot program (2 to 3 years).

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from high ($100,000 to $250,000) to higher (above $250,000).

Of the total costs, procurement costs will include the costs of any vehicles, passenger shelters (if provided), bus stop amenities (such as benches, bus stop signs, sidewalks, walking paths, etc.) and any facilities for storing or maintaining the buses. Several parks have opted not to own their own vehicles and instead have contracted for shuttle services. The contractor provides the vehicles and operates, and maintains the vehicles as part of the shuttle services offered at the park. Then, contractors typically pass the cost for leasing, operation, and maintenance of vehicles through to the owner as part of their proposal/bid for services).

Depending upon the type and size of vehicles selected, the costs can range from approximately $50,000 (for a small accessible van) to nearly $500,000 for an accessible motor coach. Passenger shelters can range from $5,000 to over $20,000 depending upon the size of the shelter and the materials used.

Parking needs should also be considered when implementing a transit/shuttle service. The costs associated with parking are provided in tools AC-3 and PT-5.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include the labor costs of a transit/shuttle system (which is a major component of the overall costs); insurance; fuel costs; repairs and replacement costs for vehicles; recapitalization costs; utility costs for shelters and maintenance facilities; marketing; and repair and upkeep costs for facilities.

Further, the location of the park (where services are offered) will likely also have an impact on operating costs. In general, expect operating costs will vary from $50 to $150 (or more) per hour for transit or shuttle services. The operating costs associated with parking are provided in tools AC-2 and PT-5.

Examples of Implementation

- Devils Postpile National Monument has a mandatory shuttle system.
  - *http://www.nps.gov/depo/planyourvisit/feesandreservations.htm*
- Examples of three shuttle bus systems (Grand Canyon, Zion, and Acadia) in national parks.
  - *http://www.nps.gov/transportation/busses_shuttles.html*
- Lessons learned from the Lewis and Clark shuttle.
  - *http://ntl.bts.gov/lib/42000/42500/42568/DOT-VNTSC-NPS-06-05.pdf*
- National Park Service National Transit Inventory.
  - *http://ntl.bts.gov/lib/47000/47800/47871/NPS_WASO_2013_Transit_Inventory.pdf*
- Grand Teton National Park Public Transit Business Plan
  - *http://www.nps.gov/grte/parkmgmt/upload/public-transit-business-plan.pdf*
- Other examples include Rocky Mountain National Park, Bryce Canyon National Park, and Harpers Ferry.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Ridership counts on shuttle/transit.
- Decreasing private automobile volumes at trailheads and parking lots.

Additional Resources

- Transportation Planning Process for Transit in Federal Land Management Areas - *http://www.triptac.org/Help/ProductSpotlight/ArchivedSpotlights/Default1.html*
- Introduction to Alternative Transportation Systems Planning for FLMAs - *http://www.triptac.org/TRIPTACResources/TRIPTACTrainings/Default.html#ATSPFLMA*
- (Module 7) Cost Estimating and Financial Sustainability Analysis Training - *http://www.triptac.org/TRIPTACResources/TRIPTACTrainings/Default.html#mod7*
- Financial Planning for Transit Services in the National Parks - *http://www.triptac.org/Documents/RepositoryDocuments/Fin_Pl_for_Transit.pdf*
- Guidebook for Start-up Transit Agencies - *http://www.triptac.org/Documents/RepositoryDocuments/Gdbk_startup.pdf*

SOLUTION/TOOL: **Adding Capacity to the Transit System**

TYPE: **Public Transportation**

PT 2

General Description

If the transit system at the park/unit is well used and running at capacity (the shuttle is always full, there is always a wait at shuttle stops, etc.), adding capacity to the transit system may be necessary. This can be completed by adding more shuttles, by decreasing time between the shuttles arriving at a destination, or by adding additional routes.

Prior to making any changes to the existing system, an evaluation of the current operations should be done to determine what changes will be most efficient, effective and beneficial to the service and visitors and which will be most financially sustainable. This type of analysis is typically called a comprehensive pro forma operational analysis.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Expanding the transit service coverage, increasing the service frequency or hours or operation, and/or adding additional routes can improve access to the park/unit and improve the service quality.
- Adding transit capacity can decrease the number of private automobiles coming to, and operating within, the park, therefore decreasing congestion.
- Transit use is a great option for non-drivers and those who do not own a car.
- Transit use can decrease environmental impacts and save visitors money.

CONS

- Simply adding capacity may not be enough to get visitors to change from their private automobile to transit. Getting visitors to change their behavior will likely require promotion of the transit system.
- Increasing shuttle capacity can lead to pulsing, over use of resources adjacent to shuttle stops and crowding on popular trails and attractions.
- Increased capacity can lead to increased congestion at entrance stations, parking lots, visitor centers, and roadways outside the park (example Zion NP).
- Although the goal of the shuttle is to alleviate traffic congestion, sometimes the

shuttle used to get around within the park/unit. If the park and ride lots within the park/unit are full, then visitors may need to park outside the park/unit and take one shuttle to transfer to yet another[19]."

- Adding transit within a park/unit does not reduce parking demand unless visitors can easily get to the park/unit via bus, bike, rail, etc. Many of the big parks with transit have added or will add hundreds of parking spaces (GRCA, ZION, ROMO, etc.).

GENERAL

- Given the high cost of transit, it would be best to target service to peak times.

Coordination/Partnerships

Transit/shuttle services are complex operations requiring a significant amount of coordination. Coordination can be required well beyond the park boundary and gateway community, and can involve local transit agencies, regional federal lands highway office, regional federal transit administration office, other land management agencies, and/or the state. Coordination will also be needed with owners of potential bus stop and park and ride locations outside the park/unit. Depending on who will operate and maintain the shuttle service, partnerships may be necessary with a concessionaire, local friends group, and others.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year) to near term (1 to 3 years).

The time to implement additional capacity to the transit service will depend on whether additional shuttles are available on hand or need to be purchased, and whether additional drivers are able to be deployed immediately or need to be hired and trained.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from to high ($100,000 to $250,000) to higher (above $250,000).

Of the total costs, procurement costs will include the costs of any vehicles, passenger shelters (if provided), bus stop amenities (such as benches, bus stop signs, sidewalks, walking paths, etc.) and any facilities for storing or maintaining the buses. Several parks have opted not to own their own vehicles and instead have contracted for shuttle services. The contractor provides the vehicles and operates, and maintains the vehicles as part of the shuttle services offered at the park. Then, contractors typically pass the cost for leasing, operation, and maintenance of vehicles through to the owner as part of their proposal/bid for services).

Depending upon the type and size of vehicles selected, the costs can range from approximately $50,000 (for a small accessible van) to nearly $500,000 for an accessible motor coach. Passenger shelters can range from $5,000 to over $20,000 depending upon the size of the shelter and the materials used.

Parking needs should also be considered when implementing a transit/shuttle service. The costs associated with parking are provided in tools AC-2 and PT-5.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include the labor costs of a transit/shuttle system (which is a major component of the overall costs); insurance; fuel costs; repairs and replacement costs for vehicles; recapitalization costs; utility costs for shelters and maintenance facilities; marketing; and repair and upkeep costs for facilities.

Further, the location of the park (where services are offered) will likely also have an impact on operating costs. In general, expect operating costs will vary from $50 to $150 (or more) per hour for transit or shuttle services. The operating costs associated with parking are provided in tools AC-2 and PT-5.

Examples of Implementation

- The Northeast Region uses a Transit Evaluation Matrix tool to assess existing and proposed alternative transportation services. The evaluation matrix scores projects based on nine categories – Critical Access, Resource Protection, Safety, Visitor Experience, Visitor Diversity & Car-Free Travel, Regional Economy & Partnerships, Recreation & Education, Ridership & Productivity, and Cost Effectiveness.
- Harpers Ferry evaluated adding shuttle routes to distribute visitors to other areas of the park. This study was documented in an alternative transportation study conducted in 2011 by a National Park Foundation transportation scholar.
  - *Etic document #119919 found at http://etic.nps.gov*
- Yosemite Area Regional Transportation System has evaluated their existing systems in order to create a short term transit plan for future changes to the system.
- The Northeast Region uses a Transit Evaluation Matrix tool to assess existing and proposed alternative transportation services. The evaluation matrix scores projects based on nine categories – Critical Access, Resource Protection, Safety, Visitor Experience, Visitor Diversity & Car-Free Travel, Regional Economy & Partnerships, Recreation & Education, Ridership & Productivity, and Cost Effectiveness.
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  - Etic document #119919 - *http://etic.nps.gov*
- Yosemite Area Regional Transportation System has evaluated their existing systems in order to create a short term transit plan for future changes to the system.
  - *http://www.yarts.com/documents/2011/srtp2011.pdf*
- An evaluation was conducted to determine the feasibility of adding transit capacity between the city of Fresno and Yosemite National Park and Sequoia and Kings Canyon National Parks.
  - *http://agendas.fresnocog.org/itemAttachments/36/Fresno_NPS_Draft_Final_Report_(1_31_2011)_FINAL_version_(3).pdf*
  - *http://www.fresnocog.org/sites/default/files/publications/Transit_Planning/ITEM_I_E_Fresno-SEKI_Draft_Service_Plan_and_Comments.pdf*
- Adams National Historical Park conducted an evaluation of their transit system and the possibility of expansion.
  - *http://www.volpe.dot.gov/transportation-planning/public-lands/adams-national-historical-park-expanded-transit-service*
- Fort McHenry National Monument and Historic Shrine conducted a feasibility study for transit implementation. The recommendation implemented was to add capacity and routes to the existing city transit system to accommodate the park.
  - *http://www.volpe.dot.gov/transportation-planning/public-lands/fort-mchenry-national-monument-and-historic-shrine-shuttle*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Ridership numbers.
- Frequency of service.

Additional Resources

- Alternative Transportation System Demand Estimation for Federal Land Management Agencies - *http://ntl.bts.gov/lib/44000/44200/44243/ATS_Demand_Estimation_1_.pdf*
- Best Practices in Transit Service Planning - *http://www.nctr.usf.edu/pdf/77720.pdf*
- Evaluating transit service operations - *http://www.vtpi.org/tdm/tdm62.htm*
- A Guide for Planning and Operating Flexible Public Transportation Services Report Number: R-140 *http://www.tcrponline.org/PDFDocuments/TCRP_RPT_140.pdf*
- A Guidebook for Developing a Transit Performance-Measurement System Report Number: R-088 *http://www.tcrponline.org/PDFDocuments/TCRP_RPT_88.pdf*

SOLUTION/TOOL: Ferry Service/Water Taxi
TYPE: Public Transportation

PT 3

General Description

Alternative public transportation is not limited to land based options. For those parks/units along rivers, lakes, coastal bays, or other bodies of water, an alternative mode of transportation may be ferry service or water taxis. Unlike a bus that typically uses the same roadways as visitors' vehicles, ferries and water taxis provide visitors an alternative route that they would not experience in their personal automobiles.

Ferries can be passenger-only or can allow for at least one deck for vehicles, as well as, decks for passengers. Smaller ferries for a limited number of passengers are known as water taxis and typically do not carry vehicles.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- A ferry or water taxi can be seen as a visitor experience in and of itself.
- Ferry use is a great option for non-drivers and those who do not own a car.
- Having a shuttle within the park/unit can make it more feasible for visitors to arrive at the park/unit via ferry because then they have a way to continue their visit within the unit without a private automobile.

CONS

- Launching a ferry system has the same issues as transit; however, this faces even more daunting odds because there are very few ferry systems in NPS, outside parks whose only access is by water.
- Ensure that the boat size is large enough to be able to withstand the weatherconditions in the area so that visitors will not be stranded at the park/unit if bad weather arrives[24].
- There are t-class (6 to 150 passenger boats) and k-class (more than 149 passengers) challenges that need to be considered. All boats are certified by the USCG as to the number of allowable passengers and the approved passenger capacity determines the regulatory requirements for licensing, inspections, crew staffing, and safety equipment.

The typical regulatory thresholds are (1) up to 49 passengers, (2) 50 to 149 passengers, and (3) more than 149 passengers. The higher the capacity, the more regulatory requirements (and associated costs). For example, a 49-passenger ferry requires a minimum of two crew while a 149-pasenger ferry requires three crew.

- May need to add a landside shuttle to get ferry passengers around the park/unit.
- Consider total cost of ownership over a 20 year term, a ferry is expensive to operate and maintain on an annual basis, and recapitalization cost are high22.
- Ferries sometimes cause a "pulsing effect" where everyone gets dropped off at one destination on a frequent basis. This can affect the resources and the visitor experience at these locations by causing crowding.
- Adding a ferry within a park/unit does not reduce parking demand unless visitors can easily get to the park/unit via bus, bike, rail, etc.

GENERAL

- Implementing a ferry system includes many considerations beyond just the boat. These include landside facilities (such as docks, ramps, parking lots, shelters, and information centers) to support the water service; ticketing; scheduling; ferry routes; licensing; inspections; crew staffing; and safety equipment.
- When choosing a ferry type and size, consider the need to transport bicycles and visitors' gear/equipment.
- Plan time in your implementation schedule for the ferry to undergo sea trials and certification by the Coast Guard[24].

Coordination/Partnerships

Ferry services are complex operations requiring a significant amount of coordination. Coordination can be required well beyond the park boundary and gateway community, and can involve local transit/ferry agencies, regional federal lands highway office, regional federal transit administration office, the Coast Guard, other land management agencies, and/or the state. Coordination will also be needed with owners of potential dock/shelter and park and ride locations outside the park/unit. Depending on who will operate and maintain the ferry service, partnerships may be necessary with a concessionaire, local friends group, and others.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from longer term (3 to 6 years) to beyond 6 years.

An example outline for a ferry launch from start to finish include developing a PMIS statement (1 month); conducting a ferry feasibility study; creating a financial pro forma and funding plan (12 to 18 months); securing approval from regional office and WASO (1 to 2 years); conducting public outreach for transportation fee (optional, 1 year); securing funding for ferries and facilities (docks, ramps, signs, shelters, etc.) (1 to 5+ years); purchasing or leasing of ferries and safety equipment; building/installing facilities; creating schedules, ticketing, and routes; promoting the ferry service; hiring and training ferry crew; sea trials and certification by Coast Guard; and operating a pilot program (2 to 3 years).

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

Of the total costs, procurement costs for passenger only ferries ranges from $90,000 to $11,400,000 with the lower end having a passenger capacity of 12 to 30 and the higher end having a capacity of 151 to 300. The capital costs for vehicle ferries range from $1,000,000 to $43,000,000, with the less expensive ferries having a passenger capacity of 25 to 100, and vehicle capacity of 2 to 15 and; and the most expensive having a passenger capacity of 250 to 500 and a vehicle capacity of 50 to 100. Additional costs will be incurred for dock and ferry facilities (around $3 million)[25].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include coordinating with the hotels, stores, and visitor centers in the gateway community (if using manual collection); software updates (if using website); repairs and replacing parts on machines (if using automated fee machines); collecting monies (all options); and monitoring use (all options).

Examples of Implementation

- Fort McHenry National Monument and Historic Shrine is accessible by water transportation from the Baltimore Inner Harbor by using the Baltimore water taxi.
  - *http://www.nps.gov/fomc/planyourvisit/directions.htm*
- Sandy Hook National Recreation Area can be accessed by ferry from Manhattan on weekends from Memorial Day to Labor Day.
  - *http://www.nps.gov/gate/planyourvisit/shumasstransit.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Number of ferry passengers.

Additional Resources

- Feasibility study for waterborne transportation at the National Parks of New York Harbor - *http://ntl.bts.gov/lib/30000/30200/30287/gnra-nyharbor.pdf*
- Water transportation alternatives in national parks - *http://www.nps.gov/transportation/atp_fact_sheet_water_based_transportation_systems.html*
- Feasibility study for waterborne transportation at the National Parks of New York Harbor - *http://ntl.bts.gov/lib/30000/30200/30287/gnra-nyharbor.pdf*
- Water transportation alternatives in national parks - *http://www.nps.gov/transportation/atp_fact_sheet_water_based_transportation_systems.html*
- Bus and Ferry Life Cycle Cost Model for FLMAs archived webinar training - *http://www.triptac.org/TRIPTACResources/TRIPTACTrainings/Default.html#busFerry*
- Bus and Ferry Lifecycle Cost Modeling - *http://www.volpe.dot.gov/transportation-planning/public-lands/department-interior-bus-and-ferry-lifecycle-cost-modeling*
- Partnership Case Study: Grand Island National Recreation Area Alternative Transportation Project - *http://www.triptac.org/Documents/RepositoryDocuments/GINRA_CStudy_web.pdf*

SOLUTION/TOOL: New or Expanded Multimodal Facilities

TYPE: Public Transportation

PT 4

General Description

New or expanded multimodal facilities include those facilities necessary for transit, ferries (or water taxis), bicycling, and walking. Examples of these facilities may include bus stops, bus shelters, ferry docks, bike racks, shared use paths, canoe launches/landings, intermodal centers, and other types of improvements.

These facilities provide safety and comfort to visitors increasing their visitor experience and may increase their willingness to use alternative modes of transportation.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Providing alternative transportation facilities can increase visitors' safety, comfort, convenience, and improve visitor experience.
- Alternative transportation facilities provide additional locations at which to provide visitors with information about the transportation system as well as interpretive information about the park/unit.
- Alternative transportation facilities can highlight the presence of alternative modes and act as a marketing platform for alternative transportation modes to and within the park/unit.

CONS

- Depending on the facility alternative transportation facilities can be expensive to construct and maintain.
- Environmental analysis will be needed to ensure that these facilities can be constructed without impacting the natural and cultural resources that the park/unit may be trying to protect.

Coordination/Partnerships

Coordination may be needed with local transit/ferry agencies, the local gateway community, and/or local bicycling organizations.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year) to near term (1 to 3 years) to longer term (3 to 6 years).

Implementation of facilities will vary based on the scope and extent of the facility. Small facilities such as bus stops, bus shelters, and bike racks will take a relatively short amount of time (less than 1 year). Time to implement a larger facility such as a shared use path or a multi-modal facility can take years for planning, design, environmental analysis, funding, and construction.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000) to higher (above $250,000)

Costs will vary based on the scope and extent of the facility. Of the total costs, procurement costs for small facilities are low such as bus stops, passenger shelters (ranging from $5,000 to over $20,000), and bike racks (range from $150 to $530 for traditional or wave bicycle racks[10]). The procurement and construction costs for a larger facility are high such as a shared use path (in general, a 10 foot wide asphalt trail can range in cost from $50 to $100 or more per linear foot depending on the amount of earthwork and other construction required[7]), ferry docks (around $3 million), or a multi-modal facility.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include repair and replacement parts, staff time, utilities, and maintenance of facilities (including mowing, trail clean-up, repaving every ten years, etc.) depending on the scope and extent of the facility.

Examples of Implementation

- Gulf Islands National Seashore and Glacier Bay National Park and Preserve both received Paul S. Sarbanes Transit in Parks program grants to replace the ferry docks.
- Acadia National Park implemented a multi-agency, intermodal center with partial funding from the Paul S. Sarbanes Transit in Parks program.
  - *http://www.maine.gov/mdot/agc/Documents/pdf/phase2&3/AGCFinalPreliminaryDesignReport2012_12_21.pdf*
  - *http://www.maine.gov/mdot/mainedotnews/agc12182009.htm*
  - *http://www.maine.gov/mdot/agc/phase1/index.htm*
- Acadia and Zion both received Paul S. Sarbanes Transit in Parks grants for new bus stops.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine the need for mitigation. In order to quantify the effectiveness of this tool on improving congestion, the data collection from tier 2 and/or 3 should be repeated. However, each tool has specific performance measures that can quantify effectiveness. For this tool, examples include:

- Number of visitors switching from personal vehicle to alternate mode.

Additional Resources

- Tusayan Transit Shelter Design Project - *http://cpcesu.nau.edu/current/documents/TusayanTransitSheltersFinalReportwAppendices.pdf*
- Cape Canaveral National Seashore Shelter Project - Etic document #206551 (May 2003), Etic document #178297 (Feb. 2004), Etic document #D394-215842 (July 1, 2008), and Etic document #4064-215858 (July 16, 2008) found at *http://etic.nps.gov*

SOLUTION/TOOL: New or Expanded Park-and-Ride Facilities (Including Promotion)
TYPE: Public Transportation

PT 5

General Description

Park-and-ride facilities allow visitors to leave their car and travel through the national park via transit. This allows for protection of resources due to decreasing the need for parking outside of designated areas, increased visitor experience when interpretation is provided on the transit, decreased traffic congestion by removing vehicles from the roadway, and increased parking availability. Park-and-ride facilities can be located in the gateway community (such as Grand Canyon and Muir Woods) and in the park/unit itself (such as Rocky Mountain).

However; even the best planned and designed park-and-ride facility will not be successful without effective marketing. The marketing activities need to be exceptionally robust when the park-and-ride operation is first implemented and then must remain strong thereafter.

The most important part of any promotion is to ensure that a consistent message is provided and that the information is timely, accurate, and reliable. One way to ensure that a consistent message is provided is to have a communications staff member who can develop press releases as well as presentations and provide "train the trainer" events for unit staff as well as in the local gateway community for businesses and lodging establishments. If the park/unit does not have staff for these activities, the chamber of commerce or local business association can often assume these responsibilities, working as partners with the park/unit.

The messages provided should ensure that visitors understand any fees that exist (e.g., bus fare, parking fees, entrance fees, etc.); where/how to pay these fees; which public transportation routes to use/times available; and how to get around the park/unit once there.

This information can be promoted through the use of other tools listed in this toolbox such as: dynamic/variable message signs (see ES-5), 511 traveler information phone number (see ES-1), websites (see VDM-14) and media/social media (see VDM-5). Park-and-ride information can also be published in the park/unit's newsletter, static signs for the park-and-ride lot, "rack cards" which can be placed at local hotels and in the bus itself, and by word of mouth at visitor centers at the park/unit and in the gateway community.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Visitors using park-and-ride facilities will create less demand for parking spaces in congested areas.
- Park-and-ride facilities promote mode shift to transit therefore decreasing the number of personal automobiles.

CONS

- While addressing traffic congestion, park-and-ride facilities may allow more people to access an area. For example, a trail head or visitor center which used to have access limited by the number of parking spaces available, will now be available to not only those parking in the area, but also those parking off site and riding public transportation. This could affect the resources and the carrying capacity of those locations in negative ways (pulsing of people arriving at attractions, visitor centers, etc.).
- It may be difficult to verify visitors have paid an entrance fee if they come through the entrance gate in a bus, so alternative payment systems need to be provided.
- Further, if more people ride the transit system, the same consequences that occur for a transit service may occur (such as pulsing of people arriving at attractions, visitor centers, etc.).
- It should also be noted that just informing the public of a park-and-ride may not be enough for them to use it, incentives such as interpretative information available on public transportation or cost savings for parking or reduced entrance fees may need to be offered.

GENERAL

- Park-and-ride capacity needs to be larger than the capacity of the parking lot it is replacing since the parking duration at a park-and-ride is longer due to travel time.
- The location of the park-and-ride facility may change how visitors access/use the visitor center. To address this, the park/unit will need to work with interpretive staff.
- Incentives and marketing efforts must be implemented to push users/visitors to these park-and-ride lots, and the associated alternative modes.
- Ensure that a consistent message is provided and that the information is timely, accurate, and reliable.

Coordination/Partnerships

This tool will require close coordination and partnership with the gateway community if the park-and-ride will be located there. It will also require close coordination and partnership with the transit provider. For the promotion aspect, partnerships will be needed with chamber of commerce, local business association, visitor centers in the gateway community, local businesses and lodging establishments, and media.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is longer term (3 to 6 years).

Creating a new park-and-ride will take years for land acquisition, planning, engineering/design, and construction. Promotion of park-and-ride lots through a media/social media campaign can be implemented in a short time. Implementing a promotional campaign using dynamic/variable message signs (see ES-5) may take longer, unless the park already owns or leases dynamic/variable message signs.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2005 and 2010 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

Of the total cost, the design/construction portion averages $4,000 to $5,000 per parking space for a surface lot[4]. For example, Grand Canyon National Park park-and-ride cost around $4700 per parking space[5]. Costs vary by type of facility. Multi-level, above grade, or below grade facilities will cost significantly more than a surface lot.

The promotional costs vary depending on the methods used. For some of the methods such as social media and "train the trainer" the majority of the cost will be staff salaries; however, there will also be costs associated with printing promotional materials. The costs associated with a dynamic/variable message sign are provided in tool ES-5.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include $400 per space annually for items such as cleaning, lighting, maintenance, repairs, security services, landscaping, snow removal, fee collection, enforcement, insurance, labor and administration[6]. Operating costs for promotion will include staff time to continually keep promotional materials updated and distributed, as well as, printing costs for promotional materials.

Examples of Implementation

- Rocky Mountain National Park has a park-and-ride lot in the park along Bear Lake Road, at the fairgrounds in Estes Park, and plans to build a second multi-level lot at the visitors' center in Estes Park. For promotion, Rocky utilized their website, dynamic/variable message signs, highway advisory radio, "rack cards," press releases, the unit newsletter, and presentations in the gateway community to promote multiple park-and-rides as part of the Bear Lake Road construction mitigation in 2011 and 2012. The park and ride concept was so successful that the Town of Estes Park received a grant to create a three story parking garage where the surface lot is now located at the town visitor center.
  - *http://www.nps.gov/romo/planyourvisit/shuttle_bus_route.htm*
- Grand Canyon National Park has a park-and-ride lot in the gateway community of Tusayan.
- Yosemite National Park has park-and-ride lots in Curry Village and Yosemite Village.
- Muir Woods National Monument has a park-and-ride lot off Highway 101 called the Pohono park-and-ride lot and a second at the Sausalito ferry terminal. A dynamic variable messages sign has been used to promote the Muir Woods shuttle and park-and-ride lots.
  - *http://www.nps.gov/muwo/planyourvisit/directions.htm*
- Bryce Canyon also has park-and-ride lots outside the park including the shuttle staging area (near Ruby's Inn) and Ruby's campground.
- *http://www.nps.gov/brca/planyourvisit/shuttle.htm*

Additional Resources

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Calculation of parking lot occupancy.
- Shuttle ridership counts from park-and-ride.

Additional Resources

- Contact the park/unit's National Park Service region's transportation coordinator or the Denver Service Center as an additional resource.
- Park and Ride information - *http://www.vtpi.org/tdm/tdm27.htm*
- Park and Ride Planning and Design Guidelines - *http://www.pbworld.com/pdfs/publications/monographs/spillar.pdf*

- Leveraging social media – ***http://www.nationalrtap.org/Resources/ResourceSearchResults.aspx?org=a2GSpnDbruI=&query=leveraging%20social%20media***
- Use of social media in public transportation (TCRP Synthesis 99) - ***http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_99.pdf***

SOLUTION/TOOL: **Rail**
TYPE: **Public Transportation**

PT 6

General Description

In a national park setting, rail is generally utilized in two ways (1) for visitors to access the park/unit such as with commuter rail, subways, or Amtrak service, and (2) as part of the visitor experience of moving within the park/unit on a tour.

In some parks, such as Yellowstone National Park, visitors originally accessed the park/unit by rail. Now, the majority of visitors to most parks arrive via private automobiles (or other vehicles). By working with partners, it may be possible to reestablish rail access in parks/units that once had such access or as a new way to access parks/units.

This is a very complex tool that should only be considered in special circumstances.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Rail service can potentially increase passenger throughput and decrease traffic congestion by relocating visitors from their private automobiles to rail transport.
- Rail may be seen as higher quality service than a bus due to being more comfortable, faster, and the provision of more options (such as a bathrooms and a food car).
- Rail can provide energy and emission reduction benefits depending on the propulsion method.
- Rail use is a great option for non-drivers and those who do not own a car.

CONS

- Even if a local rail service exists, it is not typically as easy to add a stop or adjust a route to include the park/unit as it would be with a bus/shuttle. This is due to the infrastructure required to implement rail service[18]."
- Rail service generally requires public subsidy as the revenues tend to not equal the cost of the system.
- Consider total cost of ownership over a 20 year term, rail is expensive to operate and maintain on an annual basis, and recapitalization cost are high[22].

GENERAL

- Having a shuttle within the park/unit can make it more feasible for visitors to arrive at the park/unit via rail because then they have a way to continue their visit within the unit without a private automobile.

Coordination/Partnerships

Coordination will be needed with the local transit/rail agencies, the local gateway community, Amtrak, and/or other rail service providers. Working with local transit agencies to further connect visitors from rail stations to park/unit sites also may be needed.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from longer term (3 to 6 years) to beyond 6 years.

Generally it will take years to decades to plan and implement rail service. The time to implement service will be shorter if existing infrastructure exists and can be used or rehabilitated for use. Another time savings would be to purchase or lease of rail cars from an existing local service.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2005 and 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

Costs will vary depending upon the scope of the project and whether or not there are existing facilities and/or infrastructure.

Of the total costs, the design and construction portion range from $3.5 million per mile to $44 million per mile with increases in cost for electric versus non-electric, terrain changes from plains to mountains, and land use from rural to urban26. The costs to implement a rail service with existing infrastructure will cost approximately $1.25 million per mile to purchase existing track and $250,000 per mile to rehabilitate the track. Station rehabilitation is around $1.5 million. The cost of a used rail car ranges from $20,000 to $250,000[27].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include fuel and oil; repairs and maintenance; staff time for managing sales, operating the equipment, and maintaining the equipment; insurance; and marketing. Cuyahoga Valley National Park operating expenses were $2.4 million in 2010 and $2.8 million for 2011[27].

Examples of Implementation

- Cuyahoga Valley National Park has a railroad through the park which provide access to park sites and tours. A comprehensive study was recently completed to provide recommendations for adjustments to the existing system. Cuyahoga also promotes a bike on board program with one rail car specifically designated for bicycles.
  - *http://www.nps.gov/depo/planyourvisit/feesandreservations.htm*
- Lowell National Historical Park uses trolleys to tour the park sites. In 2002, a study was conducted on the feasibility of replacing the trolleys with a light rail system. The park also promotes accessing the visitor center via commuter rail. The Lowell system is both for congestion and visitor experience.
  - *http://www.volpe.dot.gov/transportation-planning/public-lands/lowell-national-historical-park-historic-trolley-planning-study*
  - *http://www.nps.gov/lowe/planyourvisit/publictransportation.htm*
- Visitors can access Grand Canyon NP by rail from Williams, AZ. This system provides both access and visitor experience.
  - *http://www.thetrain.com/*
- Visitors can access Big South Fork National Recreation Area by rail from Stearns, KY. This system provides both access and visitor experience and contributes to reducing

crowding in the parking area and carries bikes creating a nice one-way bike experience. This type of tool is appropriate for a national recreation area which has emphases on different activities than a national park.

- *http://www.bsfsry.com/*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Number of visitors using rail.

Additional Resources

- Planning methodology for rail construction costs - *http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1392&context=etd*
- National Association of Railroad Passengers - *http://www.narprail.org/resources/links/state-passenger-rail-groups*
- Association of American Railroads - *https://www.aar.org/Pages/Home.aspx*
- Rail resources - *http://www.apta.com/resources/reportsandpublications/Pages/Rail.aspx*
- Evaluation of the benefits of rail travel - *http://www.vtpi.org/railben.pdf*

SOLUTION/TOOL: **Reserved Travel Lanes for Transit Operation**

TYPE: **Public Transportation**

PT
7

General Description

In a national park setting, one reason for implementing transit is to decrease traffic congestion. However, the transit service (buses) may get stuck in the same traffic as the private automobiles if alternative or exclusive routes/travel ways are not provided for the transit vehicles. This can cause delays and unpredictability in the schedule of the buses/ shuttles. One way to avoid this is to have reserved travel lanes for transit.

Implementation for this tool in a national park setting is very underdeveloped. Creation of a transit-only lane would likely require either a road expansion as most park roads are relatively narrow (expensive and resource intensive) or a re-evaluation of park circulation patterns such as a one-way loop. The only known examples of transit-only lanes in national parks exist an entrance stations (see AC-2).

Another option may be to allow buses to travel on shoulders during times of congestion (such as on the interstate in St. Paul, MN)[28]. However, this creates a variety of concerns related to safety and cross traffic control, and the shoulder has to be wide enough to accommodate the buses.

This is a highly specialized tool that should only be considered in special circumstances.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- [ ] Gateway Communities
- [x] Park Entrances/Entrance Stations
- [ ] Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- [x] Roadways within the Park
- [x] Roadways Providing Access to the Park (outside the park boundaries)
- [ ] Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- [x] Additional Capacity (by building or creating more space for vehicles)
- [x] Alternative Modes (by implementing improvements or promoting use)
- [x] Demand Management
- [ ] Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Reserved transit travel lanes allow transit to avoid the traffic congestion caused by private automobiles and other motor vehicles; therefore, decreasing the travel time for the buses.
- Reserved transit travel lanes can provide congestion-free routes for emergency vehicles.

CONS

- If the reserved transit lanes are only available at the entrance station, congestion at the main entrance gate lines could back-up far enough that those using the reserved transit lane still have to wait until they can access the faster lanes due to geometric constraints.
- Using shoulders or decreasing current lane widths to allow for reserved transit lanes without reconstruction may be possible, but safety analysis will be needed[11].
- Adding travel lanes for transit will typically widen the footprint of the transportation corridor and environmental analysis will be required to determine that the improvements won't negatively impactwildlife and other resources.

GENERAL

- Reconstruction of a roadway to include transit-only lanes will require an environmental assessment or environmental impact statement.

- The method for delineating the reserved lanes can determine how effective the lanes will be. Providing barriers such as curbing or planting strips to separate the reserved lane is more effective than simply painting the lanes[29].

Coordination/Partnerships

Coordination will be needed with the gateway community, the local transit agency, the local transportation agency if the roadways are outside the park's/unit's jurisdiction, and the regional federal lands highway office.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from near term (1 to 3 years) to longer term (3 to 6 years).

The time to implement reserved travel lanes for transit will depend on the size of the area and the existing roadway width and structure. For example, deploying at an entrance station will take less time (1 to 3 years) than reconstructing roadway throughout an entire park/unit (3 to 6 years). Less time will be needed if roadway width is sufficient to add a separate lane or if abandoned tunnels or rail trails can be used instead of constructing additional width.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

The costs associated with adding a limited access only lane at an entrance are provided in tool AC-2. The costs associated with increasing road capacity are provided in tool AC-5. The cost is significantly less if utilizing existing shoulders, or adding a lane by narrowing the existing lanes through re-striping.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include restriping roads; repaving or resurfacing; patching potholes; snow removal; sand application and removal; and other maintenance.

Examples of Implementation

- There are no known examples in a national park setting.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Number of riders on transit.
- Reduced travel time for transit.

Additional Resources

- Federal Highway Administration's Managed Lanes Website/Resources - *http://ops.fhwa.dot.gov/freewaymgmt/managed_lanes.htm*
- Minnesota Department of Transportation discusses buses on shoulders - *http://www.dot.state.mn.us/metro/teamtransit/docs/bosupdate.pdf*
- North Carolina Department of Transportation allows buses to operate on roadway shoulders - *http://www.ncdot.gov/nctransit/boss/*
- Park road standards - *http://www.wfl.fhwa.dot.gov/resources/design/library/park-road-std.pdf*

SOLUTION/TOOL: **Ridesharing/Vanpools**
TYPE: **Public Transportation**

PT 8

General Description

Increasing the number of people per vehicle can help decrease congestion by removing personal vehicles from roadways and entrance stations. Two ways to accomplish this is by having people rideshare (carpool) or vanpool, therefore filling seats that otherwise would have been unoccupied. Carpools (or carpooling) are typically connected with ridesharing using cars/privately owned automobiles, whereas vanpools are ridesharing in vans (often 13-15 passenger vans) that are purchased, leased, or rented specifically for ridesharing. Carpools/vanpools can originate either from a personal residence or from a centralized meeting place such as a park-and-ride (see PT-5). Organization of a carpool/vanpool can be accomplished by an individual through social media (see VDM-5) or through specific carpooling software or websites.

Ridesharing, carpooling, and vanpooling are typically used in urban as congestion management techniques for commuters and incentivized by employers; however, these techniques can also be effective in a recreation setting for visitors, employees and concessionaires to decrease vehicular congestion.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Increasing the occupancy (number of visitors) per vehicle through ridesharing/carpooling (filling seats that otherwise would have been unoccupied) can help decrease congestion by removing personal vehicles from roadways and entrance stations.
- Ridesharing and vanpooling can decrease environmental impacts by reducing pollution and other effects of single occupant vehicle use and can save employees/concessionaires money.
- Ridesharing and vanpooling are both great options for non-drivers and those who do not own a car.

CONS

- Simply setting up a ridesharing and/or vanpooling system is not enough to get drivers to leave their private automobiles. Changing visitor behavior will often require the promotion of ridesharing/vanpooling and/or offering incentives such as discount coupons or reduced fees or preferred parking spaces.
- Using ridesharing or vanpooling does not allow drivers the same flexibility as a personal vehicle in both the ability to access sites on their own schedule and to bring all of their personal equipment with them.

Coordination/Partnerships

Coordination will be needed with vanpooling companies and with local agencies that provide ride matching services such as transportation management associations, transit agencies, and community transportation organizations.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

The time to implement ridesharing services (carpooling and/or vanpooling) will depend on whether or not those services are already available in the area (gateway communities) near the park. If so, ridesharing to the park could be implemented almost immediately. If no services exist, then software programs and vehicles will need to be procured, and the ridesharing options will need to be marketed to visitors, employees, and concessionaires.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total costs, the procurement costs for a computerized ridesharing software can range from $25,000 to $80,000 (depending upon geographic coverage and other features) and for purchasing of vans typically cost $40,000 to $60,000 for 13-15 passenger vans (depending upon options and engines).

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff salaries (which will be higher if a manual ride matching program is implemented); software updates for automated ride matching; fuel; insurance; promotional materials; and repair and replacement parts for vehicles.

Automated solutions will likely have a higher capital cost, but may have a lower annual operating cost. If vanpooling is implemented, operating costs are typically incurred by those riding in the vanpool, unless the park chooses to subsidize the vanpool program.

Examples of Implementation

- The National Park Service supports carpooling.
  - *http://www.nps.gov/climatefriendlyparks/involved/resources/staffvehicles.html*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Vehicle occupancy.
- Number of employees ridesharing.

Additional Resources

- How to find a rideshare - *http://www.offthegridnews.com/2012/04/03/how-to-find-a-ride-share/*
- Ridesharing - *http://www.vtpi.org/tdm/tdm34.htm*
- Ridesharing as a Complement to Transit - *http://www.tcrponline.org/PDFDocuments/tsyn98.pdf*
- General information about vanpools and where to find existing vanpools - *http://www.vpsiinc.com/Home/index.asp?OID=261*

SOLUTION/TOOL: Transportation Technology Applications
TYPE: Public Transportation

PT 9

General Description

Transit technology applications can include automated vehicle location systems (AVL), which are electronic systems that focus on tracking buses through GPS; automated passenger counting (boarding) systems; systems that automatically track maintenance issues; in-vehicle electronic information such as stop annunciation and electronic display boards; and transit status signs to provide users with bus arrival times (often referred to as "next bus" signs). These features can help to encourage visitors to use buses/transit services for access to/from and within parks/units, and they can make transit use more efficient and effective.

This tool can be a very complex technique to deploy in a national park setting.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Real-time GPS bus tracking/mapping (automatic vehicle location) allows the capability to tell visitors when the next bus will arrive, which can make a service successful by reducing wait time perceptions and allows visitors to better plan their time at a site.
- Automated vehicle location can improve the efficiency and performance of a transit system as information can be collected and analyzed in regards to schedule timing.
- Automated annunciation can improve a visitor's experience, as information is provided as to the current bus/shuttle stop.
- Systems that monitor engine performance can identify maintenance issues before they result in on-road equipment failure.
- There may be opportunities to combine the function of automated systems with conveying visitor information and interpretation.

CONS

- Portions of this technology will require electricity onsite. If these locations are remote and do not currently have electricity, this is a complex process.
- Portions of the technology will require communications which may not be available or may have a weak signal due to the landscape.

- For a small fleet, the benefits of transit technology may not outweigh the costs.
- As with any technology, operation and maintenance of the systems requires learning each technology, and how they may be integrated into the vehicle and transit/shuttle service.
- This technology can contribute more to increasing a visitor's comfort level and satisfaction with a transit system than to increasing a transit system's effectiveness.
- This tool will require having specialized IT staff at the park/unit to monitor the automated vehicle location system and GPS applications.

Coordination/Partnerships

Coordination will be needed with the gateway community, the local transit agency, the park's transit provider, and the park interpretive plan.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this is near term (1 to 3 years).

The time to implement transit technology applications will depend on which options are selected. Stand-alone systems such as automated passenger counters will take less time to deploy then a fleet maintenance tracking which requires equipment on the vehicles as well as hardware and software to analyze the data. It will take more time if communications and electricity need to be installed.

Cost/Financial Information

(Life cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital costs, the procurement portion includes in-vehicle automated annunciation or electronic display boards (around $4,000 per vehicle), automated vehicle location systems that track a vehicles location ($500 to $2,500 per vehicle), transit status signs ($4,000 to $8,000 per location), real-time processing hardware and software necessary for analyzing the vehicle locations ($10,000 to $1,000,000), passenger counting technologies ($1,000 to more than $10,000 per vehicle), mobile data terminals for maintenance tracking ($1,500 and $5,000 per vehicle), vehicle diagnostics ($2,000 per vehicle), and a computer aided dispatch system for analyzing the data ($25,000 for a small fleet system)[3]. There will also be costs associated with upgrading transit stops with the appropriate shelters and with utilities.

A park/unit may be able to negotiate the use of transit technology applications into a contract when procuring shuttle/bus services. Many contractors may already be utilizing some of these technologies, as it makes their services more efficient (capturing the benefits noted herein).

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time, repair and replacement parts for technology, software updates, and utility costs.

Examples of Implementation

- Acadia National Park implemented two way voice communications on their transit (Island Explorer), automated vehicle location, arrival sign systems, an automated annunciator system, passenger counters, and a traveler information system.
  - *http://www.exploreacadia.com/satellites.htm*
  - *http://ntl.bts.gov/lib/jpodocs/repts_te/13196.pdf*
  - *http://ntl.bts.gov/lib/jpodocs/repts_te/13861/13861.pdf*
- Yosemite National Park produced an RFQ for automated vehicle location systems and arrival status signs for their transit system in 2011.
  - *https://www.fbo.gov/index?s=opportunity&mode=form&id=ad553bc14ffb459abeaf5a16de306124&tab=core&_cview=0*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Ridership.
- Reduced vehicle down time for maintenance.

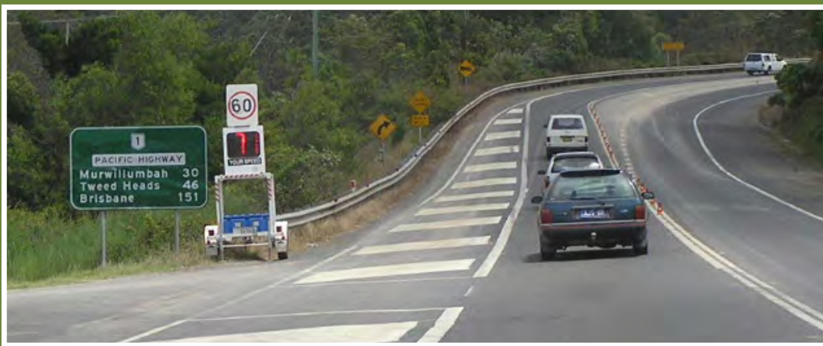
Additional Resources

- AVL Systems for Bus Transit: Update - *http://www.tcrponline.org/PDFDocuments/tsyn73.pdf*
- Automated Passenger Counting Systems - *http://publictransport.about.com/od/Transit_Technology/a/Automated-Passenger-Counting-Apc-Systems-How-Do-They-Work.htm*

SOLUTION/TOOL: **Acceleration/ Deceleration Lanes**

TYPE: **Traffic Operational Improvements**

TOI 1



General Description

Traffic flow in parks can be influenced by the speed of vehicles, which is affected by factors such as site seeing, turning movements, as well as the grade (or steepness) of roads.

Acceleration/deceleration traffic lanes, also known as “climbing” or “passing” lanes allow faster moving vehicles to use a separate lane to pass slower vehicles. The separation of slower vehicles from the traffic stream allows for greater capacity on roads especially at steeper grades where vehicles such as recreational vehicles will have a more difficult time in maintaining their speed.

Acceleration/deceleration lanes are commonly used in urban areas to manage congestion related to speeds on steep roads. It should be noted that increasing speed and efficiency is not the focus of parks. Taking that into account along with the fact that adding a lane to a roadway through reconstruction is a complex undertaking in a park, this is a tool that should only be used in special circumstances.

Roadway pull-outs or turn-outs (see TOI-13) are sometimes implemented as lower cost alternatives to construction of climbing or passing lanes (see AC-5).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- [ ] Gateway Communities
- [ ] Park Entrances/Entrance Stations
- [ ] Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- [x] Roadways within the Park
- [x] Roadways Providing Access to the Park (outside the park boundaries)
- [ ] Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- [x] Additional Capacity (by building or creating more space for vehicles)
- [ ] Alternative Modes (by implementing improvements or promoting use)
- [ ] Demand Management
- [x] Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Acceleration/deceleration lanes can separate slow moving vehicles from the traffic flow (for a segment of the roadway), and improve the overall flow of traffic, especially on roadways with steep grades.
- Acceleration/deceleration lanes are especially valuable in parks/units that have a significant number of recreational vehicles because these motorists often have a hard time maintaining speeds on roads with steep grades (slopes).

CONS

- Adding acceleration/decelerations lanes means adding new lanes to park roads, which need to be carefully designed to avoid or minimize impacts to natural resources.
- Adding lanes to roadways can be an expensive option. It may be possible to get a similar affect by creating pull-outs or turn-outs (see TOI-13) instead.
- Adding acceleration lanes can lead to excessive speed. The perception is that roadway capacity is greater and therefore the design speed is greater. This has the opposite effect of traffic calming measures.

Coordination/Partnerships

Coordination will be needed with the local gateway community and local and/or state department of transportation if the lanes are added outside of the park; and with the appropriate federal lands highway division if the lanes are added inside the park. If roadway prism is enlarged, close coordination with natural and cultural resource staff is required to maintain a balance of visitor access and preservation.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from longer term (3 to 6 years) to beyond 6 years.

Adding an acceleration/deceleration lane can take a significant amount of time, given that these lanes are often added in areas with significant road grades (slopes). Adding lanes typically will require planning, design, environmental review, and construction over a multiple year process. The only instance where this may not be the case is if there is a roadway with an adequate shoulder that could be converted to an acceleration/deceleration lane.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

Of the total capital cost, the design and construction of a lane in a rural setting is $1.6 million to $3.1 million per lane-mile; however, in an environmentally sensitive area, the costs could be larger and range from $5.8 to $9.9 million per lane-mile[11]. The cost is significantly less if only utilizing a shoulder, or adding a lane by narrowing the existing lanes through re-striping.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications include restriping roads; repaving or resurfacing; patching potholes; snow removal; sand application and removal; and other maintenance.

Examples of Implementation

- Mount Rainier National Park has acceleration lanes in some steep sections of the road.
- Zion National Park has implemented pull-outs (TOI-13) versus acceleration lanes for RV's and other vehicles that have difficulty maintaining speeds on the steep grades leading up to the tunnel. The pull-outs give the added advantage of safer locations for picture taking and enjoying the scenery.
- Parks contemplating the addition of acceleration/deceleration lanes includes: Petersburg National Battlefield and Fredericksburg & Spotsylvania National Military Park.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Better traffic flow on roadways with significant grades/slopes.
- Increased capacity and speed on roadway sections with a significant grade/slope.

Additional Resources

- Texas A&M Transportation Institute - *http://www.triptac.org/Help/http://mobility.tamu.edu/mip/strategies_pdfs/added-capacity/technical-summary/Acceleration-Deceleration-Lanes-4-Pg.pdf*
- Utah DOT Document - *https://www.udot.utah.gov/main/uconowner.gf?n=9711832185598340*

SOLUTION/TOOL: **Access Management**

TYPE: **Traffic Operational Improvements**

TOI 2

General Description

Access management includes a set of techniques that a park/unit, as well as state and local governments can use to control access to and along highways, major arterials, and other roadways. The benefits of access management include improved movement of traffic, reduced crashes, and fewer vehicle conflicts. Access management also can be beneficial to pedestrians and bicyclists by reducing the amount of conflicts (such as driveways) along their route.

In a park, for example, there may be multiple entrances and exits to large parking lots, visitor centers and other attractions. Vehicular congestion can sometime occur because there are simply too many access points (entrances and exits) off a roadway. Access management allows for controlling these points (closing or moving some, etc.) to improve traffic flow. Access management is more commonly used in urban areas.

This tool would also be appropriate as a short term pilot project.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

- Access management can reduce the number of “conflict points” along a roadway improving traffic flow and reducing potential accident situations.
- The access management process should start with analysis of the number of access points along the roadways in the park/unit.

PROS

- Access management can be one of the more simple approaches for reducing traffic “conflict points” and increase traffic flow (such as reducing congestion).
- A good access management plan can help improve safety on roadways and access points along roadways.
- Implementing access management solutions can be relatively inexpensive, such as using boulders or other natural materials to close a parking lot entrance/exit or other access point. Reducing access points in large parking lots can improve flow and increase the number of parking spaces.
- Reduced vehicle access points can be beneficial to pedestrians and bicyclists by reducing the crossings and conflict points along their route.

CONS

- Reducing the number of access points to a parking lot, visitor center, etc., may cause more congestion at the remaining access points.
- Access management may require a comprehensive review of all access points within a park/unit, and may require additional infrastructure (such as turning lanes (see TOI-6), additional pull-outs (TOI-13), and improved traffic control devices (see TOI-8)) to be effective.
- Adding new pull-outs (TOI-13) as access management can reduce vehicle conflicts by having pullouts designated right-in/right-out. This will eliminate left turns and reduce accident situations but may result in the need for additional pull-outs on the opposite side of the road.

Coordination/Partnerships

Depending upon the access management solutions to be implemented, coordination may be necessary with gateway communities, the local and/or state departments of transportation, and/or the regional Federal Land Highway Division.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

Analyzing and implementing basic measures (such as closing an entrance or exit to a parking lot or restriping) will take less time than a comprehensive access management review and implementing infrastructure improvements such as improving traffic control devices, adding new pullouts, or added turning lanes.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Capital costs will vary depending upon the exact measures used to implement the access management solution and upon how many access points will need to be closed or otherwise modified.

Of the total capital costs, the construction/implementation portion is estimated at less than $10,000 per location.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include yearly repair and replacement of materials used to close/move access points for parking lots, snow removal so visitors can see closures materials, and staff time for additional enforcement of new access patterns.

Examples of Implementation

- The parking lot at Jacob Riis Beach in Gateway National Recreation Area has several entrances as part of its historic design. The secondary ones are closed and only the main one is used now. This change was most likely implemented a long time ago, in part for safety reasons and in part for revenue control reasons.Harpers Ferry evaluated adding shuttle routes to distribute visitors to other areas of the park. This study was documented in an alternative transportation study conducted in 2011 by a National Park Foundation transportation scholar.

- Florida Department of Transportation
  - *http://www.dot.state.fl.us/planning/systems/sm/accman/pdfs/ampromo3.pdf*

- Atlanta Regional Commission.
  - *http://www.atlantaregional.com/transportation/roads--highways/access-management*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Reduction in congestion (delays) in and around access points (parking lots, visitor centers, etc.) where access management has been implemented.

Additional Resources

- Federal Highway Administration - ***http://www.ops.fhwa.dot.gov/access_mgmt/resources.htm and http://ops.fhwa.dot.gov/publications/amprimer/access_mgmt_primer.htm***
- Institute of Transportation Engineers - ***http://www.ite.org/technical/IntersectionSafety/access.pdf***

SOLUTION/TOOL: Animal Vehicle Crossings
TYPE: Traffic Operational Improvements

TOI 3

General Description

Interactions between motorists and animals can cause congestion in three ways. First, animal-vehicle collisions can result in an animal carcass and/or a disabled vehicle in the roadway. Second, motorists may stop along a roadway to view wildlife at locations along the main highway where there are inadequate shoulders or pullouts (sometimes referred to as animal jams). Third, animals moving slowly will cause traffic to stop and wait for the animal to cross the roadway.

There are a myriad of solutions for animal-vehicle conflicts including a temporary road closure during migration season (refer to Additional Resources at the end of this tool description for a link to the Report to Congress, which provides an extensive list of solution types). Although most solutions focus on only solving animal/vehicle collisions, this tool recommends providing separated crossings for wildlife to move over or under the roadway, which solves all three issues. Because wildlife viewing is important to visitor experience, this should only be implemented in areas where the level of traffic or lack of pull-outs causes a regular, significant congestion impact.

Wildlife crossing structures can be overpasses or underpasses and can vary in width (roadway length) from a few meters (such as a box culvert) to 50 meters or wider. Earth berms and terrain can be used to hide the view so animals are not hindered from crossing by the sight of vehicles and to prevent motorists from seeing the animals and stopping at the wildlife structure where it may be unsafe to stop. These structures are typically combined with wildlife fencing to funnel animals to the structure.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Reduces animal vehicle collisions.
- Improves connectivity for animals across roadways where traffic volumes are high enough to create a barrier to animal movements.
- Reduce animal jams.
- Reduce delays from vehicles waiting for animals to cross roads.

CONS

- Eliminates viewing of wildlife from roadway.
- Fencing associated with crossing structures on lower-traffic roadways can increase the barrier effect for animal movement.

GENERAL

When implementing animal crossing mitigations, consider the following:

- Wildlife guards can be used to keep animals from getting into the roadway through gaps where approach roads cross the fence.
- Various fencing end treatments can be used to minimize animals getting into the fenced road corridor by going around the end of the fence.
- For animals that do get trapped in between the fence and are stuck on the roadway, provide one-way escape opportunities for animals such as jump-outs.
- Consider vegetation and cover throughout the crossing structure to encourage animal use.
- Dual use crossing structures can reduce overall costs. For example, adding a little length to a bridge over a waterway can create enough room for animals to pass under the roadway.
- If the crossing is a vehicle bridge with wildlife access underneath, the structure must be included in the FLHP bridge inspection program and will require regularly scheduled maintenance of the structure.

Coordination/Partnerships

Non-profit advocacy groups with a wildlife mission may be able to provide financial or other support for implementing and maintaining the structure. If the roadway is outside the park/unit, coordination would be needed with the local and/or state transportation agency or regional federal lands highway division.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from near term (1 to 3 years) to longer term (3 to 6 years).

Design, environmental review, and construction can take years depending upon the size and location of the crossing.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

Of the total capital cost, the construction/implementation portion is $100,000 for a small box culvert (but this may not be very ecologically viable) and $1 to $2.5 million for a typical structure designed for wildlife (50 meters wide or wider including the road length they span). The design life of these structures is typically 30-50 years[30].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include a good fence maintenance program, regularly scheduled bridge maintenance and regular bridge inspections.

Examples of Implementation

- Banff National Park Alberta, Canada has constructed wildlife underpasses, overpasses, and fencing.
  - *http://www.pc.gc.ca/eng/pn-np/ab/banff/plan/transport/tch-rtc/passages-crossings.aspx*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Increased number of animals using crossing.
- Reduced number of animal vehicle collisions.

Additional Resources

- Wildlife Vehicle Collision Reduction Study: Report to Congress - *http://http://www.fhwa.dot.gov/publications/research/safety/08034/*
- Wildlife Vehicle Collision Reduction Study: Best Practices Manual - *http://www.westerntransportationinstitute.org/documents/reports/4W1096_Best_Practices_Manual.pdf*
- Wildlife Crossing Structure Toolkit - *http://www.cflhd.gov/programs/techDevelopment/wildlife/documents/01_Wildlife_Crossing_Structures_Handbook.pdf*

SOLUTION/TOOL: Complete Streets (Policy & Facilities)

TYPE: Traffic Operational Improvements

TOI 4

General Description

A “complete street” is a street that is a safe, comfortable, integrated transportation network for all users (and modes), regardless of age, ability, income, ethnicity, or mode of transportation. Complete streets are achieved both by having a policy (or policies) that encourage them, as well as having the infrastructure/facilities that serve all modes of transportation.

“A complete street may include: sidewalks, bike lanes (or wide paved shoulders) (see TOI-10), special bus lanes (see PT-7), comfortable and accessible public transportation stops (see PT-4), frequent and safe crossing opportunities, median islands, accessible pedestrian signals, curb extensions, narrower travel lanes, roundabouts, and more[31].” A complete street in a rural area will look significantly different than that of an urban area.

Implementing a complete street can reduce congestion by making it safer and more convenient for visitors to choose multi-modal transportation options (such as walking, bicycling, and transit); make existing roads more efficient; and therefore adding capacity to the existing roadway.

In a park setting, this would mean that the park would have policies in place that the streets (roadways) can be used by multiple modes (transit, cyclists, and pedestrians) in addition to automobiles. Further, the park would make sure that its streets/roadways are constructed as “complete streets”.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Transportation modes such as cycling, walking, and transit have the ability to use the “complete streets” within the park/unit, which can reduce congestion on roadways and enhance the visitor experience.
- Complete streets policies focus on users of all ages and abilities, which addresses provisions of the Americans with Disabilities (ADA) and other equity considerations.

CONS

- Implementing complete streets requires initial planning, design, and budgeting for full roadway improvements, and may require parks/units to add shoulders to roadways or construct separated pathways for cyclists and pedestrians.
- Implementing complete streets concepts may require additional infrastructure (such as paths and trails) that need to be carefully designed to avoid degrading the resources that the park/unit is trying to protect.

GENERAL

- Complete streets principles are often thought of as an “urban” issue, but can be implemented in rural areas, including national parks. Complete streets policies focus on users of all ages and abilities, which addresses provisions of the Americans with Disabilities (ADA) and other equity considerations.

Coordination/Partnerships

Coordination will be needed with the gateway community, local and/or state departments of transportation and/or the regional Federal Lands Highway Division, depending upon where the complete streets will be implemented.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

Implementation of a complete streets policy will take years, based upon necessary studies and processes that the park/unit has adopted for other policies (including public comment). Implementing complete streets infrastructure will vary depending upon items that will be implemented (such as separated pathways, sidewalks, or trails) and including time for planning, design, environmental review, and construction.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from high ($100,000 to $250,000) to higher (above $250,000).

The majority of cost for implementing complete streets is related design and construction of relevant infrastructure. Costs will vary depending upon the scope of the project and what facilities and/or infrastructure are implemented.

A planning study for complete streets policy can range from $150,000 to $500,000 depending on the size of the park/unit.

Of the total capital cost, the construction portion for sidewalks and pathways is $100 to more than $200 per linear foot (for a 10-foot wide path). These costs can vary significantly depending upon the grade (slope) of the roadway, or if culverts or pedestrian/bicycle bridges have to be added to cross creeks, or other natural features. Costs may be lower if a bike lane can be included on the roadway by simply striping the lanes (see TOI-10).

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include the normal maintenance of sidewalks and trails/pathways (such as snow removal and sweeping). Operating costs will vary depending upon the length of the trails, sidewalks, and pathways and any other infrastructure added as part of a complete streets policy.

Examples of Implementation

- The City of Boston and the National Park Service are collaborating to connect historic Boston via complete streets.Acadia National Park implemented a multi-agency, intermodal center with partial funding from the Paul S. Sarbanes Transit in Parks program.
  - *http://bostoncompletestreets.org/whats-new/city-of-boston-and-national-park-service-announce-connect-historic-boston/http://www.maine.gov/mdot/mainedotnews/agc12182009.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Percentage of streets/roads that allow for multi-modal use.
- Reduced congestion on roadways due to visitors shifting to other modes (measured by reduced travel time).

Additional Resources

- Complete Streets Fact Sheets - *http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/factsheets*
- Complete Streets A to Z - *http://www.smartgrowthamerica.org/complete-streets/a-to-z*
- Complete Streets in a Box Toolkit for Connecticut - *http://www.tstc.org/reports/ctcsbx/*
- Rural Walking Toolkit - *http://walkboston.org/ruralwalking*
- Taking Action on Complete Streets: A Toolkit for Implementation - *http://www.smartgrowthamerica.org/documents/cs/impl/taking-action-on-cs.pdf*
- American Planning Association - *http://www.planning.org/research/streets/*

SOLUTION/TOOL: Complete Streets (Policy & Facilities)

TYPE: Traffic Operational Improvements

TOI 5

General Description

When major destination area parking lots are full, visitors will often park on the shoulder of the approach road to the parking lot or along other roadways nearby. Parked vehicles on road shoulders will reduce speeds of and capacity for through traffic. Specifying the road shoulder as a no-parking area through clear signing, striping, and/or additional enforcement will improve traffic flow and safety of the roadway. These efforts should be considered in conjunction with parking management tools/actions (see TOI-12).

This tool would also be appropriate as a short term pilot project.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Improved traffic flow on the adjacent roadway.
- Can improve safety by reducing illegal overflow parking in unsafe areas.
- Can improve access for emergency vehicles and local access by removing vehicle blockages. (Congestion due to visitors looking for parking or parking illegally can make it difficult or impossible to get emergency vehicles through[32].
- Limits resource damage from illegal parking.

CONS

- Can result in a higher number of motorists recirculating through parking lots hunting for empty spaces.
- Can lead to dissatisfaction with visitors whose vehicles may be ticketed and/or towed for parking in no parking areas.
- Requires increased resources and staffing. "While the park rangers try to conduct enforcement actions, we have fewer staff, and need to focus resources where they will have the most impact[18].

- Can result in visitors being turned away at the entrance gate or entrance traffic backing up onto the access roadways outside the park.
- To be successful, this tool would require law enforcement staff to have the capacity to actively patrol for congestion issues.

GENERAL

When implementing enforcement, consider the following:

- Provide clear indications of policies and fines to the motorists.
- Working with law enforcement staff during the planning and implementation stages is essential to success. Law enforcement officers already have the ability to ticket visitors, but typically do not.

Coordination/Partnerships

Coordination efforts should include enforcement agencies of gateway communities in order to create consistent expectation of motorists regarding parking procedures. A procedure may need to be put in place to monitor parking areas and inform entrance station personnel so that visitors will know where they can park.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

Modifying parking regulations such as creating fines may require a regulatory change that can take slightly longer than other changes.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is low ($0 to $50,000).

Of the total capital costs, the procurement portion for "no parking" signs cost approximately $75 each, depending upon the size of the sign.

OPERATING COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include time paid to/salaries of enforcement personnel, which sometimes can be offset by fine collections.

Examples of Implementation

- Bryce Canyon National Park closes viewpoints due to a lack of parking to discourage cars circulating in these parking lots looking for a spot or parking illegally. One viewpoint was closed for 59 days during different times of the day, due to a lack of parking[22].
- Acadia National Park uses lawn signs (similar to campaign signs) to discourage parking illegally on the roadside at the visitor center parking lot. Roadside signs also direct visitors to park in the right lane of the two-lane, one-way park loop road when parking areas are full.
- Anacostia National Park enforces parking during Nationals' games.
  - *http://www.nps.gov/uspp/08316_ananatprk.htm*
- Canaveral National Seashore monitors parking lots. Once all parking is full, visitors are stopped at the entrance station where they can wait or turn around and return later.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Reduced number of illegally parked cars during parking inventories.

SOLUTION/TOOL: **Geometric Improvements**
TYPE: **Traffic Operational Improvements**

TOI
6

General Description

Geometric improvements covered in other tools include adding lanes (see AC-5), upgrading the level of intersection control (see TOI-8), adding acceleration or deceleration lanes (see TOI-1), and restricting turning movements (see TOI-20). This tool includes some additional geometric improvements that could be considered for use in parks/units[33] such as:

- Alternative intersection designs that can increase the capacity of an intersection—these are typically used for signalized intersections where adding lanes is not feasible, but can be considered with two-way stop control intersections. The typical underlying mechanism is removing left turning vehicles from the intersection. The quadrant left turn, continuous flow, bow-tie, and displaced left turn intersections are a few examples. These solutions can be complicated and should be implemented with care.
- Right/left turn lanes that can be used at intersections to improve the capacity of the intersection—these lanes are only long enough to handle the expected number of vehicles that might be queued waiting to turn and a taper to provide vehicles space to slow and get out of the through lane. Because they are short, they are less expensive than adding an extra lane for the entirety of the roadway. By removing turning vehicles, particularly left-turns, the flow of the through lane is improved.
- Similarly, occasional passing lanes can be added intermittently to two-lane highways. This can provide a significant improvement of traffic flow without the full expense of upgrading to a multi-lane highway.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Improved throughput for through lanes of traffic.
- Improved safety by reducing potential conflicts.

CONS

- Lane space and lack of sufficient right-of-way are the primary limitations of the intersection approaches.
- May require additional space for lanes and/or intersections, which may degrade the natural resources the park is trying to protect.

GENERAL

When implementing geometric improvements, consider the following:

- A traffic engineering analysis can provide an indication of how the current facilities are functioning and what improvements will result from implementing geometric changes.
- The amount of space required for the lane taper is more than most would think. Even on a short left turn lane on a typical suburban arterial can require that the road be widened by 10+ feet for a distance of 500 feet or more.

Coordination/Partnerships

Initial identification of strategies that are most appropriate for a specific location might best be determined by transportation engineers and experts who work for consultants or state or local departments of transportation in the region. Coordination may also be needed with the local federal lands highway division office.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool range from near term (1 to 3 years) to longer term (3 to 6 years).

The time to implement is highly variable depending on the specific improvement. Minor geometric changes created through striping can be implemented more quickly than larger projects that require planning, design, environmental review and construction.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2005 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000) to higher (above $250,000).

Cost is highly variable depending on the specific improvement, which can range from restriping to major reconstruction.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.).

- Operation and maintenance costs are highly variable depending on the specific improvement, which can range from restriping to major reconstruction.

Examples of Implementation

- Back Bay National Wildlife Refuge has a goal in the Regional Alternative Transportation Evaluation Report to add a turning lane and bypass lane on Sandpiper Road for vehicles turning into the parking lot so they do not impede traffic[34].

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Average vehicle delay (intersection improvements).
- Average vehicle speed (mainline improvements).

Additional Resources

- Park road standards - *http://www.wfl.fhwa.dot.gov/resources/design/library/park-road-std.pdf*
- Transportation Research Board, Highway Capacity Manual - *http://hcm.trb.org/*
- AASHTO A Policy on Geometric Design of Highways and Streets - *https://bookstore.transportation.org/collection_detail.aspx?ID=110*
- State roadway design manuals - *http://www.fhwa.dot.gov/programadmin/statemanuals.cfm*

SOLUTION/TOOL: Grade Separation for Bicycle/ Pedestrian Crossings

TYPE: Traffic Operational Improvements

TOI 7

General Description

Providing a bridge or underpass for pedestrians and bicyclists to cross roadways or highways not only can improve the safety, comfort, and visitor experience for non-motorized visitors, but also can reduce congestion on the roadway.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Improved safety, comfort, and visitor experience for non-motorized users, which may increase the use of pedestrian and cycling modes.
- Improved traffic flow on major roadway.

CONS

- Structures can be aesthetically unappealing.
- Visitors may decide not to use the crossings if they are inconvenient and time-consuming.
- May have undesirable impacts to view sheds or cultural landscapes.

GENERAL

When implementing grade separation, consider the following:

- How many pedestrians/bicycles might use the crossing if it were constructed? Consider a full delay study to estimate the benefits for a specific location. One of the downfalls of implementing grade-separated crossings that cause pedestrians and bicyclists to travel out of direction and up/down significant grades is that they may continue to cross at grade anyway if that is a faster and more convenient option.

- How would the crossing improve visitor experience and safety? For example, will the elevated crossing provide a new view and/or interpretive opportunity? Will visitors be able to cross more efficiently by avoiding waits for long streams of traffic?
- The minimum width of the structure should be the same as the paved path approaching the structure plus a minimum of two feet on either side for adequate shoulder and horizontal clearance space.
- The bicycle/pedestrian crossing must be accessible for all users.
- Consider needs for lighting.

Coordination/Partnerships

Coordination efforts should include bicycle advocacy groups in gateway communities. The decision and design process should also involve coordination with cultural and/or historic landscape experts and resource specialists.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from near term (1 to 3 years) to longer term (3 to 6 years).

Planning, design, environmental review, and construction may take multiple years depending upon the size and location of the grade separation structures.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2010 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from high ($100,000 to $250,000) to higher (above $250,000).

Of the total capital costs, the construction portion for pedestrian/bicycle bridges ranges from $900-1,600 per linear foot for a 12 foot wide path. If lengths exceed 100 feet, the costs can escalate[35]. The need to provide accessibility on either side of the crossing also can increase costs (for ramps, elevators, etc.).

Operation and Maintenance Costs

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include snow removal on the crossing, restriping, and resurfacing.

Examples of Implementation

- The multi-use pathway in Grand Teton National Park includes an underpass where it crosses US 89, the major through highway. Compared to an at-grade crossing, the underpass improved safety and comfort for the non-motorized pathway users and eliminated the need for motorists on US 89 to stop for pedestrians to cross a road.
- North Moab Recreation Areas constructed a pedestrian bridge as well as underpasses to separate the non-motorized users from the vehicles at critical crossings to improve safety.
  - *http://www.triptac.org/Documents/RepositoryDocuments/Moab_Case_Final.pdf*
- Minute Man National Historic Park has an underpass (under Hanscom Drive) so that pedestrians walking on Battle Road Trail do not have any conflicts with motorized vehicles.

Performance Standard/Measure

IIn tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

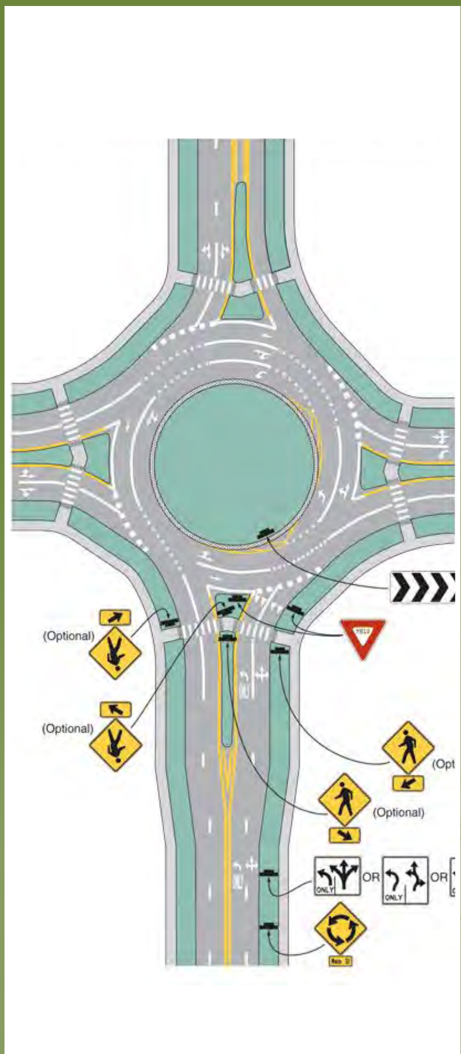
- Number of bicycle/pedestrian uses of structure.
- Estimated reduction in delay of users (both motorists and non-motorists) with delay study.

Additional Resources

- AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities - *https://bookstore.transportation.org/item_details.aspx?id=119*
- AASHTO A Policy on Geometric Design of Highways and Streets - *https://bookstore.transportation.org/collection_detail.aspx?ID=110*

SOLUTION/TOOL: **Intersection Improvements (Geometric and Traffic Control Devices)**
TYPE: **Traffic Operational Improvements**

TOI
8



General Description

At grade intersections are often the locations of the worst safety and congestion problems in the transportation system. There are several basic levels of control at an intersection:

- Uncontrolled (only normal right-of-way rule applies).
- Two-way stop or yield control (signs on minor road approaches).
- Multi-way stop control (signs on all approaches, typically four).
- Roundabout.
- Signalization.

Increasing the level of control at an intersection should be considered when the cost can be justified by safety and delay improvements. The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance on when to consider increasing the level of intersection control, such as:

- Yield or stop signs should be considered when the combined vehicular, bicycle, and pedestrian volumes entering the intersection from all approaches averages more than 2,000 units per day.
- Upgrade to a multi-directional stop control when the peak hour of an 8-hour period exceeds 300 vehicles per hour on the major street and 200 vehicles per hour on the minor street.
- Upgrade to traffic signal when, for an 8 hour period when there are more than 500 vehicles per hour on the major street and 150 vehicles per hour on the minor street. A higher volume on the major street of 750 vehicles per hour causes enough excessive delay that the minor street volume of 75 vehicles per hour might justify a signal.

This is only a sample of the guidelines used. There are many other considerations such as high pedestrian volumes, excessively high traffic during only the peak hour, and the number of lanes.

Generally roundabouts are considered an alternative to a traffic signal in terms of the amount of traffic that justifies the cost. Roundabouts tend to keep traffic flowing through intersections and are most successful when the inflow of traffic is balanced at all legs of the intersection. High peak hour traffic flows, particularly with a large portion of left turning vehicles, may be more appropriate for a signal than a roundabout. Roundabouts can be difficult for pedestrians and bicyclists to maneuver and require special design treatments to accommodate these modes. Traffic circles (not roundabouts) are typically smaller circular islands that may be used in intersections to calm traffic.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- More orderly flow of traffic.
- Reducing the number and severity of right angle collisions.
- Reducing overall delay.
- Pedestrian crossing safety and comfort can be improved.

CONS

- Increasing the level of intersection traffic control can increase the number of rear-end collisions.
- Increasing the level of intersection traffic control can increase delay during off-peak times by requiring vehicles to stop when no conflicting vehicles are around.
- Increasing signage (or adding traffic signals) can create a "visual clutter" and detract from natural surroundings.
- Installing/creating a roundabout may require more space/land than a traditional intersection, taking resources that the park may want to protect.
- Roundabouts can negatively impact pedestrian bicycle safety and access, use caution when considering this solution with trail crossings.

GENERAL

When implementing intersection improvements, consider the following:

- There is no substitute for good engineering judgment. Under certain conditions installing a traffic signal can increase the number of crashes and increase the total delay.
- Ensure adequate sight distance for vehicles entering the intersection so as to safely judge the gaps available in traffic.
- Consider pedestrian and bicycle traffic.

Coordination/Partnerships

Coordination will be needed with vanpooling companies and with local agencies that provide ride matching services such as transportation management associations, transit agencies, and community transportation organizations.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool range from near term (1 to 3 years) to longer term (3 to 6 years).

Some solutions are simple and do not require major construction, but those with a larger "footprint" such as installing a roundabout can take multiple years for planning, design, environmental review, and construction.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 1997 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000) to higher (above $250,000).

Of the total capital costs, the procurement portion for a stop or yield sign is typically around $200 per sign and for a traffic signal ranges from $100,000 to $200,000 or more. The construction portion for roundabouts vary in cost; however, a design with truck aprons and angled approach entries will typically cost around $300,000 to $500,000 depending on the extent of landscaping and other treatments.

The costs for this tool can increase considerably if right-of-way needs to be purchased (which can be high in urban areas) or if pavement needs to be added (for example left turn lanes).

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include implementing an inventory/inspection/repair program because of the potential safety impact of damaged signs and signals associated with intersection traffic control and utility costs (for traffic signals and nighttime lighting for roundabouts).

Examples of Implementation

- Colonial National Historic Park (at its “5 Points intersection”) and Valley Forge National Historic Park (at the intersection of PA 23 and PA 252) are considering the installation of roundabouts at these intersections.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service’s Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Reduced delay per vehicle.
- Reduced number of severe crashes

Additional Resources

- Manual on Uniform Traffic Control Devices (MUTCD) - *http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm*
- Transportation Research Board, Highway Capacity Manual - *http://hcm.trb.org/*
- Information Guide to Roundabouts - *http://www.fhwa.dot.gov/publications/research/safety/00068/*

SOLUTION/TOOL: **Incident Management**
TYPE: **Traffic Operational Improvements**

TOI 9

General Description

Incidents such as weather events, vehicle crashes, and fires are estimated to cause one-fourth of the traffic congestion on roadways in the United States[39]. Traffic incident management is about developing and implementing an incident management plan. This solution does not directly involve tangible hardware or infrastructure improvements, but is highly related to other tools that speed up detection of incidents such as traffic monitoring (see TOI-19) and closed circuit television (see ES-4). Also incident management is related to other improvements that can assist in managing traffic and informing motorists in real-time such as the 511 traveler information phone number (see ES-1), automated gate access (see ES-2), dynamic message signs (see ES-5) and service/courtesy patrols (see TOI-15). Some typical elements of an incident management plan are:

- Pre-incident planning, which can include a multi-agency formalized plan, training and exercises, and performance tracking.
- Evaluating and improving how incidents are detected, verified, and managed.
- Developing policies for incident response, which includes standard message sets for public notification, on-scene management (typically via an Incident Command System), incident clearance, and incident debriefing.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

Pros

- Reduced time for notification/detection, verification, and response means traffic operations can return to normal more quickly.
- Faster response times can reduce the severity of injuries occuring as a result of the incident.
- Secondary incidents can be eliminated. For example collisions can result from motorists gawking at the incident or trying to get by the incident in an unsafe manner.

Cons

- Requires up front and continual efforts to develop, update, refine, and implement the plan.

GENERAL

When implementing incident management, consider the following:

- Identify current incident management policies and practices.
- Involve multiple agencies and stakeholders in the plan development.
- Consider a selection of real world specific incidents to focus discussion and identify weaknesses in the current incident management plan.

Coordination/Partnerships

Close coordination with law enforcement or USPP will be necessary for this tool. Likely the state department of transportation has a statewide traffic incident management plan and/or program that could be leveraged for incident management specific to the park/unit. Other coordination efforts should include interactions with local/state law enforcement, fire and rescue, emergency medical services, and towing services.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

A basic incident management plan and program can be set up in a year, but becomes a basis for continual improvement and review.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital cost, the planning portion (coordinating and developing the plan) can be done in-house or in some cases consultants can be hired to develop the plan (around $50,000).

Procurement costs include systems that would detect an incident, such as closed-circuit television (ES-4), and can vary widely, depending upon how much of a roadway may be monitored and other factors. If there is an adequate number of park staff that are driving (monitoring) the roadways, then procurement costs may be minimal, requiring only the purchase of certain equipment for incident response (such as warning signs/markers).

Note that law enforcement/USPP may already use Incident Command System so these costs may be overestimated in that case.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time, repair and replacement parts for technology, software updates, and utility costs.

Examples of Implementation

- Greater Yellowstone Rural ITS Program, Incident Management Response Guide.
  - *http://www.westerntransportationinstitute.org/documents/reports/427972_Incident_Management_Guide.pdf.*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Incident response time.
- Roadway and incident clearance time.

Additional Resources

- FHWA Traffic Incident Management Handbook - *http://ops.fhwa.dot.gov/eto_tim_pse/publications/timhandbook/*
- AASHTO National Traffic Incident Management Coalition - *http://ntimc.transportation.org/Pages/default.aspx*
- National Park Service Handbook 55 Incident Management Program - *http://www.nps.gov/policy/rm55manual.pdf*

SOLUTION/TOOL: Lane Separation/Delineation
TYPE: Traffic Operational Improvements

TOI 10

General Description

Vehicular congestion can occur when vehicles making left- or right-hand turns block vehicles that want to travel straight and also when cyclists or pedestrians are sharing the travel lane, which causes motorist to slow down or stop.

Lane separation and delineation techniques focus on clearly defining travel lanes (through striping or other methods), so that visitors/motorists know where to travel. This solution also includes separating and delineating where other modes (such as cyclists and pedestrians) should travel. Exclusive lanes for use by transit/shuttle vehicles sometimes also are provided to improve transit travel time.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Can be a relatively simple and inexpensive way to increase traffic flow and reduce congestion if there is space available to delineate the lane and impacts to resources can be avoided.
- Separating and delineating lanes can increase safety because it can reduce the conflicts between vehicles traveling straight versus turning.
- Safety can also be increased when alternative modes such as cycling and walking are separated from vehicular travel lanes.

CONS

- While separating cyclists and pedestrians from the vehicular travel lanes via striping will increase safety by reminding motorists to share the road, it is still not as safe as a separate shared use path (see AC-4) that provides more space between the roadway and path users.
- Striping can detract from the visitor experience and may not be historically appropriate for some cultural landscapes.

Coordination/Partnerships

Coordination will be needed with gateway communities, as well as local and/or state departments of transportation depending upon where the solution is implemented. Within the park, the regional federal lands highway division office should be contacted.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years) to longer term (3 to 6 years).

Implementing the separation and delineation of lanes can be done relatively quickly (within a few months) if the solution is simply striping paving that already exists or expanding and striping paving where space is available. The most common way to separate and delineate lanes is by striping (painting) on the road/street. Other methods include traffic cones or reflectors, or more permanent options such as medians. Solutions involving median construction and addition of extensive new paving will take longer for planning, design, environmental review and construction.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Costs will vary depending upon the size of the project, and how the lanes are separated/delineated.

Of the total capital costs, the construction portion for simply striping (painting) lanes will be relatively inexpensive, while creating medians or other more permanent barriers may be more expensive (perhaps up to $5,000 per mile).

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include the staff time and resources for restriping and replacing traffic cones or other “less permanent” solutions (reflectors, etc.), and the inspection and possible maintenance of more permanent solutions (medians and/or barriers). In general, lanes may need to be re-striped (painted) every two to three years, depending upon weather conditions and other factors, such as the amount of traffic and snow removal on the roadway.

Examples of Implementation

- Cowpens National Battlefield

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service’s Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Decrease in number of accidents.
- Number of cyclists using the roadway.

Additional Resources

- Federal Highway Administration Manual on Uniform Traffic Control Devices - *http://mutcd.fhwa.dot.gov/services/publications/fhwaop02090/*
- Federal Highway Administration (Bicycle Lanes) - *http://safety.fhwa.dot.gov/ped_bike/univcourse/pdf/swless19.pdf*

TOI 11

SOLUTION/TOOL: Traffic Circulation Changes (Including One-way and Reversible Lanes)

TYPE: Traffic Operational Improvements

General Description

Congestion is not always the result of slow moving vehicles, vehicles parked along roadsides, accidents, and "animal jams." Congestion can also result from how vehicles circulate throughout a park/unit. If circulation is inefficient (for example vehicles are not moving through destinations in a logical order), there is not enough capacity available in the peak direction, or turning vehicles create conflict with the traffic circulation, then congestion can occur.

This tool involves management techniques such as one-way or reversible lanes for changing traffic flow patterns and circulation to reduce congestion. For example, parks may have roadways (especially to certain attractions) that have predominate "inflow" in the morning, and "outflow" at the end of the day. This can occur especially at lakeshores, beaches, mountain hiking areas, and other areas where visitors tend to arrive in the morning, and leave at the end of the day. By creating one-way or reversible lanes, parks can maximize the number of travel lanes available for the majority of visitors, and reduce the potential for traffic conflicts.

One-way routes only allow travel in one direction along a corridor and can eliminate many conflicts with opposing traffic and create a circulating effect in some circumstances (grid-type areas). Travel times can be reduced and confusion can be minimized through proper one-way routing.

Reversible lanes allow one or more lanes on a facility to shift direction during certain periods of the day to accommodate traffic patterns such as morning and evening peaks. There must be a large directional flow during peak periods to make this a viable solution. By utilizing additional lanes in the direction that demands more capacity, congestion can be reduced and overall capacity can be increased. Lane control, signs, and special pavement markings are used to inform motorists of lane direction and movements. In some cases, gates or other types of barriers may be used to control travel lanes in one direction or another.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

- Implementation of one-way and reversible lanes gets more complicated based on the number of access points along the roadway. It is easier to implement these solutions on a roadway that is a "loop road", versus a long road that has multiple access points (entrances and exits).
- A safe and successful implementation of these solutions is very dependent upon having clear and adequate signage.

PROS

- One-way and reversible lanes can achieve an increase in throughput without building more roads.
- Safety may be improved, as one-way roads reduce potential traffic conflicts (such as traffic moving in the opposite direction).
- The implementation of one-way lanes may provide an opportunity to promote alternative modes (such as cycling) along a roadway, as there may be enough lane width to create a bicycle lane when traffic is converted to one way (versus two-way).
- Reduced delay at intersections.
- Reduced congestion where implemented along circulation routes.

CONS

- Reversible lanes can be complicated to implement, and it is critical that adequate information is provided to motorists so that they know the directional flow of the various lanes during the affected time periods.
- One-way roads may require visitors to travel in a direction or path that they were not planning, as they may not be aware that certain roads are one-way roads.
- Changing the traffic circulation on one roadway to decrease congestion can move/shift the congestion to other roadways in the area if the roads are not viewed as an entire network.
- If a visitor misses a particular attraction on a one-way road/loop, they may not have time to traverse the entire route again to return to the attraction.

Coordination/Partnerships

The park/unit may want to check ownership of right-of-way during the development of this concept so the right partners are involved. Coordination will be needed with the gateway community as well as with the entity that owns and operates the road or road network outside the park such as the local and/or state departments of transportation.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

Implementation of a complete streets policy will take years, based upon necessary studies and processes that the park/unit has adopted for other policies (including public comment). Implementing complete streets infrastructure will vary depending upon items that will be implemented (such as separated pathways, sidewalks, or trails) and including time for planning, design, environmental review, and construction.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a</u>

magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital costs, the planning study portion to collect and analyze circulation patterns can cost into the tens of thousands ($30,000 is considered an average cost) depending on the size of the park/unit and the geographic area studied.

Of the total capital costs, the procurement portion for implementing one-way lanes is comprised mainly of signage to indicate that the roadway is a one-way road. The costs for signing will vary, depending upon how many signs are needed and on how many access points (entrances/exits) are along the roadway, but in general, should be no more than $2,000 to $5,000, unless the one-way road is an extremely long road with numerous access points.

Of the total capital costs, the procurement portion for implementing reversible lanes typically will be more than implementing a one-way lane/road, and will also depend upon the length of the roadway and the number of access points along the road. If islands are used at access points along one way roads there is an increased cost of $10,000 to $15,000 per location. Often traffic cones or other barriers are used so that the lanes traveling in opposite directions are separated from one another. These cones or barriers are moved so that more lanes are available for use for the dominate flow of traffic. Depending upon the length of the roadway, the number of access points, the type of barriers used, and the permanence of establishing the reversible lanes, the procurement portion can range from under $5,000 to over $200,000.

With either solution, the use of dynamic message signs (see ES-5) can help to facilitate traveler awareness of the change in travel direction. The costs associated with a dynamic message sign are provided in tool ES-5.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool do not vary from the cost of operating traditional two-way roads with the exception of the cost of staff time for moving the barriers along the reversible lane road (which can become significant depending upon the length of the roadway and how frequently the barriers may be moved), staff time for enforcement and maintenance of signs. If dynamic message signs are used to help indicate the direction of travel for the reversible lane roads, additional operating costs would include the cost of utilities and maintenance of these signs.

Examples of Implementation

ONE-WAY ROADS

- Great Smokey Mountains National Park's one-way roads include Roaring Fork Motor Nature Trail, Rich Mountain Road and Parson Branch Road.
- Rocky Mountain National Park's one-way road is Old Fall River Road.
- The loop road through a portion of Acadia National Park is one-way.

REVERSIBLE LANES

- Rock Creek Parkway, a National Park Service parkway in Washington D.C. uses reversible lanes during weekday morning and afternoon peak hours.
  - *http://www.nps.gov/rocr/faqs.htm#CP_JUMP_68721*
- Yosemite National Park has significant traffic and parking congestion. During peak season the park is over capacity. Yosemite has been studying the issue and providing recommendation which include changes to traffic circulation. Some of the recommendations include underpasses and roundabouts.
  - *http://www.nps.gov/yose/parkmgmt/upload/mrp-deis-fact-sheet-parking.pdf*
  - *http://www.nps.gov/yose/parkmgmt/upload/mrp-deis-fact-sheet-preferred.pdf*
- Yellowstone National Park is redesigning the North entrance at Gardiner to improve traffic circulation and congestion due to the hairpin turn at the arch. To alleviate this, a new roadway is being constructed called the arch bypass road.
  - *http://www.nationalparkstraveler.com/2011/11/yellowstone-national-park-receives-green-light-redesign-traffic-flow-through-north-entrance8957*
  - *http://gardinergatewayproject.org/?page_id=53*
- The Tongass National Forest reviewed how traffic (primarily tour buses) circulated at the Mendenhall Glacier Visitor Center to see if the number of idling buses could be reduced.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Decrease in congestion based upon implementation of one-way and reversible lanes/roads.
- Decrease in accidents along converted one-way roads.

Additional Resources

- Federal Highway Administration (Flexibility in Highway Design) - *http://www.fhwa.dot.gov/environment/flexibility/index.cfm*
- Federal Highway Administration (Managed Lanes) - *http://ops.fhwa.dot.gov/freewaymgmt/publications/frwy_mgmt_handbook/chapter8_01.htm*
- Texas A&M Mobility Institute - *http://mobility.tamu.edu/mip/strategies_pdfs/traffic_management/technical_summary/Reversible-Traffic-Lanes-4-Pg.pdf*
- Traffic circulation study for Del Rio - *http://library.ctr.utexas.edu/pdf2/2940-2.pdf*

SOLUTION/TOOL: Parking Management and Parking Area Improvements

TYPE: Traffic Operational Improvements

TOI 12

General Description

Trying to find parking at a popular attraction within a park/unit can be a source of congestion as vehicles drive around looking for a parking space, perhaps even leading to parking on the roadway, shoulders and other "no parking" areas. A lack of parking can also be a major source of frustration for visitors.

Parking management is a solution whereby visitors are informed either by a person/staff or by signage that a parking lot is full, and that they need to proceed to another lot. As noted, parking management can occur through the use of people or through the use of signing and/or automated systems. Parking management may also include designating some parking areas with a limited time (such as a two or three hour parking space), or through creating parking based on a reservation system.

Parking area (parking lot) improvements may include modifying the lot to decrease traffic conflicts (such as driving one-way down a lane between parking lots), and limiting the number of access points (entrances and exits) to a parking area (see TOI-2). Parking area improvements also may include restriping and/or changes to circulation to create a more efficient layout, possibly even increasing the number of spaces available for visitors.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Parking areas can be a major source of congestion, so managing parking areas can be a logical step for a park/unit.
- Visitors can be quickly frustrated when not able to find a parking spot, so parking area management can increase visitor satisfaction.

CONS

- Visitors may ignore the instructions of staff or signage and still try and find a parking space in a lot that is noted as being full.
- Using staff to manage parking lots can be time-intensive and can lead to the need for additional staff, or to take staff away from other important tasks such as visitor interpretation.
- One interviewee stated that while their park had implemented some parking management techniques, "to some extent all we have done is simply move the location of where we are having parking issues. Instead of having issues in the main canyon, we have issues at the visitor center and in town[19]."

Coordination/Partnerships

Coordination may be necessary with the local and/or state departments of transportation, depending upon the jurisdiction that is responsible for the roadways leading to parking areas/parking lots within the park/unit.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

IImplementation may take only a few weeks if staff is going to be trained and utilized to manage the parking areas. If signage or electronic systems are going to be implemented, timing may take a few months or more to fund, procure, and install signing. Basic signs will take less time than electronic signing systems. The time to implement the signage and electronic systems will generally also take longer if there are multiple entrances and exits to the parking areas (parking lots).

Parking improvements can take several months to years depending on the extent of improvements. Restriping and signing will take less time than a major parking expansion (see AC-3) or improvement that requires design, environmental review, and construction.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

The costs will depend upon what systems may be implemented to address parking management issues.

Of the total capital costs, the procurement portion for an electronic (automated) system can cost around $100,000 per parking lot, depending upon how many entrance/exit points there are per lot[16] whereas parking lot restriping can cost a few thousand dollars. The costs associated with a parking lot expansion are provided in tool AC-3.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.).

In addition, the long-term cost implications for this tool include personnel time if staff is used to manage traffic. If automated systems are used, costs would include utilities, software updates, and repairs and replacement parts. Operating costs for an automated system run about $4,000 per year[16].

Examples of Implementation

- Gateway National Recreation Area – Sandy Hook Unit
  - *http://ntl.bts.gov/lib/35000/35100/35108/DOT-VNTSC-NPS-03-05.pdf*
- Indiana Dunes National Lakeshore uses staff to manage parking lots during the Fourth of July[32].
- Bryce Canyon National Park uses staff (Rangers and shuttle drivers) to monitor the parking situation at various viewpoints and closes them due to a lack of parking to discourage cars circulating in these parking lots looking for a spot or parking illegally. One viewpoint was closed for 59 days during different times of the day, due to a lack of parking[22].
- Canaveral National Seashore uses rangers and volunteers to monitor parking lots. When all lots are full visitors are stopped at the entrance station or turned around by the local law enforcement agencies.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed.

In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

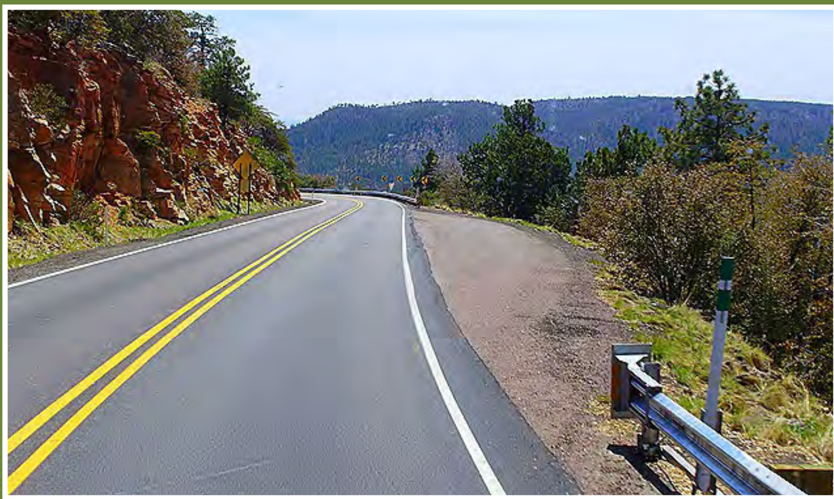
- Reduction in number of vehicles parking in "no parking" areas (including along the roadway).
- Reduction in the number of vehicles circulating through parking areas searching for a parking space.

Additional Resources

- Federal Highway Administration (Active Parking Management) - *http://ops.fhwa.dot.gov/atdm/approaches/apm.htm*
- Transportation Research Board (Traveler Response to Transportation System Changes: Chapter 18—Parking Management and Supply) *http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c18.pdf*
- Federal Lands Highway Project Development and Design Manual, Chapter 9—*http://flh.fhwa.dot.gov/resources/manuals/pddm/archives/Chapter_09.pdf*

SOLUTION/TOOL: **Roadway Pull-outs**
TYPE: **Traffic Operational Improvements**

TOI 13



General Description

Vehicles moving too slowly along park roadways due to sightseeing can cause traffic backups and congestion. Similarly, shuttles stopping in the traffic flow for passenger pick-ups/drop-offs can have the same effect (although sometimes it is planned that shuttles do not pull out of, and back into traffic). One solution is to use roadway pull-outs, which can provide space for vehicles to pass.

Roadway pull-outs can be used for slower traffic to move out of the travel lane and allow faster traffic to pass by, as additional parking for visitor attractions, as shuttle stops, as locations to repair breakdowns, and as wayside areas that may provide visitors with limited bathroom facilities (if provided), interpretive displays, and information about alternative modes, routes, and destinations in the park/unit. Pull-outs that have substantial bathroom facilities and interpretation are often referred to as "rest areas."

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Roadway pull-outs may be used as temporary parking spaces.
- Roadway pull-outs can reduce congestion by temporarily removing slower traffic from the traffic stream.
- Roadway pull-outs can provide additional locations for shuttle boarding.

CONS

- Pull-outs can generally only fit a few cars and therefore may not be large enough to fit all cars needing extra parking space.
- While pull-outs may allow slower traffic to exit the main traffic stream, this could increase the roadway speed and cause a safety issue.
- Pullouts add access points to the roadway system which can increase congestion. Be sure to consider site distances and spacing of all access points.
- Pull-outs can reduce vehicle conflicts by being designated right-in/right-out. This will eliminate left turns and reduce accident situations but may result in the need for additional pullouts on the opposite side of the road.

Coordination/Partnerships

Coordination will be needed with the jurisdiction responsible for the roadways such as city, county, and state departments of transportation.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from near term (1 to 3 years) to longer term (3 to 6 years).

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2005 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total cost, the construction portion of a paved pull-out is approximately $10,000 to $15,000 per 100 feet; however, these costs will vary depending on whether the pull-out is paved, the construction conditions, the pull-out width, if additional facilities are provided, and other considerations.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include roadway maintenance such as plowing, sanding, sweeping, and repaving.

Examples of Implementation

- The Kancamagus Highway, part of the White Mountain National Forest, has pull-outs for slower traffic and for additional parking at scenic locations.
- The Sleeping Bear Dunes National Lakeshore has pull-outs on the Pierce Stocking Scenic Drive.
- Zion National Park has implemented pull-offs versus acceleration lanes for recreation vehicles and other vehicles that have difficulty maintaining speeds on the steep grades leading up to the tunnel. The pull-offs give the added advantage of safer locations for picture taking and enjoying the scenery.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:Reduction in number of vehicles parking in "no parking" areas (including along the roadway).

- Reduced delay on roadway.
- Number of vehicles using pull-outs.

Additional Resources

- Scenic Byways – A Design Guide for Roadside Improvements - *http://www.fs.fed.us/eng/pubs/pdf/fhwa02001.pdf*
- Snoqualmie Scenic Elk Pullout Funding Application - *http://www.psrc.org/assets/9951/Snoqualmie-ScenicElkPullout-WEB.pdf*

SOLUTION/TOOL: **Road Weather Management**
TYPE: **Traffic Operational Improvements**

TOI
14

General Description

Weather conditions such as flooding, snow, high wind, ice, fire, low visibility, and sand storms can cause hazardous conditions for park/unit roadways and/or attractions.

Managing park/unit roadways for these types of weather events can cause safer conditions and less congestion. Management techniques include road closures (temporary or seasonal), providing traveler information about road closures and weather advisories (via tools such as dynamic/variable message signs (see ES-5), 511 traveler information phone number (see ES-1), National Park Service road weather telephone lines, and media/social media (see VDM-5), and roadway weather related maintenance and management.

Detection and prediction of these weather conditions can be done through weather services such as the National Weather Service and Weather Underground, as well as through the use of closed circuit television (webcams) (see ES-4), road weather information systems (see ES-9), and road maintenance staff patrols.

A road weather management program will provide guidance and suggestions for effectively and efficiently detecting/predicting weather events. For consistency, the program should have standard management techniques documented for each potential weather event and standard messages to be utilized on the traveler information devices.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

- Road weather management (a plan) may not be necessary for parks/units with limited or non-severe weather events, although even parks in areas with mild weather conditions may have roadways that are subject to periodic flooding. With climate change, weather-related conditions are requiring more frequent management actions by parks/units across the nation.

PROS

- A road weather management program will provide guidance to park/unit staff on how to detect, manage, and treat weather conditions at their park/unit efficiently, effectively, and consistently.
- Road weather management can provide safer roadway conditions and increase mobility, and as such improve visitor safety and experience.

CONS

- Road weather management and plan implementation requires an ongoing commitment of staffing and resources.

Coordination/Partnerships

To create a regional road weather management plan, coordination will be needed with the internal maintenance department, those responsible for traveler information, meteorological/forecasting services, the local and/or state departments of transportation, and city/county transportation offices.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

Creation of a plan will take less time than deploying the detection techniques addressed in the plan.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2005 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital costs, the planning portion to set-up a road weather management program is approximately $50,000 to $75,000 for a consultant to help establish the program. This amount can vary based on the mileage of roadways within the park, severity of weather events, number of visitors, etc.

The costs associated with detecting weather conditions are provided in tool ES-9.

Operation and Maintenance Costs

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff salaries for analyzing the weather data and making management decisions based on the guidelines created and utilities.

The operating costs associated with a road weather information system are provided in tool ES-9.

Examples of Implementation

- Seasonal road closures occur at Yellowstone National Park due to snow.
  - *http://www.nps.gov/yell/planyourvisit/parkroads.htm*
- Rocky Mountain National Park closes Trail Ridge Road when necessary due to weather and provides press released to warn motorists of high wind advisories to ensure motorist safety.
  - *http://www.nps.gov/romo/parknews/trail_ridge_road_reopens.htm*
- Great Smoky Mountains provides road weather information to visitors via their website, phone line, twitter, National Weather Service, and webcams.
  - *http://www.nps.gov/grsm/planyourvisit/conditions.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:Decrease in congestion based upon implementation of one-way and reversible lanes/roads.

- Number of advanced notices (including alternate routes and closures) due to use of road weather management program.
- Reduced number of vehicle incidents due to weather.

Additional Resources

- FHWA's Road Weather Management website - *http://ops.fhwa.dot.gov/Weather/*
- FHWA's Best Practices for Road Weather Management - *http://ops.fhwa.dot.gov/weather/mitigating_impacts/best_practices.htm*

SOLUTION/TOOL: **Service/Courtesy Patrols**
TYPE: **Traffic Operational Improvements**

TOI 15

General Description

Disabled vehicles, accidents, and debris in the roadway can cause a great amount of congestion and decrease safety. The sooner the vehicles or other obstructions can be cleared from the roadway or shoulder, the quicker normal traffic flow will resume.

Service/courtesy patrols are typically found in urban areas on freeways to assist during peak periods, but can be deployed in national parks as well. Examples of assistance provided by a service/courtesy patrol include servicing disabled vehicles (such as providing fuel or oil, jump starting vehicles, changing tires, minor repairs, etc.), removing stranded or disabled vehicles, removing debris from the roadway, transporting stranded motorists, assisting motorists locked out of their vehicles, providing traffic control, and providing directions or a cell phone[16].

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Provides emergency assistance to visitors, improving their visitor experience.
- Increases visitor safety by decreasing their time on the roadside.

Cons

- It may be necessary to require/suggest that the volunteer have previous law enforcement experience to recognize hazards and ensure the courtesy patrol volunteers are safe.
- A courtesy patrol may require law enforcement time when they are already very busy.

GENERAL

- This type of program can be staffed by volunteers for a nominal cost, assuming that there are vehicles available for use for the patrols.
- Even if the program is staffed by volunteers, liability insurance will be needed.
- A training program should be created to properly train staff/volunteers on the duties/responsibilities for this program.
- Coordination will be needed with park law enforcement and USPP.

- Incorporate National Park Service Operational Leadership program principles to assist in completing tasks safely.

Coordination/Partnerships

Coordination for a service/courtesy patrol program would include volunteers, park dispatch, park rangers, local tow truck companies, local medical services, local law enforcement, park law enforcement and USPP.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

If there is a vehicle already available, the time to implement this program will be relatively short (few months). Prior to starting this program, staff or volunteers would need to be recruited and trained and liability coverage would need to be obtained.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2012 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital cost for a service/courtesy patrol, the procurement portion is the cost of the vehicle to be used (if one does not already exist or cannot be donated) and any equipment that may be necessary to assist the disabled vehicle (such as traffic cones, tire repair kits, car jacks, etc.).

Operation and Maintenance Costs

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include either staff salary or benefits provided to volunteers (such as housing, RV site with hookups, coverage for tort liability and job injury, etc.), fuel, repair and replacement parts for vehicles, and replacing the equipment used to assist vehicles (such as gas, oil, tire repair kits, etc.).

Examples of Implementation

- Great Smoky Mountains National Park has a roadside assistance program staffed by volunteers. The program provides minor roadside assistance, traffic control, and information/directions.
  - *http://www.nps.gov/grsm/supportyourpark/upload/2013-Volunteer-Opportunities.pdf*
- Mount Rainier National Park also has a roadside assistance program staffed by volunteers. The following link provides a detailed description of the program (goals, duties, and anticipated results) as well as the requirements for the volunteers (qualifications, responsibilities, training, and benefits provided).
  - *http://rainiervolunteers.blogspot.com/2010/03/emergency-roadside-assistance.html*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Number of vehicles assisted.
- Reduction in delay time.

Additional Resources

- Courtesy patrol pilot benefits - *http://www.usroads.com/journals/rej/9706/re970602.htm*
- Federal Highway Administration Service Patrol Handbook - *http://www.ops.fhwa.dot.gov/publications/fhwahop08031/ffsp_handbook.pdf*
- Guidelines for Establishing Freeway Service Patrols - *http://www.ite.org/Membersonly/annualmeeting/1996/AIA96A54.pdf*

SOLUTION/TOOL: **Signage and Wayfinding**
TYPE: **Traffic Operational Improvements**

TOI
16

General Description

Signage and wayfinding techniques guide visitors to their destinations and are particularly helpful in an unfamiliar environment.

Signage and wayfinding can be used to reduce congestion in several ways, such as reducing visitors' confusion on how to get to their destination, promoting alternative transportation modes, and providing directions to access these modes including park-and-ride facilities (see PT-5) and shared-use pathways (see AC-4). Signage and wayfinding also can be used to promote alternative, less congested locations within a park/unit (see VDM-4).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Signage and wayfinding can enhance the visitor experience.
- Signage and wayfinding can help define a sense of place and be used as a teaching tool.
- Signage and wayfinding provide navigational information that can help provide a sense of security and safety because visitors are more confident of where they are in a park.

CONS

- There may be multiple types of signage and wayfinding in an area and multiple owners of this signage that will need to be coordinated and combined.
- Too much signage can cause "visual clutter" If not designed and located carefully and visual resources and viewsheds in mind.

GENERAL

- An assessment of the existing signage should be created first.
- Visitors should be surveyed to determine gaps/needs in signage.
- Consult park wayfinding plan and coordinate with interpretive staff. If signs are outside park boundaries, consult the agency managing the roadway where the sign may be placed.

Coordination/Partnerships

Adding signage and wayfinding in or near a park/unit will require coordination with park interpretive staff (for signage wording and locations) and park sign fabrication staff(for creating the signs). If signs are needed outside park boundaries, consult the agency that manages the roadway where the sign may be placed (town, city, county, etc.). Coordination may also potentially be needed with the gateway community. The Harpers Ferry Center can provide assistance and guidelines for signs and wayfinding within the park.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

The time to implement signage and wayfinding includes multiple steps such as an assessment of existing signage, surveying of visitors' needs, a design plan for placement of new signs and wayfinding elements, as well as, fabrication and installation of signs.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital cost, the signage assessment portion (documenting existing signage and identifying gaps) cost around $10,000 per assessment when done in-house by the National Park Service. Costs can vary and may be more depending on the size of the park and the complexity of signing and wayfinding systems.

The design portion can range from $17,500 to $190,000 per system in a park/unit and the fabrication portion can range in cost from $42,600 to $1.2 million[41], based on geographic size of the area to be covered, number of signs needed, and type/style of signage to be fabricated.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include replacement of signage that no longer meets signage reflectivity guidance or that has been damaged or defaced (graffiti). Operational costs may also include ongoing visitor surveys to ensure that the signage and wayfinding is continually effective.

Examples of Implementation

- Connect Historic Boston is a partnership between the National Park Service and the City of Boston. It is a program in the planning stages for providing way finding to National Park sites and other historic Boston sites.
  - *http://connecthistoric-boston.org/ideas/signage-wayfinding/*
- The National Mall is working on improving their way finding and pedestrian guides.
  - *http://parkplanning.nps.gov/projectHome.cfm?projectID=24465*
  - *http://parkplanning.nps.gov/document.cfm?parkID=427&projectID=24465&documentID=25959*
- Bar Harbor, Maine where Acadia National Park is located created a way finding plan.
  - *http://www.barharbormaine.gov/ArchiveCenter/ViewFile/Item/96*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Increased visitation at locations/attractions for which signage and wayfinding were added.

Additional Resources

- National Park Service UniGuide Sign Standards
- National Park Service Visitor Information Sign System - *http://www.nps.gov/hfc/acquisition/pdf/VISSignsandWaysideExhibitBases/Shared/VIS_Hardware_Manual.pdf*
- The Harpers Ferry Center can assist parks in designing and implementing signs - *http://www.nps.gov/hfc/products/signs/*
- Manual on Uniform Traffic Control Devices - *http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm*

SOLUTION/TOOL: Speed Management
TYPE: Traffic Operational Improvements

TOI 17

General Description

Roadways are designed with a certain design speed, which often results in the same operating speed for the constructed roadway (the speed at which drivers, on average, are observed operating their vehicles when there is no congestion). It is very common to consider reducing the posted speed limit or advisory speed on a particular roadway in an attempt to increase safety. Reducing the speed can also improve traffic flow. When the traffic demand approaches the capacity of the roadway, stop and go traffic will often result. Forcing a more uniform and optimal speed with posted speed limits can create a smoother traffic flow that reduces delay associated with stop and go traffic and as such can increase the capacity of the roadway.

This tool has three variations of implementation: (1) increase compliance of existing posted speed limits, (2) reduce the maximum posted speed limit, and (3) implement a variable speed limit. These steps can also be implemented progressively, as levels of implementation if needed at a park/unit. For reducing the operating/design speed (as opposed to just the speed limit), refer to the traffic calming tool (see TOI-18).

Compliance with speed limits can be increased through increased enforcement and education. Variable speed limit systems to reduce congestion have been implemented since 1960s. An example implemented in the past few years in the United States is in the St. Louis area along Interstate 270. The posted speed limits were originally regulatory and enforced, but were then converted to advisory speed limits and not enforced. The speed limits were set based on lane occupancy observations and vehicle speeds. When evaluated, this system was found to have benefits in regards to decreasing the number of crashes; however, law enforcement and travelers were dissatisfied with the perceived lack of benefits for congestion relief[42].

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☐ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Smoother traffic flow.
  - Fewer shockwaves in the traffic stream (stop-and-go).
  - Increases in traffic flow capacity of a few percent.
  - Mixed results in literature regarding travel time savings.
  - Reduced collisions due to weaving and sudden stops.
- Reduced noise, vehicle wear, emissions from idling traffic, and fuel use due to lower speeds and less stop-and-go traffic.
- Improved comfort and safety for bicycle and pedestrian users of the road shoulder.
- Slower speeds may increase roadway safety.
- All modes of transportation should be considered when modifying speed limits on park roads.

CONS

- Potential safety risk caused by vehicles traveling both slower and faster than the posted speed limit (a bimodal speed distribution).

GENERAL

When implementing a reduced speed limit, consider the following:

- Providing increased enforcement.
- Ensuring that reduced speed is not violating state regulations for how speed limits are set.
- An engineering speed study should be implemented to justify a lower speed limit.

Coordination/Partnerships

Coordination will be needed with those agencies that provide speed enforcement, including local, county and state enforcement agencies for roads not owned or managed by the park. Also, consider state department of transportation traffic engineering staff for guidance on setting speed limits and coordinating with the regional office of the federal lands highway division.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

Depending on state regulations, it could take some time to obtain approval for a lowered speed limit, but ordering and installing static signs could be completed in a short time frame. For variable speed limit systems, design and installation could take a few years.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000) to higher (above $250,000).

Of the total capital costs, procurement of a small variable speed sign can cost $3,500 to $5,000[1]. However, a variable speed limit system covering 40 miles over Snoqualmie Pass (pictured) was implemented with a small operations center for five million dollars. Much of this cost includes the design, communications, vehicle detection and system integration[43].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include an operator to validate the change in speed (which requires an additional staff member or additional duties for an existing dispatcher) and enforcement costs which could be offset by fines collected. Additional costs may include software upgrades, technology repair and replacement parts, and utility costs.

Examples of Implementation

- Variable Advisory Speeds on I-270 in St. Louis. Missouri.
  - ***http://www.modot.org/stlouis/links/VariableSpeedLimits.htm***

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Average travel time for given traffic flows.
- Reduction in crashes.

Additional Resources

- National Highway Traffic Safety Administration's Speed Prevention Toolkit Enforcement Materials - ***http://www.trafficsafetymarketing.gov/CAMPAIGNS/Speed+Prevention/Obey+The+Sign+or+Pay+The+Fine***
- Federal Highway Administration's Speed Management Resource Website - ***http://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa09028/***
- Transportation Research Board publication Special Report 254: Managing Speed - ***http://gulliver.trb.org/publications/sr/sr254.pdf#search='trb%20sr%20254'***

SOLUTION/TOOL: Traffic Calming
TYPE: Traffic Operational Improvements

TOI
18

General Description

Traffic calming is used to slow traffic down primarily for safety reasons, such as slowing vehicles down in high pedestrian areas. By slowing traffic down in a high pedestrian area, through traffic may take another route that results in a lower travel time. Some common traffic calming measures include traffic humps, narrower travel lanes (see TOI-4), and islands and medians. Traffic circles are another measure consisting of a circular raised median in the center of an intersection. Traffic circles should not be confused with roundabouts. Roundabouts will typically angle the approach roadways and have a wide radius in order to facilitate efficient movement of vehicles through the intersections. Conversely, traffic circles are intended to slow vehicles down and reduce the capacity of the intersection. Chokers and chicanes use raised curbs to reduce the width of the paved travel lanes for a short portion of the roadway. Trees, landscape, and other natural objects (rocks, slopes, etc.) that are closer to the roadway (but still outside required horizontal clearances) also can calm traffic. Also, curved road can calm traffic more effectively than a long, straight road. Any element that will cause a driver to slow and observe conditions more carefully will calm traffic. Traffic calming can be an effective congestion management tool because it slows traffic without affecting roadway capacity.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Can improve comfort of pedestrians and bicycle riders.
- Can improve safety.
- Provides opportunities for plantings and other aesthetic improvements.

CONS

- Increases travel times.
- May have undesirable impacts to viewsheds or cultural landscapes.
- Changes in pavement texture/treatment can affect ambient noise levels.

CONS

When implementing traffic calming measures, consider the following:

- Appropriate alternative routes for through traffic.
- Types or modes of traffic using or crossing the roadway.

Coordination/Partnerships

Coordination efforts should involve cultural and/or historic landscape experts and resource specialists in the decision and design process. Input from the public should be sought as to the various options/improvements. If the park does not own the road, coordination will be needed with the jurisdiction responsible for the roadway (such as city, county, or state department of transportation). Implementation of traffic calming along roads inside parks typically will require coordination with the regional Federal Lands Highway Division.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

Simple implementations will take less time than more extensive improvements requiring design, environmental review, and construction

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital costs, estimates for the construction portion of some traffic calming techniques are as follows[44, 45]:

- Speed hump ($1,500 to 3,000 per location).
- Speed cushion ($2,500 to $3,500 per location).
- Chokers and chicanes ($7,000 to $15,000 per location).
- Medians and islands ($5,000 to $15,000 per location).
- Pavement texture ($5 to $16 per square foot).
- Mini traffic circles ($10,000 to $60,000 per location).
- Striping ($1 to $2 per linear foot).
- Asphalt walkways ($30 to $40 per linear foot for a 5-foot wide walkway).
- Curb ramps ($1,500 per ramp).
- Curb bulbs ($10,000 to $20,000 per bulb).

Operation and Maintenance Costs

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time for enforcement; maintenance and repairs; restriping; pavement resurfacing; repainting; snow and sand removal; and landscaping and mowing.

Examples of Implementation

- Colorado National Monument added speed humps along Rim Rock Drive to enhance employee and visitor safety near the entrance stations.
  - *http://www.nps.gov/colm/parknews/traffic-calming-devices-to-be-installed.htm*
- In 2009, the Presidio launched temporary street closures as a traffic calming measure for those using Presidio Blvd as a cut-through.
  - *http://sf.streetsblog.org/2009/09/29/presidio-launches-temporary-street-closure-and-traffic-calming-study/*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Reduced average travel speed.
- Increased use by bicyclists and pedestrians

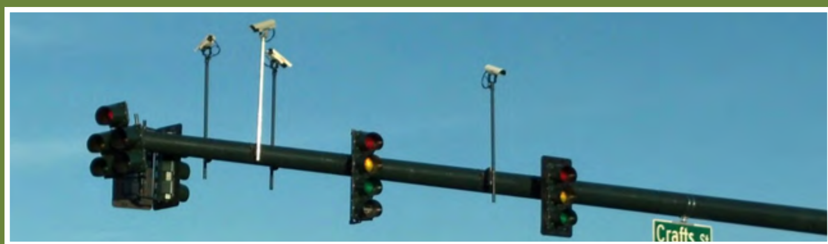
Additional Resources

- Federal Highway Administration's Traffic Calming Website - *http://www.fhwa.dot.gov/environment/traffic_calming/index.cfm*
- Victoria Transport Policy Institute's Travel Demand Website - *http://www.vtpi.org/tdm/tdm4.htm*
- Institute of Transportation Engineer's Traffic Calming Library - *http://www.ite.org/traffic/*
- American Planning Association guide to Traffic Calming and Complete Streets - *http://www.planning.org/research/streets/*

SOLUTION/TOOL: Traffic Monitoring/Data Collection and Analysis

TYPE: Traffic Operational Improvements

TOI 19



General Description

Data is a tool that can be used to help a park/unit understand their existing conditions and determine their transportation issues (help define the frequency and magnitude of congestion issues). With good data, parks can begin to predict future patterns and trends in order to plan for cost effective solutions (improvements) such as design and implementation of a new alternative transportation system, expansion of an existing system, implementing management techniques; and finally to evaluate the effectiveness of changes made.

Data provides a park with concrete, factual evidence as to why a change should, or in some cases, should not be made. Some examples of data that can be collected include traffic volumes, turning movements, pedestrian counts, pedestrian-vehicle conflicts, parking occupancy counts, incidents, and alternative transportation system counts (such as dwell time and number of passengers). Some data, such as turning movement counts, can only be collected manually, while other data, such as traffic counts can be collected using automated systems. Data collection technology continues to improve: Bluetooth detectors can be used to estimate travel time, inductive loops can be used for traffic counts and speeds, video image processing can be used for traffic counts and occupancy information, and Microwave radar can be used for traffic counts or detection of vehicles.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Data provides more accurate information for decision making as opposed to a "best guess".
- Collecting traffic data can also aid in the determination of indicators and thresholds for congestion and carrying capacity.

CONS

- The National Park Service has limited funds for traffic monitoring and a limited number of transportation professionals.
- Data collected both manually and automatically can have inconsistencies and anomalies, and comparisons should be considered carefully.
- Surveys are a great way to collect visitors' perceptions; however, surveys can require a long lead time (6 months to 1 year) and require approval from the Office of Management and Budget (OMB).

GENERAL

- Prior to collecting data, goals, objectives and performance measures should be created. These will guide what data needs to be collected.

- While the National Park Service does not typically collect traffic data (other than average daily trips for parks with permanent counters), traffic volumes can be determined using entrance stations counts if available, or by tapping into information collected beyond park boundaries by gateway communities, state departments of transportation, and others.
- Monitoring and acting on traffic data is separate from collection, and that's where parks may need the support. Support is available from the regional transportation planner, Denver Service Center, federal lands highway division offices, and consultants.

Coordination/Partnerships

Coordination will be needed with the state and/or local departments of transportation to gather data on roadways under their jurisdiction, or possibly loan the park/unit portable collection devices. Parks/units should coordinate with the regional Federal Lands Highway Division to get assistance with data collection.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

The time to implement a traffic monitoring program will depend on the type and amount of data to be collected. A portable counter can be purchased and deployed within a short amount of time; however, a detailed monitoring plan may take several months to develop. Permanent counters with communications and central server may take years to design and implement.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2007 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is higher (above $250,000).

The capital cost for traffic monitoring will depend on the type and amount of data to be collected.

Of the total capital costs, the planning portion for a park-wide transportation assessment conducted by Yosemite National Park cost over $600,000 in 2007. The procurement portion for portable automatic data collection units can cost $1,000-5,000 each, but also require staff time for training, setup, and data reduction. Consultants can also be utilized to assist with planning, data collection and analysis. A study to determine the effects of the alternate transportation system on park resources at Zion National Park costs around $675,000 in 2013.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to manage data collection efforts and to download and analyze data, as well as costs to repair and replace broken equipment (such as damaged road tubes).

Examples of Implementation

- Denali National Park has undertaken a traffic monitoring project to collect existing traffic volumes and patterns. This data was utilized to create a traffic model.
  - *http://www.nps.gov/dena/naturescience/denali-park-road-capacity-study.htm*
- Mendenhall Glacier Recreation Area conducted a vehicular and pedestrian study to measure existing conditions and providing alternatives for improving the congestion.
  - *http://www.triptac.org/Documents/RepositoryDocuments/Mend_Gl_Cong.pdf*
- Grand Teton National Park had conducted traffic monitoring for several seasons including installing road tubes to evaluate traffic patterns, an inductive loop to monitor parking lot use, and trail counters to monitor a separated shared use pathway.
- Rocky Mountain National Park uses trail counters to monitor popular locations.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Numbers of actions implemented as a result of data collection and analysis.
- Increase in the amount of data collected.

Additional Resources

- Federal Highway Administration's Traffic Monitoring Guide - ***http://www.fhwa.dot.gov/policyinformation/tmguide/***
- National Park Service Pilot Data Collection Summary - ***http://www.triptac.org/Documents/RepositoryDocuments/NPS_ATS_Data_Needs.pdf***
- Transportation Planning Process for Transit in Federal Land Management Agencies Volume 3: Methods to Define the Transit Need - ***http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol3_web.pdf***

SOLUTION/TOOL: **Turn Prohibitions/ Restrictions**

TYPE: **Traffic Operational Improvements**

TOI 20

General Description

Vehicles turning left across the traffic flow can cause conflicts with opposing traffic as well as with pedestrians and cyclists, affecting safety. During peak periods when opposing traffic is constant, leaving little to no time for left turns, there can be an increase in back-ups and potential rear-end collisions.

Typically, left turns provide challenges at intersections during peak periods, but challenges can also occur with traffic entering and/ or exiting parking lots and visitor centers. Prohibiting or restricting turning movements at intersections, parking lots, and/or visitor centers can improve traffic flow by eliminating the slower/stopped traffic attempting to turn left which improves efficiency.

Turn prohibitions can be accomplished using signage or channelization (creating medians or other "barriers" to restrict turning movements).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Turning restrictions can increase safety and efficiency.

CONS

- If turning restrictions are only during certain periods (for example 3 to 6 PM) there is a chance that visitors will not know of these restrictions.
- Turning demand may be shifted to other routes or intersections.

GENERAL

- Consider alternate routes vehicles will need to take when turn restrictions are in place.

Coordination/Partnerships

For roadways within the park, coordination will be needed with the regional Federal Lands Highway Division office. If the roadway is not owned and/or maintained by the park/unit or is outside the park/unit, coordination will occur with the jurisdiction responsible for the roadway (such as state department of transportation or city/county transportation office).

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

Since prohibiting or restricting certain turning movements does not include any construction, it should take only a few months for coordination, planning, and implementation (including fabrication of signs). However, if medians or other barriers are used to restrict turning movements, several additional months may be necessary to design and construct these barriers.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2007 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000).

Of the total capital cost, the design and implementation portion for turn restrictions at an intersection is estimated between $25,000 and $50,000 or more depending on the traffic level.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time for enforcement; maintenance and repairs; restriping; pavement resurfacing; repainting; snow and sand removal; and landscaping and mowing.

Examples of Implementation

- Fredericksburg and Spotsylvania National Military Park has a significant amount of commuter traffic on Lee Drive. The park has requested a project to restrict peak hour turns to and from Lee Drive, eliminating the benefit to commuter traffic[46].

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Reduction of turning vehicles at intersection.
- Reduction in delay at intersection.

Additional Resources

- Manual on Uniform Traffic Control Devices - *http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm*

SOLUTION/TOOL: Vehicle Use Restrictions
TYPE: Traffic Operational Improvements

TOI 21

General Description

Prohibiting or restricting certain vehicles (or certain sized vehicles) from areas in a park/unit can help improve traffic flow (reduce congestion), enhance visitor experience, and protect resources.

Vehicle use restriction examples include (1) restricting all personal vehicle traffic on a roadway and allowing only transit; (2) restricting vehicles that are too wide, too long, or weigh too much for the design standards of the roadway; (3) restricting delivery trucks to visitor centers during peak periods; and (4) prohibiting vehicles during particular times to promote pedestrian and cycling use.

Generally vehicle use restrictions require public awareness and enforcement. Marketing of vehicle use restrictions can be accomplished through signage, 511 traveler information phone number (see ES-1), dynamic/variable message signs (see ES-5), websites (see VDM-13) and GPS information, as well as media/social media (see VDM-5). Enforcement can be accomplished with law enforcement or for vehicle size restrictions, weigh-in-motion and automated vehicle classification systems can be utilized.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Vehicle use restrictions reduce the chance that a vehicle will get stuck (height or width wise) due to the road's terrain (slope/angle, width, etc.) or other features (overpasses, etc.).
- Vehicle use restrictions can decrease congestion due to large vehicles moving slower on steep grades and sharp curves.
- If the larger vehicles are not able to utilize the roadway, parking for these vehicles at the destination will also not be needed, providing more parking for smaller vehicles.
- Larger vehicle restrictions increase safety for pedestrians and cyclists sharing the roadway.

CONS

- Without enforcement, vehicle use restrictions may not be effective.
- Vehicle use restrictions without an alternative way for visitors to get to their intended destination (such as a shuttle), may cause visitors frustration and decrease their visitor experience.
- Limiting larger vehicles at peak times may have an impact on deliveries.
- Larger vehicle restrictions may eliminate commercial bus tour operators from visiting the park. This could have an economic impact on the park and gateway communities.

GENERAL

- Parking for larger vehicles may need to be provided, such as at a park-and-ride facility so those visitors that cannot take their vehicles to their intended destination due to vehicle restrictions, can leave their vehicles and continue via alternative transportation.

Coordination/Partnerships

Coordination will be needed with the park/unit and local law enforcement for enforcement of the restrictions put into place. Coordination will also be needed with the park/unit communications staff to make the public aware of the restrictions, the park/unit sign fabrication shop to create the appropriate signage, and the regional federal lands highway office for assistance in determining the appropriate restrictions.

Coordination may also be necessary with delivery companies and other partners who may be using larger vehicles to access the park.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

Implementing vehicle use restrictions requires time to fabricate signage, create a public awareness campaign, and train law enforcement. It will take longer if electronic systems such as weigh-in-motion and automated vehicle classification will be used.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2003 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital costs, initial costs for public awareness actions would be expected to cost a few thousand dollars, and potentially tens of thousands if the restriction is on a major roadway. Some signing, striping, and other infrastructure may be needed to guide motorists in the park/unit, which could cost approximately $5,000 to $10,000 per restricted roadway segment.

Operating Costs

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time for park/unit and local law enforcement and communications staff responsible for the public awareness campaign.

Examples of Implementation

- Scotts Bluff National Monument has vehicle use restrictions for Summit Road. This includes prohibiting vehicles that are longer than 25 feet and/or higher than 11 feet 7 inches and prohibiting all trailers. Hiking and biking is also only allowed during daylight hours when the road is closed to vehicles. A shuttle is available for those unable to take their vehicles to the summit.
  - *http://www.nps.gov/scbl/planyourvisit/things2know.htm*
- Glacier National Park has vehicle restrictions on the Going-to-the-Sun Road which include length, width, and height.
  - *http://www.nps.gov/glac/planyourvisit/gttsrfaq.htm*
- Crater Lake National Park closed East Rim Drive to vehicles for two days in 2013 to promote pedestrian and cycling use.
  - *http://www.prweb.com/releases/2013/6/prweb10857014.htm*
- Mesa Verde National Park prohibits trailers on the main park road past the campground. A trailer parking area is located just before the fee station for those trailers not registered at the campground.
- Recreational vehicles are restricted from several areas in Sequoia and Kings Canyon National Parks.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Decrease in the number of accidents/incidents.
- Decreased delay caused by oversize vehicles.

Additional Resources

- Victoria Transport Policy Institute - ***http://www.vtpi.org/tdm/tdm33.htm***
- Acadia National Park lists all relevant restrictions on one page - ***http://www.nps.gov/acad/planyourvisit/upload/VehicleRestrictions.pdf***

SOLUTION/TOOL: Improve Work Zone Management
TYPE: Traffic Operational Improvements

TOI 22

General Description

While a work zone is in place during construction for improvements to a roadway or parking lot, etc., the work zone may generally cause traffic congestion. Unfortunately, work zones (construction work) in national parks often occur during the peak season when visitation levels are high (during the summer when construction and visitation seasons overlap). Proper management of a work zone can decrease the impact the work zone will have on congestion.

Work zone management includes monitoring traffic and providing traveler information. This effort can be implemented several ways, including the use of intelligent transportation systems. Examples include travel time systems that provide travelers with an estimate for how long it will take to pass through the work zone; expected delay information systems that provide information on the expected delay time due to the work zone; variable speed limit signs that help determine a safe speed due to work zones, weather, and traffic; speed feedback display signs that measure a vehicles actual speed and display this along with the posted speed limit; speed advisory systems used to inform visitors about slower traffic ahead; alternative route systems; overheight/overweight warning systems; work intrusion warning systems; truck warning systems; hazardous roadway warning systems; and automated flagger assistance devices.

Work zone management also includes managing the construction project so it has minimal impact on visitors. This can include concepts such as timing construction projects during evening hours when traffic is generally less, or during months when visitation is lower. Also, alternative modes (such as a shuttle) could be implemented as part of plan to allow access during construction.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Providing traveler information on work zone conditions will prepare visitors for the congested conditions ahead, reducing stress and anxiety.
- Work zone management can increase capacity through the work zone.
- Reducing speed typically increases safety in work zones.
- Work zone management can improve the safety of workers as well as the traveling public.
- Providing information on where work zones are in place may shift visitors to other areas of the park.

CONS

- Work zones (and the construction going on in works zones) can be dynamic, changing environments and can be time-intensive to manage.

GENERAL

- Traveler information should be timely, reliable, and up-to-date.
- Traveler information should be provided well in advance of the construction zone to allow and encourage alternate routes or modes of transportation.
- Law enforcement for speed control is often needed in work zones.
- Any system that provides monitoring capabilities must be robust and reliable.

Coordination/Partnerships

Depending upon where the work zone occurs, coordination will need to take place with the construction contractor, who is typically tasked with providing the management of the work zone. Partnering with the regional Federal Lands Highway Division and/or local, county or state department of transportation when the project is being planned is also important.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

The work zone management plan should be developed when the construction project is planned. By definition, the management of a work zone needs to be in place when construction is occurring.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2012 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Work zone management is typically provided by the contractor and is typically covered in the construction cost of the specific improvement project, but the park/unit may provide some assets to help manage the work zone.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to notify visitors of where work zones exist, where to expect delays, and how long delays may be.

Examples of Implementation

- Zion National Park utilized a tool called Quickzone to determine the projected impact of construction on the queues at the entrance station. Based on the information provided by the tool, construction was delayed and the project phasing was adjusted.
  - *http://www.ops.fhwa.dot.gov/wz/traffic_analysis/quickzone/casestudies/snapshot6.htm*
- Rocky Mountain National Park is providing work zone management via multiple tools including promoting the park-and-ride (see PT-5); encouraging avoiding peak travel times (see VDM-1), encouraging visitation to less congested areas (see VDM-4), and using traveler information tools such as 511 traveler information phone number (see ES-1), dynamic/variable message signs (see ES-5), and media/social media (see VDM-5) to mitigate the impact of congestion on Bear Lake Road.
  - *http://www.triptac.org/Documents/RepositoryDocuments/ROMO_Ops_Plan_08192011.pdf*
  - *http://www.triptac.org/Documents/RepositoryDocuments/ROMO_ITS_Shuttle_Rec07192012.pdf*
- Prior to the start of Glacier National Park's Going to the Sun Road rehabilitation, different mitigation strategies (such as a flagger or signals) and work zone configurations were tested using quickzone to determine what is most efficient.
  - *http://ops.fhwa.dot.gov/wz/traffic_analysis/tatv9_wz/cs2.htm*
- In 2009, a construction zone outside Gateway National Recreation Area caused a 3 hour back-up for visitors leaving the park. To better manage the congestion due to the work zone, the park and the State Department of Transportation formed a partnership. Some of the mitigation techniques included new timing for traffic signals, improved communications with local law enforcement directing traffic, providing traveler information about delays on 511, and limiting the number of vehicles entering the park/unit.
- *http://www.nationalparkstraveler.com/2009/07/gateway-national-recreation-area-seeks-solutions-weekend-traffic-snarls-sandy-hook*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Reduced length of queue at the work zone.
- Reduced amount of delay due to work zone.

Additional Resources

- Federal Highway Administration's Work Zone Mobility and Safety Program - *http://www.ops.fhwa.dot.gov/wz/resources/publications/publications.htm*
- Manual on Uniform Traffic Control Devices Part 6 - *http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part6.pdf*

SOLUTION/TOOL: **Avoid Peak Travel**
TYPE: **Visitor Demand Management**

VDM 1

General Description

Just as there are peak travel times for travel to and from work, such as 7:00 to 9:00 am and 4:00 to 6:00 pm, there are peak travel times for national parks. For many parks, the peak travel occurs during the summer time (mid-June through Labor Day), but peak times can be more specific, such as spring break, Memorial Day weekend, and other holidays, and/or weekends during July and August. Frequent peak travel times in parks are 10:00 am to 2:00 pm.

Electronic systems, such as 511 phone information lines (see ES-1), dynamic/variable message signs (see ES-5), kiosks (see ES-8), and media/social media/mobile device apps (see VDM-5), can be used to warn visitors of busy times and potential delays, and to encourage them to travel to the park during non-peak seasons, such as, shoulder seasons, which may be from March through June and September through November in some areas, or non-peak travel times such as weekdays and hours when the park is less busy, such as before 10:00 am and after 2:00 pm.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☐ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Visitors avoiding peak travel time can lessen traffic congestion for others, creating a better visitor experience for themselves and others.
- Avoids or postpones the need to expand parking or other major capital investments that may damage resources.

CONS

- For this tool to produce benefits, visitors must take an action based on the information provided.
- Based on interviews with personnel from various parks, it can be difficult to influence visitors' behavior.

GENERAL

- As with any traveler information dissemination, the information must be accurate, timely and reliable for travelers to continue to utilize the technology.

Coordination/Partnerships

The entities for coordination will depend on the dissemination device chosen. It could range from the local media, such as social media/mobile device apps, to the state department of transportation, which may operate dynamic/variable message signs, a highway advisory radio program, and other devices.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

The amount of time required to implement this tool will depend on the dissemination device chosen. The information could be provided in a matter of hours by posting it on an already existing website, Facebook, or Twitter site. This process could take longer if devices such as dynamic/variable message signs need to be deployed first.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital costs, the procurement/implementation costs will depend on the dissemination device chosen. The costs associated with 511 phone information lines are provided in tool ES-1, dynamic/variable message signs are provided in tool ES-5, kiosks are provided in tool ES-8, and media/social media/mobile device apps are provided in tool VDM-5.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff salary for keeping information updated. Updates should be done at least once per day, and in some cases might need to be done hourly for maximum effectiveness during all peak use periods. If electronic systems are used, then operation and maintenance costs may include utilities, software updates, and technology repairs and replacement parts.

Examples of Implementation

- Arches National Park provides information on their website about expected travel times and days/times to avoid.
  - ***http://www.nps.gov/arch/planyourvisit/traffic.htm***
- Great Smoky Mountains National Park provides tips for avoiding crowds on their website.
  - ***http://www.nps.gov/grsm/planyourvisit/avoidcrowds.htm***
- Tips for avoiding peak travel times at national parks.
  - ***http://indietraveler.blogspot.com/2013/07/visiting-yosemite-national-park-5-tips.html***
  - ***http://usparks.about.com/od/nationalparksus/a/avoidcrowds.htm***
- During the summer of 2011, Rocky Mountain National Park included an "insider tip" in their highway advisory radio message encouraging visitors to come during non-peak hours.
  - ***http://www.triptac.org/Documents/RepositoryDocuments/ROMO_Eval_ReportCOMB.pdf***

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Change in the relative numbers of visitors during peak times after non-peak times are promoted (shift in visitation from peak to non-peak periods).
- Number of users/followers of various dissemination devices.

SOLUTION/TOOL: **Conduct Tours**
TYPE: **Visitor Demand Management**

VDM 2

General Description

Tours can be offered to 'undiscovered gems' as well as popular park destinations. They can be used to (1) shift visitors to a different mode of travel by offering tours via foot, bicycle, and transit; (2) encourage visitors to avoid of peak travel times (see VDM-1) by offering tours before and after peak times and (3) encourage visitors to visit less congested areas (see VDM-4) by adding these locations to the tour route.

Along with ranger-led tours, parks can also offer audio tours, tours via mobile device apps (see VDM-5), and tours using QR codes, which are quick response bar codes that can be scanned by smart phones to access websites and other information.

This tool is specific to National Park Service led tours, tour buses will be discussed in a separate tool (see VDM-10).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Tours provide visitors with an in-depth knowledge of attractions, which cannot always be gained through personal visitation to a site.
- Tours can assist in consolidating visitors to specific times and areas therefore alleviating some congestion and helping to protect resources.
- Tours can eliminate some of the pre-planning for visitors because the tour route and stops are already programmed.

CONS

- If a tour is the only option at a park and they sell out (are always full), visitors may become frustrated.
- Vehicle based audio tours could add to the congestion if they are very popular and everyone is following the same route.
- Mobile device apps allow visitors flexibility to choose multiple options and routes. However, if the goal of the tour is to route users to certain locations or to follow a particular route to mitigate congestion, a mobile device app may not be the best option. (And not all visitors have access to mobile apps.)

GENERAL

- If a tour is the only option at a park, consider offering a reservation system and prepayment online.

Coordination/Partnerships

Coordination with staff, friends groups, volunteers, concessionaires, transit agencies, gateway communities, and others will be needed to provide tours. Parks need to ensure that all tour guides are trained to provide consistent information. If audio tours and mobile device apps are to be used instead, coordination will be needed with an entity (commercial enterprise, vendor, etc.) to create these tools.

Coordination will also be needed with communication staff to promote the offered tours through websites, media, social media, park newspaper, etc. or to make audio/mobile device app tours available. Lastly, if reservation and prepayment systems are to be used, coordination will be needed between the online system and those running the tours.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

The time to implement will depend on the tour method chosen. A formal, ranger-led tour would take a few weeks for development and supervisory review. A simple ranger-led tour could take only a few days to plan. However, a more detailed mobile device app tour could take up to a year and a half to create[47].

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Of the total capital costs, the design and implementation portion for a ranger-led tour will be minimal (staff time). However, using technology for tours will be more expensive. Creating specific audio tours, such as those made available for mp3 download from Audible, iTunes, and other sources, range in cost from $40,000 to $60,000 with the higher end including tours synchronized to the road[48]. The costs associated with a mobile device app tour are provided in tool VDM-5.

There will also be significant capital costs if a park were to purchase one or more vehicles for implementing a tour program. The costs associated with purchasing vehicles are provided in tools PT-1 and PT-2.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time for ranger-led tours and costs for updating information provided in the technology based tours. Additional operating costs would be incurred if a park decided to implement a bus/shuttle tour using its own personnel to operate and maintain the vehicles.

Examples of Implementation

- In 2008, Great Smoky Mountains provided a guided shuttle tour to Cades Cove to alleviate traffic congestion. This service is no longer operating.
  - *http://www.npca.org/news/media-center/press-releases/2008/cadescove_102408.html*
- Pacific Historic Parks provides an audio tour.
  - *www.nps.gov/valr/planyourvisit/index.htm*
- Cedar Creek and Bell Grove National Historical Park were unable to permit unrestricted access to the site in 2012, but were able to take visitors on ranger-led tours to the monument for free.

- *http://www.nationalparkstraveler.com/2012/07/ranger-led-tours-reach-newly-accessible-monument-cedar-creek-civil-war-battlefield10240*

- Independence National Historical Park provides free 30-minute ranger-led tours which are on a first come, first served basis or can be reserved in advance via phone or online[49].

- Sleeping Bear Dunes National Lakeshore offers bicycle tours.
  - *www.nps.gov/ns/slbe/parknews/news2009bicycletours062409.htm*

- Fort Vancouver National Historic Site uses QR codes to provide information to visitors.
  - *www.nps.gov/fova/parknews/qrcodes1.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Number of tour participants.
- Number of mobile device app or audio tour downloads.

Additional Resources

- National Park Audio Tours – *http://travelaudios.com/index.php*
- Ideal Tourism Uses for QR Codes - *http://travel2doto.com/marketing/4-ideal-uses-tourism-qr-codes/*
- QR Codes 101 for Tourism and Hospitality - *http://travelonlinepartners.com/qr-codes-for-tourism*

SOLUTION/TOOL: Congestion Pricing/ Financial Incentives

TYPE: Visitor Demand Management

VDM 3

General Description

In many cases, simply providing the information to a visitor that their valuable time will be wasted due to congestion is not a compelling reason for them to adjust their behavior. However, when this information is paired with a monetary incentive, such as cost savings or a disincentive, such as additional cost, this may encourage visitors to change their behavior.

Time and money are two of the most important factors used in decision making. Frequently, time itself is not enough to change a visitor's behavior, but when paired with a financial benefit or consequence; this can influence one's decision making process.

Congestion pricing adjusts the cost of transportation facilities, such as roads and parking lots. Increasing costs during congested or peak visitation periods and decreasing costs during off-peak periods can encourage visitors to visit a park during off-peak periods (hours, days, seasons) or to use alternative modes. Costs can be acquired by peak-period fees, fees varying by time of day, and distance based fees.

Financial incentives such as reduction or elimination of entrance fees can also be provided to those arriving by alternative modes.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Can shift visitors to alternate transportation modes such as bicycling, walking, and transit.
- Creates revenue while possibly decreasing congestion.

CONS

- Units must petition and go through a public process to implement or adjust their fees (and there are several different types of fees)[32].
- Variable rates will be necessary and may be difficult to manage.
- Congestion (road) pricing can cause affordability challenges, especially for lower-income households.
- Along with visitors themselves, gateway communities may disagree with congestion pricing as visitors are the driving force of tourism and local economy and congestion pricing would indirectly affect them as well.

Coordination/Partnerships

Coordination will be needed with regional and WASO fee managers to evaluate if this is a possibility for the park or unit. If fees will be adjusted on transit services, then coordination will be needed with the transit provider.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is near term (1 to 3 years).

Implementation for changes in fees in the National Park Service takes at least 12 to 18 months. Implementation would require discussions on ensuring congestion pricing is allowed at the specific park or unit and coordination would be required through regional and WASO fee managers (***http://inside.nps.gov/waso/waso.cfm?prg=87&lv=2***). Planning for the pricing structure, and marketing this change to the public and local gateway community will be needed as part of implementation. Lastly, depending on the pricing structure chosen, new infrastructure may be necessary, such as an automated gate access (see ES-2), parking meters, or other devices.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000) to higher (above $250,000).

Of the total capital costs, the procurement/implementation costs could be minimal (marketing costs only) if fees are already collected at the unit and no changes need to be made. However, if additional infrastructure will be added to automate the fee collection process (automated gate access, automated fee machines, etc.) the costs may be significant. The costs associated with automated gate access are provided in ES-2, the costs associated with automated fee machines are provided in ES-3.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to continually keep promotional materials updated and distributed, as well as, printing costs for promotional materials. For fee collection, the operation and maintenance costs would include staff time if fees are collected manually or utilities, software updates, and repair and replacement parts if fee collection is automated. Automated solutions will likely have a higher capital cost, but may have a lower annual operating cost.

Examples of Implementation

- Turtle Bay Exploration Park offers discounted entrance fees for those entering after 3:30 PM (John A. Volpe National Transportation Systems Center, 2011).
  - ***http://www.turtlebay.org***
- Yosemite National Park entrance fees are $10 for people arriving by non-commercial bus as opposed to the $20 entrance fee for an automobile.
  - ***http://www.nps.gov/yose/planyourvisit/feesandreservations.htm***
- Sandy Hook National Recreation Area has parking fees rather than an entrance fee. Therefore, those arriving by public transportation, would not have to pay a fee to use the national park.
  - ***http://www.nps.gov/gate/planyourvisit/shumasstransit.htm***
  - ***http://www.nps.gov/gate/planyourvisit/feesandreservations.htm***

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples include:

- Reduction in peak period traffic volume.
- Number of visitors and amount of money collected during congestion pricing period.
- Number of visitors during times when fees are reduced or eliminated.

Additional Resources

- National Park Service fee policy
- Congestion pricing options and suggestions - *http://dc.streetsblog.org/2013/01/24/confronted-with-congestion-pricing-people-clamor-for-transit-gas-tax/*
- Road pricing information - *http://www.vtpi.org/tdm/tdm35.htm*

SOLUTION/TOOL: Encourage Visitation to Less Congested Areas

TYPE: Visitor Demand Management

VDM 4

General Description

Many national parks have attractions that are well known and that all visitors want to see such as Old Faithful at Yellowstone National Park. Encouraging visitors to go to attractions in less congested areas can decrease congestion and increase visitor experiences.

This solution also could potentially decrease congestion on roadways leading to the attraction, in parking lots, and on pathways at the attraction.

Electronic systems, such as 511 traveler information phone number (see ES-1), dynamic/variable message signs (see ES-5), kiosks (see ES-8), and media/social media/mobile device apps (see VDM-5) can be used to encourage visitors to travel to other locations within the park by warning them of congested areas/attractions.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Visitors avoiding congested areas can lessen traffic congestion for others, as well as create a better visitor experience for themselves.

CONS

- For this tool to produce benefits, visitors must take an action based on the information provided.
- Heavily promoting a less congested area could potentially create more demand at a previously undisturbed area, or area that isn't capable of handling more visitors.

GENERAL

- When implementing this solution, parks need to think of their overall visitor use management strategy, as many times they emphasize one or several iconic attractions. This solution de-emphasizes any one particular site/attraction.

Coordination/Partnerships

The entities for coordination will depend on the dissemination device chosen. It could range from the local media such as media/social media/mobile device apps, to the state department of transportation, which operates dynamic/variable message sign and other devices. Marketing efforts will need to be coordinated with partners in the gateway community.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

The amount of time required to implement this tool will depend on the dissemination device chosen. The information could be provided in a matter of hours by posting it on an already existing website, Facebook, or twitter site, but could take a few months to a year if devices such as dynamic/variable message signs or other improvements need to be deployed first.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2009 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Of the total capital costs, the procurement/implementation costs will depend on the dissemination device chosen. The costs associated with 511 phone information lines are provided in tool ES-1, dynamic/variable message signs are provided in tool ES-5, kiosks are provided in tool ES-8, and media/social media/mobile device apps are provided in tool VDM-5.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff salary for keeping information updated. If electronic systems are used, then operation and maintenance costs may include utilities, software updates, and technology repairs and replacement parts.

Examples of Implementation

- Arches National Park provides information on their website about expected travel times and days/times to avoid.
  - *http://www.nps.gov/arch/planyourvisit/traffic.htm*
- Great Smoky Mountains National Park provides tips for avoiding crowds on their website.
  - *http://www.nps.gov/grsm/planyourvisit/avoidcrowds.htm*
- Tips for avoiding peak travel times at national parks.
  - *http://indietraveler.blogspot.com/2013/07/visiting-yosemite-national-park-5-tips.html*
  - *http://usparks.about.com/od/nationalparksus/a/avoidcrowds.htm*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Change in the relative numbers of visitors to less congested areas after they are promoted.
- Number of users/followers of various dissemination devices.
- Change in percentage of visitors at congested sites during peak hours.

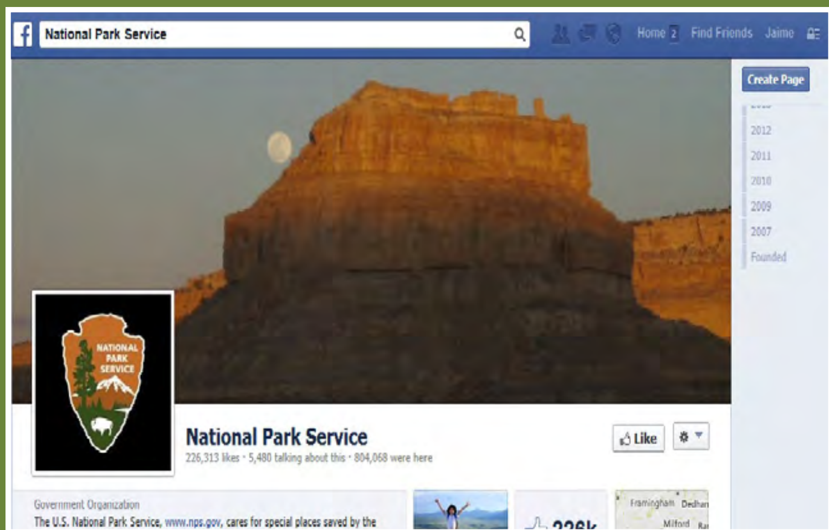
Additional Resources

- The Interagency Visitor Use Management Council - *http://www.reclink.us/forum/topics/interagency-visitor-use-management-council*
- Denver Service Center-Planning Visitor Use Management team
- Indicators and Standards of Quality - *http://www.triptac.org/Documents/RepositoryDocuments/BestPractices_Manning_Final3.pdf*
- Recreation Opportunity Spectrum - *http://www.triptac.org/Documents/RepositoryDocuments/TROS_Lit_rev.pdf.pdf*

SOLUTION/TOOL: Media/Social Media/ Mobile Device Apps

TYPE: Visitor Demand Management

VDM 5



General Description

Traditional media such as television, radio, and newspapers have always been and continue to be popular ways to get information out to the general public in a fast and efficient manner. However, with smart phones rising in popularity, the use of social media (e.g., Facebook, YouTube, Twitter, Flickr, Tumblr, Instagram, blogs, and other programs) and mobile device apps have also become acceptable low cost ways to provide information to an abundance of people.

Information provided by national parks via these tools includes transportation-related information as well as interpretive information. Mobile device apps can be used to provide general information, or can be used as tour guides. If used as a tour guide, this allows the opportunity to send visitors to less congested areas of a park or unit.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Social media can be used to promote less congested times and locations.

CONS

- Users may not be willing to pay for a mobile app when data can be accessed for free.

GENERAL

- Information must be timely, relevant, and reliable for users to continue utilizing this service.
- Parks/units need to ensure that a consistent message is being provided through media, social media, website, visitor centers, and rangers.

Coordination/Partnerships

When using traditional media, you will need close coordination with the local television and radio stations. This tool may also require partnering with a consultant or vendor to create a mobile app for your unit. When using social media for your unit, make sure that there is close coordination internally at your unit so the proper information can be shared. For example, law enforcement for road closures; rangers for congestion information; communications department for important notices; transportation staff for new project information; and interpretive staff for fun facts, natural and cultural resource protection messages, and other details.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

Media and social media will not take long to implement the first time but will require significant staff time for content updates. Mobile device apps could take up to a year and a half to develop[47].

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2003 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Many of the social media (e.g., Facebook, Youtube, Twitter, Flickr, Tumblr, and Blogs) sites are free to use.

The cost for a park/unit to develop its own mobile app would range from $50,000 to $100,000[47]. A real-time road closure and detour web app can usually be created by NPMap Builder (*http://www.nps.gov/npmap/blog/help-beta-test-the-npmap-builder.html*) at no cost to the unit if a base map of the unit exists. However, the cost to NPMap Builder to produce the app is around $2,000 to $3,000[47].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to keep the social media sites updated (which could require significant time depending upon the information shared) as well as, costs for updating information provided on the mobile apps.

Examples of Implementation

- Mobile apps can highlight multiple national park units such as the National Parks App by National Geographic and Oh Ranger! Park Finder App or can highlight a single unit such as apps for Harpers Ferry, Boston National Historical Park, and National Mall & Memorial Parks.
  - *http://news.verizonwireless.com/news/2013/05/national-parks-apps-accessories.html*
  - *http://www.nps.gov/hfc/products/digitalmedia/mobileapps/*
  - *http://www.nps.gov/nama/photosmultimedia/app-page.htm*
- Blue Ridge Parkway has a web app produced by the National Park Service's special service center, NPmap, which informs visitors of road closures and detours.
  - *http://maps.nps.gov/blri/road-closures/*
  - *http://www.nps.gov/npmap/*
- Many of the national park service units are on Facebook and Twitter. Some examples are shown below.
  - *https://www.facebook.com/nationalparkservice*
  - *https://twitter.com/NatlParkService*
  - *https://www.facebook.com/zionnps*
  - *https://twitter.com/ShenandoahNPS*
- America's Great Outdoors provides Tumblr updates for U.S. Department of the Interior.
  - *http://content.govdelivery.com/accounts/USDOI/bulletins/8746e8*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Number of users/followers.
- Change in the relative numbers of visitors at uncongested destinations after they are promoted on social media compared to visitors at congested areas not promoted.

Additional Resources

- Interim Policy on Social Media - *http://www.nps.gov/policy/Socialmedia.pdf*
- Social media and national parks - *http://www.nps.gov/hfc/products/digitalmedia/socialmedia/*
- Leveraging social media – *http://www.nationalrtap.org/Resources/ResourceSearchResults.aspx?org=a2GSpnDbruI=&query=leveraging%20social%20media*
- Use of social media in public transportation (TCRP Synthesis 99) - *http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_99.pdf*
- ITS in National Parks and Other Federal Lands – 2011 Update Appendix G - *http://ntl.bts.gov/lib/44000/44200/44256/ITSinParks2011_update.pdf*
- Twitter List for National Park Service - *http://jason-cochran.com/blog/all-the-national-park-service-twitter-accounts-in-one-place/*

SOLUTION/TOOL: **Parking Fees**
TYPE: **Visitor Demand Management**

VDM 6

General Description

To deal with insufficient parking to meet demand, one effective tool is to add or increase parking fees.

Adjusting parking fees by increasing costs at congested/high-utilization times or decreasing costs during non-congested times can encourage visitors to visit the parks during off-peak periods, adjust their visitation times, or to use alternative modes.

Park units could also increase enforcement for visitors parking illegally and raise the cost of parking tickets issued to discourage visitors from parking illegally[50]. The costs of the tickets are set by the US Park Police. Money goes to the US General Fund[53]. Although this may discourage visitors from parking illegally, the cost of a ticket for failure to obey posted signs was $100.00 in 2008, it will not provide any revenue for the park, and therefore the ticket collections cannot offset the cost of enforcement.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☐ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Can shift visitors to alternate transportation modes such as bicycling, walking, and transit.
- Creates revenue while possibly decreasing congestion.
- Can decrease vehicles circulating in parking lots which can reduce congestion and pollution.

CONS

- Units must petition and go through a public process to implement or adjust their fees (and there are several different types of fees)[32].
- Visual impacts from parking meters/kiosks.
- Parking fees can cause affordability challenges for lower-income households.
- Some visitors would rather circulate in a full but free parking lot to look for a parking spot than to pay a parking fee[32].
- Units should ensure that they do not raise the parking fees too high, or no one will utilize the parking lot.

- Implementing this technique may just push the issue to a neighboring site.
- For smaller parking lots, collection costs are likely to exceed revenues, but may also reduce enforcement costs.

GENERAL

- Doing a parking fee study in advance of implementation will assess feasibility of implementation, support the parks request to modify fees, and assess parking rates to avoid unintentional parking shifts, and assess potential fee revenue that could go back to the park as part of FLREA.
- Cooperation and agreement from law enforcement or US Park Police will be essential to successful enforcement.

Coordination/Partnerships

Coordination will be needed with the regional and WASO fee managers to evaluate if this is a possibility at your unit. If parking fees are added to parking lots outside the national park, coordination would be needed with the gateway community. Coordination will also be needed with law enforcement or US Park Police for enforcement.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year) to near term (1 to 3 years).

Implementation time could vary from one to three months if fee collection is already allowed. Parking fees are called expanded amenity fees and are only allowed at locations where you have additional amenities such as lighting, security, restroom facilities, etc. If fee collection is not already allowed, time to implement is about 12 to 18 months (although the National Mall has been trying to implement this for 5 years). Implementation would require discussions on ensuring adding or increasing parking fees is allowed at your unit, planning for the pricing structure, and marketing this change to the public and local gateway community. Coordination would be required through regional and WASO fee managers (***http://inside.nps.gov/waso/waso.cfm?prg=87&lv=2***). Lastly, depending on the pricing structure selected, new infrastructure such as parking meters or pay stations may be necessary.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000) to higher (above $250,000).

Of the total capital costs, the procurement/implementation costs could be minimal (marketing costs only) if fees are already collected at the unit and no changes need to be made. However, if additional infrastructure will be added to automate the fee collection process (automated gate access, automated fee machines, parking meters, parking management equipment, etc.) the costs may be significant. The costs associated with automated gate access are provided in ES-2, the costs associated with automated fee machines are provided in ES-3. The costs associated with parking management are provided in TOI-12.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to continually keep promotional materials updated and distributed, as well as, printing costs for promotional materials. For fee collection, the operation and maintenance costs would include staff time if fees are collected manually or utilities, software updates, and repair and replacement parts if fee collection is automated. Automated solutions will likely have a higher capital cost, but may have a lower annual operating cost.

Examples of Implementation

- To address congestion and safety concerns, Cape Cod National Seashore began prohibiting vehicles from dropping off and picking up passengers at Coast Guard

Beach in 2001 and instead requires that all visitors park at the Little Creek parking area ($15 daily fee) and take the shuttle[49].

- Golden Gate National Recreation Area implemented some paid parking and time limits (3-hour spaces) in some smaller parking lots near the Golden Gate Bridge in order to discourage commuters from using these spaces and allow turnovers[20].

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Reduction in vehicles circulating within the parking lot.
- Amount of money collected in parking lot.

Additional Resources

- National Park Service Fee Policy - *http://inside.nps.gov/waso/waso.cfm?prg=87&lv=2*
- Parking fees - *http://www.vtpi.org/tdm/tdm26.htm*
- Directors Order #22, Recreation Fees 5/14/2010
- Reference Manual 22A April 2011

SOLUTION/TOOL: **Partnerships, Collaboration, Public Involvement and Outreach**
TYPE: **Visitor Demand Management**

VDM 7

General Description

Partnerships, collaboration, public involvement, and outreach is not a standalone "tool" to be used by itself but should be used as an implementation strategy for the other tools in this toolbox. This is evidenced by the fact that "coordination/partnerships" is listed as a subheading in each tool. This tool provides more in-depth information for partnerships, collaboration, public involvement, and outreach.

There are many potential partners that parks/units can engage/outreach to in helping to solve transportation congestion problems, including gateway communities and surrounding jurisdictions, regional transit agencies, departments of transportation (state, county, etc.) transportation management districts and associations (non-profit groups that are generally public-private partnerships and provide cooperative transportation and parking management services), and others.

Public involvement from the beginning of a planning process, at key decision making steps along the way, and through implementation of congestion management activities will help the process run much smoother, help gain public support for the project, and avoid costly revisions in the end. Involving the public and local partners can help identify the needs and concerns of many different user types, test the recommendations, and inform potential solutions.

Examples of public and partnership involvement include surveys, task forces/advisory committees, focus groups, presentations at town meetings, workshops and meetings (i.e., brainstorming, visioning, and charettes) open houses, and requesting comments. Outreach to the public can be conducted similar to a marketing campaign such as press releases, printed materials, mailings, phone calls, social media, and websites.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Partnerships and coordination can lead to fast implementation of simple fixes that provide major benefits.
- The public can provide a unique viewpoint on the needs and challenges of a variety of visitor types from which to create recommendations that otherwise may not have been considered. Sometimes the best and most useful ideas come from a fresh perspective and someone who is very familiar with the park/unit from a visitor's perspective.
- Involvement and outreach provides the opportunity to inform and educate visitors about local, state, and federal technical requirements that must be adhered to, as well as key challenges in the park/unit, and potential solutions.
- Involvement and outreach can help engage the public in stewardship for the park/unit and build support for necessary improvements and changes.

CONS

- A lack of participation from stakeholders could be a barrier.
- Due to the varying opinions of the public, it can be a challenge to identify recommendations that everyone will support.
- Public needs may vary and conflict with the mission of the park/unit to protect resources.

GENERAL

- Coordination with partners may require written agreements, such as memorandums of understand, memorandums of agreement, and other partnership instruments.
- All projects involving national parks need to follow the National Environmental Policy Act (NEPA) process, which includes public involvement

Coordination/Partnerships

For this tool, the list of partners is endless and ranges from the public to transit providers, to gateway communities, to Transportation Management Associations. A list of potential partners and stakeholders can be found at: *http://www.triptac.org/TRIPTACResources/PlanningResources/Default.html*.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

Creating partnerships can take a relatively short amount of time. On occasions, it may simply take one meeting or phone call. In other cases, it may take months to create written agreements and establish trust.

Involving the public is an ongoing activity for national parks. Specific involvement and outreach related to actions in the park/unit or projects being implemented can take months to years depending on the extent of the project. Public and stakeholder involvement is usually an ongoing effort throughout the duration of any national park project.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000) to high ($100,000 to $250,000) to higher (above $250,000).

The cost for partnerships is focused on staff time for meetings and planning. Parks usually budget the cost of public and stakeholder involvement as part of capital project costs. In some cases, park/unit staff may take on involvement and outreach responsibilities, or they may hire consultants for support. The costs of public involvement and outreach will vary with the level of involvement. For development of transportation plan or engagement for review of and comment on transportation alternatives and improvements, public involvement efforts supported by consultants may run in the tens of thousands.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time.

Examples of Implementation

- Valley Forge coordinates with the South Eastern Pennsylvania Transportation Authority on alternative transportation options[18].
- Marsh-Billings-Rockefeller created partnerships with the town, regional planning organization, regional transportation provider, a local non-profit, and the Chamber of Commerce[21].
- The Alaska Federal Lands Long Range Transportation Plan engaged the public through citizen's advisory committees and requesting public comments.
  - Chapter 5 - *http://www.akfedlandslrtp.org/lrtp.html*
- Muir Woods National Monument is considering a parking reservation and shuttle system and has held public meetings and requested public comments to discuss this project.
  - *http://parkplanning.nps.gov/projectHome.cfm?projectId=48272*
- The Sleeping Bear Heritage Trail has involved the public from the beginning of the project and allowed them to provide input in the decisions for creation of the trail. They continue to keep the public apprised of the next steps in project, seek funding donation, and request public comment through newsletters, websites, blogs, surveys, and Facebook. One of the committee members for the Sleeping Bear Heritage Trail is the marketing and outreach director for TART trails, Inc. and as such, she assists in the marketing and outreach for the Sleeping Bear Heritage Trail as well.
  - *http://sleepingbeartrail.org/*
  - *http://www.leelanaunews.com/?q=node/14750*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. To quantify the effectiveness of this tool on improving congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool has specific performance measures that can quantify effectiveness. For this tool, examples for measuring the ongoing effectiveness include:

- Number of partnerships and public meetings held.
- Level of comments and input gathered via the National Park Service PEPC system and at public meetings and workshops.

Additional Resources

- Partnerships in Transportation - *www.nps.gov/transportation/partnerships_in_transportation.html*
- Innovative Transportation Planning Partnerships to Enhance National Parks and Gateway Communities – *http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP08-36(83)_FR.pdf*
- Transportation Management Associations – *http://www.vtpi.org/tdm/tdm44.htm*
- Webinar: (Module 4) Alternative Transportation Systems and the Role of Partnerships, Stakeholder Participation, and Public Involvement - *http://www.triptac.org/TRIPTACResources/TRIPTACTrainings/Default.html#mod4*
- Effective communication and public participation - *http://www.mrsc.org/subjects/governance/participation/participation.aspx*
- Federal Highway Administration's public involvement page and resource page - *http://www.fhwa.dot.gov/planning/public_involvement/* and *http://www.planning.dot.gov/focus_publicEngage.asp*
- Guide for public involvement techniques - *http://www.planning.dot.gov/publicinvolvement/pi_documents/toc-foreword.asp*
- Innovations in public involvement for transportation planning - *http://ntl.bts.gov/DOCS/trans.html*

SOLUTION/TOOL: **Promote Bicycle and Pedestrian Access (including Bike Sharing)**

TYPE: **Visitor Demand Management**

VDM 8

General Description

Promoting bicycle and pedestrian access (including bike sharing) to a unit rather than driving a motorized vehicle such as a private automobile can reduce congestion within a park (or on the access roads to the park).

Promoting bicycle and pedestrian access can be done by (1) marketing through the unit's website (see VDM-13), media/social media (see VDM-5) and newsletter, (2) providing the necessary facilities such as new or expanded multimodal facilities (see PT-4), shared use paths (see AC-4), shoulders of sufficient width for bicycling (see TOI-10), pedestrian paths and walkways, bicycle racks on the ground and on buses/shuttles, bicycle rental shops, bike sharing, and lodging that offers bikes to their customers, (3) by providing incentives/promotions such as a decrease in entrance fees, bicycle tours, and car-free events, and (4) through national programs such as "A Call to Action," "Healthy Communities," "Healthy Parks, Healthy People," "America's Great Outdoors," and "Let's Move Outside."

Note: This solution and the strategies noted herein can also be used by parks to promote the use of rivers (navigable waterways) both to access the park and for travel within the park. The same concepts (e.g., existing infrastructure) and concerns (e.g., safety and degradation of resources) are applicable to water-born transportation.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Bicycle/pedestrian access can result in many benefits such as creating a traffic calming affect that may increase vehicle throughput and can be safer for all users, providing health benefits, and providing alternative ways for tourists to visit attractions that can enhance their experience of the park/unit.
- Bicycle facilities that are linked to or can become a part of regional bike routes will tend to get more use.

CONS

- Creating the additional bicycle/pedestrian facilities may affect some of the resources that the park/unit is trying to protect if construction work is not adequately mitigated.
- Creating bicycle/pedestrian facilities within the existing ROW can take capacity being used for vehicles decreasing overall speed and volume.

Coordination/Partnerships

This tool can require coordination with a number of different entities, including surrounding gateway communities and agencies who have jurisdiction over roadways leading to or within the park/unit, as well as lodging establishments, bicycle rental concessionaires, entities that operate bike sharing, media, and coordinators of national programs.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years) to longer term (3 to 6 years).

The time to implement this tool depends on the level of activity proposed. A simple media campaign could require minimum time, whereas additional infrastructure improvements (such as adding a shared use path, bicycle and pedestrian facilities, or other features) may require months or years to analyze and construct.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

Costs will depend on whether promotion is via a media campaign (minimal cost) or by providing additional infrastructure (costs will vary depending on the extent of the improvement). The costs associated with multimodal facilities are provided in PT-4, shared-use paths are provided in tool AC-4, for complete streets are provided in tool TOI-4, and for lane separation/delineation are provided in TOI-10.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to continually keep promotional materials updated and distributed, as well as, printing costs for promotional materials. The operating costs related to additional infrastructure can be found in the associated tools (referenced above in capital costs).

Examples of Implementation

- Sleeping Bear Heritage Trail is currently four miles long, but at completion will have 27 miles. The trail is promoted through media, social media, websites, bicycle rental concessionaires, bicycles available at local bed and breakfasts, and activities such as the "Dune Dash four mile run/walk" and the "Twilight Ride."
  - *http://sleepingbeartrail.org/*
- To promote bicycle and pedestrian access, Crater Lake National Park began an annual car-free weekend in 2013.
  - *http://bikeportland.org/2013/08/19/crater-lake-national-park-to-announce-annual-carfree-weekend-92555*
- To promote bicycle use; Mesa Verde has a special bike weekend on Wetherhill Mesa each fall.
  - *http://www.nnps.gov/MEVE*
- Grand Canyon National Park has a concessionaire (Bright Angel Bicycle Rentals) located within the park for visitors to rent bicycles from.
  - *www.bikegrandcanyon.com*
- The National Mall has installed Capital Bikeshare stations to promote bike usage in the National Park and the San Antonio Bcycle expanded to reach the San Antonio Missions. The Bcycle has an app available to access the status of available bikes, docking stations, and to get directions.
  - *www.capitalbikeshare.com*
  - *www.sanantonio.bcycle.com*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed.

In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Trail user counts.
- Bicycle rental counts and revenues.

Additional Resources

- Exploring Bicycling Options for Federal Lands: Bike Sharing, Rentals and Employee Fleets - *http://www.triptac.org/Documents/RepositoryDocuments/Exp_Bike_Opt_Fed_Land.pdf*
- National Park Service Rivers, Trails, and Conservation Assistance Program - *http://www.nps.gov/orgs/rtca/index.htm*
- Active Trails Program at the National Park Foundation - *http://www.nationalparks.org/our-work/programs/active-trails*
- American Trails - *http://www.americantrails.org/*
- California State Parks Trail Managers Toolbox - *http://www.parks.ca.gov/?page_id=23419*
- Good Practices to Encourage Bicycling & Pedestrians on Federal Lands - *http://www.triptac.org/Documents/RepositoryDocuments/BikePedPlan_Web.pdf*
- Adventure Cycling Association, Missoula, MT - *http://www.adventurecycling.org*

SOLUTION/TOOL: **Promote No-Car Park Access Options**

TYPE: **Visitor Demand Management**

VDM
9

General Description

Implementing transit or ridesharing for access to/from and within a park or unit will help improve congestion issues only if visitors know about these systems and utilize them. A marketing campaign can help with getting the word out to visitors and incentives can help to encourage transit use.

A marketing campaign can consist of press releases, social media campaigns, information on websites (see VDM-13), printed materials, vehicle graphics, 511 traveler information phone number (see ES-1), dynamic /variable message signs (see ES-5), and static and electronic kiosks (see ES-8). Logos and taglines are some of the most memorable elements of a marketing campaign.

Another way to promote transit use and ridesharing is through the use of incentives. Incentives can include providing interpretation on transit, reducing entrance fees for transit and ridesharing participants, preferred parking for ridesharing participants, charging fees at a discount by party rather than individual on transit and providing coupons for local stores to those using transit and ridesharing. Charging visitors to park their vehicles inside the park/unit can also help to incentivize the use of transit, as long as visitors do not have to pay a parking charge at the shuttle pick-up location.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☐ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☐ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Real-time GPS bus mapping allows the capability to tell visitors when the next bus will arrive which can make a service successful by reducing wait time perceptions.
- Ridesharing and transit are both great options for non-drivers and those who do not own a car.

CONS

- Using transit and ridesharing do not allow visitors the same flexibility as a personal vehicle in both the ability to access sites on their own schedule and to bring all of their personal equipment with them.
- Promoting transit services can potentially increase the number of users beyond the capacity of the current system.
- Simply setting up a ridesharing system is not enough to get drivers to leave their private automobiles. Changing visitor behavior will often require the promotion of ridesharing and/or offering incentives such as discount coupons or reduced fees or preferred parking spaces.

GENERAL

- There is a need to collect feedback on transit to continually improve the service. This can be done through annual on-board surveys.
- Depending on the park, it would be advisable to work with transit companies to create ways for people to bring typical gear with them. For example, beach gear, backpacks, strollers, picnics or bicycle.

Coordination/Partnerships

Coordination will be necessary with the local transit agency, local media, and local ridesharing companies.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

Promoting ridesharing and transit services can take weeks or months, depending upon how sophisticated and extensive the media campaign is. Simply adding messages that promote transit and ridesharing to existing media will take a minimal amount of time. Planning and implementing a new media campaign focusing on ridesharing and transit will take several months. f additional stops are needed, or if the park is to modify existing equipment; coordination can take a year or more.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2011 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation is low ($0 to $50,000).

Equipment purchases may include adding bicycle racks to existing buses. The average cost is $465[54].

The cost for marketing will vary greatly based on how extensive of a marketing plan is implemented as well as whether the marketing is done in-house or using a marketing firm. Marketing plans can range from simple with minimal set up cost, such as with social media, press releases, and website information, to extensive with the use of vehicle graphics, advertisements in print and/or radio and television, and other actions.

As an example, Marsh Billings Rockefeller National Historical Park budgets approximately $15,000 per year to cover marketing for their shuttle. This includes items such as weekly ads in the regional and local papers, materials for Trolley stop signs, brochures, cost of advertising in Welcome Centers, and website maintenance[51].

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.).
In addition, the long-term cost implications for this tool include staff time to continually keep promotional materials updated and distributed, as well as, printing costs for promotional materials.

Examples of Implementation

- The Island Explorer in Acadia National Park has a marketing plan that includes vehicle graphics, information on a website, print materials, press releases as well as other activities.
  - Chapter 11 - *http://www.exploreacadia.com/IEX_SRTP.pdf*
- Marsh-Billings-Rockefeller uses the tag line “powered by 16 cows and a community” to market their transit system and its sustainability and alternative energy[21].
- At the Sandy Hook unit of Gateway National Recreation Area, a parking fee, in lieu of an entrance fee, is charged during the peak season, therefore, providing an incentive to those who arrive by transit and would not pay a fee[3].
- In the San Francisco Bay Area, the Bay Area Open Space Council has a website that allows people to find transit to access trails in the area including ridesharing.
  - *http://www.transitandtrails.org/find/trips*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Vehicle occupancy.
- Number of private automobiles, ridesharing users, and transit users.

Additional Resources

- Leveraging social media – *http://www.nationalrtap.org/Resources/ResourceSearchResults.aspx?org=a2GSpnDbruI=&query=leveraging%20social%20media*
- Use of social media in public transportation (TCRP Synthesis 99) - *http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_99.pdf*
- Marketing transit - *http://www.embarq.org/sites/default/files/EMB2011_From_Here_to_There_web.pdf*
- Transit Cooperative Research Program (TCRP) - *www.tcrponline.org*
- American Public Transportation Association (APTA) - *www.apta.com*
- Example of marketing for transit in Los Angeles - *http://thecityfix.com/blog/transit-agencies-need-to-invest-in-marketing-a-lesson-from-los-angeles/*
- How to find a ride share - *http://www.offthegridnews.com/2012/04/03/how-to-find-a-ride-share/*
- Ridesharing - *http://www.vtpi.org/tdm/tdm34.htm*
- A Return on Investment Analysis of Bikes-on-Bus Programs - *http://www.nctr.usf.edu/pdf/576-05.pdf*

SOLUTION/TOOL: **Promote Tour Bus Use**
TYPE: **Visitor Demand Management**

VDM 10

General Description

Visitation via tour buses rather than private automobiles can assist the unit in decreasing congestion related to automobiles and can also provide an opportunity to enhance the visitor experience. Promotion of tour buses can be accomplished much the same way as promoting other transportation modes. A marketing plan should be created and can consist of elements such as press releases, information on a website, social media, and print materials.

To promote tour bus use, also consider other tools such as transit signal prioritization (see ES-10), transit technology applications such as fast pass (see PT-9) or reserved travel lanes for transit operation (see PT-7).

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☑ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☑ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Tour buses provide the added benefit of interpretation, which can enhance the visitor experience.
- Working with tour bus operators, the demand at certain attractions can be managed by having itineraries that spread out the visitors and/or direct visitors to areas that are less congested during peak periods.

CONS

- Units should be careful to not promote tour buses to the extent that the tour buses then become the issue. This can be accomplished by planning for the management of tour buses (such as larger parking spaces, staging areas in parking lots, more maneuvering room in parking lots, queuing during the loading and unloading process, as well as wear and tear on pavement) to ensure that tour bus operations run smoothly and do not add to existing congestion challenges.
- If there are multiple private tour buses in the area, the unit needs to ensure that they are promoting tour bus use in general or giving all private companies equal promotion. Units should examine their concession contracts and commercial use authorization permits for requirements.

- Modifying parking areas to accommodate larger tour bus vehicles will reduce the number of spaces available for private vehicles.
- Tour buses create a pulsing of visitors that could overwhelm the carrying capacity of popular attractions.

GENERAL

- Provide tour bus staging to minimize noise and air quality concerns.

Coordination/Partnerships

The unit will need to coordinate with the local media and gateway communities and sometimes beyond to reach the visitor population in order to promote tour bus usage. The park/unit may also find it beneficial to partner with a marketing company to assist with promoting tour bus usage. Lastly, the park/unit should partner with the tour bus vendor/concessionaire and the gateway community on tour bus operations and management to ensure that the tour buses are running efficiently and not adding to the traffic congestion.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool ranges from immediate (less than 1 year) to near term (1 to 3 years).

The time to promote tour bus use will depend upon how sophisticated and extensive the marketing campaign may be. Simply providing press releases to existing media takes a minimal amount of time; however, planning and implementing a new media campaign focusing on tour bus use can take several months.

Modifying facilities such as parking lots overlooks, pedestrian access areas and visitor centers to provide a pleasant experience for tour bus patrons can take several years. Adding infrastructure such as transit signal prioritization (see ES-10), transit technology applications such as fast pass (see PT-9) or reserved travel lanes for transit operation (see PT-7) to promote tour bus use can take significant time.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000).

The cost for marketing will vary greatly based on how extensive of a marketing plan is implemented as well as whether the marketing is done in-house or using a marketing firm. Marketing can range from simple and low cost, such as for ads in local media and brochures to extensive with the use of vehicle graphics, advertisements, in print and/or through radio and television, and other actions.

While not a tour bus, an example of transit marketing with a similar effort, Marsh Billings Rockefeller National Historical Park budgets approximately $15,000 per year to cover marketing for their shuttle. These includes items such as weekly ads in the regional and local papers, materials for Trolley stop signs, brochures, cost of advertising in Welcome Centers, and website maintenance[50].

The costs associated with adding infrastructure such as transit signal prioritization are provided in tool ES-10, transit technology applications such as fast pass are provided in tool PT-9 or reserved travel lanes for transit operation are provided in tool PT-7. Cost for modifying facilities to handle increased tour bus operations can range from the tens of thousands to several million dollars depending on needed changes. The costs associated with expanding the parking supply are provided in tool AC-3 and for implementing transit/shuttle services/operations are provided in tool PT-1.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to continually keep promotional materials updated and distributed, as well as, printing costs for promotional materials. The operating costs related to additional infrastructure can be found in the associated tools (referenced above in capital costs).

Examples of Implementation

EXAMPLES OF TOUR BUS PROMOTION:

- Denali National Park has several shuttle and tour bus options available. As part of their promotion, they have a webpage set-up to discuss the differences and help visitors determine which is right for them.
  - *http://www.nps.gov/dena/planyourvisit/which-bus-to-choose.htm*
- Acadia National Park also has several tour bus options available and promotes these via their website.
  - *http://www.nps.gov/acad/planyourvisit/guidedtours.htm*

EXAMPLES OF TOUR BUS MANAGEMENT/OPERATIONS:

- Tongass National Forest at Mendenhall Glacier conducted a study on tour bus operations at the visitor center to gather recommendations for reducing congestion and increasing pedestrian safety. The recommendation was to implement a scheduled tour bus arrival sequence.
  - *http://ntl.bts.gov/lib/35000/35000/35073/DOT-VNTSC-USDA-07-01.pdf*
- Independence National Historical Park has a challenge providing enough tour bus parking due to the new visitor center having less parking than the previous one[51].
- Washington D.C. conducted a tour bus management initiative to identify traffic challenges and provide recommendations for alleviating these challenges.
  - *http://www.ncpc.gov/DocumentDepot/Publications/DCTourBus_2003.pdf*

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

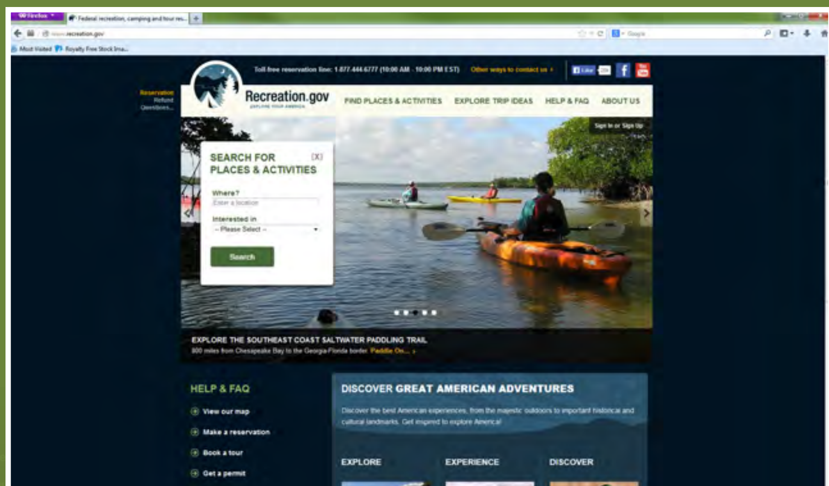
- Annual (or peak season) number of tour buses.
- Tour bus visitation as a percentage of overall visitation.

Additional Resources

- Leveraging social media – *http://www.nationalrtap.org/Resources/ResourceSearchResults.aspx?org=a2GSpnDbruI=&query=leveraging%20social%20media*
- Use of social media in public transportation (TCRP Synthesis 99) - *http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_99.pdf*
- Marketing transit - *http://www.embarq.org/sites/default/files/EMB2011_From_Here_to_There_web.pdf*
- SF Park tour bus management plan - *http://sfpark.org/2011/07/15/2378/*
- American Bus Association - *http://www.buses.org/*
- Federal Motor Carrier Safety Administration - *http://www.fmcsa.dot.gov/*

SOLUTION/TOOL: **Reservation Systems**
TYPE: **Visitor Demand Management**

VDM
11



General Description

National parks sometimes utilize reservation systems for campgrounds or in a few cases, for special attractions to efficiently manage the flow of visitors. Reservation systems can be used to manage traffic congestion at popular destinations within a park or unit.

Reservations systems are a great way to manage the demand placed on a destination within a unit that has limited capacity by allowing the number of visitors entering a location to be capped/limited to a maximum number. Reservation systems can be used for entering the entire park/unit, to access a particular parking lot or trail, or to take a tour.

Reservation systems typically allow reservations to be made prior to arrival through the use of a website or telephone number. However, reservation systems are not a typical tool for the National Park Service, given that visitor access is a primary part of the mission.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- [ ] Gateway Communities
- [x] Park Entrances/Entrance Stations
- [x] Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- [x] Roadways within the Park
- [ ] Roadways Providing Access to the Park (outside the park boundaries)
- [ ] Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- [ ] Additional Capacity (by building or creating more space for vehicles)
- [ ] Alternative Modes (by implementing improvements or promoting use)
- [x] Demand Management
- [x] Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Reservation systems can manage the number of visitors allowed at a site (or at the park) at any given time, which can reduce vehicular (and visitor) congestion.
- Reservations allow visitors to preplan their trip to a park or a specific destination within the park.

CONS

- Reservation systems can be controversial, and visitors may be disappointed if they are not able to see a specific site/attraction at the time they are visiting. It is critical that visitors have as much advance knowledge as possible that some sites or attractions require reservation (such as through information on the park/unit website). If the reservation system is not marketed well, many visitors may arrive at the unit without realizing they needed prior reservations.
- Visitors may find it frustrating to have to make reservations up to six months in advance to be able to visit a site such as the Statue of Liberty.
- The park plays a significant role in the tourism, and therefore local economy, for a gateway community. Due to this, the gateway community may not support a reservation system as they may see it as a detriment to the local economy[22].

GENERAL

- It should be noted that congestion can be created when the amount of time for visitation needs to be decreased. For example, Independence Hall had to reduce their available tour hours by three hours due to sequestration and this caused pedestrian congestion to increase[52].
- Installing a reservation system of any type would likely require a study, and close coordination with regional leadership and park partners.
- There is no standard process for approving reservation systems since this tool is rarely used.

Coordination/Partnerships

Coordination will be necessary with the gateway community to get local buy in and support, with the concessionaire or National Recreation Reservation Service for implementing the reservations, and with local media for marketing.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year) to near term (1 to 3 years).

The time to implement a reservation system will vary based on the level of planning and amount of public comment necessary to implement a reservation system, but can vary from a few months to a few years. Utilizing the existing National Recreation Reservation System can significantly decrease the implementation time required; however, this would not be a decision that a park could make on its own and jump right to implementation with the National Recreation Reservation System.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from medium ($50,000 to $100,000) to high ($100,000 to $250,000) to higher (above $250,000).

The capital costs for a reservation system include the technology used to place the reservations, the marketing costs for promoting the system to the public, and the staff time required to manage the system. The cost for implementing a reservation system could potentially be low if (1) the concessionaire is in charge of the reservation system or (2) the park/unit takes advantage of the already existing recreation.gov website for reservations.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include ongoing staff time to market and manage the reservation system as well as utilities, software updates, and technology repairs and replacement parts.

Recreation.gov charges a fee of about $3.00 per reservation. This may not be practical if the unit is trying to keep costs down.

Examples of Implementation

- Independence National Historical Park has a timed ticket entry to Independence Hall. Reservations can be made online National Recreation Reservation Service or via their toll free telephone number.
  - *http://www.nps.gov/inde/advance-ticket-information.htm*
- Muir Woods is considering a parking reservation system to help solve traffic congestion.
  - *http://parkplanning.nps.gov/projectHome.cfm?projectId=48272*
- Reservations are recommended, but not required for cave tours at Mammoth Cave and can be completed through the National Recreation Reservation Service or via their toll free telephone number.
  - *http://www.nps.gov/maca/planyourvisit/reservations.htm*

- Denali National Park is only paved for the first 15 miles. While these 15 miles are able to be traversed by private automobile, beyond those 15 miles, travel via tour bus or shuttle are required. Shuttle buses are less expensive and allow for visitors to disembark and choose other shuttle routes, allowing visitors to take day hikes and explore areas. Tour buses, however provide narrated visitor information about the park and wildlife. Reservations need to be made through the concessionaire.
    - *http://www.nps.gov/dena/planyourvisit/visiting-denali.htm*
- Harpers Ferry National Historical Park provides in-depth battlefield tours. Preregistration and prepayment are required.
    - *http://www.nps.gov/hafe/planyourvisit/hfhaparkguides.htm*
- Alcatraz Island requires reservations which include the entrance fee, ferry transportation, and cell audio tour.
    - *http://www.nps.gov/alca/planyourvisit/feesandreservations.htm*
- Mesa Verde has a reservation system for accessing the ruins. Visitors are oriented to the steep ladders and small tunnels when they purchase their tour tickets. This helps visitors understand the challenges of visiting this part of the park.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Number of visitors using the reservation system.
- Demand for reservations versus the supply.

Additional Resources

- Website generally used for national park reservations - *http://www.recreation.gov/*

SOLUTION/TOOL: Modify Visitor Center Operations

TYPE: Visitor Demand Management

VDM 12

General Description

Visitor centers are onsite or offsite locations for visitors to obtain information for planning their visit to the park/unit, to ask questions of rangers, to possibly pay entrance fees if they are not required at the entrance gate, to transfer to shuttles, and to purchase souvenirs.

A simple and inexpensive way to help manage congestion would be to take advantage of the existing visitor centers and their role within the park and gateway community to provide information to visitors related to congestion management. Rather than just using transportation, such as a shuttle, as a method of providing information about a park/unit, the visitor center could be used to provide information that could affect visitors' transportation choices and destinations. This could include highlighting less congested areas of interest rather than the better known areas of interest, providing information on congestion at various destinations within the park, training visitor center staff on responses to assist in congestion alleviation, and using visitor center as a park-and-ride location.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☐ Gateway Communities
- ☐ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☐ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Providing visitors with targeted information can help inform their travel decisions.
- Providing visitors with options such as alternative locations, modes, and routes, as well as congestion information can help them in adjusting their travel plans.
- Ensuring that the signage, print materials, and staff provide a consistent message will help visitors feel the information is timely and accurate.

CONS

- Visitor centers (and a park's marketing materials) tend to highlight their most popular destinations, which in turn can lead to congestion.
- By promoting locations that are not already congested, tourists may choose to visit areas that are not capable (do not have the infrastructure) to handle higher levels of visitation.
- May need to expand parking at visitor center.

Coordination/Partnerships

Coordination will be necessary with the park's/unit's interpretive and public affairs staff to create new signage and consistent messaging and with visitor center staff for training. Coordination with gateway communities will also help ensure a consistent message, and will help influence which sites are visited by tourists.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year).

The time to implement this technique could vary between a few weeks to a few months. It may take a little while to create a plan and a consistent message about congestion, to fabricate signs, print materials, and to conduct trainings for visitor center staff. It may take a year or more to modify a unit's movie or other automated interpretive program.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. <u>This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)</u>

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Capital costs would vary based on what techniques are implemented but could include creation of a plan, sign fabrication, creation of training and other printed materials.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to train new visitor center staff and to keep materials updated, as well as the printing of current materials.

Examples of Implementation

- Arches National Park staff and partners distribute information to visitors at the park visitor center as well as the Moab visitor information center, including information about when specific sites/attractions are most congested and the best times to visit.
- Zion National Park uses existing visitor centers as locations to orient visitors to the shuttle system that serves Zion Canyon National Park, directing visitors where to park and access the system.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Decrease in the number of visitors at destinations known to be congested.
- Increase in the number of visitors at less popular destinations.

Additional Resources

- Creating consistent brand messages - *http://www.marketingtrenches.com/marketing-strategy/mission-possible-delivering-consistent-brand-messages/*
- Planning for interpretive media - *http://www.nps.gov/hfc/*
- Interpretive Planning Guide - *http://www.nps.gov/hfc/pdf/ip/interp-visitor-exper.pdf*
- Comprehensive Interpretive Planning - *http://www.nps.gov/hfc/pdf/ip/cip-guideline.pdf*

SOLUTION/TOOL: Traveler Information (Via Website, Hotels, and Gateway Communities)

TYPE: Visitor Demand Management

VDM 13

General Description

A simple, low-cost technique for providing traveler information to visitors is to utilize services already existing at the park (e.g., website, hotels, and gateway communities). Information provided by national parks via these tools includes transportation-related information as well as interpretive information.

All national parks already have websites, so adding pages dedicated to transportation is a fast, efficient way to get information to a large number of people. Another option is to provide information to visitor centers and hotels outside the park. Having these entities in the gateway communities be able to provide a consistent message about transportation (such as using the park-and-ride (see PT-5), avoiding peak travel times (see VDM-1), and encouraging visitation to less congested areas (see VDM-4)) will provide benefits to the park.

Location/Emphasis Area

(Locations that should benefit from the implemented solution/tool)

- ☑ Gateway Communities
- ☑ Park Entrances/Entrance Stations
- ☑ Parking Areas (including at trail heads, scenic overlooks, and park-and-rides)
- ☑ Roadways within the Park
- ☑ Roadways Providing Access to the Park (outside the park boundaries)
- ☑ Visitor Centers (includes people/pedestrian loading areas)

Strategies Achieved/Effects of Solution

- ☐ Additional Capacity (by building or creating more space for vehicles)
- ☑ Alternative Modes (by implementing improvements or promoting use)
- ☑ Demand Management
- ☐ Increase Throughput (by managing efficiency and mode of travel)

Implementation Considerations

PROS

- Ensuring that the signage, print materials, and staff provide a consistent message will help visitors feel the information is timely and accurate.
- Websites, visitor centers, and hotels can be used to promote less congested times and locations.
- Providing visitors with targeted information can help inform their travel decisions.
- Providing visitors with options such as alternative locations, modes, and routes, as well as congestion information can help them in adjusting their travel plans.

CONS

- To produce benefits, visitors must take an action based on the information provided.
- A lack of participation from stakeholders could be a barrier.
- Visitor centers (and a park's marketing materials) tend to highlight their most popular destinations, which in turn can lead to congestion.
- By promoting locations that are not already congested, tourists may choose to visit areas that are not capable (do not have the infrastructure) to handle higher levels of visitation.

GENERAL

- Information must be timely, relevant, and reliable for users to continue utilizing this service.
- Parks/units need to ensure that a consistent message is being provided through media, social media, website, visitor centers, hotels, and rangers.

Coordination/Partnerships

Close coordination will be necessary internally at the unit so the proper information can be shared. For example, law enforcement for road closures, rangers for congestion information, communications department for important notices, transportation staff for new project information, interpretation of fun facts, natural and cultural resource protection messages, and other details. Coordination will also be needed with visitor centers and hotels in the gateway community, this may also be able to be coordinated through the chamber of commerce.

Time to Implement

The implementation timeframe (including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation) for this tool is immediate (less than 1 year).

The time to implement this technique could vary between a few weeks to a few months. It may take a little while to create a plan and a consistent message about congestion, to fabricate signs, print materials, and to conduct trainings for visitor center and hotel staff.

Cost/Financial Information

(Lifecycle cost / Total cost of ownership)

(Cost/financial information, where noted, is based on 2013 dollars. Cost/financial information is estimated, and will vary based on size and scope of project, number of units, geographic location of park/unit, etc. This information should only be used as a magnitude of cost to determine if this tool is a wise investment for your park/unit. It should not be considered a detailed Class C cost estimate.)

CAPITAL COSTS

The total capital cost for this tool including PMIS statement, obtaining funding, planning, evaluate/select preferred alternative, NEPA study, coordination/partnership outreach, design, equipment purchase, and construction/implementation ranges from low ($0 to $50,000) to medium ($50,000 to $100,000).

Capital costs would vary based on what techniques are implemented but could include creation of a plan, sign fabrication, creation of training, creation of webpages, and other printed materials.

OPERATION AND MAINTENANCE COSTS

For all tools, the operations and maintenance costs should include staff time to monitor and upgrade the tool (including collecting data on performance measures and reporting them, evaluating recapitalization needs, changes to technology, etc.). In addition, the long-term cost implications for this tool include staff time to train new visitor center and hotel staff and to keep materials updated (including webpages), as well as the printing of current materials.

Examples of Implementation

- Arches National Park staff and partners distribute information to visitors at the park visitor center as well as the Moab visitor information center, including information about when specific sites/attractions are most congested and the best times to visit.
- Zion National Park uses existing visitor centers as locations to orient visitors to the shuttle system that serves Zion Canyon National Park, directing visitors where to park and access the system.
- Rocky Mountain National Park conducted presentation at the Estes Park Chamber of Commerce meetings to train visitor center and hotel staff on the transportation information related to the Bear Lake Road construction. The park also provided rack cards with information about the construction and park-and-ride, QR codes for getting additional information, and new webpages dedicated to the construction and transportation information.

Performance Standard/Measure

In tier 2 and/or 3 of the National Park Service's Congestion Management System Process, the park/unit quantified the level of congestion to determine if mitigation is needed. In order to quantify the effectiveness of this particular tool on improving that congestion, the original data collection from tier 2 and/or 3 should be repeated. However, each tool also has specific performance measures which can quantify the effectiveness of the tool itself. For this tool, examples for measuring the ongoing effectiveness include:

- Number of visitor center and hotel staff attending trainings.
- Number of visitors to transportation specific webpages.

Additional Resources

- Creating consistent brand messages - *http://www.marketingtrenches.com/marketing-strategy/mission-possible-delivering-consistent-brand-messages/*
- Planning for interpretive media - *http://www.nps.gov/hfc/*
- Interpretive Planning Guide - *http://www.nps.gov/hfc/pdf/ip/interp-visitor-exper.pdf*
- Comprehensive Interpretive Planning - *http://www.nps.gov/hfc/pdf/ip/cip-guideline.pdf*

INDEX: Location/Emphasis Area Cross Reference Table

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PARKING AREAS (PA)

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ROADWAYS PROVIDING ACCESS TO THE PARK (RPA)

VISITOR CENTERS (VC)

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