



**U.S. Department of Transportation
Federal Transit Administration**

**Paul S. Sarbanes Transit in Parks Program (Transit in the Parks Program)
Project Proposal for Fiscal Year 2009 Funds – Planning Project**

BASIC PROJECT INFORMATION

Project Name (Please provide a 1-2 sentence description of the project):

Alternative Transportation Planning Study at Colorado Front Range High Visitation Sites in the Arapaho-Roosevelt National Forest (ARNF)

The purpose of this project is to support coordinated, multi-agency transportation planning in the Colorado Front Range by conducting baseline data collection on existing transportation conditions and visitor use standards for three high-use recreation sites: Brainard Lake Recreation Area, Mount Evans, and Guanella Pass. Potential alternative transportation solutions to reduce traffic and parking congestion at each site will be evaluated using an integrated modeling system incorporating Forest Service management objectives and corresponding acceptable use and carrying capacity policies.

Proposed Funding Recipient: **USDA Forest Service – Arapaho-Roosevelt National Forest (ARNF)**

Public land unit(s) involved:

USDA-Forest Service, ARNF; Clear Creek Ranger District and Boulder Ranger District

Location of Project

**City: NA
County: Clear Creek, Park, and Boulder Counties
State: Colorado
Congressional District: Districts 2 and 5**

Federal Land Management Agency managing the above unit(s):

- Bureau of Land Management
- Bureau of Reclamation
- Fish and Wildlife Service
- Forest Service
- National Park Service
- Other (e.g. Federal Trust)

Describe:

Type of Planning Project:

(Implementation projects, please use the alternate form)
 Planning

This project will determine the feasibility and optimal mode(s) of alternative transportation at 3 high-use recreation sites in the ARNF.

- Proposal is to plan for a possible new alternative transportation system where none currently exists.
- Proposal is to plan for a possible expansion or enhancement of an existing alternative transportation system.

Transit in Parks Program Funding Requested during FY 2009
\$580,000

Total Cost of Planning Project at Completion (All sources)
\$600,000

Were you awarded Transit in Parks Program funds for this project in the past? Yes No
If answer "Yes," please provide amount awarded: \$

Do you plan to request additional Transit in Parks Program funds in future years? Yes No
(Note: If you wish to compete for future Transit in Parks Program fiscal year funds you must reapply).

If answer "Yes," please specify Transit in Parks Program proposed funding levels for out years below:

FY 2010 \$	FY 2011 \$	FY 2012 \$
FY 2009 Funding Amounts from sources other than Transit in Parks Program funds? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If answer "Yes," please specify funding levels per source below:		
State \$	Local \$	Federal (other than Transit in Parks Program) \$20,000
Private sources \$		

CONTACT PERSON	
Name: Carol Kruse	Phone: 970-295-6663
Position: Special Projects Coordinator	E-mail: ckruse@fs.fed.us
Address: Arapaho-Roosevelt NF and Pawnee NG; 2150 Centre Ave, Bldg E; Fort Collins, CO 80521	

OTHER PROJECT SPONSORS (in addition to funding recipient)
Central Federal Lands Highway Division has programmed \$20,000 to support this planning project. (See attached letter of support)

REQUIREMENTS
<input type="checkbox"/> If a State, Tribal, or local government entity is proposing the project, the applicant has contacted the manager of the Federal land unit(s) and has the consent of the Federal land management agency or agencies affected. <input checked="" type="checkbox"/> The project is consistent with the metropolitan and statewide planning process. <input checked="" type="checkbox"/> The project is consistent with agency plans. <input checked="" type="checkbox"/> The planning project will analyze all reasonable alternatives, including a non-construction option.

BASIC PROJECT DATA	
Number of Visitors (Annual): more than 250,000 at the 3 sites combined	Daily Number of Visitors (Peak season): approx. 7,500 at the 3 sites combined
Average Number of Vehicles per Day at Peak Visitation: approx. 3,000 at the 3 sites combined	
Current Road Level of Service at Peak Visitation: Estimated LOS ranges from LOSB-LOSD, depending on site and time of day. Congestion is most severe in parking areas.	
What time of the year does your land unit experience Peak Visitation? <input type="checkbox"/> Spring <input checked="" type="checkbox"/> Summer (all three sites) <input type="checkbox"/> Fall <input checked="" type="checkbox"/> Winter (at Brainard Lake Recreation Area)	

Current Carrying Capacity of Existing Roads:

Unknown - Carrying capacity of existing roads will be calculated as a task in this project.

What percent of that capacity is the site operating at during peak periods?

Unknown - Percentage capacity at all three sites during peak periods will be calculated as a task in this project.

Current parking shortages during peak visitation:

>200% capacity in parking areas at each of the 3 sites

Current Number of Persons who use the alternative transportation system (if one already exists) at peak visitation (average number of visitors/daily at peak):

N/A – no system existing

Estimated Annual Number of Persons who will use the alternative transportation system at project completion:

Unknown – this study will provide anticipated number of riders or users/annually.

Average number of auto collisions with wildlife in the area?

Unknown – this study will provide that wildlife collision data.



Executive Summary

Please provide an executive summary of your proposal that is no more than one page in length.

The Front Range of Colorado contains a complex of federal land units and population centers, most notably, Denver. With its combination of major population centers and adjacent public lands, the area attracts over 23 million recreation visits annually and contains two of the most visited national forests in the United States. Furthermore, it is one of the fastest growing regions in the United States.

The burgeoning population and outdoor recreation pressures in the Front Range have resulted in significant transportation issues throughout the region. The Front Range Interagency Transportation Assistance Group (TAG) Report (see attachment) concluded that many of the primary transportation corridors in the Front Range are insufficient to handle current and projected traffic. This issue is particularly pronounced on the I-70 corridor, which provides access for more than 20,000 vehicles per weekend day to public lands recreation areas in the region. Consequently, state and regional transportation planning authorities are engaged in long range planning initiatives, and explicitly recognize the need to increase coordination of these efforts with the federal land management agencies (FLMA's).

However, as the Front Range TAG report notes, while there are near term opportunities for sustainable transportation solutions to traffic congestion in the Front Range, a greater awareness among state, regional, and federal agencies of each others needs and constraints is required. For example, alternatives for managing traffic congestion on the I-70 corridor include developing mass transit along the main corridor, with branches servicing popular adjacent public lands. Such a transit system would directly affect visitation to federal recreation sites in the Front Range. Yet, state and regional transportation agencies have limited or no information with which to design an I-70 transit system that comports with FLMA management objectives.

Similarly, the TAG report acknowledges opportunities for alternative transportation solutions to traffic and parking issues at specific National Forest sites accessed via I-70 – Brainard Lake Recreation Area, Mt. Evans, Guanella Pass – but the feasibility of alternative transportation solutions has never been explored at these sites. The US Forest Service (USFS) and other FLMA's know little about the effects of such systems on traffic, parking, and visitor use conditions at the sites themselves, or on regional traffic levels and patterns beyond their jurisdictional boundaries. The TAG report concludes that technical assistance to facilitate cross-jurisdictional transportation planning in the Front Range is needed and further suggests that coordinated transportation planning would be facilitated by tightening the geographic scope of such efforts, citing the Arapaho-Roosevelt and White River National Forests as particularly well suited to benefit from improved coordination of transportation issues.

The purpose of this project is to support coordinated, multi-agency transportation planning in the Front Range. Specifically, the project will conduct baseline data collection on existing transportation conditions and visitor use standards for high-use recreation sites. This information is seen as providing the foundation from which Problems, Opportunities, and Constraints to alternative transportation investments can be defined. From this foundation, potential alternative transportation solutions to reduce traffic and parking congestion at each site will be evaluated using an integrated modeling system. This evaluation will incorporate explicit consideration of how potential transportation solutions are in accordance with FLMA management objectives and corresponding acceptable use and carrying capacity policies.

The project includes two interagency and research team project workshops: 1) a problem assessment workshop and, 2) a study findings/implementation workshop. The project also includes integrated transportation and carrying capacity studies at the three selected USFS sites identified in the Front Range TAG report as near term opportunities for alternative transportation solutions.

The studies include four interrelated components at each of the three sites:

- 1) Baseline transportation data collection and modeling;
- 2) Visitor surveys regarding visitor travel mode choice, and crowding, resource, and transportation noise impacts;
- 3) Transportation and visitor use-related resource impact assessments; and,
- 4) Visitor use modeling at key recreation venues within study sites.

Beyond establishing an interagency transportation planning group, the research component of this project will also provide tools to: 1) evaluate alternative transportation at the three study sites; and 2) facilitate direct linkages between regional transportation models/forecasts and visitor use and resource conditions at the study sites.

Thus, the project will support coordinated, sustainable alternative transportation planning in the Front Range.

Project Description

What activities would be funded by the requested Transit in Parks Program financial assistance? Please provide a project description that is no more than one page in length. You may attach up to two pages of maps or other illustrations that do not count towards the page limit.

The project will include two interagency and project team workshops convening state, regional, and FLMA transportation planning officials and the project research team. The kickoff workshop will involve a problem assessment and site scoping. The second workshop, conducted near project completion, will include presentation of findings from the research components and development of action items to incorporate study findings into agency long range transportation planning. These workshops will be the genesis of a Front Range FLMA Transportation Planning Working Group to ensure that coordination continues beyond this effort.

The planning project has 4 integrated research components which will be conducted at Brainard Lake, Guanella Pass, and Mt Evans, all of which were identified in the TAG report as having near term opportunities for alternative transportation solutions to traffic, parking, and visitor use issues. (See attached map)

1) Baseline transportation data collection and modeling

Basic transportation data are not available for the 3 sites of interest. Existing conditions on traffic volumes, origins of visitors, safety, and congestion need to first be collected and assembled on a base map. From this foundation, modeling tools can be appropriately developed to estimate baseline transportation conditions and to test multimodal alternative solutions to traffic congestion and parking shortages. Transportation models will be integrated with visitor use models linking visitor arrivals/departures with site specific impacts.

2) Visitor surveys regarding visitor travel mode choice, and crowding, resource, and transportation noise impacts

Visitor surveys will identify transportation-, recreation-, and resource-related variables that are important to the quality of visitor experience. The second part of the surveys will use visual and audio research methods to measure visitor-based standards for crowding, resource, and transportation noise impacts. Results will help assess the acceptability of visitor experience and resource conditions associated with alternative transportation. Data collection will also include visitor surveys to collect baseline information about visitors' travel patterns and modes of travel access to and within the study sites. The survey will include stated preference questions to identify influential factors related to visitors' choices of travel modes. The results will include estimates of the proportion of visitors who would use alternative transportation, if made available, to travel to and/or within the study sites.

3) Transportation- and visitor use-related resource impacts assessments

This component of the project will inventory and assess transportation- and visitor use- related impacts (e.g. disturbance to soil, vegetation and other ecosystem attributes at the selected sites). This project will employ a monitoring and assessment approach to quantify the current resource conditions. Trails and sites will be assessed using multi-parameter techniques, and the location and extent of impacts will be mapped using GPS and GIS technology. Relationships between visitor use, transportation delivery systems, and resource conditions will be developed to evaluate effects of potential alternative transportation solutions on resource conditions.

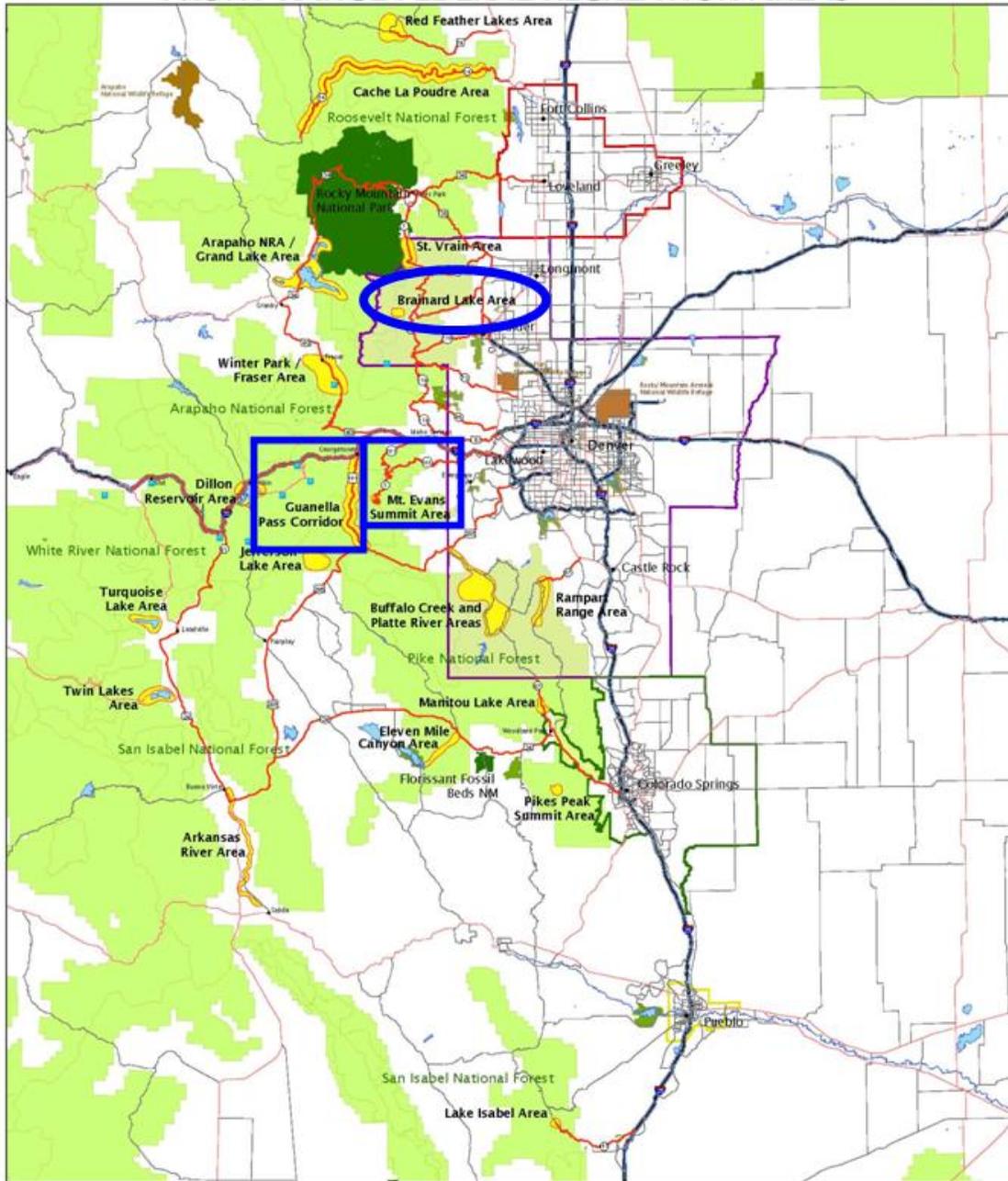
4) Visitor use modeling at key recreation venues within study sites

Visitor use and behavior data will be collected and used to develop simulation models of visitor use at key venues (i.e., trails and/or attractions) within the study sites. The visitor use models will be integrated with transportation models (item 1) to estimate the number of people at one time at key venues, under baseline transportation conditions and associated with implementation of potential alternative transportation systems at the study sites. Results will provide a quantitative tool to evaluate the effects of potential alternative transportation solutions on congestion, parking shortages, site crowding, and resource conditions.

There are 4 key deliverables of this project including development of:

- 1) A core interagency group to advance long range transportation planning for FLMA's in the Front Range;
- 2) Baseline transportation, visitor use, and resource impact data to establish visitor travel needs and preferences;
- 3) Integrated transportation-visitor use models to test the impacts of alternative solutions on transportation problems, visitor experience, and resource impacts (Figure 1); and,
- 4) Visitor experience thresholds and performance metrics to support decisions about alternative transportation solutions that correspond with USFS management objectives (Table 1).

FRONT RANGE FEDERAL RECREATION AREAS



Legend

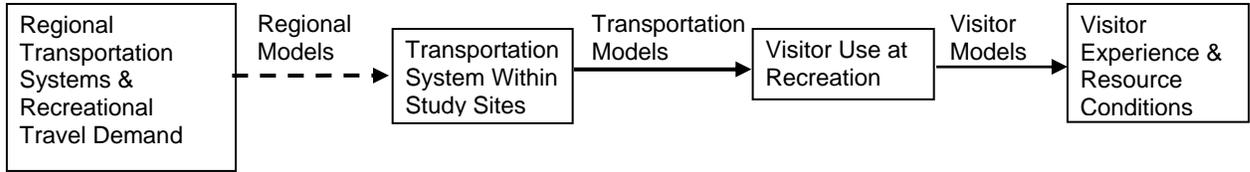
- Major Corridor
- Front Range MPD's
- Denver Regional COG
- North Front Range MPD
- Pikes Peak Area COG
- Pueblo Area COG
- State Parks
- National Park Service
- National Wildlife Service
- U.S. Forest Service
- Interstate Highways
- U.S. Highways
- State and Local Roads

Scale: 0 5 10 20 30 40 Miles
 Projection: Universal Transverse Mercator NAD 1983, UTM Zone 13
 1:360,761

Study Area

Compiled by James Swartz, Central Federal Lands Highway Division Denver, Colorado 2007

Figure 1: Linkages between Regional Transportation Models and Site Impact Models



Note: Linkage with “Regional Models” is denoted with dashed line because regional modeling is not proposed as part of this project, but the research components in this project could be linked with transportation models developed in other state and regional studies

Table 1: Sample performance measures

		Do Nothing	Alternative 1	Alternative 2	Alternative 3
Transportation Model Performance Measures	Maximum and Projected Daily Transit Passengers				
	Trailhead Visitor Delivery Rate				
	Operating Cost per Annual Passenger				
	Passengers per Vehicle Mile & per Operating Hour				
	Emissions/Fuel Consumption per Passenger Mile				
	Parking Lot Utilization (on site and off site)				
Visitor Use Model Performance Measures	People at One Time (PAOT) at Recreation Sites				
	People per Viewscape (PPV) along Trails				
	Average Daily Use at Recreation Sites				
	Average Daily Use along Trails, by Trail Segment				
Resource Assessment Performance Measures	Resource impact metric 1 (soil displacement, trail erosion)				
	Resource impact metric 2 (soil exposure)				
	Resource impact metric 3 (extent of visitor created trails)				
	Resource impact metric 4 (cost effectiveness of resource mgt. actions)				
Visitor Survey Performance Measures	Visitor-based Acceptability Threshold - PAOT				
	Visitor-based Acceptability Threshold - PPV				
	Visitor-based Acceptability Threshold - Trail Erosion				
	Visitor-based Acceptability of Transit System				

Alternative Transportation in the Parks and Public Lands Planning Evaluation Criteria

(There are separate evaluation factors for implementation projects. Use the implementation project proposal template for implementation projects.)

Criteria	Points	Weight
1. Demonstration of Need		50%
a. Visitor mobility & experience	(1-5)	
b. Environmental condition as result of existing transportation system	(1-5)	
2. Methodology for Assessing: Visitor Mobility & Experience Benefits of Project		15%
a. Reduced traffic congestion	(1-5)	
b. Enhanced visitor mobility, accessibility, and safety	(1-5)	
c. Improved visitor education, recreation, and health benefits	(1-5)	
3. Methodology for Assessing: Environmental Benefits of Project		15%
a. Protection of sensitive natural, cultural, and historical resources	(1-5)	
b. Reduced pollution	(1-5)	
4. Methodology for Assessing: Operational Efficiency and Financial Sustainability of Alternatives		20%
a. Effectiveness in meeting management goals	(1-5)	
b. Financial plan and cost effectiveness	(1-5)	
c. Cost effectiveness	(1-5)	
d. Partnerships and funding from other sources	(1-5)	

Planning Justification

Your responses to these questions must total no more than eight pages.

1. Demonstration of Need

- a. Visitor mobility and experience:** Describe the site's current and/or anticipated transportation problem or opportunity for improvement. You should include information on issues such as traffic congestion, traffic delays, parking shortages, difficulty in accessing destinations, safety issues, lack of access for persons with disabilities, lack of access for individuals with lower incomes or without cars, and visitor frustration. Please cite reports, plans, studies, and other documentation to support your description.

Brainard Lake, Mt. Evans, and Guanella Pass provide a variety of outdoor recreation experiences for a burgeoning metro population seeking day-long, restorative connections to the natural landscape. It is estimated that between ¼ and ½ million people visit these three sites during the summer season, and the number of visitors increases each year as the Front Range population continuously expands. The rapidly increasing use of these sites is negatively impacting traffic safety, recreation experience, and natural resources at all three areas; new management tools are needed to protect both the resources and visitors' experience. Access is restricted for those without cars or the physical ability to ride a bicycle.

1. Brainard Lake is a "gateway" to the Indian Peaks Wilderness, the most-accessible Wilderness from the Denver metro area. Two hours from Denver via I-70 and the Peak-to-Peak Scenic Byway, the Brainard Lake site provides year-round and day-use activities in a high-mountain, forested setting. The trailhead for Wilderness camping or popular day hikes, as well as fishing, camping, picnicking, hiking, snowshoeing and cross-country skiing, and other dispersed recreation opportunities both in and outside the Wilderness all begin at Brainard Lake. As a key destination on the Peak-to-Peak Scenic Byway, this area was identified in the FTA/FHWA 3039 study as a potential site for further study for alternative transportation. Parking is limited (and always will be due to topography). A 2005 plan for Brainard Lake Recreation Area broached the idea of a shuttle system as an alternative method of access; however, lack of basic visitor and transportation information has postponed further investigation of alternatives.

Current improvements at Brainard Lake include consideration for the possible future implementation of a shuttle system in conjunction with relocation and realignment of parking facilities. Unlike the other two sites included in this study, Brainard Lake provides heavily-used winter season recreation opportunities both within and outside the Wilderness



2. The highest paved road in North America leads to the only 14,000'+ mountain summit in Colorado that is accessible by motorized transportation, Mount Evans. The two-lane highway to the summit provides spectacular views of the Rocky Mountains, Echo and Summit Lakes, and access to the Denver Botanic Gardens' satellite alpine Garden at Mount Goliath as it ascends the side of this 14,260' mountain. A parking lot at the summit allows visitors to take a short walk around the area before descending once again to I-70. Ascending this peak between Memorial Day and Labor Day is an annual goal of hundreds of thousands of visitors, and of bicyclists as well. The Mount Evans "ride" has become an increasingly popular challenge for thousands of bicyclists who mix with heavily-congested vehicular traffic along this sinuous, shoulder-less highway without guardrails. Safety issues on Mount Evans Road are severe, with frequent accidents and a fatality in the past few years.

3. The paved and gravel Scenic Byway over Guanella Pass carries visitors from I-70 at picturesque Georgetown, Colorado, up the flank of Mount Bierstadt and down to State Highway 285 to either Denver or destination sites such as Breckenridge, Copper Mountain, and Vail. This is a popular "loop drive" for thousands in the Denver metro area seeking a one-day "top of the Rockies" experience. A parking lot at the high point of the Pass is the trailhead for a moderate hike to the summit of Mount Bierstadt, another 14,000'+ peak. Recent improvements to the road and parking lot area have increased the lure and accessibility of this recreation site, which has negatively impacted parking lot and resource capacities. Parking demand frequently exceeds supply on weekends, causing visitors to park on the fragile alpine tundra. Additional road improvements are underway, which will only heighten the need for new visitor management tools at this site.

Little data has been collected at any of these sites that can inform regional transportation planning. No transportation modeling or planning has been done to explore the feasibility of various alternative transportation modes to help achieve visitor and resource management goals. Transportation modes and highway improvements to increase the carrying capacity of the I-70 mountain corridor are currently under study, to facilitate greatly-increased traffic demand; some form of Advanced Guideway System will likely be part of the solution. Those improvements will likely bring higher numbers of visitors to these three sites; the 2007 TAG report recognized that if the Forest Service is to continue providing quality recreation experiences to higher numbers of visitors, it is imperative that a transportation plan be developed for each of these sites that optimizes visitor and resource management efforts and also connects and integrates with the future I-70 mountain corridor solution. This project's data collection and modeling will inform the development of integrated transportation plans for these three high-use recreation sites, while providing important data on visitor experience and natural resource protection priorities.

- b. Environmental condition as a result of the existing transportation system:** Describe the site's current or anticipated problem or opportunity for improvement of the environment in this area. You should include information on current or anticipated problems such as air pollution, noise pollution, runoff, water quality, harm to vegetation and wildlife, and other impacts or stressors on natural, scenic, cultural and/or historic resources caused by the existing transportation system. Please cite documentation in agency plans, studies, reports and other documentation that will help to support your description.

In addition to a degraded visitor mobility and experience, the three selected sites have experienced negative impacts to environmental conditions. All three areas contain highly sensitive fragile, alpine ecosystems that are impacted by overuse and parking demand. These sites are also impacted by

Denver's air quality non-attainment status as they are within or on the edge of the non-attainment area. This project will provide the data and tools to evaluate the environmental conditions and offer alternative transportation solutions to improve those conditions.

1. Traffic to and from Brainard Lake moves along a two-lane, shoulder-less highway that leaves State Highway 72 (Peak-to-Peak Scenic Byway), winds through the pine forests, and loops one-way around Brainard Lake. Day users and campers can access a parking lot near the developed campground adjacent to the Lake. Indian Peak Wilderness visitors park in this lot and walk to the Wilderness trailhead, or can be driven to the trailhead if the driver then continues along the loop around the Lake.

The parking lot capacity is frequently exceeded, so many users park off the edge of the road, damaging sensitive resources. Parked cars often line both sides of this shoulder-less highway from its intersection with St Hwy 72 and all the way around the Lake, in both summer and winter seasons.

This past summer a large culvert under the loop around Brainard Lake collapsed. A shortage of funds and contracting constraints prevented the Forest Service from repairing the culvert, so traffic can no longer move continuously around the Lake. Traffic flow is therefore disrupted, increasing road congestion and pressure on the parking lot/roadside parking; increased pedestrian traffic is negatively impacting area resources.

2. Much of the length of State Highway 5 to Mount Evans is often congested with vehicular and bicycle traffic moving both up and down the mountain. An average of approximately 45,000 vehicles make the trip to the summit and back each year during the short Memorial Day to Labor Day season. There can be as many as 500 vehicles and hundreds of bicyclists sharing the road during peak visitation times. The mixture of bicyclists and vehicles on this sinuous, shoulder-less, two-lane highway is a serious safety concern. In addition, the parking lot at the summit is frequently filled to 200 percent or more of developed capacity. After the long drive to the summit, visitors often circle the parking area repeatedly to find a parking space, causing air quality and noise impacts at the site.

Approximately 127,000 people make this popular drive every season; there is no count of bicyclists, though estimates number in the thousands. As the population along the Front Range continues to escalate, so does the number of visitors to Mount Evans. Alternative transportation solutions could help address both the safety issues and modal conflicts on the road to Mount Evans.



3. Federal Highway Administration and several local government and civic partners cooperated on improvements to County Road 381 over Guanella Pass in the last several years. Visual impacts have been greatly reduced and context-sensitive improvements were made to the parking lot at the high point of the road, which provides access to the Mount Bierstadt trail. Driving to Guanella Pass and making the short hike to the summit of Mount Bierstadt is a popular one-day outdoor experience for many in the Denver metro area, as it is considered one of the "easiest" 14ers close to the Denver area. A study in 2000 showed average daily traffic counts exceed 300 vehicles on the Georgetown side of the Pass and exceed 200 vehicles on the Highway 285 side of the Pass, though counts have recorded more than 2,500 vehicles per day traveling over Guanella Pass. More than 50 percent of the use occurs on weekends. FHWA estimated in 2000 that, with the improvements which have been made, traffic volume would increase 117% by 2015. Planned additional improvements will likely increase demand further.

The 50-vehicle parking capacity of the Mount Bierstadt trailhead parking lot is frequently exceeded. More than 200 vehicles have been observed parking on the fragile alpine tundra alongside the highway on high-use days.

Based on Forest Plan standards and guidelines, a 1995 Recreation Capacity Study showed that use on several of the trails in the area exceeded the estimated social capacity by as much as 68 percent. With recent improvements increasing accessibility, that capacity is, and will continue to be, exceeded even further.



Scope of Work and Methodology

The planning project's scope of work and methodology should include tasks that will assess the areas below in a thorough and professional manner. The planning project should have a scope of work and methodology at this proposal phase, although it may be refined later.

2. Methodology for Assessing - Visitor Mobility & Experience Benefits of Project

Please address how the planning project's scope and methodology will assess the visitor mobility & experience benefits of a potential alternative transportation system improvement in the following areas:

- a. Reduced traffic congestion:** This criterion includes: reduced average number of daily motorized vehicle trips during peak visitation, time lost to traffic delays, visitor frustration, and the area's current capacity of the existing transportation system.

Traffic congestion, and visitor mobility generally, is a growing problem at the 3 sites targeted for this Transit in Parks (TIP) planning study. Congestion problems have increased as day use of these 3 areas has increased. In addition, each site has unique issues related to existing infrastructure (roadway condition, parking, etc.), adaptability to alternative transportation systems such as transit and ITS, and visitor use patterns.

Of particular note is the relative scarcity of basic data regarding the transportation system at each site. Standard transportation data are needed to establish baseline conditions which, in turn, will enable an informed Multimodal Alternatives Analysis to occur. Our scope of work will include the following steps to ensure that an appropriate transportation data foundation is established for this project:

- Compile and review existing transportation studies
- Describe existing transportation conditions (traffic volumes, safety data, parking conditions)
- Describe existing multimodal operations (access to the sites via non-automobile modes).
- Describe how transportation conditions affect visitor experience and biophysical conditions at each site.
- Prepare transportation base map

This information will be used to develop an appropriate transportation model for each site. The exact type of model will be determined based on the issues faced within each site and on the potential types of alternatives that will be considered. Microsimulation modeling incorporating the ability to estimate modal shifts is a likely candidate for at least one of the sites, if not all three. Micro-simulation models can track numbers of people being delivered over time to the key venues by private automobile, shuttle bus, and other modes. This information is a key input to a visitor use model that will process the arrivals, departures, and residence volume of visitors (# People at One Time) at each venue and complement measurements of visitor experience and resource integrity.

The transportation modeling effort will be tied directly to an appropriate pedestrian and resource degradation model at each site. Resource protection objectives can be met by reducing resource degradation in sensitive areas, and visitor experience objectives can be met by minimizing overcrowding and waiting. Transportation objectives are met by reducing waiting times, travel times, and congestion.

The transportation model will generate traffic efficiency indicators that can be used to evaluate transit service alternatives: vehicle miles traveled (VMT), average travel time to key destinations, parking lot utilization, and vehicle hours of delay (VHD).

- b. Enhanced visitor mobility, accessibility, and safety:** This criterion includes enhanced intermodal interconnectivity, improved public access to resources, improved access for those with disabilities and low incomes, traffic safety, pedestrian/cycling safety, and safety in the case of catastrophic events (i.e., forest fires or security threats).

Potential shuttle services and deployment of ITS technologies, as appropriate to each of the 3 sites, will be evaluated. Shuttle services will need to be associated with appropriate parking areas, and should dovetail with existing local transit services wherever possible.

Transit service variables such as transit vehicle headway, capacity, and stop location will be evaluated for their effects on visitor experience. The model will be used to test how the visitor use experience changes with alternative transit service offerings. The model will allow us to test policy variables such as adaptive management strategies to modify visitor use patterns. Such strategies could include Shuttle Only Access Periods, Vehicle Reservation Systems, or ITS systems for informing visitors of capacity constraints prevailing in the park at any point in time.

- c. Improved visitor education, recreation, and health benefits:** Describe how the project's scope and methodology will assess improved visitor education, recreation and health benefits?

A fundamental purpose of the Arapaho and Roosevelt National Forests (ARNF) is to provide the public with opportunities to learn about and enjoy the natural, cultural, and historical resources and improve the settings for outdoor recreation. Traffic congestion at popular locations, such as the "fourteeners" and scenic overlooks, creates delays, safety concerns, and results in visitor frustration. Parking facilities frequently overflow during summer afternoons, exacerbating visitor frustration and safety concerns.

This project will help to inform planning to provide opportunities for high quality outdoor recreation experiences by evaluating the feasibility of potential alternative transportation solutions to reduce traffic and parking congestion and corresponding acceptable use levels at high use destinations.

This effort will evaluate the feasibility of providing alternative transportation to alleviate such pressures. For example, a Peak-to-Peak Transit Shuttle system has been suggested as a tool to enhance recreational opportunities at popular activity sites and reduce congestion at the trailheads served by the highway. The most significant need is for relief of traffic and parking congestion which occurs at the Brainard Lake area during summer weekends. Alternative transportation solutions have the potential to reduce traffic and parking congestion, and at the same time provide a means by which to systematically design the “delivery of visitors” to recreation sites in accordance with Forest Service management objectives. However, to date there has been no systematic planning at the sites to investigate how potential alternative transportation solutions affect the condition of natural resources and the quality of visitors’ experiences at the study sites.

Within this project, several types of visitor use data will be collected during the ARNF peak periods of visitation. Models of transportation systems at selected national forest recreation sites in the Front Range region will be developed to quantify the effects of baseline transportation conditions and potential alternative transportation solutions on traffic congestion and parking shortages at the study sites. The models will also “deliver” visitors to different use areas in the study sites, as inputs to the visitor use models and related visitor experience and resource impact evaluations described below. The modeling systems will be designed to generate a variety of performance measures to evaluate transportation effectiveness. Thus, the integration of the vehicle and visitor use models developed in this project will provide precise estimates of visitor use conditions resulting from potential alternative transportation systems.

Measurable results of the visitor use models will include the number of people at one time (PAOT) at recreation sites and the number of people per viewscape (PPV) along trails. These results will provide a quantitative basis for assessing the degree to which current transportation conditions and proposed alternative transportation solutions affect site crowding and resource conditions. Further, visitor model outputs will be compared with visitor-based evaluations of acceptable resource and social conditions to assess the impacts of existing transportation conditions and potential alternative transportation solutions on the quality of visitors’ experiences. Thus, this project will assist the ARNF in evaluating potential alternative transportation solutions to parking and traffic congestion in a manner that preserves and enhances the quality and safety of visitors’ experiences.

3. Methodology for Assessing - Environmental Benefits of Project

Please address how the planning project’s scope and methodology will assess the environmental benefits of a potential alternative transportation system improvement in the following areas:

- a. Protection of sensitive natural, cultural, and historical resources:** This criterion includes energy conservation, energy efficiency, ecosystem sustainability, preservation of archeological and/or historical resources, watershed and watershed preservation, reduction in auto-wildlife collision rates, improved habitat connectivity, ensuring that visitation does not exceed an area’s ability to handle increased levels of visitation or the “carrying capacity” of the land unit, and other protection benefits where applicable.

Protecting the Resource

Visitor activities inevitably have some consequences to natural resource conditions. Even the most careful visitors to natural environments can potentially disturb soil, vegetation and other ecosystem attributes. Fundamental management decisions as to the level of acceptable and appropriate disturbance to natural systems can be difficult and challenging and must be well informed. Our proposed project will employ an assessment approach to quantify the current resource conditions and a modeling approach to predict the tolerance of off trail areas to dispersed visitor use. This information will be integrated to the greatest extent possible into the transportation and pedestrian modeling effort to develop a more complete picture of the consequences of existing transportation conditions and the potential benefits of alternative transportation solutions with respect to environmental conditions.

Continuous areas of vegetation and soil disturbance are generally formed on the landscape as a consequence of visitors gathering for day use. While managers and other visitors generally accept some level of disturbance in these areas, excessive impact can have ecological, social and managerial consequences. Areas of soil and plant disturbance will be assessed utilizing methodologies developed

for monitoring campsites (Marion 1995; Monz 2000; Cole and others 2008). These methods employ the variable radial transect procedure for measuring the size of the impacted area and multi parameter measurements of resource condition. Both designated and visitor created trails will also be mapped and assessed utilizing established assessment techniques (e.g., Marion 2003). These trail methods will utilize both event based and sampling based approaches in order to provide information for both trail maintenance and overall resource condition. Areas of dispersed, off trail visitor use will be mapped and assessed as to the relative tolerance of these areas to recreation use. This information will be utilized to generate accurate maps and conduct spatial analyses of the location and extent of areas where current recreation use has affected resource conditions and to determine areas where alterations in visitation may lead to additional disturbance.

- b. Reduced pollution:** This criterion includes air pollution, water pollution, noise pollution, and visual pollution.

Alternative transit service plans will generate a daily/annual patronage estimate that will be important in evaluating a final preferred service alternative. Associated with this analysis, each alternative service plan will be evaluated for their emissions and fuel consumption per passenger. Displaced fuel consumption and emissions from private vehicles induced to use the shuttle system or affected by ITS deployment will also be estimated.

Modeling of alternatives such as park and shuttle or ITS will enable the project to describe the basic operating parameters of such a system and optimize its efficiency. Optimizing system efficiency will also allow more visitors to utilize the bus, thereby reducing auto traffic. Reduced air and noise pollution (and as a consequence an enhanced visitor experience) are a logical result of this effort.

4. Methodology for Assessing - Operational Efficiency and Financial Sustainability

Please address how the planning project's scope and methodology will assess the operational efficiency and the financial sustainability of a potential alternative transportation system improvement in the following areas:

- a. Operational efficiency:** This criterion includes considerations of how a potential alternative system may/may not meet identified management goals and objectives for this site, including consideration of multiple alternatives.

For transit alternatives, operational efficiency will be measured by the following metrics:

- a. Shuttle bus capacity utilization (# passengers/bus capacity)
- b. Operating cost per passenger
- c. Passengers per vehicle mile
- d. Passengers per operating hour

These standard measures of performance will be included in an overall evaluation matrix. As such, the project will yield a composite measure of operational efficiency, inclusive of visitor experience and resource integrity. In addition, other non-transit transportation tools, such as Intelligent Transportation Systems (ITS), will be considered in this analysis.

- b. Financial feasibility:** This criterion includes the development of a financial plan that will incorporate a potential alternative transportation system, including the evaluation of multiple alternatives.

Financial scenarios for implementing and operating the various alternatives will be developed to help inform the selection of a preferred alternative. Once the preferred alternative is selected, a more detailed financial plan will be developed for that system, including items such as fleet estimates, operations, maintenance, site development costs, ITS components, etc. In addition, timelines for implementation and resulting budgetary impacts will be considered in the financial plan.

- c. Cost effectiveness:** This criterion includes the development of an analysis of cost effectiveness considerations that includes multiple alternatives.

The cost of operating the shuttle system for each alternative will be estimated and yield a measurement operating cost per passenger mile and per operating hour. Similar metrics will be developed to evaluate the cost effectiveness of implementing ITS. These cost metrics will be explicitly included in the overall evaluation matrix to contribute to the selection of a preferred alternative.

- d. **Partnerships and funding from other sources:** This criterion includes planning projects that would be carried out or funded in partnership with other entities in addition to the sponsor and will receive points depending on the level of partnership. Documentation (e.g., partnership agreements, letters of partnership support, letters of confirmation of financial contribution, letters of in-kind contributions, etc.) that supports and verifies involvement of partners and level of partnership *must* accompany this proposal.

Central Federal Lands Highway Division will contribute \$20,000 to support this planning effort through the Colorado Forest Highway Program. The roads surrounding these three high-use locations are all designated Forest Highways, and the data collected will help support long range planning for future road projects in these areas. In addition, in-kind staffing contributions will be made by the ongoing involvement of Susan Law, Alternative Transportation Planner, from Central Federal Lands.

This project will be conducted in collaboration with Colorado State University (CSU), Utah State University (USU) and Resource Systems Group, Inc. (RSG) through the involvement and participation of Dr. Peter Newman (CSU), Dr. Christopher Monz (USU) and Dr. Steven Lawson and Mr. Robert Chamberlin (RSG). Dr. Newman and Dr. Monz have a history of collaborating with FLMAs with a high degree of cost-effectiveness via the Cooperative Ecosystem Studies Unit (CESU) agreements currently in place with the Rocky Mountains CESU. CSU has lowered its 53% overhead rate to 17.5% providing a cost recovery of 36% of total CSU costs or an in-kind contribution of \$43,000. USU has lowered its 39.1% overhead rate to 17.5% providing a cost recovery of 21.6% of total USU costs or an in-kind contribution of \$18,000.

Budget By Task

This budget includes resources to support integrated transportation and carrying capacity studies at **three** high use recreation areas in the Colorado Front Range. In doing so, efficiencies of scale will be realized, as costs of conducting such studies on a site-by-site basis would be substantially greater (roughly 30% higher).

Task	Budget
Interagency Project workshops (2)	\$30,000
1) Baseline transportation data collection and modeling	\$130,000
2) Visitor surveys regarding visitor travel mode choice, and crowding, resource, and transportation noise impacts	\$150,000
3) Transportation and visitor use-related resource impact assessments	\$120,000
4) Visitor use modeling at key recreation venues within study sites	\$150,000
Total	\$580,000

Literature Cited

Marion, Jeffrey L. 1995. Capabilities and management utility of recreation impact monitoring programs. *Environmental Management*.19(5): 763-771.

Marion, J. L. (2003). Acadia National Park trail monitoring manual: A description of procedures. National Park Service Unpublished report.

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Cole DN, Foti P, Brown M (2008) Twenty years of change on campsites in the backcountry of Grand Canyon National Park. *Environmental Management* 41:959-970