National Park Service
U.S. Department of the Interior
Grand Canyon National Park
Grand Canyon, Arizona

Mule Operations and Stock Use
Environmental Assessment

March 2010

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Mule Operations and Stock Use

Environmental Assessment

Summary

High levels of use on three major Grand Canyon National Park trails, combined with insufficient trail maintenance funding, create a number of problems needing management action. Deteriorated trail conditions, conflicts between trail users, inadequate facilities and infrastructure, and upcoming stock-use concession contracts renewal present an opportunity to plan for stock-use management. Objectives are to 1) provide opportunities for park mule and stock use for as large a cross section of visitors as practicable; 2) through improved maintenance and operations, reduce conflicts between stock users and hikers on park trails; 3) establish appropriate levels and types of stock use (i.e. number of stock per day, group size) on park trails that will allow for improved maintenance and reduced resource impacts and costs associated with trail maintenance; and 4) identify optimal stock-facility locations, including associated infrastructure size and locations for improving health, safety, and overall visitor experience.

This Environmental Assessment (EA) evaluates a No Action Alternative (Alternative A) and four Action Alternatives to address the purpose and need for action.

The Preferred Alternative (Alternative B) includes the following primary elements

South Rim Commercial Stock Use

- Up to 10,000 commercial mule rides, including Inner Canyon and above-rim rides would be offered each year (current average use is 8,315 rides)
- On Bright Angel Trail, up to 10 rides per day would be allowed to Phantom Ranch. Plateau Point day rides from South Rim would not be offered under this alternative
- On South Kaibab Trail, up to 10 rides per day from Phantom Ranch plus up to 12 pack stock to and from Phantom Ranch would be allowed
- An above-the-rim ride from Yaki Point area east toward Shoshone Point would be allowed at a level of 40 rides per day
- The current mule barn in Grand Canyon Village would house a small number of concessioner stock; the majority of concessioner stock operations would be moved to South Kaibab Trailhead mule barn

North Rim Commercial Use

- Up to 8,000 commercial mule rides, including Inner Canyon and above-rim rides, would be offered each year (current average use is 7,072 rides)
- On North Kaibab Trail, up to 40 rides per day would be allowed to Supai Tunnel. The North Kaibab Trail would be open for commercial stock to Supai Tunnel and not to Roaring Springs
- Up to 40 one-hour rides on the Ken Patrick Trail to the Uncle Jim Junction would be allowed daily
- Up to 20 half-day rides to Uncle Jim Point would be allowed daily

- The hitching rail at Uncle Jim Point would remain in place, and a one-stall composting toilet would be installed to replace the existing temporary toilet

Monitoring and Adaptive Management Stock-use trails and facilities would be monitored to assess conditions and impacts to resources. Cost of trail work, amount of work completed, and amount of stock and hiker use would be tracked to determine impacts. An adaptive management strategy would allow park managers to implement additional management options, as needed, if trails cannot be adequately maintained in the future. For example, park managers could choose to further limit stock use (number per day or year) or close trails to stock use permanently or seasonally.

Private Stock Use

- Overnight below-the-rim groups would be allowed up to 6 stock and 6 people. Day-use group size would be allowed up to 12 stock and 12 people.

Summary of Impacts

No alternative would have more than minor impacts on special status species, visual/scenic quality, air quality, soundscapes, environmental justice, prime and unique farmland, or Indian trust resources. Alternative B, the Preferred Alternative would result in minor to moderate, adverse and beneficial impacts to historic structures and cultural landscapes, archeological and ethnographic resources, vegetation, general wildlife, soil resources, water resources, visitor experience, park operations, socioeconomic environment, wilderness character, and public health and safety. No park resource impairment would occur through implementation of any alternative.

Public Comment

If you wish to comment on the environmental assessment, you may post comments online at http://parkplanning.nps.gov/grca or mail comments to: Steve Martin, Superintendent, Attn: Stock Use EA, Grand Canyon National Park, P.O. Box 129 /1 Village Loop, Grand Canyon, AZ 86023.

This Environmental Assessment will be on public review for 45 days. Comments must be posted online of postmarked by April 30, 2010. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee we will be able to do so.

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CHAPTER 1 PURPOSE AND NEED

Introduction

Grand Canyon National Park (GRCA) is located on the Colorado Plateau in northwestern Arizona. On January 11, 1908, GRCA was established as a national monument and later dedicated as a national park February 26, 1919. Over 1.2 million Grand Canyon acres were set aside as a place of national and global importance to preserve and protect natural and cultural resources and ecological processes, as well as scenic, aesthetic, and scientific values; and to provide visitors opportunities to experience and understand environmental inter-relationships, resources, and values of Grand Canyon without impairing resources (NPS 1995).

The purpose of this Environmental Assessment is to examine environmental impacts associated with the proposal to make changes to stock use and mule operations in Grand Canyon National Park. Changes proposed include lowering the number of commercial, visitor mule rides from South Rim into the canyon; addition of a South Rim, above-rim, commercial mule ride; establishment of limits for North Rim commercial, visitor mule rides; elimination of commercial stock use below Supai Tunnel, and use of an adaptive management strategy for future stock use in the park. More detailed information is provided in Chapter 2's Preferred Alternative (Alternative B).

This EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) regulations (40 CFR §1508.9), and NPS Director's Order (DO) 12 (Conservation Planning, Environmental Impact Analysis, and Decision-Making).

Background

Stock use and trails have a long and intertwined history in Grand Canyon National Park. The first uses of stock in the canyon were primarily extractive, with miners building the first trails to reach claims, most of which proved to have little value. With the advent of tourism in the early Twentieth Century, some entrepreneurs began using stock to transport visitors to canyon and rim lodges, such as the Hermits Rest Lodge about eight miles west of today's Grand Canyon Village.

After President Roosevelt created Grand Canyon National Monument in 1908 (with Congress creating the national park 11 years later), visitor travel into the canyon by stock continued to grow, eventually becoming a fundamental part of the canyon experience for many. The Santa Fe Railroad's 1901 arrival in South Rim's Grand Canyon Village, and the 1928 completion of North Rim's Grand Canyon Lodge, focused visitor use in those rim areas. Stock use responded to the new tourist geography, migrating to the Corridor Trails (North and South Kaibab and Bright Angel Trails) to take visitors from rim developments into the canyon (Anderson 2000). These Inner Canyon mule rides continue today. Mules have long supplied Inner Canyon lodges, work stations, and river trips, and are currently used by the NPS and concessioner to transport supplies into and out of the canyon and assist with trail work.

Current stock use in the park is guided by the 1988 Backcountry Management Plan (BMP), the 1995 General Management Plan (GMP), and the 2009 park Compendium of Designations, Closures, Use and Activity Restrictions, Permit Requirements, and Other Regulations (Compendium). The BMP and GMP were prepared in accordance with NEPA, including public involvement. The park's Compendium affords management, protection, and public use of Grand Canyon National Park in accordance with delegated authority provided by regulations published

under Title 36 Code of Federal Regulations (36 CFR), Chapter 1, Parts 1 through 7, authorized by Title 16 United States Code, Section 3.

Using the BMP, GMP, and Compendium, the following question and answer section was created to explain current management of stock use in Grand Canyon National Park.

What is "stock"?

As defined in the park's Compendium, stock only includes horses, mules, and burros. Mules and horses are most commonly used, whereas burro use is very rare. North and South Rim concessioners operate visitor mule rides, and use mules to pack supplies into and out of Phantom Ranch at the bottom of the canyon. Private stock users bring horses and mules into the park and ride below the canyon rim. NPS uses both mules and horses for park operations. Mules access Inner Canyon sites for maintenance and supply of facilities, and to haul dirt and support trail crew operations. Horses are used on North and South Rim by NPS Visitor and Resource Protection and Interpretation staff, but are not taken below the rim.

Where is private stock use currently permitted?

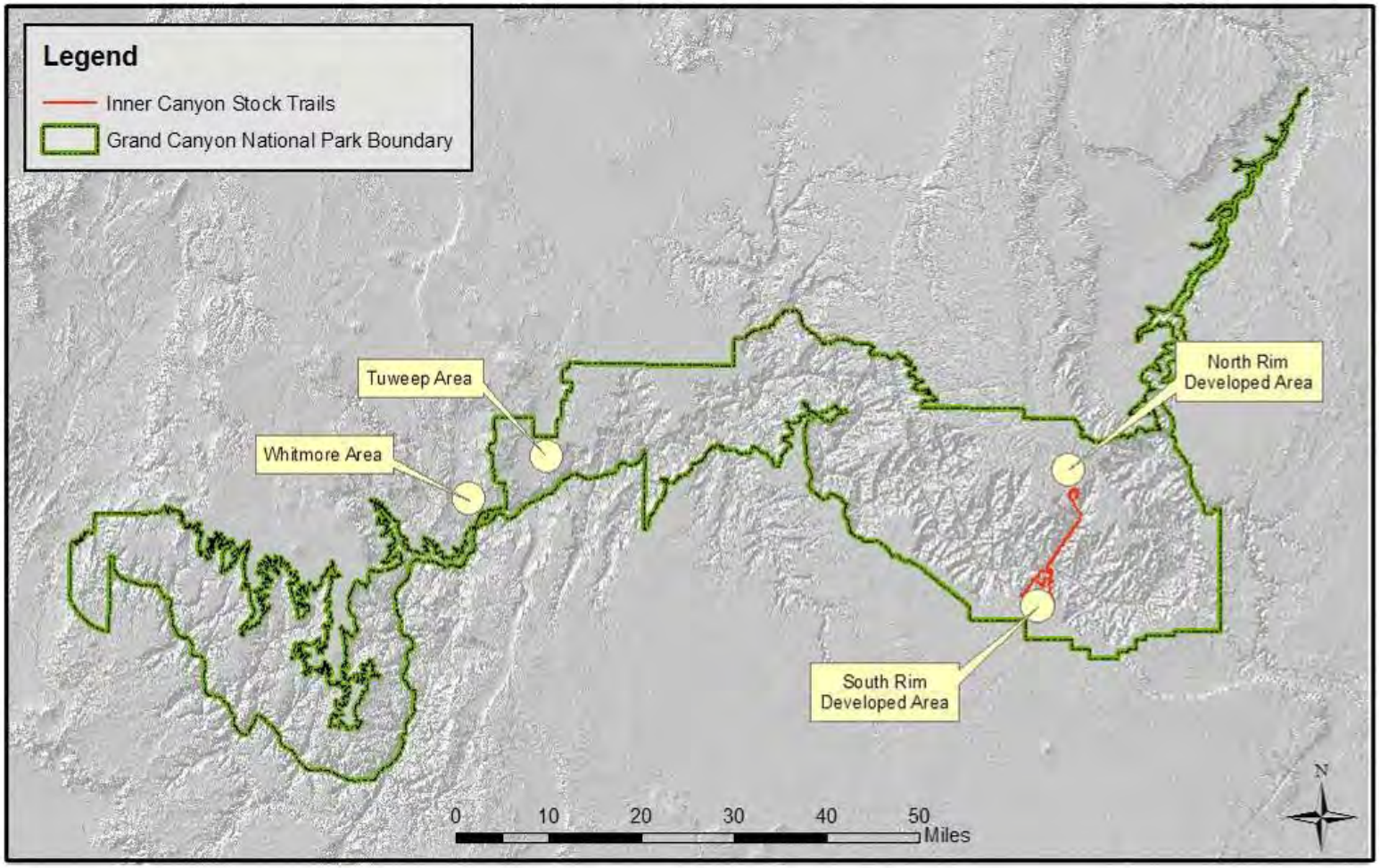
The BMP allows private stock use on the Bright Angel Trail, River Trail, North and South Kaibab Trails, Plateau Point Trail, Tonto Trail between the South Kaibab and Bright Angel Trails, Whitmore Trail, Ken Patrick Trail to the Uncle Jim Trail on to Uncle Jim Point and on designated rim roads and trails. The Whitmore Trail, although currently open to stock use, is not routinely maintained due to remote location and non-existent stock use. The Compendium confirms these locations without distinguishing between private and commercial stock. In addition, it states that stock is allowed on all primitive roads on North and South Rim and on bridle paths, but not on the Rim Trail from Pipe Spring Overlook to First Trailview (see Appendix A and Map 1 and 2).

Where is commercial stock use currently permitted?

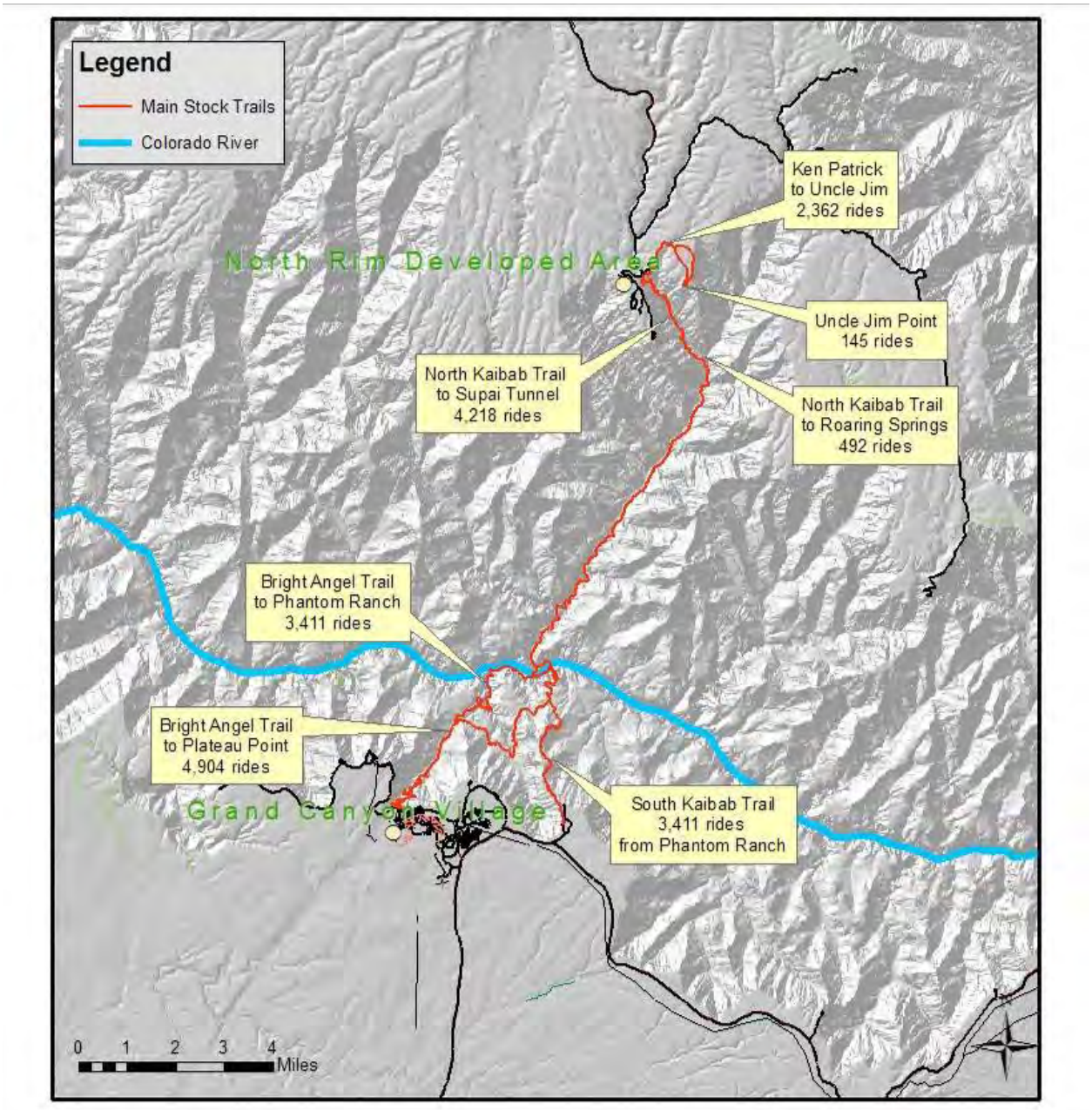
The BMP allows commercial stock use on the Bright Angel, River, South Kaibab, and Plateau Point Trails; on South Rim from the former Moqui Lodge to the rim via Long Jim Canyon Road; on Whitmore Trail (although not maintained or currently accessible by stock due to deteriorated condition); the North Kaibab Trail between North Rim and Roaring Springs; and the Ken Patrick Trail to the Uncle Jim Trail and on to Uncle Jim Point (see Map 2).

At Tuweep, the NPS allows horseback rides under a commercial use authorization (CUA). Currently, one business offers this service. Rides start at the semi-developed area at Tuweep, and travel into Saddle Horse Canyon. Riders and guides, up to 11 people total, can stay in the Tuweep Campground group site if space is available, but stock is not permitted in the campground overnight. The permit holder is required to remove stock from park if groups stay overnight. A 2007 moratorium was placed on all Tuweep CUAs, including horse rides, because a number of requests were received by the park to operate commercial transportation tours (i.e., jeep rides) in the area. Impacts of these tours had not been evaluated in a previous planning effort and NEPA document, but have potential to impact park resources. Therefore, the moratorium was placed to keep use low until these uses could be evaluated. The moratorium placed a limit on commercial horse rides, limiting the number of trips to those conducted in 2006 which was no more than six.

Map 1 General stock-use areas in Grand Canyon National Park – South Rim, North Rim, Whitmore, Tuweep



Map 2 Inner Canyon stock trails and average annual commercial use (2002-2008)



In 2009, several temporary changes to mule operations on both North and South Rim were analyzed in Categorical Exclusions (CEs), a Memo to File, and then implemented. These changes were made to address trail conditions and offset impacts to concessioners and visitors, and include

- Temporary closure of South Kaibab Trail to stock use, for two-to-four years, during trail rehabilitation. This closure was implemented to address safety concerns because, during trail reconstruction, the trail's rock surface, before a dirt layer is applied, can be difficult for stock to navigate. A CE was completed for this action
- A commercial, above-rim mule ride from Grand Canyon Village to the Abyss was added to address increased Bright Angel Trail stock use during temporary closure of South Kaibab Trail. All commercial mule rides and supply mules were using the Bright Angel Trail between May and September 2009 which caused concerns with created conflicts with users and further impacted trail conditions. The ride was approved to replace the temporary elimination of the day ride to Plateau Point. A Memo to File on a previous Environmental Assessment titled South Rim Mule Ride (1991) that analyzed this ride was completed for this action
- Elimination of the commercial mule ride on North Kaibab Trail below Supai Tunnel to Roaring Springs addressed trail maintenance concerns on this section of trail. A CE was completed for this action
- Increased trail work on Uncle Jim Trail, installation of new hitching rails, and a temporary toilet at Uncle Jim Point occurred to allow increased stock use in an effort to compensate for temporary elimination of commercial mule rides to Roaring Springs. A CE was completed for this action

All of these actions are being re-evaluated in this EA.

How much stock use occurs in Grand Canyon National Park?

Overnight private stock use below the rim, 2002 to 2008, averaged 13 groups, 49 riders, and 56 stock per year. Amount of day use is unknown because permits are not required unless stock users stay overnight in the canyon. Additionally, no daily or annual maximums are put on private stock use beyond group size limitations discussed below.

Total commercial mule use from South Rim to Phantom Ranch, 2002 to 2008, averaged 15,387 riders and 19,734 stock per year, including guides and pack stock (12,000 day rides, plus 3,410 Phantom Ranch overnights). Commercial stock use limits were identified in the GMP at up to 20 rides per day on South Kaibab Trail, 60 passes (equal to 20 rides) to Plateau Point and back, and 20 rides to Phantom Ranch per day on Bright Angel Trail; no limits were set for North Kaibab Trail or for supply mules on South Kaibab or Bright Angel Trails.

Table 1 Current GRCA commercial stock use, in rides per year

Location	GMP-set Annual Use Limits	Current Use
Bright Angel Trail	14,600	8,315
South Kaibab Trail	7,300	3,410
North Kaibab Trail	Unlimited	4,710
Uncle Jim Trail	Unlimited	2,362

Mules are also used administratively to transport supplies into and out of the canyon, and assist with trail work. Inner Canyon ranger stations at Phantom Ranch, Indian Garden, Cottonwood, and Roaring Springs are supplied by mule. Restrooms along the Bright Angel, South Kaibab, North

Kaibab, and Uncle Jim Trails are accessed by mule for cleaning and maintaining these facilities. The NPS trail crew also uses mules to transport supplies and haul dirt for Corridor Trails work. Grand Canyon National Park will continue to permit administrative stock use, and annual use is not limited. Grand Canyon's intent is to ensure administrative stock use amount is appropriate to complete administrative functions.

How many mules and/or riders are allowed in each group?

The 1988 BMP set maximum group size at 12 stock and 8 people for private overnight trips into the canyon. This number was changed in 1993 under the authority of the 1988 BMP to 12 stock and 6 people when the backcountry hiker small-group size was decreased from 8 to 6. In 2003, the Compendium again changed private-stock group size to 12 riders or stock, with a maximum ratio of 5 pack stock to one saddle stock, and a maximum of one pack animal per non-rider. This final change was based on limited infrastructure at Inner Canyon stock-use sites. Two stock-use campsites are located in the canyon, at Phantom Ranch and Cottonwood Campground.

For commercial use below the rim, concessioners' operating plans allow a maximum of 10 rider mules per group plus 1-2 guide mules. For pack strings, maximum size is 5 pack stock to one saddle stock.

What other information is available regarding private stock use?

The park's Backcountry Information Center (BIC) issues permits for overnight use on North Rim and in the canyon at Phantom Ranch and Cottonwood Campgrounds. The BIC encourages day-stock users to check-in prior to rides for additional information on trail conditions, parking, feed requirements, water availability, and timing of commercial stock trips. See Appendix A for more information.

How is trail work funded and accomplished in Grand Canyon National Park?

Trail work funding comes from park entrance fees, concessions franchise fees, and other Federal sources such as the American Recovery and Reinvestment Act of 2009 (ARRA).

The NPS trail crew is responsible for maintaining park trails. Approximately 49 NPS employees work on trail crew in various capacities, including Inner Canyon restroom maintenance, supply trips to Inner Canyon ranger stations, trail work on rim trails, and trail work on Inner Canyon trails. In addition, trail crew also hires and oversees American Conservation Experience (ACE) and Coconino Rural Environment Corps (CREC) to complete trail work.

The South Rim concessioner, currently Xanterra South Rim, LLC, also has a four-person trail crew maintaining trails. This crew was established to clean mule waste from trails, but due to the overwhelming amount of trail work, the crew has been working primarily to maintain Corridor Trails. Trail work completed by the concessioner crew is evaluated by the NPS to ensure trail standards are maintained.

Trail maintenance efforts are focused on Corridor Trails where most use, by both hikers and stock, occurs. Other trails are maintained as time and funding allow. For example, the Whitmore Trail, currently open to stock use, is not routinely maintained due to remote location and non-existent stock use.

What is the cost of trail maintenance on trails where stock use occurs?

Deferred maintenance costs are defined as postponed repairs or maintenance which result in degradation of a structure, property, or in this case, a trail. Deferred maintenance costs on Corridor Trails are estimated at approximately $24 million (NPS 2006a). These deferred maintenance costs will continue to increase if management actions are not taken.

On an annual basis, $1.5 to $2 million is spent to maintain GRCA trails; the majority on Corridor Trails. However, the NPS estimates $3 million is needed to prevent further increases in deferred maintenance costs. Therefore, the park is short at least $1 million annually for routine trail maintenance.

Does anyone clean up mule waste on the trails?

Yes, the concessioners offering mule rides have operating plans that specifically address removal and clean-up of mule waste on trails. Under these plans, concessioners are required to eradicate urine pools and remove manure from trails. In addition, concessioners' operating plans may require trail maintenance, snow and ice removal, insect control, and documentation of these actions.

Will stock use be addressed in an updated Backcountry Management Plan?

The park does not anticipate addressing stock use in detail in the upcoming effort to update the park's Backcountry Management Plan.

Any changes proposed and approved through this EA and subsequent decision document will amend the BMP, GMP, and Compendium as appropriate.

Purpose and Need

The purpose of this project is to address resource, visitor experience, geographic, and financial challenges associated with mule operations and stock use, each of which is described in greater detail below.

Trail Conditions The park's trails have deteriorated for over 60 years, since their initial construction, and annual budgets have not been sufficient to complete preventative maintenance. As a result, the park is faced with a $24-million dollar backlog of trail maintenance on Corridor Trails. Significant portions of the park's main Corridor Trails are deeply rutted and eroded. The condition of these trails is, to a large extent, from stock use. In addition, support walls and structures need to be upgraded or rebuilt to improve safety conditions for both hikers and stock users alike.

Visitor Conflicts The park's GMP directs that "Where livestock and visitors share the same trails and areas," the park should, "minimize conflicts and resource impacts, and enhance safety." The park has received complaints regarding trail conditions and mule waste. In addition, both stock users and hikers have expressed concerns regarding safety of stock users, lack of knowledge regarding trail etiquette from some hikers, and discourtesy from some stock users.

Stock Facilities and Infrastructure Several stock-related facilities are in need of upgrades or relocation. Examples include the GMP-directed relocation of concessioner mule operations from the historic South Rim mule barn to a new location, and the need for improved facilities for overnight private stock use in the canyon.

Concession Contracts Concession contracts on both North and South Rim, that include mule operations in the park, will be up for renewal in 2010 and 2011. Decisions made as a result of this EA will directly affect terms of new concession contracts.

Project Objectives

The project is needed to accomplish the following objectives:

1. Provide opportunities for mule and stock use in Grand Canyon National Park to as large a cross section of visitors as practicable
2. Through improved maintenance and operations, reduce conflicts between stock users and hikers on park trails
3. Establish appropriate levels and types of stock use (i.e. number of stock per day, group size) on park trails that will allow for improved maintenance and reduced resource impacts and costs associated with trail maintenance
4. Identify optimal stock-facility locations, including associated infrastructure size and locations for improving health, safety, and overall visitor experience

Relationship to Other Plans and Policies

Current plans and policies pertaining to this proposal (Chapter 2's Preferred Alternative) include the park's 1988 Backcountry Management Plan (NPS 1988), the 1995 Grand Canyon National Park General Management Plan (NPS 1995), and National Park Service Management Policies (NPS 2006b). Following is more information on how this proposal meets goals and objectives of these plans and policies.

- The proposal is consistent with goals outlined in the park's 1988 Backcountry Management Plan (BMP) which were to
    - Maintain and perpetuate natural ecosystem processes in the park
    - Protect and preserve historic and prehistoric cultural resources, and
    - Provide and promote a variety of backcountry recreational opportunities for visitors compatible with resource protection and visitor safety

- The proposal is consistent with goals outlined in the 1995 Grand Canyon National Park General Management Plan (GMP) intended to preserve and protect park resources while providing for a range of enjoyable visitor activities. Specifically, the GMP states the NPS will
    - *Provide a diverse range of quality visitor experiences, as appropriate, based on resources and values of Grand Canyon, compatible with protection of those resources and values*
    - *Provide access appropriate and consistent with the character and nature of each landscape unit and the desired visitor experience*

- Specifically regarding the Corridor Trails, the GMP directs the NPS will
    - *Where livestock and visitors share the same trails and areas, minimize conflicts and resource impact, and enhance safety*
    - *Provide a high level of NPS management presence to enhance the visitor experience and safety, and protect park resources and values*

  - *Provide a quality backcountry experience consistent with historic uses of the cross-canyon corridor*
  - *Maintain the Bright Angel, North Kaibab, South Kaibab, and River Trails to accommodate high levels of backcountry visitor use*

- Specifically regarding Tuweep and the park's undeveloped areas, the GMP directs the NPS to
  - *Maintain Tuweep as a place for an uncrowded, rustic, and remote experience dominated by nature and sound*
  - *Manage and monitor visitor use and park resources in the park's undeveloped areas to preserve and protect natural and cultural resources and ecosystem processes, and to preserve and maintain a wilderness experience or, where an area is not proposed for wilderness, a primitive experience*
  - *Provide a variety of primitive recreational opportunities consistent with wilderness and NPS policies on accessibility. In deciding which opportunities would be provided in the park's undeveloped areas, consider recreational opportunities available outside the park, as well as opportunities available in park developed areas*
  - *Consistent with the above goals, reduce conflicts among undeveloped areas users, including river, hiker, stock, and motorized and non-motorized users*

- The proposal deviates from the GMP's plan to remove and relocate stock from Grand Canyon Village. The GMP identified an area near the intersection of Hermit and Rowe Well Roads for construction of a new concessioner mule barn, and in 2000 an Environmental Assessment for the project was initiated, but not completed. The GMP planned a concentration of interpretive facilities in the powerhouse area of Grand Canyon Village, and the current mule barn was to become an American Indian cultural center. Due to funding concerns and the historic presence of mules, this building will continue to house some stock. This EA proposes several alternatives for the existing Village mule barn; however, future uses of this facility (i.e., removal of all stock) may need to be evaluated through additional NEPA documentation.

- The proposal is consistent with goals and objectives of Management Policies 2006, which state
  - Equine species … may be employed when an appropriate use to support backcountry transport of people and materials and will not result in unacceptable impacts…
  - Planning for recreational stock use should be conducted in the context of visitor use planning to address social, biological, and physical carrying capacity considerations, and to make allocation decisions that minimize potential conflicts between and among user groups. The plan should (1) establish routes, trails, and areas of travel; and (2) identify the need for supporting infrastructure such as designated horse camps, hitching rails, corrals, and appropriate trailhead facilities designed for vehicles towing horse trailers. The plan should also identify sensitive natural and cultural resource areas and develop management strategies to protect these resources.

Appropriate Use

Management Policies 2006, Section 1.5, Appropriate Use of the Parks, directs that the National Park Service must ensure allowed park uses would not cause impairment of, or unacceptable impacts on, park resources and values. A new form of use may be allowed in a park only after a

determination has been made in the professional judgment of the park manager that it will not result in unacceptable impacts.

Management Policies 2006, Section 8.1.2, Process for Determining Appropriate Uses, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for

- consistency with applicable laws, executive orders, regulations, and policies;
- consistency with existing plans for public use and resource management;
- actual and potential effects on park resources and values;
- total costs to the Service; and
- whether the public interest will be served

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts. If unanticipated and unacceptable impacts emerge, the park manager must engage in a thoughtful, deliberate process to further manage or constrain the use, or discontinue it.

Recreational uses of national parks are fundamental to the parks' and the National Park Service's existence. As indicated, not all forms of recreation are appropriate in each park. Although, Grand Canyon stock use is an appropriate use; the locations, forms, and levels of such use must still be determined in such a way that park resources and values and visitor experience are preserved.

It is also the policy of the National Park Service that any commercial visitor services will be authorized through concession contracts or commercial use authorizations (CUAs), unless otherwise provided by law (NPS 2006b).

A decision to authorize a park concession is based on a determination that the facility or service

- is consistent with enabling legislation and complementary to a park's mission and visitor service objectives, and
- is necessary and appropriate for the public use and enjoyment of the park in which it is located and is not or cannot be provided outside park boundaries, and
- incorporates sustainable principles and practices in planning, design, siting, construction, and maintenance, and
- adopts appropriate energy and water conservation, source reduction [waste/pollution reduction], and environmental purchasing standards and goals, and
- will not cause unacceptable impacts

Similarly, CUAs may be issued only to authorize a service determined an appropriate park use that will have minimal impact on park resources and is consistent with the purpose for which the unit was established, as well as all applicable management plans, park policies, and regulations. In addition, no park may issue CUAs in a quantity inconsistent with preservation and proper management of park resources and values. Each park issuing a CUA will ensure it contains provisions for protection of park visitors, resources, and values (NPS 2006b).

Generally, a service is appropriate if it is not in conflict with law, regulation, or park policy, and promotes the park mission. Beyond that, it is necessary if it is a service needed in remote areas, or is needed to accomplish the park's mission of preserving its resources, promoting interpretive goals, or facilitating recreation. The decision whether a service is necessary and appropriate, and at what level, is a management decision based on park planning.

This document addresses issues related to commercial stock activities. Description and analysis of potential impacts on affected environment resulting from commercial operations are detailed in Chapter 3, Affected Environment and Environmental Consequences.

A trip to the bottom of Grand Canyon can be a life-shaping experience. Thousands of visitors each year seek to experience Grand Canyon in this intimate and adventurous way. Since many visitors who wish to visit the Inner Canyon would not be physically capable of arduous hiking, and do not have their own stock, the NPS has determined it is necessary and appropriate for public use and enjoyment to allow experienced and professional guides to provide such opportunities. Similarly, a mule ride outside developed areas along Grand Canyon's rim provides a unique experience for those visitors not physically capable of exploring rim or canyon areas on foot; therefore, the NPS determined rides outside developed areas and along the canyon rim are appropriate.

The next question is whether such use can be sustained without causing unacceptable impacts to park resources and values. That analysis is found in Chapter 3, Affected Environment and Environmental Consequences.

Scoping

Scoping is a process to identify resources that may be affected by a project or program, and explores possible alternative ways of addressing purpose and need for action and project objectives while minimizing adverse impacts. Grand Canyon National Park conducted internal scoping with National Park Service staff, as described in Chapter 4, Consultation and Coordination. The park also conducted public scoping with the public and interested and affected groups as described below.

External scoping was initiated with distribution of a scoping letter to inform the public of the purpose and need for action and project objectives for mule operations and stock use in the park, and to generate input on EA preparation The scoping letter, dated May 21, 2009, was sent to the park's mailing list of approximately 280 individuals, businesses, and organizations. In addition, the scoping letter was mailed to various Federal and state agencies and affiliated Native American tribes. Scoping information was also posted on the park's planning website.

Three public meetings were held: in Flagstaff, Arizona June 2; at South Rim June 3; and in Kanab, Utah June 4, 2009. Over 100 individuals attended these open-house-format meetings, engaged in conversations with park staff, and provided comments on flip charts and comment forms.

During the public scoping period, 278 responses were received from 262 individuals, three conservation groups, eight horsemen groups, two backpacking groups, the Arizona Trail Association, the Arizona Department of Environmental Quality, and the U.S. Fish and Wildlife Service. Because the park did not have a specific proposal for scoping, many comments were directed at stock use in general. These comments, summarized in Table 2, were used to confirm project purpose and need, identify additional impact topics to be analyzed, and develop the range of alternatives.

A predominant comment theme related to closing trails to mule or hiker use to address trail maintenance and user-conflict concerns. Other comments related to protecting natural and cultural resources, impacts to visitor experience, and concerns with health and safety for visitors and mules.

Table 2 Issues and Concerns Raised in Internal and Public Scoping

Trail Access
Mules enable those who would otherwise be unable to experience the Inner Canyon to do so.
Please keep the Bright Angel Trail (specifically) open to mule use, in order to provide viewing opportunities of mule trains and because this trail is not as steep as the South Kaibab.
Retain stock use all the way to the river, from South and North Rim.
Consider allowing concessions mule rides on the South Rim both east and west of the village.
Do not offer rim rides.
Reinstate all day rides from North Rim to Roaring Springs.
Allow mules to use roads with a painted safety path.
Open the Old Bright Angel Trail to hikers on the North Rim.
Restrict all North Rim stock use to rim trails; consider building a new rim trail for this purpose.
Restrict mule rides to the area above Supai Tunnel
The South Kaibab Trail should remain open to stock use.
Mule use should be eliminated from one or both trails to enhance the hiker's experience.
Consider limiting stock use numbers on the trails.
NPS should retain the ability to bring and use private stock in the park.
Do not allow private stock use.
Both South Rim trails should remain open to hikers/neither trail should become mule-use only.
Close some trails in winter (Oct-April) to minimize stock damage.
Discontinue overnight mule rides.
Increase number of cabins at Phantom Ranch for hikers; put mule riders in the dorms.
Day trips by horses to Plateau Point should be terminated.
Trail Maintenance
Due to mule use, National Park maintenance crews must create steps on paths that would normally have a smooth surface. This is harder for hikers to walk on.
The fine material required for mules rapidly erodes away and must constantly be replaced.
Mules grind the pathways to talcum powder, which in turn encourages erosion, needing constant and expensive attention.
When rebuilding the South Kaibab Trail, use 7" or smaller steps for hiker comfort and safety.
Consider making Xanterra responsible in part or completely for trail maintenance.
Consider hardening trails open to stock use to minimize impacts, such as through cobbling or asphalt.
Consider working with volunteer groups such as Backcountry Horsemen of America to accomplish trail maintenance.
Consider increasing stock use and/or hiker fees to cover costs of maintenance.
User Conflicts
Stock use should be reduced to minimize conflicts with other users.
Mule train leaders are too loud when talking to their groups.
Consider manure bags or rotating use of trails by to reduce offensive odors from mule urine and droppings.
Remove stock droppings to reduce associated impacts and odors. Alternatively, regularly sprinkle soil or some other additive to soak up urine & droppings or help them decompose faster.
Consider moving the mule corral away from the trail to reduce offensive odors, such as Yaki Point or the area beyond the South Rim backcountry office.

Doubling stock use of one corridor trail by closing the other to mules will increase conflicts between hikers and mules.
Create more areas where mule trains can stop to relieve themselves so that impacts can be more dispersed. Being creatures of habit, mules will regularly urinate in preferred places, which should make cleaning such areas simpler.
Mule droppings and urine made hiking the trail offensive or unpleasant.
Restrict hiker numbers to reduce impacts.
Consider spatial zoning to segregate users (one trail for horses only, another for hikers only).
Educate users as to what to expect on their hike or stock trip.
Implement a permit system for concessioner and private mules.
Limit mule use to 20 per day on trails open to stock; have restrictions apply to both commercial and private stock groups.
Health and Safety
Mule use leads to safety issues for hikers. These include the risk of passing on narrow trails and the health hazard of breathing excrement-contaminated dust.
Mule use in GRCA is unethical; mules are overloaded and overworked. They are not exercised in winter, have no shelter from harsh weather, and must stand in their own waste.
Use temporal zoning to minimize safety concerns of groups passing each other on narrow trails.
Consider employing a person to look after mule welfare (exclusively/non-partisan).
Create "passing lanes" for hikers and stock to safely pass each other, specifically on North Kaibab Trail.
Stock use on the Bright Angel Trail is more dangerous and expensive (for the concessioner) than such use on the South Kaibab Trail.
Screen mule riders to restrict the rides to those who have enough experience to stay in the saddle (avoid being thrown).
Consider penalties for those who do not pass each other according to the permit instructions, as a way of improving safety. One penalty could be revocation of permit or being barred from one in the future.
Natural Resources
Mules eat trailside vegetation, causing impacts.
Stock use may increase nest parasitism of the southwestern willow flycatcher; NPS should analyze this possibility. NPS should also analyze whether any new uses impact threatened and endangered species.
Consider whether any move of the stock corral fits within previous USFWS consultations.
Mule use should be eliminated from one or both trails to preserve natural resources.
EA should disclose effects of stock use on natural resources, including water quality and vegetation.
Consider whether stock use contributes to sediment and selenium loading in streams and Colorado River.
Mule droppings contaminate water supplies; they may also contain harmful trace chemicals that affect natural environment.
Cultural Resources
NPS should evaluate whether the mules and trails are cultural resources/landscapes worthy of historic designation and preservation.
Mule use should be retained as a way to experience the canyon and preserve an important component of the park's history.
NPS should consider effects of stock use on archeological resources.

Socioeconomic Impacts
Mule rides provide many jobs for people in the area, this should be considered in the EA.
The EA needs to examine the financial impacts of stock use.
Visitor Experience/Helicopter Use
Mules are necessary to service Phantom Ranch, use mules not helicopters
Use helicopters to supply Phantom Ranch, not mules (eliminate mule use).
Helicopter noise distracts from the wilderness experience.
Other
Monitor impacts of both visitor groups (stock and hiker).
Include a description of current use and a map of trails open to stock and hiker use.
"Sustainable" needs to be clearly defined.
Use mules to ferry river runners out of canyon instead of helicopters. Also, make this an affordable service – remove the 5 mule minimum requirement.
Consider allowing llamas in the canyon; they incur fewer impacts than horses or mules.

Evaluation of these comments received during internal, public, and agency scoping resulted in identification of several main issues related to park resources, socioeconomic conditions, and visitor experiences. Various project elements and potential stock use changes described in the May 2009 scoping letter resulted in the following consolidated concerns

- New trail construction could disturb archeological sites and/or ethnographic resources
- Changes in use could alter historic character of barns and/or trails, as well as cultural landscapes of which they are a part
- Construction of new trails or buildings could affect vegetation and rare plants
- Increases in stock use or changes in location could attract brown-headed cowbirds, a known nest parasite of the southwest willow flycatcher, an endangered species; other special status species could also be affected
- Changes in locations and/or amounts of stock use could affect the visitor experience as well as park operations
- Increases in stock use or changes in location could affect watersheds, through stock waste and fugitive dust
- New trail construction could affect wetlands
- Changes in stock use could affect the local or regional economy
- Changes in stock use could affect the wilderness character of Grand Canyon National Park
- Changes in stock use could affect public health and safety

Identified issues were used to formulate alternatives and mitigation measures. Impact topics were then selected for detailed analysis based on substantive issues, environmental statutes, regulations, executive orders, and Management Policies 2006. A summary of impact topics and rationale for selection or dismissal are given below.

Impact Topics Retained for Further Analysis

In this section and the following section, Impact Topics Dismissed from Further Analysis, the NPS takes a look at all potential impacts by considering direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. Impacts are described in terms of context and duration. Impact context or extent is described as localized or widespread. Impact duration is described as short term, ranging from days to three years; or long

term, extending up to 20 years or longer. Impact intensity and type is described as negligible, minor, moderate, or major, and as beneficial or adverse. The NPS equates major effects as significant. Identification of major effects would trigger an environmental impact statement (EIS). Where intensity of impact could be described quantitatively, numerical data is presented; however, most impact analyses are qualitative and use best professional judgment in making the assessment.

The NPS defines measurable impacts as moderate or greater effects. It equates *no measurable effects* as minor or less. *No measurable effect* is used by the NPS in determining if a Categorical Exclusion applies, or if impact topics may be dismissed from further evaluation in an EA or EIS. The use of *no measurable effects* in this EA pertains to whether the NPS dismisses an impact topic from further detailed evaluation. The reason the NPS uses *no measurable effects* to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues truly significant to the action in question, rather than amassing needless detail in accordance with CEQ regulations at 1500.1(b).

What follows is a limited evaluation and explanation as to why some impact topics are not evaluated in more detail. Impact topics are dismissed from further evaluation in this EA if

- they do not exist in the analysis area, or
- they would not be affected by the proposal, or the likelihood of impacts are not reasonably expected, or
- through application of mitigation measures, there would be minor or less effects (i.e., no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic

Due to there being no effect, or no measurable effects, there would either be no contribution toward cumulative effects, or contribution would be low. For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct, indirect, and cumulative effects is presented. There is no impairment analysis included in the limited evaluations for dismissed topics because the NPS threshold for considering whether there could be an impairment is based on major effects.

Impact topics for this project have been identified on the basis of Federal laws, regulations, and orders; Management Policies 2006; and National Park Service knowledge of resources at Grand Canyon National Park. Impact topics carried forward for further analysis in this Environmental Assessment are listed below along with the reasons why the impact topic is further analyzed.

Archeological Resources, Cultural Landscapes, Historic Structures, and Ethnographic Resources
NPS managers must comply with Section 106 of the National Historic Preservation Act of 1966, as amended; Archeological Resources Protection Act of 1979, as amended; and NPS Director's Order 28, Cultural Resources Management. Mule operations and stock use have a long history in Grand Canyon, and changes to current operations and facilities could affect these cultural resources. A new stock-use trail on South Rim has potential to specifically impact archeological and ethnographic resources whereas changes to historic barns or corrals could impact cultural landscapes and historic structures. Therefore, these cultural resources are discussed in Chapter 3.

Vegetation
According to Management Policies 2006, the National Park Service strives to maintain all components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and ecological integrity of plants (NPS 2006b). The proposed new South Rim stock trail, and upgrades to stock facilities throughout the park, would involve vegetative community

disturbance and tree removal. Potential exists to increase disturbance to adjacent biotic communities through spread of exotic vegetation and noxious weeds. Therefore, vegetation is discussed in Chapter 3.

General Wildlife
Management Policies 2006 state the NPS will, "maintain as parts of the natural ecosystems of the parks all native plants and animals." As mentioned previously, disturbance to vegetative communities and tree removal would occur under the proposed actions. This type of disturbance would directly impact wildlife and wildlife habitat. Other potential impacts to wildlife include noise disturbance from stock users, and indirect impacts of non-native species, such as cowbirds, attracted to stock use facilities. Therefore, general wildlife is discussed in Chapter 3.

Soil Resources
According to Management Policies 2006, "The Service will actively seek to understand and preserve the soil resources of parks, and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources." Trail degradation and erosion is a driver for this document because stock use impacts trails and subsequent erosion. In addition, changes in stock facilities (i.e., expansion) would also have impacts on soil resources. Therefore, soil resources are discussed in Chapter 3.

Water Resources (Riparian, Floodplain, Wetland, and Water Quality)
Executive Order 11990, Protection of Wetlands; Executive Order 11988, Floodplain Management; the Clean Water Act of 1972; and NPS Director's Order 77-1, Wetland Protection require Federal land management agencies to avoid, where possible, adversely affecting wetlands. Management Policies 2006 reflect these regulations, and direct park managers to

- perpetuate surface waters and ground waters as integral components of park aquatic and terrestrial ecosystems;
- manage for preservation of floodplain values;
- protect, preserve, and restore natural resources and functions of floodplains;
- preserve and enhance natural and beneficial values of wetlands;
- provide leadership and take action to prevent destruction, loss, or degradation of wetlands; and
- maintain or restore water quality

Proposed actions including stock use in and around surface water have potential to affect water and aquatic resources. Therefore, water resources are discussed in Chapter 3.

Visitor Experience
The 1916 NPS Organic Act and Management Policies 2006 direct national parks to provide for public enjoyment of park resources and values. Mule operations and stock use activities that could affect visitor experience include changes in stock use levels, trail maintenance and conditions, and changes to facilities or infrastructure associated with stock use. Therefore, visitor experience is discussed in Chapter 3.

Public Health and Safety
Management Policies 2006 direct park managers to strive to protect human life, as well as provide for injury-free visits and a safe and healthful environment for visitors and employees. Stock use on trails, and trail conditions, could impact human safety. Therefore, public health and safety is discussed in Chapter 3.

Park Operations
NPS Director's Order 12 (DO-12) provides guidance to national parks on inclusion of park operations as an impact topic. Although Management Policies 2006 do not specifically address park operations, virtually every action or proposal evaluated in the NEPA process has either a direct or indirect effect on park operations. Park operations (including concessions management, concessioner mule operations, and trail maintenance) have potential to be affected by proposed actions. Therefore, park operations are discussed in Chapter 3.

Socioeconomic Environment
Socioeconomic values consist of local and regional businesses and residents, the local and regional economy, and park concessions. The local economy and most business in neighboring communities are based on construction, recreation, transportation, tourist sales, services, and educational research; the regional economy is strongly influenced by tourist activity. Proposed actions could affect park concessions that offer mule rides, in particular. Therefore, socioeconomic environment is discussed in Chapter 3.

Wilderness Character
Most of the park is recommended for wilderness designation. Until Congress formally acts on this recommendation, Management Policies 2006 require these areas be managed under Wilderness Act provisions. Actions related to stock use that could affect wilderness character include construction of facilities in proposed wilderness areas, changes in visitor-use levels and types of use, and changes in trail maintenance needs. Therefore, wilderness character is discussed in Chapter 3.

Impact Topics Dismissed From Further Analysis

Impact topics, as listed below, were initially considered, but dismissed from further consideration in this document. During internal scoping, the park's interdisciplinary team conducted a preliminary resources analysis to determine context, duration, and intensity of effects the proposal may have on those resources. If the magnitude of effects was determined to be either negligible or minor, there is no potential for significant impact and further impact analysis is unnecessary; therefore, the resource is dismissed as an impact topic.

For purposes of this section, an impact of negligible intensity is "at the lowest levels of detection, barely perceptible, and not measurable." An impact of minor intensity is "measurable or perceptible, but slight, localized, and would result in a limited alteration or a limited area." Rationale for dismissing these specific topics is stated for each resource.

Special Status Species
The Endangered Species Act of 1973 requires examination of impacts on all Federally listed threatened, endangered, and candidate species. Section 7 of the Endangered Species Act requires Federal agencies consult with the U.S. Fish and Wildlife Service (USFWS) to ensure any action authorized, funded, or carried out by the agency does not jeopardize continued existence of listed species or critical habitats. In addition, Management Policies 2006 and DO 77, Natural Resources Management Guidelines, require the NPS examine impacts on Federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. Note that special status plant species are discussed under the vegetation topic carried forward to Chapter 3. Based on the project area and knowledge of special status wildlife, impacts to the following species were considered

Southwestern willow flycatcher (SWWF)

The presence of brown-headed cowbirds near stock-use areas presents some concern for SWWF. Cowbirds are known to parasitize SWWF nests. Cowbirds are attracted to seed in stock feed, and insects in manure. The current South Rim mule concessioner recently changed to a pelletized feed that promises less seed and thus less cowbirds. NPS staff plans to continue monitoring cowbird activity as funding is available.

Further, GRCA SWWF territories are generally located in riparian areas along the River Corridor (Sogge et al. 1997) away from proposed project areas and stock-use trails. The Grand Canyon population is small (average of less than two nests per year) and restricted to a particular reach of the River Corridor (river mile 28 to 71) near the western park boundary at river mile 259 to 275. It is unknown whether cowbirds travel from current stock-use areas to nesting locations near the river. However, because GRCA is not proposing an increase in overall stock or new concentrations of mules away from existing facilities it is expected impacts to SWWF would not be measurable.

California condor

The main concern with California condors in relation to stock use is potential for contact with humans. Condors are naturally curious, and it is not uncommon for them to frequent areas of high human activity, such as Grand Canyon Village. Noise and activity associated with stock use (rim rides, expansion of South Kaibab Trailhead facilities) has potential to attract condors, and increase potential interaction between condors and humans. Condor contact with humans would be of concern if work crews harass the birds or if the birds become habituated to humans. Mitigation measures to educate stock users and riders about condor concerns, and to cease activities if condors are present, would minimize potential disturbance to the birds.

Mexican spotted owl (MSO)

Presence of GRCA MSO was confirmed in 1992 through field surveys. Additional survey results in subsequent years suggest MSO occupy rugged canyon terrain below the canyon rims. Currently 41 park protected activity centers (PACs) have been designated (Bowden 2008). In reviewing the most current information on MSO locations, park staff determined no known MSO habitat or PACs occur in project areas. For this reason, the project would have no impacts to MSOs or MSO habitat in GRCA.

Because impacts to special status wildlife species would be minor or less, this impact topic was dismissed from further analysis.

Museum Collections

Director's Order-24 *Museum Collections* requires the consideration of impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript material), and provides further policy guidance, standards, and requirements for preserving, protecting, documenting, and providing access to, and use of NPS museum collections. Actions proposed for mule operations and stock use are not expected to have impacts on museum collections and therefore this topic was dismissed from further analysis in this document.

Visual/Scenic Quality

Conserving national park scenery and providing for visitor enjoyment are elemental NPS purposes as identified in the 1916 Organic Act. Stock use, even under increased-use scenarios, does not

affect vistas available in Grand Canyon National Park. Impacts to visitor experience, such as visual impacts of stock use and corrals, are carried forward and considered under Visitor Experience

Air Quality
Grand Canyon National Park is a Federally mandated Class I Area under the Clean Air Act. As such, park air receives the most stringent protection against increases in air pollution and further degradation of air quality-related values. The Act then sets a further goal of natural visibility conditions, free of human-caused haze. Park air quality is generally good, and park pollution levels fall below those established by the Environmental Protection Agency to protect human health and welfare. However, visibility is usually well below natural levels due to air pollution, most of which originates far outside park boundaries, and arrives as a well-mixed regional haze rather than as distinct plumes.

Section 118 of the Clean Air Act requires all Federal facilities to comply with existing Federal, state, and local air pollution control laws and regulations. The park Air Quality Specialist has determined this project would not require NPS consultation with the State of Arizona regarding air quality. However, because there may be ground disturbance involved with proposed improvements to stock-use facilities and trails, there is a possibility of raising fugitive dust during project implementation or from disturbed areas afterwards. Application of mulch and gravel on any construction sites, after work is completed, would provide long-term dust control. Mulch and gravel would stabilize the soil surface and reduce wind speed/shear against the ground surface. Impacts to visitors from dust raised by stock on trails are discussed under visitor experience and public health and safety topics carried forward.

Soundscapes
The NPS is mandated by Director's Order 47 to articulate operational policies that require, to the fullest extent practicable, protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources. Natural sounds are intrinsic elements of the environment often associated with parks and park purposes. They are inherent components of "the scenery and the natural and historic objects and the wild life" protected by the NPS Organic Act. Natural sounds are vital to the natural functioning of many parks, and may provide valuable indicators of the health of various ecosystems. Intrusive sounds are of concern because they sometimes impede the Service's ability to accomplish its mission.

Stock use in general creates nominal amounts of noise, amounts well within accepted levels for developed areas and Corridor Trails. Construction activities from improvements to the South Kaibab Trailhead mule facility would generate some noise in the development zone above ambient conditions. Noise sources include vehicles, equipment, and additional people in the area conducting the work. Noise impacts from construction elements of this proposal would only last the duration of construction. All construction would occur during daylight hours when noise from roads and associated traffic already affect the project area. Any additional traffic would only be temporary and would negligibly affect the areas in the short-term. Therefore, this project would have no considerable effects on soundscape. Therefore, soundscape was dismissed from further analysis.

Environmental Justice
Executive Order 12898 requires consideration of impacts to minority and low-income populations to ensure these populations do not receive a disproportionately high number of adverse or human-health impacts. This issue was dismissed from further analysis because the proposed project will not specifically affect minority or low-income populations.

Prime and Unique Farmland

The Farmland Protection Policy Act of 1981, as amended, requires Federal agencies consider adverse effects to prime and unique farmlands that would result in conversion of these lands to non-agricultural uses. Prime or unique farmland is defined as soil that particularly produces general crops as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. This proposed project's location and surrounding lands have been evaluated by appropriate park technical area specialists and specialists from the Natural Resources Conservation Service (NRCS). Based on their observations, the project area is not considered prime or unique farmland (Camp 2002). Therefore, this topic was dismissed from further analysis.

Indian Trust Resources

Secretarial Order 3175 requires any anticipated impacts to Indian Trust resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The Federal Indian Trust responsibility is the legally enforceable fiduciary obligation on the part of the United States to project tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of Federal law with respect to American Indian and Alaska Native tribes. Grand Canyon National Park does not have any Indian Trust resources; therefore, this topic was dismissed from further analysis.

CHAPTER 2 ALTERNATIVES

Alternative A – No Action Alternative

Under this alternative, temporary changes implemented in 2009 (restricting stock use below Supai Tunnel; temporary South Kaibab Trail closure to stock use; addition of a rim ride from the mule barn in Grand Canyon Village, along Rowe Well Road to the Abyss; and the toilet and hitching rail at Uncle Jim Point) would terminate if this alternative were selected. Under the No Action Alternative, the following levels of activity would continue.

South Rim

Commercial Stock Use

Bright Angel Trail

Commercial stock use would be allowed at a maximum level of 20 rides from South Rim to Plateau Point and back, and 20 one-way rides to Phantom Ranch for a total 40 rides per day as described in the 1995 GRCA GMP. These numbers do not include guides which average one for every ten riders. Current annual limits set in the GMP allow 14,600 rides, not including guides; however, these numbers do not reflect current use levels. Current stock use on Bright Angel Trail is approximately 8,315 (4,904 day and 3,411overnight) rides per year.

South Kaibab Trail

Commercial stock use would continue at a maximum level of 20 rides from Phantom Ranch, not including guide mules. In addition, approximately 12 supply mules, including guides, would occur on the trail from South Rim to Phantom Ranch and back daily. The current temporary closure of this trail to stock for trail rehabilitation would cease, and the trail would reopen to stock use. Current annual limits set in the GMP allow up to 7,300 rides, not including guides or supply mules; however, these numbers do not reflect current use levels. Current stock use on South Kaibab Trail is approximately 3,411 (overnight) rides per year.

Above-rim ride

No commercial above-rim rides would be offered; all commercial stock use would occur below the rim.

South Rim Commercial Stock Facilities

The current mule barn in Grand Canyon Village would continue to house a majority of concessioner mules and stock operations on South Rim; a smaller number of mules would be located at the South Kaibab Trailhead barn.

Private Stock Use

Private stock use on Bright Angel and South Kaibab Trails, bridle paths, and all primitive roads as described in Chapter 1 and Appendix A would continue. Maximum group size would remain 12 stock and/or people for overnight use with no defined limits on day-use group size. Other rules and regulations outlined in the Backcountry Information Center handout (Appendix A) would also apply.

Administrative Stock Use

Stock used by the NPS for trail work, restroom maintenance, and supply of Inner Canyon ranger stations would continue at approximately 4,608 one-way trips per year (about six mules per day). Stock used to supply Phantom Ranch concession operations (lodging, food, duffel service) is included under Commercial Stock Use above.

North Rim, including Tuweep and Whitmore

Commercial Stock Use

North Kaibab Trail

This trail would be open for commercial stock use to Roaring Springs. No limits would be placed on commercial use. The current temporary trail closure from Supai Tunnel to Roaring Springs to address trail condition concerns would cease. Annual use on North Kaibab Trail would continue to Supai Tunnel at approximately 4,285 rides annually and to Roaring Springs at 492 rides, not including guides. No widening or bypasses would be constructed as proposed in other alternatives.

Ken Patrick Trail

One-hour commercial rides would continue without a cap on the number of mules allowed each day. Annual use on the Ken Patrick Trail would continue at approximately 2,100 rides not including guides.

Uncle Jim Trail

Half-day commercial rides to Uncle Jim Point would continue without a cap on the number of rides allowed each day. Annual use on Uncle Jim Trail would continue at approximately 145 rides not including guides.

North Rim Stock Facilities

The Uncle Jim Point hitching rail and toilet, temporarily installed in 2009, would be removed.

Tuweep

Up to six groups per year, as described in Chapter 1, would be allowed to occur under a Commercial Use Authorization (CUA) at Tuweep.

Whitmore Trail

Although currently open to stock use, Whitmore Trail receives little or no use due to its remote location and current condition (not passable by stock). Under the No Action Alternative, the trail would remain open to stock use.

Private Stock Use

Private stock use would be allowed to continue on the North Kaibab and Uncle Jim Trails, bridle paths, and primitive roads as described in Chapter 1 and Appendix A.

Administrative Stock Use

NPS Administrative stock use for trail work, restroom maintenance, and supply of Inner Canyon ranger stations would continue at approximately 40 supply mules, including guides, on the North Kaibab Trail per year.

Action Alternatives

Four action alternatives were developed to address the purpose and need for action. Several Elements Common to All Action Alternatives are presented below.

Elements Common to All Action Alternatives

These elements are being proposed to specifically address commercial stock use at Tuweep and on Whitmore Trail, overall trail conditions and potential for future management actions if trails cannot be maintained, mule waste on the trails, and the user conflicts of crowding and trail etiquette. Primary elements include 1) allowing commercial stock use at Tuweep and Whitmore similar to current levels, 2) trail and resource monitoring, 3) adaptive management to allow future management actions, if needed, 4) continued funding and completion of trail maintenance, 5) education and interpretation, and 6) active clean-up of mule waste from trails.

Commercial Use at Tuweep and on Whitmore Trail

Up to six stock use groups would be allowed to occur at Tuweep each year. This use would be authorized under a commercial use authorization (CUA). Each group would be no more than 12 stock and 12 people, including guides, and would occur as day rides only. If sites were available, groups could camp in the Tuweep Campground; stock would not be allowed overnight. No additional commercial stock use would be allowed at Tuweep; however, if requests for more than six groups occur in the future, the park could consider these requests and could increase the number of groups using the adaptive management strategy described below.

No stock use would be allowed on the Whitmore Trail under the Action Alternatives. The trail is not currently maintained due to its remote location and non-existent use.

Monitoring

Stock use trails and facilities would be monitored to assess conditions and impacts to resources. Cost of trail work, amount of work completed, and amount of stock and hiker use would be tracked to determine impacts.

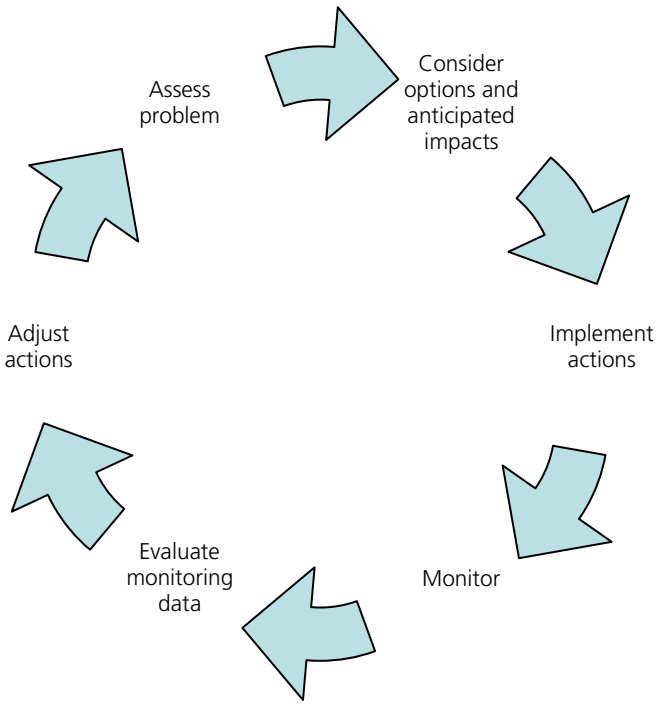
The Facility Management System Software (FMSS) program is currently used to track trail conditions over time, and calculate deferred maintenance. Condition assessments are completed annually, and evaluate overall trail condition and areas that may be impassable. Comprehensive condition assessments are completed every five years that assess trail structures, number of erosion control devices, number of liner rocks, amount of tread present, and condition of these trail components. This FMSS program could be expanded to address additional monitoring needs such as impacts to natural and cultural resources or visitor experience.

Other monitoring efforts could include trailhead registration for private stock users to help track amount of day use, particularly on Corridor Trails, visitor surveys, and others as developed.

A monitoring plan would be developed after completion of a decision document for this EA. Impact indicators may include soil loss on trails, amount of mule waste on trails, stock camp condition, and browsing of vegetation along trails, among others. Measurable standards would be developed as part of the monitoring plan. The NPS Trail Crew, and Science and Resource Management Division would evaluate trail and resource conditions, and inform further management actions as necessary (see Adaptive Management below).

Adaptive Management
Adaptive management can be described as a series of repeating incremental steps: collect information on existing trail conditions, analyze it, propose appropriate management actions, implement the actions, monitor the trail and resource conditions, evaluate trail and resource conditions against measurable standards developed in a monitoring plan and if needed – use additional management actions to ease the problem(s) (see Figure 1).

Figure 1 Adaptive Management Concept



The adaptive management concept proposed for stock use, after implementation of the selected alternative, is a systematic approach intended to manage concerns such as deteriorated trail conditions, increased deferred maintenance costs, conflicts between trail users, and accidents and injuries of stock, stock users, and hikers.

Adaptive management for stock use would start with the lowest level action that could effectively resolve issues with trail conditions and visitor experience. The NPS would develop management objectives to evaluate the effectiveness of the selected alternative and guide future management actions. If needed, additional limits on stock use could be phased-in over a number of years, as park staff monitors trail conditions, costs, and visitor experience to determine the best course of action to take next if the lowest level of action is unsuccessful. To address trail conditions, for example, the park could begin with low level actions such as trail rehabilitation including installation of water erosion control devices and construction of durable trail surfaces (e.g. rip rap) using standards currently being developed by the NPS, active removal of mule waste from the trails, and increased education of trail users. If those interventions are not successful at improving trail conditions and reducing deferred maintenance costs and user conflicts, then the park could consider seasonal trail closures (similar to those described in Alternative E) or further limits on stock use.

The highest level actions (such as eliminating stock use on Corridor Trails) would be considered only if other types of actions had been tried, evaluated and proven unsuccessful. Additional compliance would be completed as required for each phase of adaptive management.

Trail maintenance
The NPS would continue to maintain trails throughout the park, including those where stock use would occur. Methods and standards for trail maintenance are currently being prepared by NPS, both nationally and at the park level. These standards would be used in the adaptive management strategy described above.

Trail Closures
Trail and/or weather conditions including ice, wash outs, and collapsed retaining walls, can require closure of park trails to stock use. As needed, temporary trail closures would occur for the safety of stock and stock users.

Mule Waste Clean-up
Concession contracts would continue to include requirements for trails to be cleared of mule waste. NPS staff would ensure these measures are followed.

Educating Trail Users
Education and outreach would be enhanced to address user conflicts and safety concerns on stock use trails. Methods to educate users would include signage, internet, interpreters, and other methods as developed. For example, signage and other outreach methods could be used on the North Kaibab Trail to alert hikers of mules stopping at Cinch Up. This area is of particular concern because stopping is necessary to ensure rider and mule safety; however, hikers often attempt to pass the mules at this location even though the trail is not wide enough.

Funding
The NPS would continue to seek funding for trail maintenance under all Alternatives. Additionally, the park would seek to use volunteers to assist with trail work on some stock use trails, such as the Arizona Trail on South and North Rim, and the Ken Patrick and Uncle Jim Trails.

Annual Limit on Rides
Each Action Alternative identifies an annual limit for commercial mule rides from and on both North and South Rim. This concept allows concessioners flexibility to accommodate more visitors during high visitation times up to daily limits proposed for each trail. However, it does not allow for the maximum number of rides on all trails everyday; instead annual limits assume there will be days when the weather does not allow any rides, when visitation and ride demand is low, or trail conditions cause trail closures. The current-condition baseline for the average number of commercial mule rides annually from South Rim is 8,315, and 7,072 from North Rim.

Duffel Service and Drag Outs
The South Rim concessioner that operates mule rides and supplies Phantom Ranch also provides duffel and drag-out service to and from Phantom Ranch. These services would continue under all Action Alternatives. Duffel service would continue as current; the concessioner hauls duffels as space allows on supply mules going to and from Phantom Ranch. Drag-out, or drag-in, service allows visitors to take a one-way mule trip, generally from Phantom Ranch to South Rim or from South Rim to Phantom Ranch. When a drag-out is requested, the South Rim concessioner has a string of five mules available to transport up to five visitors. This service would continue at no more than 100 visitors per year, which is ten more than the maximum number of drag-outs that occurred

in any year since 2002. If demand were to increase, park managers could use an adaptive management strategy to consider allowance of additional drag-outs which would include reevaluation of trail conditions and resource impacts to determine if additional mule traffic would have measurable impacts.

Stock Facilities
Most corrals, hitching rails, and other infrastructure associated with stock would remain in its current condition, and maintained and upgraded as necessary. Additional NEPA documentation could be required in the future if facility upgrades have environmental impact potential.

The Indian Garden corral, located in the Garden Creek floodplain, would be relocated under all Action Alternatives when funding becomes available. Another corral may be constructed to accommodate NPS stock. Additional NEPA would be required depending on size and location of new corral. Site-specific analysis for this action is not included in this EA.

Private stock campsites at Phantom Ranch and Cottonwood Campground would be improved if funding becomes available and could include construction of pens and shade structures for stock.

Each Action Alternative specifically addresses the Grand Canyon Village mule barn and South Kaibab Trailhead mule barn because changes to these facilities differ by alternative.

Administrative Stock Use
NPS would limit administrative stock use as much as possible to lessen stock impacts to trails (i.e., erosion); however, some stock use would occur for trail and restroom maintenance and Indian Garden staff supply. Helicopters could also be used when needed to supply Indian Garden and for trail material transport, in accordance with GRCA aircraft regulations. South Kaibab Trail would be used as the primary NPS stock route to supply Phantom Ranch, maintain restrooms along the trail, transport trail materials, and access other Inner Canyon locations such as Cottonwood Campground and Clear Creek.

Table 3 Summary of commercial stock use by alternative

Commercial Stock Use								
	Bright Angel	South Kaibab	South Rim Above-Rim Ride	South Rim Facilities	North Kaibab	Ken Patrick/ Uncle Jim	Tuweep/ Whitmore	Total Annual Use
Alternative A No Action	Up to 20 rides to Phantom Ranch and 20 rides to Plateau Point daily	Up to 20 rides from Phantom Ranch daily, plus supply mules	No above-rim ride offered	Majority of mule operations at Village barn, some at South Kaibab Trailhead	No cap on rides to Supai Tunnel or Roaring Springs	No cap on one-hour rides on Ken Patrick or rides to Uncle Jim Point	Single company operates under a commercial use authorization (CUA) at Tuweep; no stock use at Whitmore	Daily limit only, no annual limit; average use from South Rim is 8,315 and North Rim is 7,072 rides per year
Alternative B Preferred	Up to 10 rides to Phantom Ranch daily; no rides to Plateau Point	Up to 10 rides from Phantom Ranch daily, plus supply mules	Up to 40 rides daily from Yaki Point area east	Move mule operations to South Kaibab Trailhead, leave a few mules at Village barn	Up to 40 rides to Supai Tunnel daily, no rides to Roaring Springs	Up to 40 one-hour rides on Ken Patrick daily, and 20 rides to Uncle Jim Point	Maintain similar use level at Tuweep; no stock use at Whitmore	Up to 10,000 rides from South Rim and 8,000 rides from North Rim
Alternative C South Kaibab/ North Kaibab	No rides or supply mules	Up to 10 rides to and 10 rides from Phantom Ranch daily, up to 10 rides to Cedar Ridge daily, plus supply mules	Up to 60 rides daily from Yaki Point area east	Move mule operations to South Kaibab Trailhead, no concessioner mules at Village barn	Up to 40 rides to Supai Tunnel and 10 rides to Roaring Springs daily	Up to 30 one-hour rides on Ken Patrick and 10 rides to Uncle Jim Point	Same as Alternative B	Up to 12,000 rides from South Rim and 10,000 rides from North Rim
Alternative D Bright Angel/ Uncle Jim	Up to 20 rides to Phantom Ranch and 20 rides from Phantom Ranch daily, plus supply mules	No rides or supply mules	Up to 30 rides from Village west to Abyss	Construct new mule barn near Village for concessions, move NPS stock operations to Village barn	Up to 20 rides to Supai Tunnel daily; no rides to Roaring Springs	Up to 50 one-hour rides on Ken Patrick and 20 rides to Uncle Jim Point	Same as Alternative B	Up to 8,000 rides from South Rim and 8,000 rides from North Rim
Alternative E Seasonal/ Limited Use	Up to 20 rides to Phantom Ranch daily April to December, no rides January to March	Up to 20 rides from Phantom Ranch daily April to December, plus supply mules, no rides January to March	No above-rim rides from South Rim	Move mule operations to South Kaibab Trailhead, leave a few mules at Village barn	Up to 10 rides to Supai Tunnel daily; no rides to Roaring Springs	Up to 30 one-hour rides on Ken Patrick and 10 rides to Uncle Jim Point	Same as Alternative B	Up to 6,000 rides from South Rim and 6,000 rides from North Rim

Note: Daily and annual ride numbers do not include supply or guide mules

Table 4 Summary of private stock use by alternative

	Private Stock Use
Alternative A No Action	Average overnight private stock use below the rim has been 56 stock per year. Permits not required for day use and numbers are unknown. No total annual use limits currently defined
Alternative B Preferred	No annual use limits would be established, but NPS would define when and if further evaluation and/or management action would be needed in the future. Overnight below-the-rim groups would be allowed up to 6 stock and 6 people. Day-use group size would be allowed up to 12 stock and 12 people. Private stock use guidelines would apply as described in Appendix A
Alternative C South Kaibab/North Kaibab	No stock use allowed on Bright Angel Trail. All stock use from South Rim into the canyon on South Kaibab Trail. Other trails and roads, including North Rim open as described in Chapter 1. Group size and guidelines would be the same as those described for Alternative B
Alternative D Bright Angel/Uncle Jim	No stock use allowed on South Kaibab Trail. All stock use from South Rim into the canyon on Bright Angel Trail. Other trails and roads, including North Rim open as described in Chapter 1. Group size and guidelines would be the same as those described for Alternative B
Alternative E Seasonal/Limited Use	Stock use allowed seasonally on Bright Angel and South Kaibab similar to commercial use. Stock allowed on Bright Angel and South Kaibab Trail April to December; no stock allowed January to March. Other trails and roads, including North Rim open as described in Chapter 1. Group size and guidelines would be the same as those described for Alternative B

Alternative B –Preferred

This alternative is proposed to specifically address trail conditions, crowding at Supai Tunnel, and public and concessioner interest in continuing mule rides in the park similar to current levels. Primary elements include 1) limiting commercial stock use on Bright Angel Trail, 2) eliminating commercial use below Supai Tunnel on North Kaibab Trail, 3) setting a maximum number of mules at Supai Tunnel based on hitching rail location and size, and overall area layout, and 4) adding an above-rim ride on South Rim.

South Rim

Commercial Stock Use

Up to 10,000 commercial mule rides, including Inner Canyon and above-rim rides, would be offered each year (current average use is 8,315 rides).

Bright Angel Trail

Up to 10 rides per day plus up to 2 guides would be allowed to Phantom Ranch. Plateau Point day rides from South Rim would not be offered under this alternative.

South Kaibab Trail

Stock use would be allowed up to 10 rides plus guides per day from Phantom Ranch. Additionally, up to 12 supply mules including guides would be allowed daily to supply Phantom Ranch.

Above-rim ride

An above-the-rim ride would be allowed at a level of 40 rider mules per day with a minimum of one guide for every 10 riders.

This ride would begin at South Kaibab Trailhead and parallel the road toward Yaki Point. The ride would meet the rim just east of Yaki Point, then continue east along the rim for approximately one mile and would return using the same route or loop back to South Kaibab Trailhead through the forest (see Map 3). Total length would be approximately three miles. The exact route would be developed to minimize resource impacts, by an interdisciplinary park staff team.

The trail developed for this ride would be four-to-six feet wide and unpaved. Much of the proposed alignment follows an existing rim social trail. The concessioner would maintain and clean mule waste from the trail as necessary. Signs regarding trail etiquette for hikers would be displayed near the trail to minimize any potential conflicts with users. Bicycles would not be allowed on this trail section. No other above rim commercial mule rides would occur on South Rim.

South Rim Commercial Stock Facilities

The current Grand Canyon Village mule barn would house a small number of concessioner stock, and the majority of concessioner stock operations would be moved to the South Kaibab Trailhead barn. Due to an increase in mules at the South Kaibab Trailhead location, improvements such as expansion of pens and barns, and addition of a restroom would be needed.

Map 3 Above rim mule ride general alignment, proposed under Alternatives B and C

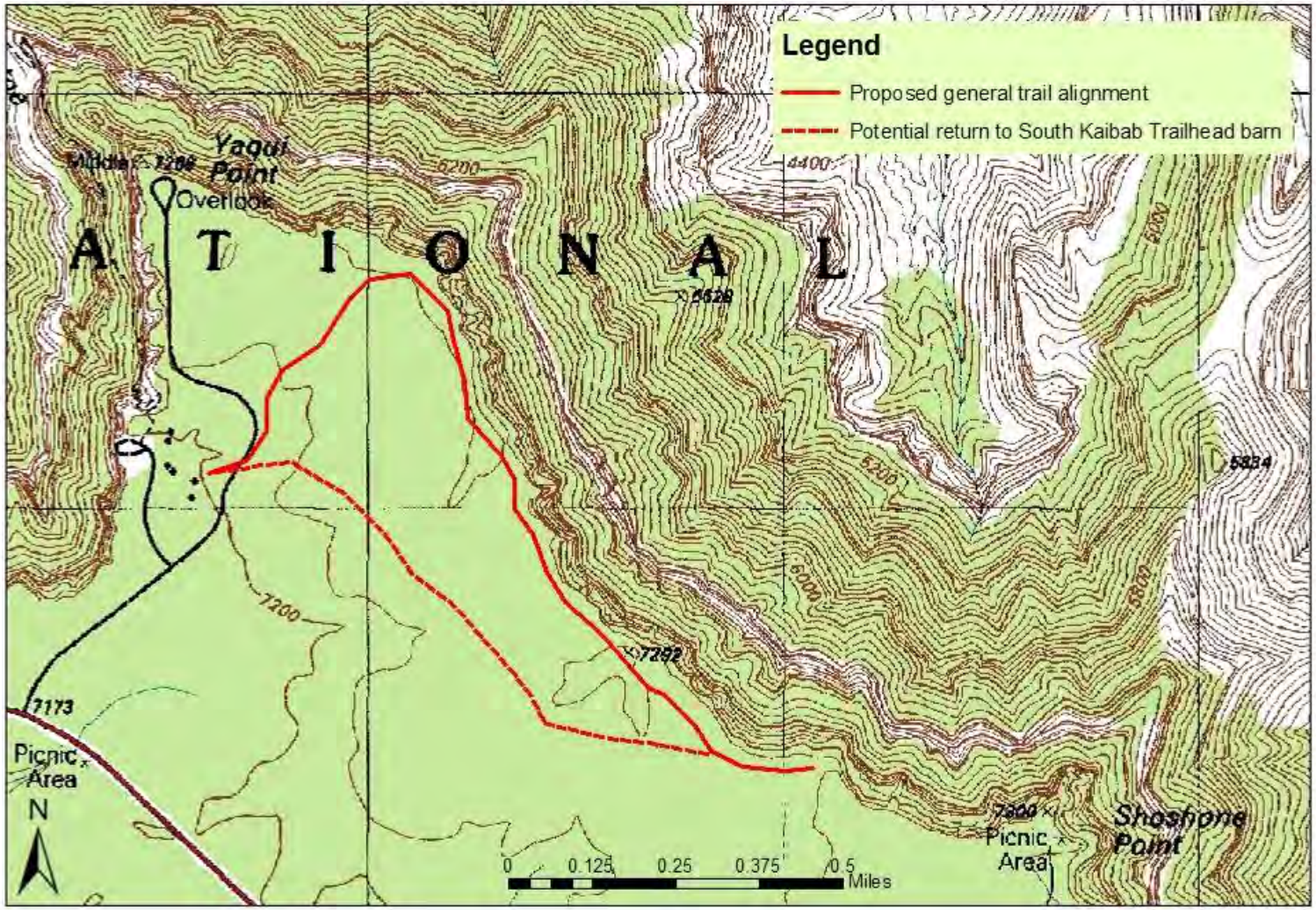


Table 5 Comparison of South Rim Commercial Use Limits and Current Use

Alternative	Use Limit	Current Use*	Change from Current Use
Alternative A No Action	14,600	8,315	0
Alternative B Preferred	10,000	n/a	+1,685
Alternative C South Kaibab/ North Kaibab	12,000	n/a	+3,685
Alternative D Bright Angel/ North Kaibab	8,000	n/a	-315
Alternative E Seasonal/ Limited Use	8,000	n/a	-2,315

* Current use is average annual use 2002-2008

Private Stock Use

Overnight below-the-rim groups would be allowed up to 6 stock and 6 people. Day-use group size would be allowed up to 12 stock and 12 people. Private stock use guidelines would apply as described in Appendix A.

North Rim

Commercial Stock Use

Up to 8,000 commercial mule rides, including Inner Canyon and above-rim rides, would be offered each year (current average use is 7,072 rides).

North Kaibab Trail

Up to 40 rides per day would be allowed to Supai Tunnel with no more than 20 rides on the trail at one time. The North Kaibab Trail would be open for commercial stock to Supai Tunnel and not to Roaring Springs.

No widening or bypasses would be constructed on the North Kaibab Trail to address crowding at Cinch Up and at Supai Tunnel. Instead, the park and concessioner would work together to educate hikers on trail etiquette specifically regarding mules on the trail.

Ken Patrick Trail

Up to 40 one-hour rides on the Ken Patrick Trail to the Uncle Jim Junction would be allowed daily, with no more than 20 rides on this section of trail at any one time.

Uncle Jim Trail

Up to 20 half-day rides to Uncle Jim Point would be allowed daily.

North Rim Stock Facilities

The hitching rail at Uncle Jim Point would remain in place, and a one-stall composting toilet would be installed to replace the existing toilet. Unit installation could require helicopter use. Cleaning and routine maintenance would occur on a weekly basis or as needed, and the site would be accessed by foot or stock. Emptying the unit would occur as needed and could be accomplished by helicopter or stock.

Table 6 Comparison of North Rim Commercial Use Limits and Current Use

Alternative	Use Limit	Current Use*	Change from Current Use
Alternative A No Action	n/a	7,072	0
Alternative B Preferred	8,000	n/a	+928
Alternative C South Kaibab/North Kaibab	10,000	n/a	+2,928
Alternative D Bright Angel/North Kaibab	8,000	n/a	+928
Alternative E Seasonal/ Limited Use	6,000	n/a	-1,072

* Current use is based on average annual use 2002-2008

Private Stock Use

Overnight below-the-rim groups would be allowed up to 6 stock and 6 people. Day-use group size would be allowed up to 12 stock and 12 people. Private stock use guidelines would apply as described in Appendix A.

Alternative C – South Kaibab/North Kaibab

This alternative is being considered to specifically address trail conditions and user conflicts on South Rim Inner Canyon trails, a request from the current concessioner to construct bypasses and/or widen the North Kaibab Trail to alleviate crowding and user conflicts, public interest in increased opportunities for mule rides in the park, and concerns related to the Uncle Jim area located in proposed wilderness. Primary elements include 1) hosting all stock use on South Kaibab Trail from South Rim into canyon, 2) construction of bypasses and trail widening on North Kaibab Trail, 3) increased opportunities for mule rides parkwide, and 4) limiting stock use and development at Uncle Jim Point.

South Rim

Commercial Stock Use

Up to 12,000 commercial mule rides, including Inner Canyon and above-rim, would be offered each year.

Bright Angel Trail

Commercial stock use on Bright Angel Trail and to Plateau Point would cease.

South Kaibab Trail

Up to 20 rides per day not including guides would be allowed to Phantom Ranch. Up to 10 rides per day not including guides would be allowed to Cedar Ridge. Up to 12 supply mules, including guides, per day would be allowed to Phantom Ranch.

Above-rim ride

An above-the-rim ride would be allowed at a level of 60 rides per day not including guides. A minimum of one guide would accompany every 10 riders. This ride would begin at the South Kaibab Trailhead and follow the alignment described in Alternative B. A hitching rail and restroom would be constructed at the east end of this trail along the rim between Yaki and Shoshone Point. Rides would return using the same route or loop back to South Kaibab Trailhead barn through the forest.

South Rim Commercial Stock Facilities

Concessioners stock and stock operations would be moved to the South Kaibab Trailhead facility. Due to an increase in mules at the South Kaibab Trailhead location, improvements such as expansion of pens and barns, and addition of a restroom would be needed. NPS horses and mules would be moved to the Grand Canyon Village mule barn and would vacate current pens and barns located near the residential area on Juniper Hill.

Private Stock Use

No private stock, overnight or day-use, allowed on Bright Angel Trail. All stock use from South Rim into the canyon would occur on South Kaibab Trail. Other South Rim trails and roads would be open as described in Chapter 1 and Appendix A.

North Rim

Commercial Stock Use

Up to 10,000 commercial mule rides, including Inner Canyon and above-rim rides would be offered each year.

North Kaibab Trail

The North Kaibab Trail would be open for commercial stock use to Roaring Springs at a level of 40 rides per day from the rim to Supai Tunnel and 10 rides per day from the rim to Roaring Springs, not including guides. Each mule string would be no more than 10 riders and 2 guides, not to exceed a total group size of 11. Additionally, no more than 20 rider mules would be allowed at Supai Tunnel at one time.

Widening of the North Kaibab Trail at Cinch-Up and construction of a bypass at Supai Tunnel would occur under this alternative. The trail at Cinch-Up would be widened up to 10 feet for a distance of 150 feet to accommodate stock and hikers simultaneously. At Supai Tunnel a bypass trail would be constructed to access the hitching area from above.

Ken Patrick Trail

Up to 30 one-hour rides on the Ken Patrick Trail to the Uncle Jim Junction would be allowed daily, not including guides. No more than 10 rider mules would be allowed on this section of trail at any given time.

Uncle Jim Trail

Up to 10 half-day rides to Uncle Jim Point would be allowed daily, not including guides.

North Rim Stock Facilities

The hitching rail and Romtec toilet at Uncle Jim Point would be removed.

Private Stock Use

Private stock use, both overnight and day use, would be allowed to continue as described in Alternative B.

Alternative D – Bright Angel/Uncle Jim

This alternative is being considered to specifically address trail conditions and user conflicts on South Rim Inner Canyon trails, trail conditions and user conflicts on North Kaibab Trail, and the GMP-recommendation to relocate South Rim concessioner mule operations. Primary elements include 1) hosting all stock use on Bright Angel Trail from South Rim into canyon, 2) development of an above-rim ride to the west of the Village area (as opposed to east as proposed under Alternative B and C), 3) same maximum number of rides each year on North and South Rim for comparison, 4) limiting stock use on North Kaibab Trail, 5) and increasing use on Uncle Jim Trail and at Uncle Jim Point.

South Rim

Commercial Stock Use

Up to 8,000 commercial mule rides, including Inner Canyon and above-rim rides would be offered each year.

Bright Angel Trail

Up to 20 rides per day not including guides would be allowed to either Plateau Point or Phantom Ranch. Additionally, up to 12 supply mules including guides would be allowed to and from Phantom Ranch daily.

South Kaibab Trail

Stock use on South Kaibab Trail would cease.

Above-rim ride

An above-the-rim ride would be allowed at a level of 40 riders per day not including guides. A minimum of one guide would accompany every 10 riders. This ride would begin near Grand Canyon Village and would follow the existing temporary above-rim ride alignment. This route travels west to Rowe Well Road, parallels the road until it meets a dirt road where the route crosses Rowe Well Road, and follows the dirt road to the Abyss.

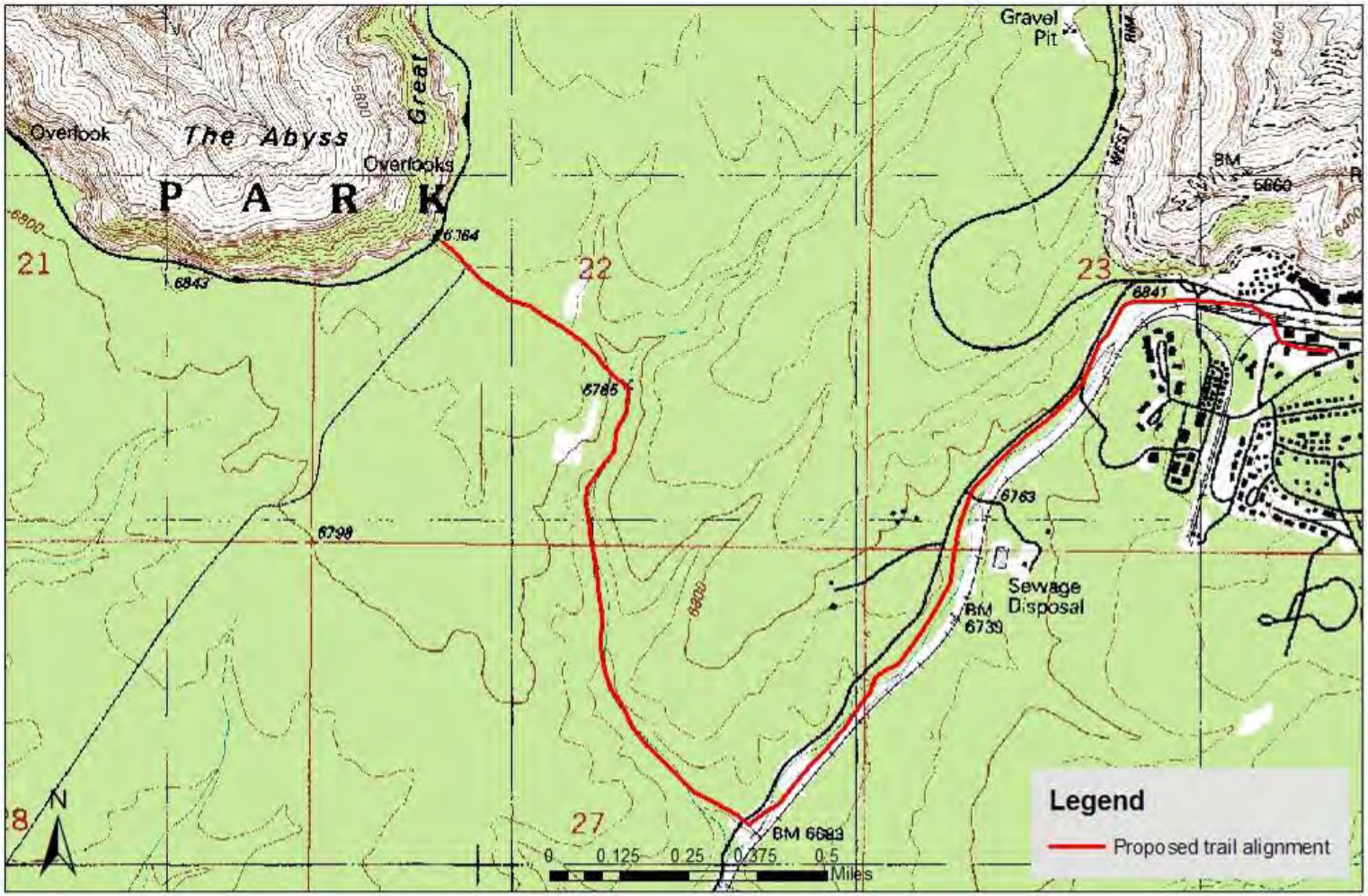
South Rim Stock Facilities

A new mule barn would be constructed near the Village to house South Rim concessioner stock operations.

Private Stock Use

No private stock, overnight or day use, would be allowed on South Kaibab Trail. All stock use from South Rim into the canyon would occur on Bright Angel Trail. Other trails and roads on South Rim would be open as described in Chapter 1 and in Appendix A.

Map 4 Above rim mule ride from Grand Canyon Village to the Abyss overlook, proposed in Alternative D



North Rim

Commercial Stock Use

Up to 8,000 commercial mule rides, including Inner Canyon and above-rim rides would be offered each year.

North Kaibab Trail

North Kaibab Trail would be open for commercial stock use to Supai Tunnel at up to 20 rides per day not including guides. No rides would be offered to Roaring Springs. No widening or bypasses would be constructed on North Kaibab Trail.

Ken Patrick Trail

Up to 50 one-hour rides on the Ken Patrick Trail to the Uncle Jim Junction would be allowed daily, with no more than 20 rider mules on this section of trail at any given time.

Uncle Jim Trail

Up to 20 half-day rides to Uncle Jim Point not including guides would be allowed daily.

North Rim Stock Facilities

The hitching rail at Uncle Jim Point would remain in place and a composting toilet would replace the existing Romtec toilet near the point.

Private Stock Use

Private stock use, both overnight and day use, would be allowed to continue as described in Alternative B.

Alternative E – Seasonal and Limited Stock Use

This alternative is being considered to specifically address trail conditions and user conflicts on stock-use trails and resource concerns with development associated with stock use (i.e., new trails and restroom). Primary elements include 1) seasonal stock use from South Rim into the canyon (open April through December, closed January through March), 2) no above-rim South Rim ride, 3) limited commercial mule rides on North Kaibab, Uncle Jim and Ken Patrick Trails, 4) fewer rides annually on North and South Rim compared to current, 5) and removal of hitching rail and toilet at Uncle Jim Point.

Commercial Stock Use

Up to 6,000 commercial mule rides, including Inner Canyon and above-rim rides would be offered each year.

Bright Angel Trail

Stock use would be allowed on Bright Angel Trail April through December each year at a level of 20 rides to Phantom Ranch. No rides to Plateau Point would be offered.

South Kaibab Trail

Stock use would be allowed on South Kaibab Trail April through December each year at a level of 20 rides from Phantom Ranch per day not including guides, and up to 12 supply mules, including guides to Phantom Ranch daily. Supply mules would continue on a limited basis January through March at no more than 12 per day no more than five days per week.

Above-rim ride

No above-rim ride would be offered under Alternative E.

South Rim Stock Use Facilities

The current Grand Canyon Village mule barn would house a small number of concessioner stock, and concessioner stock operations would be moved to South Kaibab Trailhead facilities. Due to an increase in mules at the South Kaibab Trailhead location, improvements such as expansion of pens and barns, and a restroom would be needed as described in Alternative B.

Private Stock Use

Stock use would be allowed seasonally as described for commercial use. No private stock use would be allowed below the rim from South Rim between January 1 and March 31. Additionally, overnight below-the-rim groups would be allowed up to 6 stock and 6 people. Day use group size would be allowed up to 12 stock and 12 people. Private stock use guidelines would apply as described in Appendix A.

North Rim

Commercial Stock Use

Up to 6,000 commercial mule rides, including Inner Canyon and above-rim rides would be offered each year.

North Kaibab Trail

North Kaibab Trail would be open for commercial stock use to Supai Tunnel at up to 10 rides per day, not including guides. No rides would be offered to Roaring Springs. No widening or bypasses would be constructed on North Kaibab Trail.

Ken Patrick Trail

Up to 30 one-hour rides on the Ken Patrick Trail to the Uncle Jim Junction would be allowed daily, not including guides. No more than 20 rider mules would be allowed on this section of trail at any given time.

Uncle Jim Trail

Up to 10 half-day rides to Uncle Jim Point would be allowed daily, not including guides. The hitching rail and toilet at Uncle Jim Point would be removed under this alternative.

North Rim Stock Facilities

The hitching rail and Romtec toilet at Uncle Jim Point would be removed.

Private Stock Use

Private stock use, both overnight and day use, would be allowed to continue as described in Alternative B.

Mitigation Measures

The following mitigation measures were developed to minimize the degree of adverse effects, and would be implemented during execution of the selected alternative, as needed. Many mitigation measures apply only to construction activities, and few proposed actions include construction (i.e. expansion of mule facilities at South Kaibab Trailhead, installation of composting toilet at Uncle Jim

Point). The park's Project Manager would be responsible for implementation of these mitigation measures.

Contractor Orientation Contractors working in the park are given orientation concerning proper conduct. This orientation is provided both in writing and verbally at a preconstruction meeting. This policy would continue for this project. Orientation would include, but not be limited to

- Wildlife should not be approached or fed
- Collecting any park resources, including plants, animals, and historic or prehistoric materials, is prohibited
- Contractor must have a safety policy and a vehicle fuel-spill and package policy

Soil Erosion To minimize soil erosion, the following mitigation measures would be implemented

- Standard erosion control measures such as silt fences, sand bags, or equivalent control methods would be used to minimize any potential soil erosion, specifically during construction activities
- No disturbance outside of construction fencing would be allowed

Vegetation To minimize vegetation impacts, prevent exotic vegetation introduction, and minimize spread of noxious weeds, the following mitigation measures would be implemented

- The park's Vegetation Program Manager would provide input on salvage potential and tree avoidance at project sites where necessary and would also spot-check work progress
- All construction equipment that would leave paved roads would be pressure-washed prior to entering the park and would be clean of any soil, plant matter, or other materials
- Staging area locations for construction equipment would be park-approved. If determined by the Vegetation Program Manager to be necessary, exotic vegetation would be treated prior to beginning of construction
- Pruning necessary for this project, specifically along trails, and for any future periodic maintenance, would adhere to the park's pruning guidelines with the goal of retaining health and integrity of trees and shrubs treated. Damage to trees or roots in or adjacent to project areas during construction would be avoided as much as possible, and proper root pruning practices must be used
- Any fill materials needed would be obtained from a park-approved source in adherence to park standard operating procedures. Topsoil from the project area would be retained whenever feasible
- Any revegetation efforts would use site-adapted native seed and/or plants
- Weed seed free feed would be used by all stock users as guided by the park policy
- Tree material removed during the project would be cut and chipped onsite
- Disturbed areas would be mulched, or gravel applied, as appropriate, to limit invasion and spread of invasive, nonnative plants
- Aspen fiber erosion control products, not straw products would be used
- If erosion control fencing were used, soil would be piled in front of the fence to avoid creating bare soil and potential for invasive plant species encroachment
- Native soil retention: In areas with little to no invasive plants and with high quality native soil, duff, and litter, soils will be scraped and piled onsite for re-use as topsoil once construction is complete. The soil will be stored in windrows no wider than three feet and no higher than three feet to retain healthy biological activity and native seed sources.

Special Status Species To protect any unknown or undiscovered threatened, endangered, or special status species, the construction contract would include provisions for discovery of such. These provisions would require cessation of construction activities until park staff evaluated the impact, and would allow contract modification for any measures determined necessary to protect the discovery. Although no special status species or habitat occur within the project area, mitigation measures are included here as further precautionary measures should these species occur in the future

California Condor

- If a condor lands within 300 feet of the construction site, construction would cease until it leaves on its own, or permitted personnel employ techniques that result in the individual condor leaving the area
- If a condor lands within 300 feet of a mule string, riders would stop until the condor leaves on its own, or permitted personnel employ techniques that result in the individual condor leaving the area
- Construction workers and supervisors would be instructed to avoid interaction with condors, and to contact appropriate park or Peregrine Fund personnel immediately if and when condor(s) occur at a construction site
- The construction site would be cleaned at the end of each day work is conducted (i.e.,, trash disposed of, scrap materials picked up) to minimize likelihood of condors visiting the site. Park condor staff would complete a site visit to the area to ensure adequate clean-up measures are taken
- To prevent water contamination and potential condor poisoning, the park-approved vehicle fluid-leakage and spill plan would be adhered to for this project. This plan would be reviewed by the park's Wildlife Biologist to ensure adequacy in condor protection for this project
- If condor nesting activity is known within 0.5 miles of the project area, light and heavy construction in the project area would be restricted during the active nesting season, if viable nests persist. The active nesting season is February 1 to October 15, or until young are fully fledged. These dates may be modified based on the most current information, in consultation with the park's Wildlife Biologist and the U.S. Fish and Wildlife Service (USFWS)

Mexican Spotted Owl (MSO)

- The park's Wildlife Biologist would be contacted annually for any new information related to MSO or their status near the project areas

Soundscapes To minimize construction impacts on soundscapes, the following mitigation measure would be implemented

- To reduce noise, construction equipment or vehicles carrying stock would not be left idling any longer than is necessary for safety and mechanical reasons, and no construction would occur at night

Cultural Resources To minimize impacts on cultural resources, the following mitigation measures would be implemented

- If previously unknown archeological resources are discovered during the project, a park Archeologist would be contacted immediately. All work in the immediate vicinity of the discovery would be halted until the resources could be identified, documented, and an appropriate mitigation strategy developed, if necessary, in accordance with stipulations of

the applicable programmatic agreements among the National Park Service, the Arizona State Historic Preservation Officer, and the Advisory Council on Historic Preservation
- All park staff, concessioners, and others with knowledge of the discovery would be informed of the penalties of illegally collecting artifacts or intentionally damaging any archeological or historic property, and would be informed of correct procedures if previously unknown resources are uncovered during project activities
- Areas selected for equipment and materials staging are expected to be in existing disturbed areas where there is no potential for archeological resource disturbance; these locations would be reviewed by the park Archeologist
- The park Archeologist would review all new construction activities for impact potential and may recommend inventory survey and/or construction monitoring
- Commercial mule and horse riders would be accompanied by concessioner guides at all times including during breaks when riders dismount
- Commercial mule and horse guides would follow the park's archeological site disclosure policy when informing visitors about archeological resources
- Archeological sites within the area proposed for new rim rides would be monitored for impacts, disturbances and changes in site condition
- A memorandum of agreement would be completed to complete data recovery of archeological sites if sites cannot be avoided in trail designation or other construction activities

Visitor Experience The following mitigation measure would be implemented to minimize impacts on visitor experience
- Unless otherwise approved by the park, operation of heavy construction equipment would be restricted to dawn to dusk, year-round

Park Operations and Safety The following mitigation measure would be implemented to minimize impacts on park operations, and minimize safety risks to employees, visitors, and residents
- NPS, concessionaires, other park employees, and residents would receive public notification on project implementation and trail closures, trail restrictions, road delays, or road closures, as appropriate

Air Quality Air quality impacts are expected to be temporary and localized. To minimize these impacts, the following actions would be taken
- To reduce entrainment of fine particles from hauling material, sufficient freeboard would be maintained, and loose material loads (aggregate, soils, etc.) would be tarped
- To reduce tailpipe emissions, construction equipment would not be left idling any longer than necessary for safety and mechanical reasons
- To reduce construction dust in the short term, water would be applied to problem areas. Equipment would be limited to the fenced project area to minimize soil disturbance and consequent dust generation
- Landscaping and revegetation would control long-term soil dust production. Mulch and plants would stabilize soil and reduce ground surface wind speed/shear

Alternatives Considered and Dismissed

The following alternatives were considered for project implementation, but ultimately dismissed from further analysis for the reasons described below. However, these actions could be considered in the future and would require additional NEPA documentation.

Stock Use from South Rim Only
An alternative to eliminate commercial stock use from and on North Rim was considered to address damage to trails and costs associated with trail maintenance. This was also considered because North Rim visitation is significantly less than that on South Rim; elimination of commercial mule rides would potentially affect a fewer number of visitors and still allow ride opportunities from South Rim. Under this alternative, South Rim stock use would have continued similar to current; mule rides into the canyon and supply of Phantom Ranch. Because this alternative would not provide opportunities to as many visitors as practicable, as described in the objectives for this project, this alternative was dismissed from further analysis.

Commercial Mule Rides from North Rim to Phantom Ranch
The park initially considered an alternative to allow commercial mule rides from North Rim to Phantom Ranch based on public interest. Distance between these locations is approximately 21 miles and traveling this distance in one day with visitors is not realistic. A small number of riders and stock could camp at Cottonwood campground located seven miles from North Rim; however, use of Cottonwood would take opportunities from private stock users and hikers. Finally, mule rides to Phantom Ranch are available from South Rim and therefore not necessary from North Rim. For these reasons, this alternative was dismissed from further analysis.

Open Additional Inner Canyon Trails to Stock Use
Based on comments received in both internal and public scoping, an alternative to allow stock use on other park trails, such as Grandview, Hermit and Old Bright Angel Trails, was considered. Due to the increased trail maintenance and associated cost, and potential user conflicts, this alternative was not carried through for further analysis.

Use of Other Types of Stock (llamas, goats, etc.)
The use of other types of stock, including llamas and goats, was initially considered because these animals are used to supply backcountry trips on other state and Federal lands throughout the country. Use of these animals could create additional conflicts between users, overnight use in the Inner Canyon is limited (there are only two campsites in the Inner Canyon that allow stock use) and additional types of stock could cause competition for use of these facilities, potential conflicts with mules, horses, and burros, and overall impacts from these animals on trails, and cultural and natural resources in Grand Canyon is unknown at this time. For these reasons, the use of other stock types was dismissed from further analysis in this document.

Helicopter Use Instead of Stock Use to Supply Inner Canyon
Several comments from the public suggested helicopters be used to support Inner Canyon facilities and projects. This was initially considered to address current concerns with trail conditions and funding, and would eliminate stock use that currently supports and supplies the Inner Canyon. Helicopter use is very expensive ($2,544 to $3,178 per flight-hour in 2010) and would need to occur at least once each week to take food and supplies into the Inner Canyon and carry out trash and recycling. The park currently optimizes any helicopter flight into and out of the Inner Canyon to move NPS materials, food, trash, and recycling whenever possible. Additionally, NPS administrative stock use is fairly low on Corridor Trails when compared to visitor mule rides.

Helicopters are not generally used for concessioner operations (food, trash, recycling to and from Phantom Ranch). Due to the limited amount of storage at Phantom Ranch, projected frequency of flights, cost of helicopter use, and impacts of helicopters on visitor experience and wilderness character, this alternative was dismissed from further analysis.

No Overnight Private Stock Use in Inner Canyon

An alternative to eliminate overnight private stock use was initially considered because this use is quite low on an annual basis and because private stock facilities at Phantom Ranch and Cottonwood are not completely adequate for stock or people. The inadequacy of these facilities includes limited size of the campsites and hitching rails, lack of stock pens, and lack of shade. However, because this type of use does not measurably impact trail conditions or other park resources, the NPS determined overnight private stock use should continue. Private overnight stock use is addressed under all alternatives in this document, and elimination of this use was dismissed from further evaluation.

Alternative Summaries

Table 7 summarizes major components of all five alternatives analyzed in this document, and compares the ability of these alternatives to meet project objectives (project objectives are identified in *Purpose and Need*). As shown in Table 7, Alternative B meets each of the objectives identified for this project, while the other four alternatives do not address all of the objectives.

Table 7 Summary of Alternatives and Project Objectives

Project Objectives	Alternative A No Action	Alternative B Preferred	Alternative C South Kaibab/ North Kaibab	Alternative D Bright Angel/ Uncle Jim	Alternative E Seasonal/ Limited Use
Provide opportunities for mule and stock use in Grand Canyon National Park to as large a cross section of visitors as practicable	Yes, current mule rides from North and South Rim provide a variety of visitor opportunities.	Yes, number of opportunities for North and South Rim commercial mule rides increase from current average use; private stock use opportunities similar to current	Yes, number of opportunities for North and South Rim commercial mule rides increase from current average use; private stock use opportunities use similar to current	No, number of opportunities for South Rim commercial mule rides decrease from current average use; however, North Rim commercial mule rides increase, and private stock use similar to current	No, number of opportunities for North and South Rim commercial mule rides decrease; no South Rim above-rim ride; number of rides into canyon limited; private stock use opportunities from South Rim limited seasonally
Reduce conflicts between stock users and hikers on park trails	No, conflicts between stock users and hikers currently exist in the park, and are a driving factor for this EA	Yes, limiting commercial stock use on Corridor Trails, Ken Patrick, and Uncle Jim, combined with increased trail user education, and active mule waste clean-up on trails reduce conflicts	No, although conflicts between trail users reduced on Bright Angel, Ken Patrick, and Uncle Jim Trails, conflicts continue and possibly increase on South and North Kaibab Trails from increased stock use	No, although conflicts between trail educed on South and North Kaibab Trails, conflicts continue and possibly increase on Bright Angel, Ken Patrick, and Uncle Jim Trails from increased stock use	Yes, seasonal stock use from South Rim into the canyon, and limited commercial North Rim stock use, reduce conflicts between stock users and hikers
Identify appropriate stock use levels and types on park trails to reduce resource impacts and costs associated with trail maintenance	No, North Rim commercial mule rides not currently limited. Further, amount of Inner Canyon stock use has added to trail deterioration and increased funding need	Yes, alternative created to reduce resource impacts and trail maintenance costs, particularly in the Inner Canyon	No, although resource impacts and trail main-tenance costs decreased on Bright Angel, Ken Patrick, and Uncle Jim Trails, trail condition impacts and concerns increase on South and North Kaibab Trails	No, although resource trail maintenance impacts and costs decreased on South and North Kaibab Trails, trail condition impacts and concerns increase on Bright Angel, Ken Patrick, and Uncle Jim Trails	Yes, South Rim Inner Canyon trail seasonal use, and limited stock use from North Rim, reduce trail resource impacts and maintenance costs
Identify optimal stock facility locations, including associated infrastructure size and locations for improving health, safety, and overall visitor experience	No, some concerns exist with commercial and private stock facility location and condition, including Grand Canyon Village mule barn and Inner Canyon private stock campsites	Yes, a majority of concessioner stock operations moved from Grand Canyon Village to South Kaibab Trailhead barn, and changes to private stock campsites could occur	Yes, same as Alternative B	Yes, a new concessioner South Rim mule barn constructed, although not fully analyzed in this document. Additional NEPA documentation necessary to construct facility	Yes, same as Alternative B

Table 8 summarizes anticipated environmental impacts for all alternatives. Only impact topics carried forward for further analysis are included. Chapter 3, Affected Environment and Environmental Consequences, provides a more detailed explanation and impact analysis.

Table 8 Environmental Impact Summary by Alternative

Impact Topic	Alternative A No Action	Alternative B Preferred	Alternative C South Kaibab/ North Kaibab	Alternative D Bright Angel/ Uncle Jim	Alternative E Seasonal/ Limited Use
Historic Structures and Cultural Landscapes	Minor beneficial long-term impacts from continued original use of historic barns, trails, and corrals	Minor adverse long-term impacts from relocation of most commercial stock to South Kaibab mule barn, and expansion and improvements to this barn Minor beneficial long-term impacts result from continued stock use on Corridor Trails Cumulative impacts minor adverse long term	Moderate adverse long-term impacts due to elimination of mule use on Bright Angel Trail, relocation of most commercial mule operations to South Kaibab Trailhead barn, and potential expansion of South Kaibab mule barn	Minor adverse long-term impacts from limiting stock use on Bright Angel trail, and elimination of stock use on South Kaibab Minor beneficial long-term impacts result from continued stock use on Bright Angel Trail	Minor adverse long-term impacts from relocation of commercial mule operations and majority of mules from historic Grand Canyon Village to the South Kaibab Trailhead barn Minor beneficial long-term impacts result from continued stock use on Bright Angel Trail
Archeological and Ethnographic Resources	Minor adverse long-term impacts from increased visitation to known archeological sites and potential impacts to unknown sites	Moderate adverse long-term impacts from development of above-rim ride, and potential direct impacts to archeological sites, increased visitation at Uncle Jim Point, ground disturbance from improvements at South Kaibab Trailhead barn, and installation of a composting toilet at Uncle Jim Point Cumulative impacts moderate adverse long term	Moderate adverse long-term impacts from development of above-rim ride, and potential direct impacts to archeological sites and ground disturbance for South Kaibab Trailhead barn improvements	Minor adverse long-term impacts from installation of a composting toilet at Uncle Jim Point, and development of above-rim ride, which have potential to directly impact archeological sites	Minor adverse long-term impacts from ground-disturbing activities for improvements to South Kaibab Trailhead barn

Impact Topic	Alternative A No Action	Alternative B Preferred	Alternative C South Kaibab/ North Kaibab	Alternative D Bright Angel/ Uncle Jim	Alternative E Seasonal/ Limited Use
Vegetation	Minor adverse impacts from continued browsing of native plants, and potential spread and introduction of invasive plants Minor beneficial impacts result because above-rim ride not offered and would limit impacts to vegetation	Moderate adverse long-term impacts to vegetation from development of above-rim ride on South Rim, and installation of composting toilet and retention of hitching rails at Uncle Jim Point. These actions have potential to introduce and spread invasive plant species Cumulative impacts moderate adverse long term	Moderate adverse long-term impacts from development of above-rim ride on South Rim, and placement of hitching rails and a restroom facility. These actions have potential to introduce and spread invasive plant species Minor beneficial long term impacts from elimination of stock use on Bright Angel Trail	Minor adverse long-term impacts from installation of a composting toilet at Uncle Jim Point, and development of above-rim ride on South Rim. These actions have potential to introduce and spread invasive plant species Minor beneficial long-term impacts from elimination of stock use on South Kaibab Trail	Minor adverse long-term impacts due to browsing of native vegetation, and introduction and spread of invasive plant species along stock use trails Minor beneficial long-term impacts from seasonal closures on Bright Angel and South Kaibab Trails, and no above-rim ride
General Wildlife	Minor adverse impacts from continued occurrence of brown-headed cowbirds in stock-use areas, and cowbird parasitization of native-songbird nests	Minor adverse long-term impacts from occurrence of brown-headed cowbirds, removal of wildlife habitat for above-rim ride, and noise disturbance from stock use on Uncle Jim Trail Cumulative impacts minor adverse long term	Minor adverse long-term impacts from occurrence of brown-headed cowbirds, removal of wildlife habitat for above-rim ride, and noise disturbance from stock use on Uncle Jim Trail	Minor adverse long-term impacts from presence of brown-headed cowbirds and noise disturbance from stock use on Uncle Jim Trail	Minor adverse long-term impacts from occurrence of brown-headed cowbirds and noise disturbance from stock use on Uncle Jim Trail
Soil Resources	Moderate adverse long-term impacts from erosion and trail degradation particularly on Corridor Trails	Minor adverse long-term impacts from increased soil erosion and compaction as a result of changes in stock use on the Bright Angel, North Kaibab, and Uncle Jim Trails, improvements at South Kaibab Trailhead barn, and designation of above-rim ride Minor beneficial long-term impacts result from limiting commercial stock use on Bright Angel Trail and North	Moderate adverse long-term impacts from increased soil erosion and compaction due to new disturbance of soils through development of an above-rim ride, increased commercial stock use on South and North Kaibab Trails, and improvements at South Kaibab Trailhead barn Minor beneficial impacts	Moderate adverse long-term impacts from increased soil erosion and compaction due to new disturbance of soils through development of an above-rim ride, increased commercial stock use on Bright Angel, Ken Patrick and Uncle Jim Trails Minor beneficial impacts to soils on South Kaibab	Minor adverse long-term impacts from improvements at South Kaibab Trailhead barn Minor beneficial long-term impacts from decreased stock use parkwide

Impact Topic	Alternative A No Action	Alternative B Preferred	Alternative C South Kaibab/ North Kaibab	Alternative D Bright Angel/ Uncle Jim	Alternative E Seasonal/ Limited Use
		Kaibab Trail below Supai Tunnel Cumulative impacts minor adverse long term	to soils on Bright Angel Trail from elimination of stock use	Trail from elimination of stock use	
Water Resources	Moderate adverse short-term impacts from potential contamination of surface water and increased turbidity from stock waste	Minor beneficial long-term impacts from relocation of Indian Garden mule barn and elimination of commercial mule rides to Roaring Springs day use area which would decrease potential for surface water contamination Minor adverse short-term impacts from potential contamination of surface water and increased turbidity Cumulative impacts minor beneficial long term	Moderate beneficial impacts from elimination of stock use on Bright Angel Trail, and relocation of Indian Garden mule barn Adverse impacts minor short term from continued mule rides to Roaring Springs and potential contamination from stock waste	Minor beneficial long-term impacts from elimination of stock use to Roaring Springs day use area and relocation of Indian Garden mule barn Moderate adverse short-term impacts from increased use of Bright Angel Trail and potential for contamination of surface water along the trail	Minor beneficial impacts from seasonal stock use on Bright Angel Trail, elimination of rides to Roaring Springs day use area, and relocation of Indian Garden mule barn Minor adverse short-term impacts from potential contamination of surface water and increased turbidity
Visitor Access and Experience	Moderate adverse impacts from mule waste on trails, dust, poor trail conditions, congestion, crowding, and lack of trail etiquette Moderate beneficial impacts from continued visitor opportunities to ride mules in the park	Moderate adverse long-term impacts from reduction of Inner Canyon rides and opportunities for rides to Plateau Point Moderate beneficial long-term impacts from reduced mule waste and dust, improved trail conditions, reduced crowding, congestion, and increased trail etiquette Cumulative impacts moderate beneficial long term	Moderate adverse long-term impacts of increased South Kaibab Trail soil erosion and compaction, elimination of Bright Angel Trail stock use, decreased opportunity for rides on Ken Patrick and Uncle Jim Trails Moderate beneficial impacts from decreased mule waste and user conflicts on Bright Angel Trail and opportunity for rides to Roaring Springs	Moderate adverse long-term impacts from increased soil erosion and compaction on Bright Angel Trail, elimination of stock use on South Kaibab Trail, and decreased rides on North Kaibab Trail Moderate beneficial long-term impacts from decreased mule waste and user conflicts on South and North Kaibab Trails	Moderate adverse long-term impacts from decreased opportunities for commercial mule rides in the park Moderate beneficial long-term impacts from decreased mule waste and user conflicts on trails, and improved trail conditions

Impact Topic	Alternative A No Action	Alternative B Preferred	Alternative C South Kaibab/ North Kaibab	Alternative D Bright Angel/ Uncle Jim	Alternative E Seasonal/ Limited Use
Park Operations	Moderate adverse long-term impacts from high deferred-maintenance costs on Corridor Trails and high costs to minimally maintain these trails	Minor adverse long-term impacts from continued stock use trails maintenance and implementation of resource and trail monitoring program Moderate beneficial long-term impacts from decreased cost of trail maintenance over time Cumulative impacts minor beneficial long term	Moderate adverse long-term impacts from increased commercial stock use on South Kaibab Trail and opportunity for mule rides to Roaring Springs, which would increase need for and cost of trail maintenance Moderate beneficial long-term impacts from decreased stock use on Bright Angel, Ken Patrick, and Uncle Jim Trails because need for and cost of trail maintenance decrease	Moderate adverse long-term impacts from continued commercial stock use on Bright Angel Trail which would increase need for and cost of trail maintenance Moderate beneficial long-term impacts from decreased stock use on South and North Kaibab Trails because need for and cost of trail maintenance would decrease	Moderate beneficial impacts from decreased commercial stock use on Corridor Trails, Ken Patrick, and Uncle Jim Trails, and projected decrease in trail maintenance costs
Socioeconomic Environment	Minor beneficial long-term impacts from continued concessioner income, employment, and visitor spending related to stock use	Minor beneficial long-term impacts from increased annual commercial mule ride limits, retention of jobs, and continued concessioner income Minor to moderate adverse impacts if future changes, specifically stock limits, occur. Cumulative impacts would be minor adverse long term.	Moderate beneficial long-term impacts from increased annual limits for commercial mule rides and potential increase in number of jobs and concessioner income Minor to moderate adverse impacts if future changes, specifically stock limits, occur	Negligible beneficial impacts from minimal increase in annual limits for commercial mule rides from North Rim. Minor to moderate adverse impacts if future changes, specifically stock limits, occur	Moderate adverse impacts from decrease in commercial mule rides and resultant impacts on concessioner income and number of jobs to support commercial stock operations, and if future changes, specifically stock limits, occur
Wilderness Character	Minor adverse short- to long-term impacts from potential encounters with stock	Moderate adverse short- and long-term impacts from installation of new facilities (composting toilet and	Minor adverse short- and long-term impacts from potential encounters with stock	Moderate adverse short- and long-term impacts from installation of composting toilet at	Minor adverse short- and long-term impacts from potential encounters with stock

Impact Topic	Alternative A No Action	Alternative B Preferred	Alternative C South Kaibab/ North Kaibab	Alternative D Bright Angel/ Uncle Jim	Alternative E Seasonal/ Limited Use
	users and impacts to sights and sounds on Uncle Jim Trail located in proposed wilderness	hitching rails) in proposed wilderness and potential encounters with stock users and impacts to sounds and sights on trails Cumulative impacts moderate adverse long term	users and impacts to sights and sounds on trails, and Uncle Jim Trail routine maintenance from increased use	Uncle Jim Point, routine maintenance of the Uncle Jim Trail, and potential encounters with stock users and resultant impacts to sounds and sights	users and impacts to sounds and sights on trails, and routine maintenance of Uncle Jim Trail
Public Health and Safety	Minor adverse long-term impacts from deteriorated trail conditions, mule waste on the trails, potential concerns with stock passing on narrow and exposed sections of Inner Canyon trails, concerns with human waste at Uncle Jim Point, and concerns with infrastructure at Inner Canyon private stock campsites Minor, beneficial, long-term impacts from continued trail maintenance	Moderate beneficial long-term impacts from improved trail conditions and minimized user conflicts from installation of Uncle Jim Point composting toilet, active removal of mule waste from trails, and improvements to private stock campsites Minor adverse short-term impacts during construction activities to complete improvements at South Kaibab Trailhead mule barn and during trail work Cumulative impacts moderate beneficial long term	Moderate beneficial long-term impacts from improved trail conditions on Bright Angel and Uncle Jim Trails and minimized potential for user conflicts Moderate adverse short- and long-term impacts from construction activities at South Kaibab Trailhead barn, deteriorated trail conditions on South and North Kaibab Trails, increased stock use on South Kaibab Trail, and concerns with human waste at Uncle Jim Point	Moderate beneficial long-term impacts from improved trail conditions on South and North Kaibab Trails, installation of composting toilet at Uncle Jim Point resulting in minimized health and safety concerns Moderate adverse long-term impacts from deteriorated trail conditions on South and North Kaibab Trails, and increased stock use on South Kaibab Trail	Moderate beneficial long-term impacts from improved trail conditions and minimized potential for user conflicts Minor adverse short- and long-term impacts from construction activities at South Kaibab Trailhead barn and concerns with human waste at Uncle Jim Point

Identification of the Environmentally Preferred Alternative

The Environmentally Preferred Alternative is determined by applying criteria suggested in the National Environmental Policy Act of 1969, which guides the Council on Environmental Quality (CEQ). CEQ provides direction that "[t]he environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in NEPA's §101, to:

1. Fulfill responsibilities of each generation as trustee of the environment for succeeding generations
2. Assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences
4. Preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources"

Through the process of internal and public scoping, the Environmentally Preferred Alternative selected is Alternative B, the Preferred Alternative. Alternative B best meets the purpose and need for action and best addresses overall NPS objectives and evaluation factors while minimizing impacts to park resources. Alternative B promotes safe, healthful, productive, and esthetically and culturally pleasing surroundings, identified in Criteria 2. Alternative B also protects important historic and cultural resources identified in Criteria 4. Finally, this Alternative best achieves a balance between population and resources use, as identified in Criteria 5.

CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment, or present condition, in the project area, and analyzes potential environmental consequences, or impacts, expected from implementing an Action Alternative or taking no action at this time. Impact topics selected in Chapter 1 include historic and cultural landscapes, archeological and ethnographic resources, vegetation, general wildlife, soil resources, water and aquatic resources, visitor access and experience, public health and safety, park operations, socioeconomic environment, and wilderness character. Direct, indirect, cumulative effects, and impairment are analyzed for each resource topic carried forward. Potential impacts are described in terms of type, context, duration, and intensity. General definitions are as follows, while specific impact thresholds are given for each resource at the beginning of each resource section.

- **Type** describes impact as either beneficial or adverse, direct or indirect:
  - *Beneficial* A positive change in resource condition or appearance, or change that moves resource toward a desired condition
  - *Adverse* A change that moves resource away from a desired condition or detracts from its appearance or condition
  - *Direct* An effect caused by an action and occurs in the same time and place
  - *Indirect* An effect caused by an action but later in time or farther removed in distance, but still reasonably foreseeable
- **Context** describes area or location impacts will occur. Are effects site-specific, local, regional, or even broader?
- **Duration** describes length of time an effect will occur, either short or long term. Because duration definitions vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this EA.
- **Intensity** describes impact degree, level, or strength. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because intensity definitions vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this EA.

Methodology

Impact analysis and conclusions contained in this chapter were based on park staff knowledge of resources and site, review of existing literature and park studies, information provided by specialists in the NPS and other agencies, and professional judgment. Detailed information on natural and cultural resources in Grand Canyon National Park summarized in the 1995 GMP and EIS was specifically referenced for information on affected resources in the project area.

Cumulative Effects

Council on Environmental Quality regulations, which implement the National Environmental Policy Act of 1969 (42 USC 4321 et seq.), require assessment of cumulative impacts in the decision-making process for Federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the No Action and Action Alternatives.

Cumulative impacts were determined by combining Preferred Alternative impacts with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Grand Canyon National Park and, if applicable, the surrounding region. Because the scope of this project is relatively large, the geographic and temporal scope of the cumulative analysis is similarly large. The geographic scope for this analysis includes actions in park boundaries, while the temporal scope includes projects in a range of approximately ten years. Given this, the following projects were identified for the purpose of conducting cumulative effects analysis, listed from past to future:

Historic Railroad Depot Rehabilitation A 2008 historic structures report provided specific treatment recommendations for structure rehabilitation. Major interior and exterior building improvements are anticipated 2013-2014, including repairs to non-functioning restrooms and accessibility upgrades. Due to drainage problems on the building's north side, the paved lane adjacent to the building may be removed to re-grade and facilitate drainage away from the building. Approximately 0.5 acres would be disturbed.

South Rim Visitor Transportation Plan (SRVTP) The SRVTP's purpose is to provide a transportation system that addresses the park's most pressing transportation issues through the year 2020. The plan accommodates current and anticipated South Rim visitation levels, facilitates enhanced visitor experiences, and protects park resources. The plan includes constructing new parking areas near the Visitor Center, expanded shuttle bus service from Tusayan, expanded shuttle bus transit in the Village and to Hermits Rest, and South Entrance Station improvements such as additional vehicle lanes and tour bus management.

Bright Angel Trailhead Area Design Plan Grand Canyon plans to implement a design plan for the Bright Angel Trailhead area. Proposed actions include developing a plaza near the primary trailhead, enhancing trail connections and wayfinding, constructing a new restroom near the proposed plaza and existing mule corral, and improving parking area vehicle circulation. Future phases could include hardening the parking surface and delineating parking spaces, additional revegetating and landscaping, and enhancing wayfinding and interpretive signs.

Concessions Environmental Assessment The contract to provide most hospitality services (including lodging, retail sales, food services, mule rides, and some tours) expires in 2011. At that time, the NPS will accept bids on a new prospectus for such services for the ensuing 15 years. While most primary services will continue as they currently exist, the new prospectus may call for some employee dormitories to be converted to visitor lodging, associated development of replacement employee housing, construction of new employee dining and lounge facilities, construction of new maintenance and/or warehouse facilities, and construction of a composting and greenhouse facility/facilities.

Science and Resource Management Building Grand Canyon is proposing to construct a new building for the park's science and resource management staff. The building is proposed to be built adjacent to the magistrate's office, across from ranger operations building, in the next two years.

Supai Camp Improvements This camp is a small housing area for Havasupai Tribe members, who used Grand Canyon for millennia before Euro-American settlement. Currently in poor condition without most basic utilities, Grand Canyon is proposing to upgrade existing facilities and construct additional new lodging units, again in the next two years.

Greenway Trail Phase III (Greenway III) When complete this approximately seven-mile segment of Greenway Trail will provide a pedestrian/bicycle/equestrian trail from the community of Tusayan to the Grand Canyon Visitor Center in GRCA. This trail will provide an alternative option for non-motorized access into the park (NPS 2000). The trail will be designated as the Arizona Trail into the park for hikers, cyclists, and equestrians. Once incorporated into the park's overall trail system it will be routinely patrolled by park rangers. Construction began on a small trail section near the Grand Canyon Visitor Center, but has stalled due to a lack of funds. Construction will resume with South Rim Visitor Transportation Plan implementation. New ground disturbance is estimated at approximately four acres.

Greenway Trail Phase V (Greenway V) The National Park Service proposes to construct an approximately one-mile long paved trail from Pipe Creek Vista, an overlook along Desert View Drive, to the South Kaibab Trailhead. Completion of this trail segment would connect the paved Rim Trail from Mather Point to South Kaibab Trailhead. The majority of the trail alignment would use existing disturbed corridors to minimize new ground disturbance. Pipe Creek Vista and South Kaibab Trailhead are both accessible by shuttle bus, and Pipe Creek Vista also provides some vehicular parking. Project scope includes reconfiguring overlook parking for enhanced safety and to provide adequate room for the trail to cross the overlook area; creation of an accessible path from the South Kaibab Trailhead parking area to the trailhead itself with improved site amenities; and identification of a connector trail between South Entrance Road and the project area for Arizona Trail users, bicyclists, and equestrians.

Hermit Road Rehabilitation This seven-mile, narrow, historic roadway connecting Grand Canyon Village to Hermits Rest will be widened and rehabilitated to accommodate current levels of shuttle bus and tour bus traffic. This project also includes repair and upgrades to multiple overlook parking areas and construction of an approximately three-mile multi-modal greenway trail between the Abyss (a popular overlook) and Hermits Rest. Implementation will begin in April 2008.

Relocation of Stock Camp to Mather Campground A project is currently underway to relocate the South Rim stock camp for private stock users from the NPS housing and maintenance area near Juniper Hill to Mather Campground. The Juniper Hill private stock camp area is difficult for visitors to locate, has no permanent restroom facility or water source, has no delineated boundaries, and is not easily accessible to other visitor facilities. New paneling, stalls, water troughs, feed bins, and a manure dumpster will be located in the campsites being developed at Mather Campground. The project is expected to be completed in late-spring or summer 2010.

Backcountry Management Plan The National Park Service is planning to initiate the process to revise the 1988 Backcountry Management Plan. The 1988 plan needs to be updated to comply with the 1995 General Management Plan and NPS Management Policies 2006. The scope of the plan is still being considered, but is expected to include visitor use and access into the backcountry, natural and cultural resource stewardship, and recommended wilderness. The plan will complement other recently completed plans such as the Colorado River Management Plan and the Fire Management Plan. It is expected that Corridor Trails (Bright Angel, South Kaibab and North Kaibab) will be included in the plan.

Other Ongoing Activities

Exotic Plant Management Activities Exotic plant management is an ongoing activity throughout the park and includes integrated pest management to treat high-priority invasive, nonnative plant species. Treatments include cultural, manual, mechanical, and chemical controls.

Routine Trails Maintenance Maintenance of all park trails is ongoing as described in Chapter 1.

Borrow pit Use Trail materials, dirt, and rock are required to maintain Grand Canyon trails. These materials are taken from borrow pits in the Inner Canyon and active drainages near trails.

Historic Structures and Cultural Landscapes

Affected Environment

Historic Structures
For over a century, livestock has transported visitors into Grand Canyon's depths. Built by northern Arizona businessmen during 1890 and 1891 to provide access to canyon mining claims, the Bright Angel Trail initially extended only from South Rim to Indian Garden. This trail followed pathways created by the Havasupai, who farmed the Indian Garden area prior to Euro-American settlement and associated Native American displacement (NPS 1975).

Once the railroad arrived at South Rim in 1901, visitor demand for mule rides increased substantially. Consequently, Fred Harvey Company began mule rides, but trail improvements were necessary to support the mules. Because Grand Canyon was open to private development at the time, various entrepreneurs extended Bright Angel Trail to the river, and built a similar trail from North Rim down Bright Angel Canyon to the Colorado River. In 1907, the first cable bridge was built across the river. Consisting of a single cable with a suspended cage large enough for a single mule, the "bridge" enabled a river crossing only slightly less interesting than fording or swimming the river. The National Park Service built new bridges in 1921 and 1928—each more substantial—strong enough for stock to cross without causing the structure to sway. Stock carried materials for both bridges, except 550-foot-long cables used in the final bridge—they were carried by a snaking team of Havasupai men.

At the same time the trails were developed, Fred Harvey Company began constructing mule operations support buildings. At Phantom Ranch, a small tent camp existed at the mouth of Bright Angel Creek by 1907. Initially called Rust's Camp (for David D. Rust, one of the early trail entrepreneurs), it became known as Roosevelt's Camp after Teddy Roosevelt camped there in 1913. With increasing trail use in the 1920s (due in part to new NPS-supervised trail construction), Fred Harvey Company financed construction of new lodging facilities at Phantom Ranch. Designed by architect Mary Jane Colter, Phantom Ranch featured a stone dining hall and nearby cabins. The company later constructed additional cabins, responding to increasing demand for the experience of staying overnight in a cabin by the river. On South Rim, the company also built facilities to house pack stock, including a mule barn, livery stable (missing), and blacksmith shop (all completed in 1906), with a stone and wood corral at Bright Angel Trailhead completed around 1930 (NPS 2004).

Because Bright Angel Trail was a toll-trail (the only one in the national park system, and a source of embarrassment and frustration for the agency until acquired in 1928), the National Park Service constructed a second, free, trail from South Rim into the canyon in 1924. Four-and-a-half-feet wide, the South Kaibab Trail descended a steep ridge to the Colorado River, and featured spectacular views. The NPS connected South Kaibab Trail to Phantom Ranch and Bright Angel Trail by designing River Trail, completed by the Civilian Conservation Corps in 1936. When the NPS acquired Bright Angel Trail, the agency eliminated the toll, which offered visitors two primary trails from South Rim to the river. Throughout the 1930s, the agency also reconstructed and realigned Bright Angel Trail.

The 1920s also saw North Kaibab Trail improvements. The NPS rerouted and rebuilt portions of the trail starting in 1920, reducing stream crossings from 68 to just seven, spanned by steel-beam and concrete bridges. As part of this work, the agency moved the trail from the creek bed and routed the upper portion up Roaring Springs Canyon. The agency also built Cottonwood Campground at the same time.

Thousands of hikers and stock riders have traveled South and North Kaibab, Bright Angel, and River Trails. Recognizing this significance, the NPS designed these four trails, called the Corridor Trails, as National Recreation Trails in 1981. The trails are also a fundamental part of the Cross-Canyon Corridor Historic District, which includes 44 buildings. The District's principal structures are four trailside shelters and the Phantom Ranch complex.

Other specific historic structures potentially affected by actions in this EA include the mule barns located near South Kaibab Trailhead and the mule barn in Grand Canyon Village (Livery Stable).

Figure 2 Grand Canyon Village Mule Barn

Cultural Landscapes

As defined in Director's Order 28 (DO-28), Cultural Resource Management Guideline, cultural landscapes are settings humans create in the natural world. They are intertwined patterns of things both natural and constructed, expressions of human land manipulation and adaptation. Characteristics of cultural landscapes include land uses and activities, patterns of spatial organization, responses to the natural environment, cultural traditions, circulation networks, vegetation, buildings, structures, and features.

Cultural Landscape Inventories have been completed in several park areas. The most prominent is the Grand Canyon Village Cultural Landscape. Grand Canyon Village is one of the largest, and most intact, NPS-constructed (or supervised) villages in the national park system. Centered on the canyon rim, hotels, and the railroad depot, the Village is an excellent example of a union of nature and culture. Not only is the canyon the focal point of much of the Village, but most structures within it were designed and built to harmonize with the natural setting. In part for these reasons, the Village was declared a National Historic Landmark in 1997.

Although the actual mules are not considered a historic resource or defined as part of the cultural landscape, their use and presence has been part of the Grand Canyon experience for many years. Impacts to the mules' long-term presence and use are evaluated in Environmental Consequences.

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to historic structures and cultural landscapes is based on how the project will affect features for which these resources and landscape are significant. The thresholds for this impact assessment are

Negligible Impacts at lowest levels of detection with neither adverse nor beneficial consequences; historic properties receive no change to diagnostic artifacts, defining features, or characteristics that contribute to National Register of Historic Places (National Register) eligibility

Minor *Adverse* Impacts detectable but do not diminish overall resource integrity. Impacts such as feature degradation or displacement could occur and would be measurable, but would be localized and would not result in changes to defining elements. They would not affect or jeopardize defining features or characteristics of a historic resource or a character-defining pattern or feature of a landscape listed in or eligible for listing on the Register or aspects of integrity that contribute to eligibility for the National Register.

Beneficial Historic structures and features stabilized and preserved in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. Preservation of landscape patterns and features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*

Moderate *Adverse* Disturbance of a site or sites result in loss of overall integrity and detection of measurable changes to character-defining elements and contribute to increased instability of historic structures and features. For cultural landscapes, impacts alter a character-defining pattern(s) or feature(s) of the cultural landscape, but do not diminish landscape integrity to the extent its National Register eligibility is jeopardized. Moderate effects jeopardize a structure's National Register eligibility

Beneficial Effects include increasing stability of a structure or historic feature, maintaining structure setting, or rehabilitating a landscape or its patterns or features. A structure, historic feature, or landscape maintained and restored in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with guidelines for the treatment of cultural landscapes*

Major *Adverse* Disturbance of an historic resource or a landscape's patterns or features result in loss of overall integrity and significant change to character-defining elements or alter a character-defining pattern or feature of a landscape to the extent it would no longer be eligible to be listed on the National Register. Impacts include destabilization of structures or cultural contexts, and an increase in exposure, or vulnerability to natural elements (*e.g.* fire, flood, wind)

Beneficial An historic structure or feature or a landscape's patterns or features maintained and restored in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.* Beneficial effects could include maintaining native or culturally significant vegetation

Duration *Short-term* Impacts to a contributing feature(s) or pattern temporary, transitional, or construction-related. Within five years effects no longer detectable, and the resource returned to its predisturbance condition or appearance

Long-term Impacts last longer than five years or are permanent

Context All impacts to historic structures and cultural landscapes localized

Impacts Alternative A No Action

Current stock use and mule operations have potential to directly impact historic structures and cultural landscapes. Continued stock operations and stock use in the Grand Canyon Village National Historic Landmark District (Village NHLD), and the upkeep and continued use of historic mule barns, corrals, and other associated infrastructure throughout the park would have minor beneficial long-term impacts on historic structures.

In regard to cultural landscapes, the Cultural Landscape Report (CLR) for the Village NHLD describes the area around the Livery Stable and Mule Barn as the Utility Area. The CLR does not specifically address continued use of these facilities for stock operations. However, recommendations for this area include retention of circulation patterns, removal of the substation adjacent to the Livery Stable, repair and maintenance of all contributing buildings and structures in the Utility Area, and adaptive reuse of buildings as possible. Based on the CLR assessment and recommendation, the No Action alternative would have negligible impacts on the Village NHLD's cultural landscape. Other stock-use areas were not evaluated in a CLR and, therefore, are not included here.

Cumulative Effects Historic park resources have been impacted by historic building and structure modifications, and incompatible modern building intrusion into historic districts. In addition, deterioration of some buildings due to natural weathering and use has compromised defining architectural characteristics. These past impacts are moderate adverse long term.

Recently implemented, in-progress, and foreseeable future projects with potential to affect historic structures include the historic railroad depot rehabilitation, South Rim Visitor Transportation Plan, Bright Angel Trailhead Area Design Plan, concessions improvements, construction of a new Science and Resource Management building, and ongoing historic structures maintenance. These projects have been or will be assessed for effects to historic structures, and discussed with the State Historic Preservation Officer (SHPO). Consultation with the SHPO and park's cultural resource staff would ensure any adverse impacts of future projects on historic structures would be minimized. Therefore, cumulative impacts to historic structures would be adverse minor long term.

Conclusion Alternative A implementation would result in minor beneficial long-term impacts on historic structures and cultural landscapes from continued original use of historic barns, trails, and corrals. Cumulative impacts would be minor adverse long term.

Impacts Alternative B Preferred Alternative

Elements Common to All Action Alternatives have little potential to affect historic structures and cultural landscapes. Commercial use at Tuweep would continue under all alternatives up to six trips each year, similar to past use in this area. At Whitmore, no stock use would occur. The Whitmore Trail is not maintained due to its remote location, and has received little if any stock use over the past ten years. Other elements including trail monitoring, adaptive management strategy use, trail maintenance and funding, temporary trail closures due to weather and trail conditions, mule waste removal from trails, trail users education, implementation of annual use limits on rides, general retention of stock facilities, and continuation of administrative stock use would have negligible impacts on historic structures and cultural landscapes.

Alternative B implementation would have impacts on historic structures and cultural landscapes due to a change in stock use on Bright Angel Trail, at the Village NHLD Livery Barn, and at South Kaibab Trailhead barn. A reduction in rides on Bright Angel Trail is proposed under Alternative B; up to 10 rides to Phantom Ranch would be allowed compared to current 20 rides to Phantom Ranch and 20 rides to and from Plateau Point daily. No rides to Plateau Point would occur. Changes proposed on Bright Angel Trail would result in minor adverse long-term impacts to historic structures.

A majority of concessioner mules would be moved from the Village NHLD Livery Barn to South Kaibab Trailhead barn. Some mules, maybe 15-20, would remain in the Village for visitor viewing and to maintain historic building use. Moving mules to South Kaibab Trailhead barn would require improvements to accommodate additional stock. All improvements would be sensitive to historic structures and accomplished using the *Secretary of the Interior's Standards for the Treatment of Historic Properties.* These stock facilities changes would have minor adverse long-term impacts on historic structures.

The number of riders on the South Kaibab Trail would also be reduced from the current 20 per day to 10 per day. All pack stock, up to 12 per day, and administrative use would continue on South Kaibab Trail; total use would be similar to current condition. Minor beneficial long-term impacts would result from continued stock use on these trails.

No measurable impacts to historic structures and cultural landscapes are expected from development of a commercial above-rim mule ride and new South Rim trail; rides on North Kaibab Trail to Supai Tunnel, Ken Patrick to Uncle Jim Trail Junction, and Uncle Jim Point, composting toilet and hitching rail installation at Uncle Jim Point; or continued private stock use on trails where this use is allowed throughout the park.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be minor adverse long term, and minor beneficial long term.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to historic structures. As discussed under Alternative A, adverse impacts have occurred in the past as a result of modifications to historic buildings and structures, intrusion of incompatible modern buildings in historic districts, and deteriorations of historic buildings. Present and reasonable foreseeable future actions are carefully assessed to minimize adverse impacts to historic structures and cultural landscapes. Alternative B would result in minor adverse impacts, and would add to the overall adverse cumulative effect. Cumulative impacts under Alternative B would be moderate adverse long term.

Conclusion Alternative B implementation would result in minor adverse long-term impacts to historic structures and cultural landscapes from changes to stock use on historic trails and improvement to and expansion of South Kaibab mule barn. Minor beneficial long-term impacts would result from continued stock use on Corridor Trails. Cumulative impacts would be minor adverse long term.

Impacts Alternative C South Kaibab/North Kaibab

Implementation of Alternative C would have impacts on historic structures and cultural landscapes due to elimination of stock use on Bright Angel Trail, changes to the Village NHLD Livery Barn, and changes to South Kaibab Trailhead stock use facilities. Stock use on Bright Angel Trail would cease. Changes proposed on Bright Angel Trail would result in moderate adverse long-term impacts to historic structures and cultural landscapes.

All concessioner mules and mule operations would be moved from the Village NHLD Livery Barn to South Kaibab Trailhead barn. NPS mules and horses would be moved to the Village NHLD Livery Barn. Moving all concessioner mules to South Kaibab Trailhead barn would require improvements to accommodate additional stock. All improvements would be sensitive to historic structures and would use the

Impacts Alternative D Bright Angel/Uncle Jim

Alternative D implementation would have impacts on historic structures and cultural landscapes due to elimination of stock use on South Kaibab Trail, and construction of a new mule barn adjacent to the Village for concessioner stock. Stock use on South Kaibab Trail would cease. Changes proposed on South Kaibab Trail would result in minor adverse long-term impacts to historic structures.

All concessioner mules and mule operations would be moved from the Village NHLD Livery Barn to a new mule barn constructed adjacent to the Village. NPS mules and horses would be moved to the Livery Barn. Construction of a new mule barn would be evaluated under a separate NEPA document to consider site-specific environmental impacts. Construction would be sensitive to the historic district and would consider impacts to historic structures and cultural landscapes. These changes in stock facilities, not including construction of a new mule barn, would have minor adverse impacts on historic structures.

The number of rides on Bright Angel Trail would decrease from the current 20 per day to Phantom Ranch and 20 riders to and 20 riders from Plateau Point each day to a maximum 20 rides to either Plateau Point or Phantom Ranch daily. All pack stock, up to 12 per day, and administrative use would also use Bright Angel Trail. Continued stock use on Bright Angel Trail would result in minor beneficial long-term impacts.

No measurable impacts to historic structures and cultural landscapes are expected from rides on the proposed above-rim South Rim ride; on North Kaibab Trail to Supai Tunnel; on Ken Patrick to Uncle Jim Trail Junction, or to Uncle Jim Point; installation of a composting toilet at Uncle Jim Point; or continue private stock use on trails where this use is allowed throughout the park (under this alternative private stock use would not be allowed on South Kaibab Trail).

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to historic structures. As discussed under Alternative A, adverse impacts have occurred in the past as a result of modifications to historic buildings and structures, intrusion of incompatible modern buildings in historic districts, and deteriorations of historic buildings. Present and reasonable foreseeable future actions are carefully assessed to minimize adverse impacts to historic structures and cultural landscapes. Cumulative impacts under Alternative D would be minor adverse long term.

Conclusion Alternative D implementation would result in minor adverse long-term impacts to historic structures and cultural landscapes, changes to retention of stock use on Bright Angel Trail, and elimination of stock use on South Kaibab Trail. Minor beneficial long-term impacts would result from continued stock use on Bright Angel Trail. Cumulative impacts would be minor adverse long term.

Impacts Alternative E Seasonal/Limited Use

Implementation of Alternative E would have impacts on historic structures and cultural landscapes due to seasonal closures on South Rim stock use trails, limited use of North Rim stock use trails, changes to the Village NHLD Livery Barn, and changes to South Kaibab Trailhead stock use facilities. Rides on Bright Angel Trail to Phantom Ranch would be allowed up to 20 per day April through December; no rides would occur January through March. These proposed changes on Bright Angel

Trail, and continued stock use, would result in minor beneficial long-term impacts to historic structures and cultural landscapes.

A majority of concessioner mules would be moved from the Village NHLD Livery Barn to South Kaibab Trailhead barn. Some mules, maybe 15-20, would remain in the Village for visitor viewing and to maintain historic building use. Moving mules to South Kaibab Trailhead barn would require improvements to accommodate additional stock. All improvements would be sensitive to historic structures and would be accomplished using the *Secretary of the Interior's Standards for the Treatment of Historic Properties.* These changes in stock facilities would have minor adverse impacts on historic structures.

The same seasonal closure would apply to South Kaibab Trail, and would allow up to 20 rides per day from Phantom Ranch April through December; no rides January to March. In addition, all pack stock, up to 12 per day, and administrative use would continue on South Kaibab Trail.

No measurable impacts to historic structures and cultural landscapes are expected from commercial mule rides on North Kaibab Trail to Supai Tunnel; the Ken Patrick to Uncle Jim Trail Junction, or to Uncle Jim Point, removal of temporary toilet and hitching rail at Uncle Jim Point; or continued private stock use on trails where this use is allowed throughout the park (under this alternative private stock use would follow the seasonal closure described for South Rim trails).

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to historic structures. As discussed under Alternative A, adverse impacts have occurred in the past as a result of modifications to historic buildings and structures, intrusion of incompatible modern buildings in historic districts, and deteriorations of historic buildings. Present and reasonable foreseeable future actions are carefully assessed to minimize adverse impacts to historic structures and cultural landscapes. Cumulative impacts under Alternative E would be minor adverse long term.

Conclusion Alternative E implementation would result in minor adverse long-term impacts to historic structures and cultural landscapes from relocation of commercial mule operations, and most mules from historic Grand Canyon Village to South Kaibab Trailhead barn. Minor beneficial long-term impacts would result from continued stock use on Bright Angel Trail. Cumulative impacts would be minor adverse long term.

Archeological and Ethnographic Resources

Affected Environment

Archeological Resources
Archeological sites are abundant in Grand Canyon National Park. Based on those documented so far, archeologists estimate the park contains over 60,000 such sites. Two archeological sites are on the National Register of Historic Places: Tusayan ruins east of Grand Canyon Village, and the Little Jug site west of Toroweap Valley. Although only these two sites are listed as individual properties, all previously recorded and newly discovered GRCA archeological sites have been determined eligible for listing by individual or district Determinations of Eligibility (DOEs) or by virtue of a 1984 multiple properties nomination (NPS, 1984). These archeological sites are considered important at local and regional levels, and contribute to overall understanding of Grand Canyon human history.

Archeological sites can be broadly categorized as prehistoric or historic. Prehistoric sites can be further categorized as undated prehistoric, Paleoindian (10,000-12,000 years old), Archaic (2,500-10,000 years old), Formative (700-2,500 years old), and late Prehistoric (450-700 years old). Historic sites can be categorized as Historic Native American or Historic Euro-American.
Based on latest data (NPS 2006b), distribution of known archeological sites is:

South Rim South Rim includes 70,360 acres of which 19,148 (27%) have been surveyed for archeological sites. A total 1,135 sites have been identified, including 33 Archaic, 361 Formative, 4 Proto-Historic, 258 Historic, 211 multi- component, and 268 sites of unknown temporal affiliation. Overall South Rim site density is one site per 16.9 acres.

North Rim North Rim includes 189,202 acres of which 38,522 acres (20%) have been surveyed for archeological sites. A total 1,040 sites have been identified, including 26 Archaic, 591 Formative, 4 Proto-Historic, 91 Historic, 85 multi-component, and 243 sites of unknown temporal affiliation. Overall North Rim site density is one site per 37 acres.

Inner Canyon Inner Canyon includes 933,060 acres of which 27,761 acres (3%) have been surveyed for archeological sites. A total 1,471 sites have been identified, including one Paleo-Indian, 25 Archaic, 565 Formative, 24 Proto-Historic, 115 Historic, 227 multi-component, and 541 sites of unknown temporal affiliation. Inner Canyon site density is one site per 18.2 acres.

Some of the densest site concentrations in the park are in the Grand Canyon Village area. These sites do not tend to be extensive, but rather artifact scatters and other signs of dispersed prehistoric use. Most prehistoric sites date to the Pueblo II period (ancestral Puebloan or Cohonina cultures) of occupation, between about 1,300 and 1,000 years BP (before present). Most Euro-American archeological sites date to the historic period and are associated with early mining exploration, tourism, livestock operations, and park development.

Inventory surveys for archeological sites have occurred in the areas proposed for ground disturbance and development for stock use (NPS 2010 and Table 9). Archeological sites have been identified directly within or in close proximity to most but not all areas of potential effect associated with this EA. Potential impacts to archeological resources include construction-related disturbances, trail erosion near archeological sites, and unguided visitation on archeological sites, among others. These impacts are discussed in the analysis for each alternative.

Table 9 Archeological Surveys Completed for Park Stock Use Trails

Trail Name	Archeological Survey	Sites
Bright Angel Trail	1974 (NPS/MNA); 2009 (NPS/MNA)	Yes
Plateau Point Trail	1984 (NPS/MNA)	Yes
South Kaibab Trail	1974 (NPS/MNA)	No
Tonto Trail (between Bright Angel and South Kaibab Trails)	2005 (NPS)	Yes
North Kaibab Trail	1974 (NPS/MNA), 1978 (NPS), NPS (2008)	Yes
Ken Patrick Trail to Uncle Jim Junction	1999 (NPS)	Yes
Uncle Jim Trail	1999 (NPS)	Yes
South Rim, Above-rim Ride to Abyss	2009 (NPS)	Yes
South Rim (between Yaki and Shoshone Point)	1998 (NPS)	Yes

Ethnographic Resources
Ethnographic resources are defined by the NPS as any "site, structure, object, landscape, or natural resource feature assigned traditional, legendary, subsistence, or other significance in the cultural system of a group traditionally associated with it" (Director's Order 28, Cultural Resource Management). Grand Canyon National Park lands are traditionally affiliated with eleven American Indian groups: Havasupai, Hopi, Hualapai, Kaibab Band of Paiute Indians, Las Vegas Band of Paiute Indians, Navajo, Paiute Indian Tribe of Utah, White Mountain Apache, Yavapai Apache, San Juan Southern Paiute, and Pueblo of Zuni. Regional Native American groups recognize certain tangible properties as important in their traditional tribal histories. These properties, which may or may not be archeological sites, are referred to as traditional cultural properties in National Register Bulletin 38 (Parker and King 1990). Like other cultural resources, traditional cultural properties are given consideration under NHPA.

Colorado River corridor tribal studies (Neal and Gilpin 2000) identified Grand Canyon National Park ethnographic resources primarily in the river corridor but in other areas as well. These included archeological sites (including rock art sites, trails, and graves), sacred sites, places mentioned in traditional history, subsistence areas, boundary lines, natural landmarks, minerals, plants, animals, and water (including springs). No ethnographic resources have been specifically identified in the project area including stock use trails and stock operations infrastructure. All affiliated tribes have been contacted for any concerns they have with project implementation. If any tribe subsequently identifies the presence of any project area ethnographic resources, appropriate mitigation measures would be undertaken in consultation with the tribes. Ethnographic site locations would not be made public.

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to archeological and ethnographic resources is based on how the project will affect features for which these resources are significant. Thresholds for this impact assessment are

Negligible Negligible impacts are barely perceptible and alter neither resource condition, such as traditional access and site preservation, nor relationship between resource and affiliated group's body of practices and beliefs

Minor *Adverse* Impacts slight and noticeable and neither appreciably alter resource conditions, such as traditional access or site preservation, nor relationship between resource and affiliated group's body of beliefs and practices

Beneficial Impacts allow access to and/or accommodate a group's traditional practices or beliefs

Moderate *Adverse* Impacts apparent and alter resource conditions or interfere with traditional access, site preservation, or relationship between resource and affiliated group's practices and beliefs, even though the group's practices and beliefs survive

Beneficial Impacts facilitate traditional access and/or accommodate a group's practices or beliefs

Major *Adverse* Impacts alter resource conditions. Proposed actions block or greatly affect traditional access, site preservation, or relationship between resource and affiliated group's body of beliefs and practices, to the extent that survival of a group's beliefs and/or practices jeopardized. Impacts result in significant changes or destabilization to defining elements and resource condition and an increase in exposure or vulnerability to natural elements

Beneficial Impacts encourage traditional practices and/or accommodate a group's beliefs or practices. Beneficial effects include maintaining natural ecosystem processes

Duration *Short-term* No longer be detectable within five years because the resource would return to its predisturbance condition or appearance (e.g. trash and other items removed, or vegetation trampled, but not removed)

Long-term A change in a resource or its condition that would not return the resource to its predisturbance condition or appearance and for all practical purposes considered permanent (e.g., damage to features or removal of artifacts)

Context All impacts to archeological and ethnographic resources localized

Impacts Alternative A No Action

Current stock use and mule operations have little potential to directly impact archeological and ethnographic resources. Most commercial and private stock use occurs on Corridor Trails, and North Rim's Ken Patrick and Uncle Jim Trails. This use has occurred for over a century, and potential to disturb unknown archeological or ethnographic resources is very low.

Stock use in less developed areas, such as Tuweep and on North and South Rim dirt roads has potential to impact archeological or ethnographic resources from increased visitation of known archeological sites. Potential exists to discover unknown archeological resources while in these less visited park areas. Impacts to archeological and ethnographic resources would be minor adverse long term.

In the commercial use authorization for Tuweep stock trips, specific language allows archeological site visitation as guided by the Grand Canyon National Park Cultural Site Information Standard Operating Procedure (SOP). The SOP allows the permittee to disclose the location, lead clients to Class I archeological sites, and visit Class II sites as long as the permittee visits them only when specifically requested by clients and does not promote them to trip participants.

Cumulative Effects Park archeological and ethnographic resources have been impacted by development that has changed the way the area is used today. Past development has likely impacted area archeological and ethnographic resources. Loss or disturbance of these resources (in conjunction with previous losses and prevailing threats to finite numbers of these resources throughout the region) incrementally diminishes overall understanding of Grand Canyon's cultural history. These past impacts are moderate adverse long term.

Recently implemented, in-progress, and foreseeable future projects with potential to affect archeological and ethnographic resources include the South Rim Visitor Transportation Plan, Hermit Road Rehabilitation, and construction of Three Mile restroom. All park projects are and/or will be

assessed for effects to these resources and discussed with SHPO. Consultation with the SHPO and park cultural resource staff would ensure adverse impacts of future projects on archeological and ethnographic resources would be minimized. Therefore, when combined with Alternative A, cumulative impacts to archeological and ethnographic resources would be moderate adverse long term.

Conclusion Alternative A implementation would result in minor adverse long-term impacts from increased visitation to known archeological sites, and potential impacts to unknown sites. Cumulative impacts would be moderate adverse long term.

Impacts Alternative B Preferred Alternative

Elements Common to All Action Alternatives have minimal potential to affect archeological and ethnographic resources. Commercial use at Tuweep would continue under all alternatives up to six trips each year, similar to past use in this area. At Whitmore, no stock use would occur.

Other elements including trail monitoring, use of an adaptive management strategy, trail maintenance and funding, temporary trail closures due to weather and trail conditions, removal of mule waste from the trails, increased education of trail users, implementation of annual use limits on commercial rides, general retention of stock facilities, and continued administrative stock use would have negligible impacts on archeological and ethnographic resources.

Implementation of Alternative B would have impacts on archeological and ethnographic resources due to improvements needed at South Kaibab Trailhead, and development of an above-rim ride. Ground disturbance would occur to expand pens, construct a restroom, and possibly expand South Kaibab Trailhead barns. Because no archeological or ethnographic resources are known in this area (NPS 2010), impacts to these resources would be negligible. Mitigation measures are included in Chapter 2 to address discovery of unknown archeological or ethnographic resources during project implementation.

The commercial above-rim mule ride proposed under this alternative from South Kaibab Trailhead barn east toward Shoshone Point could have direct impacts on archeological sites. Several archeological sites were determined in close proximity to the rim along the proposed alignment. All efforts would be made to avoid these sites, but if sites cannot be avoided, a memorandum of agreement would be developed for site mitigation. Impacts to archeological resources from development of this trail would be moderate adverse long term.

Proposed changes in number of rides on Bright Angel, South Kaibab, North Kaibab, or Ken Patrick Trails would not have any effect on archeological or ethnographic resources. It is possible increased use to Uncle Jim Point would have some impacts on the historic archeological site located in this area. Additionally, installation of a composting toilet would have some potential to impact unknown archeological resources in the project area; however, known archeological sites have been identified and would be avoided during placement. These impacts would be minor adverse long term.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be moderate adverse long term.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate adverse impacts to archeological and

ethnographic resources. As discussed under Alternative A, adverse impacts have occurred in the past as a result of development, and loss and disturbance of cultural resources. Present and reasonable foreseeable future actions are carefully assessed to minimize adverse impacts to ethnographic resources and cultural landscapes. Cumulative impacts under Alternative B would be moderate adverse long term.

Conclusion Alternative B implementation would result in moderate adverse long-term impacts to archeological and ethnographic resources from development of an above-rim trail that could directly impact archeological sites, increased visitation at Uncle Jim Point, ground disturbance associated with improvements at South Kaibab Trailhead barn, and installation of a composting toilet at Uncle Jim Point. Cumulative impacts would be moderate adverse long term.

Impacts Alternative C South Kaibab/North Kaibab

Implementation of Alternative C would have impacts on archeological and ethnographic resources due to improvements needed at South Kaibab Trailhead barn, and development of an above-rim ride similar to those described in Alternative B. Impacts from ground disturbance for improvement in the South Kaibab Trailhead barn, development of an above-rim trail from South Kaibab Trailhead to Yaki Point rim area east, and installation of hitching rails and restroom at this trail's east end would have moderate adverse long term impacts to archeological or ethnographic resources.

The proposed exclusive use of South Kaibab Trail for stock use from South Rim, except for minimal administrative use on Bright Angel as necessary, would not affect archeological or ethnographic resources. Similarly, stock use on North Kaibab and Ken Patrick Trails, and up to 10 rides to Uncle Jim Point daily would not measurably affect these resources.

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate adverse impacts to archeological and ethnographic resources. As discussed under Alternative A, adverse impacts have occurred in the past as a result of development, and loss and disturbance of cultural resources. Present and reasonable foreseeable future actions are carefully assessed to minimize adverse impacts to ethnographic resources and cultural landscapes. Cumulative impacts under Alternative C would be moderate adverse long term.

Conclusion Alternative C implementation would result in moderate adverse long-term impacts to archeological and ethnographic resources from development of an above-rim trail that could directly impact archeological sites and ground disturbance associated with improvements at South Kaibab Trailhead barn. Cumulative impacts would be moderate adverse long term.

Impacts Alternative D Bright Angel/Uncle Jim

Implementation of Alternative D would result in minimal impacts on archeological and ethnographic resources. The only new ground disturbance proposed in Alternative D would be at Uncle Jim Point. A composting toilet would be installed to replace the existing temporary toilet. Known archeological sites would be avoided, although it is possible unknown archeological or ethnographic resources could be discovered. Mitigation measures included in Chapter 2 of this EA minimize impacts to these resources should they be discovered. These impacts would be negligible.

Additional impacts could also occur from development of an above-rim mule ride that would follow the existing temporary-ride alignment from the Village, along Rowe Well Road, to the Abyss. This

alignment was previously surveyed for archeological and ethnographic resources, and several historic artifact scatters were found in the trail alignment. Two sites would be further impacted if more permanent trail use occurred. A new alignment would be considered to avoid these sites; however, site mitigation could be necessary if avoidance is not possible. Impacts from this mitigation, or continued impacts to these sites, are expected to be minor adverse long term.

Proposed exclusive Bright Angel Trail use for stock use from South Rim, except for minimal administrative use on the South Kaibab Trail as necessary, would not affect archeological or ethnographic resources. Similarly, stock use on North Kaibab or Ken Patrick Trails, and up to 20 rides to Uncle Jim Point daily would not affect these resources.

Overall impacts of Alternative D and Elements Common to All Action Alternatives would be minor adverse long term.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to archeological and ethnographic resources. As discussed under Alternative A, adverse impacts have occurred in the past as a result of development, and loss and disturbance of cultural resources. Present and reasonable foreseeable future actions are carefully assessed to minimize adverse impacts to ethnographic resources and cultural landscapes. Cumulative impacts under Alternative D would be minor adverse long term.

Conclusion Alternative D implementation would result in minor adverse long-term impacts to archeological and ethnographic resources from installation of a composting toilet at Uncle Jim Point, and further development of an above-rim trail that could directly impact archeological sites. Cumulative impacts would be minor adverse long term.

Impacts Alternative E Seasonal/Limited Use

Implementation of Alternative E would have impacts on archeological and ethnographic resources due to improvements needed at South Kaibab Trailhead barn and above-rim ride similar to those described in Alternative B. Impacts from ground disturbance for improvement in South Kaibab Trailhead barns would have negligible impacts to archeological or ethnographic resources because there are no known resources in the project area.

Proposed seasonal stock use on South Kaibab and Bright Angel Trails from South Rim, would not affect archeological or ethnographic resources. Similarly, stock use on North Kaibab or Ken Patrick Trails, and up to 20 rides to Uncle Jim Point daily would not affect these resources.

Overall impacts of Alternative E and Elements Common to All Action Alternatives would be minor adverse long term from ground disturbing activities at South Kaibab Trailhead mule barn and potential impacts at Tuweep and in other undeveloped areas of the park from visitation as discussed in Alternative A.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to archeological and ethnographic resources. As discussed under Alternative A, adverse impacts have occurred in the past as a result of development, and loss and disturbance of cultural resources. Present and reasonable foreseeable future actions are carefully assessed to minimize adverse impacts to

ethnographic resources and cultural landscapes. Cumulative impacts under Alternative E would be minor adverse long term.

Conclusion Alternative E implementation would result in minor adverse long term impacts to archeological and ethnographic resources from ground-disturbing activities at South Kaibab Trailhead mule barn. Cumulative impacts would be minor adverse long term.

Vegetation

Affected Environment

Due to the Grand Canyon's immense size and variety of geology, climate, and microhabitats, a vast array of plant life exists. Within the park, vegetation from five of the seven American life zones (Lower Sonoran, Upper Sonoran, Transition, Canadian, and Hudsonian), and three of the four North American Deserts (Great Basin, Mojave, and Sonoran) occur (NPS 1995).

At least 129 distinct vegetation communities occur in Grand Canyon. Broadly, these communities fall in the broader habitat types of forested areas (10% of the park), woodlands (29%), desert scrub (42%), and a mixture of habitat types (19%) (Warren et al., 1982). Forested communities are dominated by blue spruce, Engelmann spruce and subalpine fir at the highest elevations (8,700 – 9,200 feet). Ponderosa pine, Gambel oak, and New Mexico locust dominate dryer ponderosa pine forests at elevations beginning around 6,800 feet with white fir, quaking aspen, and Douglas-fir joining in at intermediate elevations. Pinyon and juniper dominate lower elevation woodlands (5,500 – 6,800 feet elevation) (Warren et al., 1982).

Other Grand Canyon vegetation types include Great Basin desert scrub dominated by big sagebrush, rabbitbrush and Mormon tea; Mojave desert scrub including blackbrush, turpentine broom, and Mexican bladder sage; and Sonoran desert scrub with dominant species of brittle bush, catclaw acacia, ocotillo and desert willow. The park also contains interior chaparral such as manzanita and silktassel; and riparian communities with willow, cottonwood, and tamarisk. Meadows, hanging gardens, and other microhabitat communities are also components of the park's diverse environment (Warren et al., 1982).

Human activity has altered native vegetation. Among the most important disturbance events that historically affected understory vegetation of southwestern conifer forests was fire-suppression, livestock grazing, and increased shade from resultant unnaturally dense forests. A shift in species composition has likely occurred in understory of these forests, with the possibility of a total loss of select fire-dependent, very palatable, or shade-intolerant species. In addition, prior to Grand Canyon National Park's 1919establishment, mining, logging, and grazing activities introduced exotic plants. Park development, increased visitation, and Glen Canyon Dam further contributed to establishment and spread of park exotic plants. Developed areas including roads, campgrounds, visitor centers, employee housing, and utility areas contain the largest exotic plant concentrations. In addition to human activities, natural disturbances such as fire and flash flooding have greatly influenced park vegetative communities. Combinations of natural and human disturbances contributed to the great number of exotic plant species found in the park today.

Today, Grand Canyon has are approximately 1,737 known vascular plants species, 167 fungi species, 64 moss species, and 195 lichen species. This variety is largely due to the 8,000 foot elevation change from the Colorado River to North Rim's highest point. Grand Canyon boasts nine endemic plants (known only in park boundaries), with an additional 25 rare or restricted species

that are of concern to management. At present, 191 species, nearly ten percent of park flora is exotic.

One population of Tusayan flameflower (*Phemeranthus validulus*) occurs along the rim east of Yaki Point (Crawford 2006). However, indirect impacts could occur to this species from increased human use of the trail and exploration along the rim in this area. Previous surveys of the rim area for sentry milkvetch (*Astragalus cremnophylax var. cremnophylax*) did not find any occurrence of this species along the rim from Yaki Point to Shoshone Point. However, two locations were identified as potential sentry milkvetch reintroduction sites. Although specific surveys have not occurred for deer goldenbush (*Ericameria arizonica*), it is likely that this species, one of Grand Canyon's endemic plant species, would occur along the rim, in this area, as well.

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to vegetation is based on how the project will affect native and exotic vegetation in the project area. Thresholds for this impact assessment are

Negligible No native vegetation affected, or some individual native plants could be affected, but a change to a biotic community not measurable or perceptible

Minor Action results in a measurable or perceptible, small, localized change to a biotic community. The change is of little consequence

Moderate Action results in an impact to a biotic community measurable and of consequence, but localized

Major Action results in a measurable change to a biotic community. Change large and/or widespread and could have serious consequences for the species or natural community

Duration *Short-term* One year or less

Long-term Greater than one year

Context All impacts to vegetation localized

Impacts Alternative A No Action

Current stock use and mule operations directly impact vegetation through browsing of native plants and spread and introduction of invasive non-native plant species. Stock use concentration is in the Cross Canyon Corridor and on North Rim's Ken Patrick and Uncle Jim Trails. These trails are near developed areas and susceptible to invasive plant infestation from vehicles, hikers, construction equipment, and wildlife. Browsing of plants along trails is not monitored, but has been observed by park staff as a concern. These impacts are minor adverse long term.

Stock use in less developed areas, such as Tuweep and on both North and South Rim dirt roads has increased potential to impact vegetation. Because these areas are less developed, there is increased potential to introduce invasive plant species. Weed-seed-free feed is required for all stock users,

and would therefore minimize invasive plant spread. These efforts are expected to decrease impacts of invasive plants.

Exclusion of an above-rim ride would have minor beneficial long-term impacts on vegetation because there would be no commercial stock use in less developed South Rim areas, and concerns with browsing and invasive plant species spread would be minimal. Private stock users would be allowed on dirt roads as described in Chapter 1; however, this type of use is expected to remain low and would result in negligible impacts to vegetation.

Cumulative Effects Project area vegetation has been impacted by native vegetation removal, soil compaction, and invasive plant introduction and spread. Impacts are minor adverse long term.

Recently implemented, in-progress, and foreseeable future projects with potential to affect vegetation include the South Rim Visitor Transportation Plan, Concessions Environmental Assessment, Supai Camp Improvements, Greenway Trail Phases III and V, Hermit Road Rehabilitation, invasive exotic plant species management, and fire management plan activities. Vegetation is considered, and mitigation measures are included, in most projects to limit impacts to native and minimize the spread of exotic plant species. Revegetation plans are often incorporated into project planning to take advantage of native plant salvage potential prior to ground disturbance, treat invasive plant species before and after ground disturbance, and plan for revegetation efforts after construction projects. Therefore, when combined with Alternative A, cumulative impacts to vegetation would be adverse minor long term.

Conclusion Alternative A implementation would result in minor adverse impacts from continued browsing of native plant species and potential spread and introduction of invasive plants. Minor beneficial impacts would result because an above-rim ride would not be offered and would limit further impacts to vegetation. Cumulative impacts would be minor adverse long term.

Impacts Alternative B Preferred Alternative

Elements Common to All Action Alternatives have minimal potential to affect vegetation. Commercial use at Tuweep would continue under all alternatives up to six trips each year, similar to past use in this area with similar minimal impacts to vegetation. At Whitmore, no stock use would occur.

Other elements including trail monitoring, use of an adaptive management strategy, trail maintenance and funding, temporary trail closures due to weather and trail conditions, removal of mule waste from the trails, education of trail users, implementation of annual use limits on rides, general retention of stock facilities, and continuation of administrative stock use would have negligible impacts on vegetation.

Implementation of Alternative B would have impacts on vegetation from increased number of stock at South Kaibab Trailhead barn and proposed above-rim ride. Some adverse impacts would occur from increased stock at South Kaibab Trailhead barn; however, use of weed-seed-free feed would help minimize impacts that would be negligible to minor long term adverse.

Disturbance of vegetation for the above-rim ride proposed under this alternative (South Kaibab Trailhead east toward Shoshone Point) is estimated at two to four acres, assuming the disturbance width to vegetation would be between six and ten feet for the length of the trail. This calculation also assumes the trail is a loop, not out and back on the same alignment. All efforts would be

made to avoid vegetation removal, but some trees and shrub removal would occur. In addition to the direct impact to native vegetation, introduction of stock use into this rim area could promote invasive plant species introduction and spread. Impacts to vegetation from development of this trail would be moderate adverse long term.

The above-rim ride also has potential to impact special status plant species. As described in the Affected Environment section, one population of Tusayan flameflower and two potential reintroduction sites for sentry milkvetch occur on the rim between Yaki and Shoshone Points. All efforts would be made to avoid this population and potential reintroduction sites in trail delineation. Trail development would not preclude sentry milkvetch reintroduction; however, potential for future impacts to reintroduced populations would be increased and the trail could degrade potential reintroduction sites or lead to increased visitor access to the proposed site locations. Impacts would be moderate adverse long term.

Proposed changes in number of rides on Bright Angel, South Kaibab, North Kaibab, or Ken Patrick Trails would not have measurable impacts on vegetation. However, increased stock use to Uncle Jim Point would have impacts on native vegetation through direct disturbance from mules at the hitching rail, and potential for increased invasive plant species to occur. Installation of a composting toilet would also directly impact a small area of native vegetation. These impacts would be minor adverse long term.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be moderate adverse long term.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate adverse impacts to vegetation. As discussed under Alternative A, adverse impacts have occurred in the past as a result of native vegetation removal, soil compaction, and introduction and spread of invasive plants. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to native vegetation and spread of invasive plant species. Cumulative impacts under Alternative B would be moderate adverse long term.

Conclusion Alternative B implementation would result in moderate adverse long-term impacts to vegetation from development of an above-rim ride on South Rim, and installation of a composting toilet and retention of hitching rails at Uncle Jim Point. These actions have potential to introduce and spread invasive plant species. Cumulative impacts would be moderate adverse long term.

Impacts Alternative C South Kaibab/North Kaibab

Implementation of Alternative C would have impacts on vegetation from increased number of stock at South Kaibab Trailhead barn, and proposed above-rim ride similar to those described for Alternative B. Increased stock in the trailhead area have potential to directly affect native vegetation through expansion of pens and improvements to facilities. The above-rim ride along the rim east of Yaki Point, and installation of hitching rails and a restroom at the trail's eastern end, would directly impact native vegetation and also have potential to introduce and spread invasive plants along the trail. These impacts are expected to be moderate adverse long term.

The proposed exclusive use of South Kaibab Trail for stock use from South Rim, except for minimal administrative use on Bright Angel Trail as necessary, would have beneficial impacts to vegetation

on Bright Angel Trail. Browsing of native vegetation would be minimized and there would be less potential to introduce and spread invasive plant species. Beneficial impacts would be minor long term.

Stock use on North Kaibab and Ken Patrick Trails, and up to 10 rides to Uncle Jim Point daily would have impacts to vegetation similar to those described in Alternative A; potential browsing and introduction of invasive plants would occur. These impacts would be minor adverse long term.

Overall impacts of Alternative C and Elements Common to All Action Alternatives would be moderate adverse long term.

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate adverse impacts to vegetation. As discussed under Alternative A, adverse impacts have occurred in the past as a result of native vegetation removal, soil compaction, and introduction and spread of invasive plants. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to native vegetation and spread of invasive plant species. Cumulative impacts under Alternative C would be moderate adverse long term.

Conclusion Alternative C implementation would result in moderate adverse long-term impacts to vegetation from development of an above-rim ride on South Rim and placement of hitching rails and a restroom facility. These actions have potential to introduce and spread invasive plant species. Minor beneficial long-term impacts would occur from elimination of stock use on the Bright Angel Trail. Cumulative impacts would be moderate adverse long term.

Impacts Alternative D Bright Angel/Uncle Jim

Implementation of Alternative D would have impacts on vegetation from installation of a composting toilet at Uncle Jim Point, and mule rides up to 20 on North Kaibab, up to 50 on Ken Patrick, up to 20 rides to Uncle Jim Point, and up to 40 on the above-rim ride daily. Vegetation may need to be removed for installation of the composting toilet and access trail at Uncle Jim Point. Potential browsing and introduction and spread of invasive plants from stock use on trails would impact vegetation. These impacts are expected to be minor adverse long term.

Proposed exclusive use of Bright Angel Trail for stock from South Rim into the canyon, except for minimal administrative use on South Kaibab as necessary, would have beneficial impacts to vegetation on South Kaibab Trail. Browsing of native vegetation would be minimized and there would be less potential to introduce and spread invasive plant species. Beneficial impacts would be minor long term.

Additional impacts to vegetation could occur from an above-rim ride that would follow the existing temporary ride alignment from Grand Canyon Village, along Rowe Well Road, to the Abyss. This alignment was previously surveyed for vegetation, and no special status species were located in the trail alignment. Continued use of this trail would have impacts to native vegetation from browsing and potential introduction and spread of invasive plant species. These impacts would be minor adverse long term.

Overall impacts of Alternative D and Elements Common to All Action Alternatives would be minor adverse long term.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to vegetation. As discussed under Alternative A, adverse impacts have occurred in the past as a result of native vegetation removal, soil compaction, and introduction and spread of invasive plants. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to native vegetation and spread invasive plant species. Cumulative impacts under Alternative D would be minor adverse long term.

Conclusion Alternative D implementation would result in minor adverse long-term impacts to vegetation from installation of a composting toilet at Uncle Jim Point and development of above-rim ride on South Rim. These actions have potential to introduce and spread invasive plant species. Minor beneficial long term impacts would occur from elimination of stock use on South Kaibab Trail. Cumulative impacts would be minor adverse long term.

Impacts Alternative E Seasonal/Limited Use

Implementation of Alternative E would have impacts on vegetation from mule rides, up to 20 on Bright Angel Trail to Phantom Ranch, and 20 on South Kaibab Trail from Phantom Ranch, April through December; 10 on North Kaibab, up to 30 on Ken Patrick, and up to 10 rides to Uncle Jim Point. Potential browsing and introduction and spread of invasive plants from stock use on trails would impact vegetation. These impacts are expected to be minor adverse long term.

Proposed seasonal use of Bright Angel and South Kaibab Trails for stock use from South Rim would have beneficial impacts to vegetation. Browsing of native vegetation would be minimized, and there would be less potential to introduce and spread invasive plant species. Beneficial impacts would be minor long term.

Additional beneficial impacts to vegetation would occur under Alternative E because no above-rim ride would be offered. This would further limit impacts to native and special status plant species and limit opportunities for spread of invasive plants. These impacts would be minor beneficial long term.

Overall impacts of Alternative E and Elements Common to All Action Alternatives would be minor adverse long term and minor beneficial long term.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse and minor beneficial impacts to vegetation. As discussed under Alternative A, adverse impacts have occurred in the past as a result of native vegetation removal, soil compaction, and introduction and spread of invasive plants. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to native vegetation and spread of invasive plant species. Cumulative impacts under Alternative E would be minor adverse long term.

Conclusion Alternative E implementation would result in minor adverse long-term impacts due to browsing of native vegetation and introduction and spread of invasive plant species along stock use trails. Minor beneficial long term impacts would occur from seasonal closures on Bright Angel and an above-rim ride was not developed. Cumulative impacts would be minor adverse long term.

General Wildlife

Affected Environment

Due to its large size and diverse environments, approximately 355 bird, 89 mammal, 47 reptile, 9 amphibian, 17 fish (including five native species), and thousands of aquatic and terrestrial invertebrate species can be found in Grand Canyon. Habitats include riparian, desert scrub, woodlands, and coniferous forests. Project areas—South Rim, Corridor Trails, Tuweep, and North Rim—occur in all these habitat types.

Riparian Wildlife
Common mammals occurring in riparian habitat and side canyons include: bats, beaver, coyote, ringtail, and desert woodrat. Other, less common, mammals using riparian zones include bobcats, gray fox, and mountain lion. Mule deer and desert bighorn frequent the river corridor. The most common amphibians in riparian areas are canyon tree frog, red-spotted toad, and Woodhouse's toad. As with many mammals, reptiles use all habitats, but riparian areas support higher densities.

Lush vegetation and plant species diversity in riparian zones create a wide variety of bird habitats in a relatively small area. Of 355 bird species recorded in the greater Grand Canyon region, 250 are found in the Colorado River corridor. Forty-eight bird species regularly nest along the river while others use the river as a migration corridor or over-wintering habitat.

Insect species commonly found in the river corridor and tributaries are midges, caddis flies, mayflies, stoneflies, black flies, mites, beetles, butterflies, moths, and fire ants. Numerous species of spiders and several scorpion species, including the bark scorpion (and the giant hairy scorpion) inhabit the riparian zone.

Desert Scrub and Woodland Wildlife
Mammalian fauna in desert scrub and woodland communities consists of mostly rodents and bats. Amphibians are generally absent from dry desert uplands over one mile from a water source. Reptiles and desert-adapted rodents thrive in these habitats.

Approximately 30 bird species breed primarily in Inner Canyon desert, uplands, and cliffs. Common bird species include canyon wren, black-throated sparrow, and Gambels quail.

Numerous insects and arachnids live in Grand Canyon's desert scrub, woodlands, and coniferous forest habitats. Some common insects found at elevations above 2,000 feet are orange paper wasps, honey bees, black flies, tarantula hawks, stink bugs, beetles, black ants, and monarch and swallowtail butterflies. Solpugids, wood spiders, garden spiders, black widow spiders, and tarantulas can be found crawling around in higher elevations.

Coniferous Forest Wildlife
Coniferous forests provide habitat for porcupines, voles, shrews, red squirrels, Kaibab and Abert squirrels, mountain lion, mule deer, and elk. Common amphibians and reptiles of this habitat include Utah tiger salamander, Great Basin spadefoot toad, and mountain short-horned lizard.

Of approximately 90 bird species that breed in coniferous forests, 51 are summer residents and at least 15 of these are known neotropical migrants. Common bird species include Steller's jay, pinyon jay, red-tailed hawk, and American kestrel.

Table 10 Wildlife Species of Management Concern in Grand Canyon National Park

Common Name	Scientific Name
Northern leopard frog	*Lithobates pipiens*
Desert tortoise	*Gopherus agassizii*
River otter	*Lontra canadensis*
Desert bighorn sheep	*Ovis canadensis*
Mountain lion	*Felis concolor*
Rocky Mountain elk	*Cervus elaphus nelsoni*
Mexican vole	*Microtus mexicanus navaho*
Northern goshawk	*Accipiter gentilis*
Bald eagle	*Haliaetus leucocephalus*
Peregrine falcon	*Falco peregrinus*
Yellow-billed cuckoo	Coccyzus americanus

Environmental Consequences

Intensity Level Definitions

Methodology

Methodology used for assessing impacts to wildlife is based on how changes in stock use and mule operations would affect wildlife and wildlife habitats. Thresholds for impact assessment are

Negligible Impacts to wildlife and/or habitats not perceptible or measurable. Impacts not of any consequence to wildlife populations or supporting habitat

Minor Impacts to wildlife and/or habitat small, measurable, and perceptible, but of little consequence. Population numbers, population structure, genetic variability, and other demographic factors might have slight changes but characteristics remain stable. Key ecosystem processes might have slight disruptions within natural variability, and habitat for all species remain functional

Moderate Impacts to wildlife and/or habitat perceptible and measurable. Population numbers, population structure, genetic variability, and other demographic factors for species have measurable changes creating declines, which could result from displacement, but be expected to rebound to pre-impact numbers. No species at risk of being extirpated from the park, key ecosystem processes might have slight disruptions outside natural variability, and habitat for all species remains functional

Major Impacts to wildlife and/or habitat perceptible and measurable. Population numbers, population structure, genetic variability, and other demographic factors might have large, short-term declines with long-term population numbers considerably depressed. In extreme cases, species might be extirpated from the park, key ecosystem processes like nutrient cycling might be disrupted, or habitat for any species may be rendered not functional

Duration *Short-term* One year or less for individual or habitat; five years or less for a population

Long-term Greater than one year for individual or habitat; greater than five years for a population

Context All impacts to vegetation localized

Impacts Alternative A No Action

The No Action alternative would maintain the project areas in their current state and continue to provide habitat for wildlife species. Without proposed changes in vegetation or human use, wildlife populations would generally remain the same. Continued use of existing developments would not impact any sensitive wildlife-habitat requirements such as nesting and/or roosting sites, key foraging areas, key calving or fawning areas, or primary wildlife travel corridors. Impacts to wildlife under the No Action Alternative are negligible.

Some impacts occur from current stock use and mule operations. Brown-headed cowbirds are attracted to stock operations, particularly seed found in feed and insects in manure. Cowbirds are known to parasitize other birds' nests and therefore have an impact on native bird species. It is unknown to what extent these birds are parasitizing nests. The park has been actively monitoring and exterminating cowbirds to minimize impacts to native and special status species. These impacts, although not fully known, are expected to be minor adverse long term.

Disturbance to general wildlife species along Corridor Trails is possible and can result in species habituation to stock and human presence. There is also a slight possibility of disease transmission from stock to wildlife, but very rare. Finally, stock could transfer insect-borne diseases to wildlife. These impacts would be adverse minor long term.

Cumulative Effects Wildlife and wildlife habitat in the project areas on South Rim, Inner Canyon, North Rim, and Tuweep have been impacted by habitat modification and noise disturbance. These impacts are minor adverse long term.

Recently implemented, in-progress, and foreseeable future projects with potential to affect wildlife and wildlife habitat in particular include the South Rim Visitor Transportation Plan, Concessions Environmental Assessment, Supai Camp Improvements, Greenway Trail Phase III and V, Hermit Road Rehabilitation, and fire management activities. Impacts to wildlife are considered, and mitigation measures developed, for most projects to limit impacts. Therefore, when combined with Alternative A, cumulative impacts to general wildlife would be adverse minor long term.

Conclusion Alternative A implementation would result in minor adverse long-term impacts from continued occurrence of brown-headed cowbirds to stock-use areas in the park, and cowbird impact on native bird species. Cumulative impacts would be minor adverse long term.

Impacts Alternative B Preferred Alternative

Elements Common to All Action Alternatives have minimal potential to affect general wildlife. Commercial use at Tuweep would continue under all alternatives up to six trips each year, similar to past use in this area with similar minimal impacts to wildlife. At Whitmore, no stock use would occur.

Other elements including trail monitoring, use of an adaptive management strategy, trail maintenance and funding, temporary trail closures due to weather and trail conditions, removal of

mule waste from the trails, education of trail users, implementation of annual use limits on rides, general retention of stock facilities, and continued administrative stock use would not result in impacts to wildlife.

Implementation of Alternative B would have direct impacts on wildlife from the increased number of stock at the South Kaibab Trailhead barn and proposed above-rim ride. It is expected increased stock facilities at South Kaibab Trailhead could attract additional brown-headed cowbirds known to parasitize native songbird nests; however, pelletized feed use may help minimize the cowbirds presence because the feed has less seed and less ground spillage. This pelletized feed has been used by the North Rim concessioner since the 1970s, and for the entire time this concessioner has operated park mule rides; the South Rim concessioner recently changed to this feed type. It should also be noted that cowbirds are not prevalent in and around stock facilities on North Rim which may be correlated to feed type. Impacts from increased stock at South Kaibab Trailhead barn would result in negligible to minor long-term adverse impacts to wildlife.

The above-rim ride proposed under this alternative would leave from South Kaibab Trailhead barn, meet the rim east of Yaki Point, and then follow the rim for approximately one mile. An option to loop back through the forest would be considered, or the ride could return along the trail on the rim. Vegetation disturbance to create this trail is estimated at a maximum two to four acres of pinyon-juniper woodland. Because of the continuous, undisturbed forest east and south of the proposed trail, impacts to wildlife habitat would be lessened. Further, the proposed trail follows an existing social trail along the rim on the edge of developed and undisturbed land and is used as such by wildlife. However, the direct disturbance to wildlife habitat would likely result in mortality of mammalian prey species and loss of multiple bird territories.

A review of avifauna studies of pinyon-juniper woodland in northern Arizona, Utah, and Colorado indicate 60 to 190 bird territories per 40 hectares in this habitat type (Dickson and Ward 2000, Larue 1994, O'Meara et al. 1981, Balda and Masters 1980, Grue 1977). Due to the sparse vegetation occurring in close proximity to the rim for the proposed trail, the lower estimates for avifauna territories are probably more applicable, and are estimated to be 60 to 100 per 40 hectares, or 0.5 to one per acre. Therefore, removal of two to four acres of this habitat type would result in destruction of one to four bird territories, and degradation of a similar number of territories which would be closer to disturbed areas.

There are relatively few studies which provide absolute density estimates for small mammals in the pinyon-juniper habitat type. Wide fluctuations in numbers have been consistently noted and are most often correlated with precipitation. In general, the studies show densities in normal years of 10 to 30 small mammals per acre in this habitat type. Preliminary analysis of data collected in Grand Canyon suggests the approximate density in pinyon-juniper habitat is on the order of 15 to 20 small mammals per acre (Lawes and Ward 2006). Therefore, removal of two to four acres of this habitat type would result in destruction of habitat supporting 30 to 80 small mammals.

It is obvious that small mammal and bird species have smaller home ranges and more limited habitat requirements than larger species such as deer, elk, big horn, mountain lion and raptors, and therefore, have higher potential to be directly impacted through direct vegetation loss. However, while short-term wildlife losses are expected, populations are not expected to be substantially impacted adversely long-term due to availability of adjacent undisturbed habitat, species mobility, and mitigation measure implementation. In addition to loss of habitat, impacts of implementing Alternative B would include decreased wildlife security and increased disturbance to adjacent habitat.

Other aspects of Alternative B (installation of composting toilet at Uncle Jim Point, increased stock facilities at South Kaibab Trailhead) would result in some new ground disturbance, although tree removal is not anticipated. These project components are smaller in scale and localized. For these reasons, adverse impacts to wildlife would be minimized.

The proposed changes in number of rides on the Bright Angel, South Kaibab, or North Kaibab Trails would not have measurable impacts on wildlife. However, increased use to Uncle Jim Point could have minor adverse impacts on wildlife through noise disturbance and stock presence. Wildlife on Uncle Jim Trail with potential to be affected include peregrine falcon, turkey, goshawk, and grouse. Grouse may also occur on Ken Patrick Trail and could be minimally impacted by stock use.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be minor adverse long term.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to wildlife. As discussed under Alternative A, adverse impacts have occurred in the past as a result of habitat modification and noise disturbance. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to wildlife. Cumulative impacts under Alternative B would be minor adverse long term.

Conclusion Alternative B implementation would result in minor adverse long-term impacts to wildlife from presence of brown-headed cowbirds, removal of wildlife habitat for an above rim mule ride, and noise disturbance from stock use on Uncle Jim Trail. Cumulative impacts would be minor adverse long term.

Impacts Alternative C South Kaibab/North Kaibab

Implementation of Alternative C would have direct impacts on wildlife from the increased number of stock at South Kaibab Trailhead and proposed above-rim mule ride similar to those described for Alternative B. Presence of brown-headed cowbirds could increase near South Kaibab Trailhead barn and have minor adverse impacts on native songbirds.

Designation of an above-rim ride from South Kaibab Trailhead barn towards Yaki Point and along the rim east toward Shoshone Point would directly impact vegetation. Disturbance of two to four acres of native vegetation would likely result in mortality of mammalian prey species and loss of multiple bird territories. It is estimated that approximately one to tour bird territories would be obliterated, and a similar number of territories would be degraded because they would be closer to disturbed areas. It is also estimated that removal of this amount of vegetation would result in destruction of habitat supporting 30 to 80 small mammals. Alternative C would include decreased wildlife security and increased disturbance to adjacent habitat.

Increased stock facilities at South Kaibab Trailhead barn would result in some new ground disturbance, although tree removal is not anticipated. This project component is smaller in scale and localized. For these reasons, adverse impacts to wildlife would be minimized.

The proposed exclusive use of South Kaibab Trail for stock use from South Rim, except for minimal administrative use on Bright Angel Trail as necessary, would not have measurable impacts on general wildlife.

Stock use on North Kaibab and Ken Patrick Trails, and up to 10 rides to Uncle Jim Point daily would have impacts to general wildlife similar to those described in Alternative A, including presence of cowbirds. However, these impacts are expected to be negligible. Minor adverse impacts to peregrine falcon and other bird species, described for Alternative B, could also result.

Overall impacts of Alternative C and Elements Common to All Action Alternatives would be minor adverse and long term.

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to wildlife. As discussed under Alternative A, adverse impacts have occurred in the past as a result of habitat modification and noise disturbance. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to wildlife. Cumulative impacts under Alternative B would be minor adverse long term.

Conclusion Alternative C implementation would result in minor adverse long-term impacts to wildlife from presence of brown-headed cowbirds, removal of wildlife habitat for an above-rim ride, and noise disturbance from stock use. Cumulative impacts would be minor adverse long term.

Impacts Alternative D Bright Angel/Uncle Jim

Implementation of Alternative D would have impacts on wildlife from installation of a composting toilet at and increased stock use to Uncle Jim Point, and potential brown-headed cowbird presence at stock facilities. Minimal vegetation may be removed for installation of the composting toilet and access trail at Uncle Jim Point which would have negligible impacts to wildlife. As discussed under Alternatives A, B, and C, brown-headed cowbirds are attracted to stock facilities and known to have adverse impacts on native songbirds. Under this alternative, South Rim concessioner mule operations would be moved to a location adjacent to the Village. This new facility would have potential to attract cowbirds and add an additional location for a stock-use facility. These impacts are expected to be minor adverse long term.

Impacts to wildlife could also occur from implementation of an above-rim ride that would follow the existing temporary ride alignment from the Village, along Rowe Well Road, to the Abyss. This alignment has been used since October 2009; the park's wildlife biologist was consulted for temporary trail use and recommended wildlife surveys, particularly for goshawks, be completed to fully determine impacts to wildlife from trail use. Under Alternative D, monitoring of goshawks and other species of concern would occur annually. Based on vegetation type along the ride alignment, impacts are expected to be minor adverse long term.

Proposed exclusive use of Bright Angel Trail for stock use from South Rim, except for minimal administrative use on South Kaibab Trail as necessary, would not have measurable impacts on general wildlife. Similarly, mule rides up to 20 on North Kaibab, up to 50 on Ken Patrick are not expected to measurably impact wildlife. Minor adverse impacts to peregrine falcon and other bird species, described for Alternative B, could also result.

Overall impacts of Alternative D and Elements Common to All Action Alternatives would be minor adverse long term.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to wildlife. As discussed under

Alternative A, adverse impacts have occurred in the past as a result of habitat modification and noise disturbance. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to wildlife. Cumulative impacts under Alternative D would be minor adverse long term.

Conclusion Alternative D implementation would result in minor adverse long-term impacts to wildlife from presence of brown-headed cowbirds and noise disturbance from stock use on Uncle Jim Trail. Cumulative impacts would be minor adverse long term.

Impacts Alternative E Seasonal/Limited Use

Implementation of Alternative E would have impacts on wildlife similar to those described for Alternative A. Under this alternative, stock use would be limited below current use, no above-rim ride would occur, and a composting toilet would not be installed at Uncle Jim Point. Therefore, the only expected impacts to wildlife would be from brown-headed cowbirds as described in Alternative A. These impacts are expected to be minor adverse long term.

Proposed seasonal use of Bright Angel and South Kaibab Trails for stock use from South Rim would have negligible impacts on wildlife. Similarly, proposed stock use on North Rim would not have measurable impacts on wildlife.

Overall impacts of Alternative E and Elements Common to All Action Alternatives would be minor adverse long term.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to wildlife. As discussed under Alternative A, adverse impacts have occurred in the past as a result of habitat modification and noise disturbance. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to wildlife. Cumulative impacts under Alternative E would be minor adverse long term.

Conclusion Alternative E implementation would result in minor adverse long-term impacts to wildlife from presence of brown-headed cowbirds and some noise disturbance from stock use on Uncle Jim Trail. Cumulative impacts would be minor adverse long term.

Soil Resources

Affected Environment

Geology and slope strongly influence most Grand Canyon soils. Currently, soils throughout the canyon are categorized as poorly developed. Soils are highly variable, ranging from North Rim's moist forest soils to the Inner Canyon's shallow, dry mineral soils and bedrock exposures. Inner Canyon soil textures are sandy loam, sands, or loamy sands. It is likely a few silt loams or clay loams exist in the Hermit and Bright Angel Shales and in Toroweap Valley.

Most Grand Canyon soil types erode very easily and regenerate slowly. Their sandy nature allows immediate water absorption, leaving the ground dry shortly after rain showers. Soils are typically fragile and require little disturbance to create erosion problems. Large park areas show essentially no human impacts to soils. Other areas, used for recreational activities, have heavily impacted soils.

Biological soil (cryptogamic) crusts are very sensitive soil systems specific to arid lands. These crusts cover a significant portion of Inner Canyon soil. Cyanobacteria form the crust while other bacteria, algae, fungi, lichens, and mosses are often present. Crusts play important roles in reducing soil erosion, increasing water conservation, and in promoting nitrogen fixation. They create a more favorable environment for vascular plants to germinate under arid conditions. Crusts are highly susceptible to trampling and air pollution.

The park's General Management Plan describes Corridor Trail soils in the following detail, *The corridor trails cross most of the canyon's geologic formations, with each formation presenting its own characteristics in terms of trail building, soils, erodibility, and topography. Slopes are often unstable, with shallow soils that tend to be highly erodible with vegetation cover is removed or soil crust is disturbed* (NPS 1995).

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to soil resources is based on how changes in stock use and mule operations would affect soils, specifically on trails and in any construction activities. Thresholds for this impact assessment are as follows

Negligible *Adverse* Impacts to soils, including biological crusts, not perceptible or measurable

Beneficial Impacts improve condition of soils at minute levels. Any changes to soil productivity, integrity, stability, or fertility imperceptible

Minor *Adverse* Effects to soils and biological crusts barely perceptible or measurable. Any adverse impacts to soil productivity, integrity, stability, or fertility small and reversible

Beneficial Impacts to soils and biological crusts barely perceptible or measurable. Effects improve condition of soils slightly. If mitigation was needed to offset adverse effects, it would be relatively simple to implement and would likely be successful. A beneficial effect would slightly reduce level of mitigation needed

Moderate *Adverse* Impacts to soils and biological crusts readily perceptible and measurable. Effects to soil productivity, integrity, stability, or fertility readily apparent, and would result in a change to soil character. Mitigation measures necessary to offset adverse effects and would likely be successful

Beneficial Impacts to soils and biological crusts readily perceptible and measurable. Effects substantially improve condition of soils, greatly reducing amount of necessary mitigation

Major *Adverse* Impacts to soils and biological crusts readily perceptible, measurable, and constitute a substantial change from natural conditions. Effects to soil productivity, integrity, stability, or fertility readily apparent and substantially change character of soils. Mitigation measures to offset adverse effects needed, extensive, and success not be guaranteed

Beneficial Impacts to soils and biological crusts readily perceptible, measurable, and constitute a substantial change from natural conditions. Effects would return soils back to natural conditions, and mitigation not necessary

Duration *Short-term* One year or less and soils return to pre-disturbance condition the next year

Long-term Greater than one year

Context Effects to soils proposed under all alternatives localized

Impacts Alternative A No Action

Current stock use and mule operations have potential to directly impact soil resources through compaction and erosion from stock travel. Most commercial and private stock use occurs on Corridor Trails and Uncle Jim Trail on North Rim. Use of designated trails minimizes potential impacts to undisturbed soils. Stock use in less developed areas, such as Tuweep and on dirt roads on both North and South Rim, has minimal potential to impact soil resources due to low use.

Although use of borrow pits and routine trail work is not analyzed in this document, these actions are necessary in large part from stock use on park trails. Indirect impacts to soils from these actions would be adverse minor long term.

Cumulative Effects Soil resources in the project areas have been impacted by loss of vegetation, soil compaction, and erosion. These impacts are minor adverse long term.

Recently implemented, in-progress, and foreseeable future projects with potential to affect vegetation include the South Rim Visitor Transportation Plan, Concessions Improvements, Supai Camp Improvements, Greenway Phase III and V, and use of borrow pits for trail maintenance. Soils are considered and mitigation measures included in most projects to limit impacts such as erosion and compaction. Therefore, when combined with Alternative A, cumulative impacts to soil resources would be adverse moderate long term.

Conclusion Alternative A implementation would result in moderate adverse long-term impacts from erosion and trail degradation particularly on Corridor Trails. Cumulative impacts would be moderate adverse long term.

Impacts Alternative B Preferred Alternative

Elements Common to All Action Alternatives have minimal potential to affect soils. Commercial use at Tuweep would continue under all alternatives up to six trips each year, similar to past use in this area which has little potential to have impacts on soil resources. At Whitmore, no stock use would occur.

Other elements including trail monitoring, use of an adaptive management strategy, trail maintenance and funding, temporary trail closures due to weather and trail conditions, removal of mule waste from the trails, education of trail users, implementation of annual use limits on rides, and general retention of stock facilities would have negligible impacts on soil resources.

Alternative B implementation would have impacts on soil resources from Bright Angel Trail stock use changes, improvements at South Kaibab Trailhead barn, continued administrative stock use, designation of an above-rim ride, and changes in stock use on North Kaibab and Uncle Jim Trails.

A reduction in rides on Bright Angel Trail is proposed under this alternative which would result in decreased erosion and impacts to trails from stock use when compared to current use. No rides to Plateau Point would occur and, therefore, impacts to soil resources from Indian Garden would be improved from current condition. Current average use is 3,410 rides to Phantom Ranch and 4,904 rides to and from Plateau Point totaling 14,541 one-way mule trips between the rim and Indian Garden. Under Alternative B, there will be no more than 3,650 rides per year and 4,015 one-way mule trips, including guides and riders, between the rim and Indian Garden. This is a net decrease of 10,526 one-way mule trips on Bright Angel Trail per year.

A majority of the concessioner mules and mule operations would be moved to the South Kaibab Trailhead barn from the Grand Canyon Village barn. Improvements at South Kaibab Trailhead barn would include expansion of pens, construction of a restroom, and possible expansion of existing buildings. Direct impacts to soils would occur during construction, although improvements are expected within previously disturbed areas adjacent to existing mule facilities. Additionally, erosion-control devices would be employed to minimize run-off and erosion during any construction or ground disturbing work.

The above-rim mule ride proposed under this alternative would leave from the South Kaibab Trailhead barn, parallel the road towards Yaki Point to the rim, and then follow the rim for approximately one mile. Direct ground disturbance of vegetation for this trail is estimated at a maximum one to two acres. The proposed trail follows an existing social trail along the rim and would be formalized as a stock trail. NPS and concessioners would work together to design the trail to minimize erosion and run-off. Checks and steps may be necessary along the trail to address impacts to soils.

On North Kaibab Trail, mule rides would continue to Supai Tunnel, with no commercial rides offered below Supai Tunnel. Impacts to soil resources on the trail between the rim and Supai Tunnel would be similar to current condition described under Alternative A. One-way mule trips under Alternative B would occur up to 13,464 compared to current use of 9,280 with a potential increase of 4,184 one-way trips if maximum number of rides are booked every day.
Below Supai Tunnel to Roaring Springs, it is expected that soil conditions would be impacted by natural erosion, but no additional impacts from commercial stock use would occur. This would have minor beneficial long-term impacts on soils. Private stock use would continue be allowed on this section of trail; however, private stock use is low in the Inner Canyon (less than 13 groups per year on average) and is not expected to measurably contribute to erosion on the trail.

On Uncle Jim Trail, anticipated increased use over current would have additional impacts to the trail and hitching area at Uncle Jim Point. These anticipated impacts on the trail would be through compaction and erosion. Under Alternative B, up to 20 rides daily would be allowed to Uncle Jim Point, and 30 rides to Ken Patrick and Uncle Jim Junction. One-way mule trips to Uncle Jim Point would occur up to 6,732 compared to current use of 319. On Ken Patrick Trail, one-way mule trips would occur up to 13,464 compared to current use of 5,196. These measurable increases would occur if trips are booked to the maximum every day. Further, installation of a composting toilet and designation of a trail to access the toilet would impact soils through direct compaction increasing potential for erosion.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be minor adverse long term from erosion on trails and new disturbance of soils for an above-rim ride, installation of a toilet at Uncle Jim Point, and improvements at the South Kaibab Trailhead barn, and minor beneficial from decreased stock use on Bright Angel Trail.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to soil resources. As discussed under Alternative A, adverse impacts have occurred in the past as a result of loss of vegetation, soil compaction, and erosion. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to soils. Cumulative impacts under Alternative B would be minor adverse long term.

Conclusion Alternative B implementation would result in minor adverse long-term impacts of increased soil erosion and compaction from the changes in stock use on Bright Angel, North Kaibab and Uncle Jim Trails, improvements at South Kaibab Trailhead, and designation of an above-rim mule ride. Minor beneficial long-term impacts would result from elimination of commercial stock use below Supai Tunnel. Cumulative impacts would be minor adverse long term.

Impacts Alternative C South Kaibab/North Kaibab

Implementation of Alternative C would have impacts on soil resources from elimination of commercial and private stock use on Bright Angel Trail, increased use on South Kaibab Trail, development of an above-rim ride on South Rim, improvements at the South Kaibab Trailhead barn, continued administrative stock use, widening and construction of bypasses on North Kaibab Trail, and changes in stock use on North Kaibab and Uncle Jim Trails.

Proposed exclusive use of South Kaibab Trail for commercial and private stock use into the canyon from South Rim would have beneficial impacts to soils on Bright Angel Trail from decreased stock use. Some administrative stock use would occur; however, this use would not occur daily. The current 14,051 one-way trips on Bright Angel Trail would be reduced to zero commercial stock use trips and less than 650 one-way administrative stock trips (assuming one string of six NPS mules going down and back up the Bright Angel Trail each week). Additionally, no rides to Plateau Point would occur and therefore impacts to soil resources from Indian Garden would be improved from current condition.

Stock use on South Kaibab Trail would increase under this alternative from 20 rides from Phantom Ranch daily to 20 rides to Phantom Ranch, 20 rides from Phantom Ranch, and 10 rides to Cedar Ridge and back. Supply of Phantom Ranch would continue the same as current, up to 12 supply mules, including guides to Phantom Ranch and back daily. In one-way mule trips, it is expected that between the rim and Cedar Ridge one-way trips would increase from 0 to 8,030 and between the rim and Phantom Ranch one-way trips would increase from 11,205 to 24,820. The upper part of the South Kaibab between the rim and Cedar Ridge would receive almost three times current commercial stock use (32,850 under Alternative C compared to 11,205 under current use). It is expected increased use would measurably increase South Kaibab Trail erosion. These impacts would be moderate adverse long term.

The above-rim ride proposed under this alternative would have the same impacts described under Alternative B. Direct ground disturbance for this trail is estimated at a maximum one to two acres. Impacts would be minor adverse long term.

Improvements to the South Kaibab Trailhead barn would be the same as those described in Alternative B. Direct impacts to soils would occur during construction although improvements are expected to be within previously disturbed areas adjacent to existing mule facilities. These impacts would be minor adverse long term.

On North Kaibab Trail, commercial mule rides would continue to Supai Tunnel and Roaring Springs. Impacts to soil resources on the trail between the rim and Roaring Springs would be increased from current condition. Under current condition 4,198 one-way mule trips occur between North Rim and Supai Tunnel each year, and 984 one-way mule trips occur between the rim and Roaring Springs. Under Alternative C, maximum Supai Tunnel one-way trips would be 12,240, and Roaring Springs one-way trips would be 3,060. This is a net increase of 8,042 between rim and Supai Tunnel and 4,982 between rim and Roaring Springs which is expected to have moderate adverse impacts to soils on the North Kaibab Trail. Administrative and private stock use is very low on North Kaibab and would not measurably add to these impacts.

On Uncle Jim Trail, anticipated increased use over current would have some impacts to the trail through compaction and erosion. Under Alternative C, up to 10 rides daily would be allowed to Uncle Jim Point. In the past, very little (less than one ride per day on average) commercial or private stock use has occurred to Uncle Jim Point. Further, removal of the hitching rails and temporary toilet would have long-term minor beneficial impacts due to decreased compaction in these areas. Impacts to soils from these actions would be minor adverse long term.

Overall impacts of Alternative C and Elements Common to All Action Alternatives would be moderate adverse long term from erosion on trails and new disturbance of soils for an above-rim ride, increased commercial stock use on South Kaibab Trail, and improvements at South Kaibab Trailhead and minor beneficial from decreased stock use on Bright Angel Trail.

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate adverse impacts to soil resources. As discussed under Alternative A, adverse impacts have occurred in the past as a result of loss of vegetation, soil compaction, and erosion. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to soils. Cumulative impacts under Alternative C would be moderate adverse long term.

Conclusion Alternative C implementation would result in moderate adverse long-term impacts of increased soil erosion and compaction from erosion on trails and new disturbance of soils for an above-rim ride, increased commercial stock use on South and North Kaibab Trails, and improvements at South Kaibab Trailhead. Minor beneficial impacts would result from decreased stock use on Bright Angel Trail. Cumulative impacts would be moderate adverse long term.

Impacts Alternative D Bright Angel/Uncle Jim

Implementation of Alternative D would have impacts on soil resources from elimination of commercial and private stock use on South Kaibab Trail, increased use on Bright Angel Trail, development of an above-rim ride on South Rim, continued administrative stock use, and changes in stock use on North Kaibab and Uncle Jim Trails.

Proposed exclusive use of Bright Angel Trail for commercial and private stock use into the canyon from South Rim would have beneficial impacts to soils on South Kaibab Trail from decreased stock use. Some administrative stock use would occur; however, this use would not occur daily. The

current 11,205 one-way trips on South Kaibab Trail would be reduced to zero commercial stock use trips, and approximately 650 one-way administrative stock trips (assuming one string of six NPS mules going down and back up the South Kaibab Trail each week).

Amount of stock use on the Bright Angel Trail would increase from current use, and types of use would be expanded to include supply mules, all private stock, and a majority of administrative stock. Under this alternative one-way mule trips between the rim and Phantom Ranch could total as many as 24,820 compared to the current 14,541 trips. This is a total increase of 10,279 one-way trips on Bright Angel Trail and is expected to measurably increase erosion. These impacts would be moderate adverse long term.

Impacts to soils could also occur from implementation of an above-rim ride that would follow the existing temporary ride alignment from the Village, along Rowe Well Road, to the Abyss. This alignment has been used since October 2009, and continued impacts to soils would occur if the trail were used for the long term. Much of the trail follows existing social trails, but potential exists for rutting and erosion if up to 40 rides occur each day. Impacts are expected to be minor adverse long term.

On North Kaibab Trail, mule rides would continue to Supai Tunnel at 20 rides per day. Impacts to soil resources between the rim and Supai Tunnel would be similar to current condition. Under this alternative one-way mule trips between the rim and Supai Tunnel could total as many as 6,732 compared to the current 9,280 trips. This would be a decrease of 2,548 one-way trips on North Kaibab Trail and is expected to decrease overall erosion and impacts to the trail.

On Uncle Jim Trail, the increased number of rides would have impacts to the trail through compaction and erosion. Under Alternative D, up to 50 rides would be allowed to the Ken Patrick and Uncle Jim Junction, and 20 rides would be allowed to Uncle Jim Point daily. In the past, very little (less than one ride per day on average) commercial or private stock use has occurred to Uncle Jim Point. One-way mule trips from North Kaibab Trailhead to Ken Patrick and Uncle Jim Trail Junction would be 13,464 under this alternative compared to 5,196 under current use. On the ride to Uncle Jim Point, one-way mule trips would be up to 6,732 under this alternative compared to 319 under current use. Impacts to soils from these actions would be moderate adverse long term.

Overall impacts of Alternative D and Elements Common to All Action Alternatives would be moderate adverse long term from erosion on trails and new disturbance of soils, and increased commercial stock use on Uncle Jim Trail; and minor beneficial from decreased stock use on South Kaibab and North Kaibab Trail.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate adverse impacts to soil resources. As discussed under Alternative A, adverse impacts have occurred in the past as a result of loss of vegetation, soil compaction, and erosion. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to soils. Cumulative impacts under Alternative D would be moderate adverse long term.

Conclusion Alternative D implementation would result in moderate adverse long term from erosion on trails and new disturbance of soils, and increased commercial stock use on Bright Angel and Uncle Jim Trails. Minor long-term beneficial impacts would result from decreased stock use on South Kaibab Trail. Cumulative impacts would be moderate adverse long term.

Impacts Alternative E Seasonal/Limited Use

Under this alternative, stock use would be limited below current use, no above-rim ride would occur, a composting toilet would not be installed at Uncle Jim Point. Therefore, the only expected impacts to soils would be from continued stock use on trails, and improvements to stock facilities at South Kaibab Trailhead barn.

Proposed use levels of up to 10 rides to Supai Tunnel on North Kaibab Trail, 10 rides to Uncle Jim Point, and 30 rides to Ken Patrick and Uncle Jim Junction, would have beneficial impacts on soils when compared to current condition. These impacts would be minor long term.

Proposed seasonal use of Bright Angel and South Kaibab Trails for stock use from South Rim would have reduced impacts on soils from current condition. This alternative was specifically considered to address erosion and trail impacts during snow melt when trails are more susceptible to damage. Therefore, impacts to soils anticipated on these trails are minor beneficial long term.

Improvements at South Kaibab Trailhead mule barn would be the same as those described in Alternative B. Direct impacts to soils would occur during construction although improvements are expected within previously disturbed areas adjacent to existing mule facilities. These impacts would be minor adverse long term.

Overall impacts of Alternative E and Elements Common to All Action Alternatives would be minor adverse long term from improvements at South Kaibab Trailhead mule barn, and minor beneficial long term from decreased stock use parkwide.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to soil resources. As discussed under Alternative A, adverse impacts have occurred in the past as a result of loss of vegetation, soil compaction, and erosion. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to soils. Cumulative impacts under Alternative E would be minor adverse long term.

Conclusion Alternative E implementation would result in minor adverse long term from improvements at South Kaibab Trailhead mule barn, and minor beneficial long term from decreased stock use parkwide. Cumulative impacts would be minor adverse long term.

Water Resources

Affected Environment

Grand Canyon water sources can be perennial or intermittent, with the source coming from regional and local water-bearing sedimentary rocks that drain Colorado Plateau aquifer systems. Many of these sources have small discharges that become intermittent during part of the year. Many of the canyon's springs, seeps, and riparian areas are among the least altered in the southwest and are rare and important resources. These areas exhibit unparalleled aesthetic, recreational, educational, and scientific value. They are also the most productive and biologically diverse terrestrial ecosystems, and commonly host 100- to 500-fold higher species concentrations than surrounding landscapes (Stevens, 1989). Adjacent to water sources, floodplains are subject to recurring floods and are continually changing environments. Wetlands are areas saturated by either ground or surface water and contain water-loving plant species.

Canyon water quality is generally considered good in most areas (i.e., below state and Federal standards) though localized exceedances in arsenic, selenium, nutrients, radionuclides, and seasonal, brief exceedances in turbidity do occur. Water quality degradation exists in areas of high visitor use. Through limited sampling, giardia (*Giardia lamblia*) has been detected occasionally and fecal coliform/fecal Streptococcus has been identified in all areas sampled (Gerba et al., 1997).

Several studies were completed in California that determined mules and horses can carry giardia. One study tested pack stock manure and found 4.6% of 305 stock tested did carry giardia (Derlet and Carlson 2003). It is not known if any stock in Grand Canyon National Park have brought giardia into the park, nor is information currently available concerning other impacts stock manure and urine have on water quality.

Water sources that could be affected by actions proposed in this EA include Garden Creek, Pipe Creek, surface water in the Roaring Springs day-use area, and Bright Angel Creek.

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to water resources is based on how changes in stock use and mule operations would affect these resources. Thresholds for this impact assessment are

Negligible Chemical, physical, or biological changes to water quality not detectable

Minor *Adverse* Chemical, physical, or biological changes to water quality detectable and degrade water quality, but within historical baseline or desired water quality conditions

Beneficial Impacts result in detectable improvements to water quality

Moderate *Adverse* Chemical, physical, or biological changes to water quality detectable, but historical baseline or desired water quality conditions only temporarily degraded

Beneficial Impacts result in improved water quality and overall achievement of desired water quality conditions

Major *Adverse* Chemical, physical, and biological changes to water quality represent a significant degradation from historical baseline water quality conditions. Alternations could be long term

Beneficial Significant improvements in water quality also result

Duration *Short-term* One day or less for water resources

Long-term Greater than one day for water resources

Context Effects to water quality proposed under all alternatives localized

Impacts Alternative A No Action

Current stock use and mule operations have potential to directly impact water resources through degradation of water quality and increased erosion. These impacts would result from manure and urine getting into surface water along Corridor Trails. Water-borne bacteria and nutrients from stock waste could impact water resources.

The Indian Garden day-use area, along Bright Angel Trail, is used by concessioner, private, and administrative stock users. Mules or horses are tied to hitching rails or placed in the corral in close proximity to Garden Creek. There is potential for manure and urine to contaminate the creek. Concentrations are expected to be diluted downstream. It is currently unknown how far downstream bacteria would be diluted enough to be rendered harmless, which likely varies with creek dynamics such as flow and turbidity. However, based on best available information, impacts to water quality in this location are expected to be short term minor to moderate and adverse.

Bright Angel Trail crosses Pipe Creek several times, and there is potential for stock manure and urine to enter the creek. Because stock may stop to drink from the creek, but are not necessarily kept for long periods near the creek, impacts are expected to be adverse and negligible.

North Kaibab Trail crosses Bright Angel Creek several times between the rim and Phantom Ranch, and commercial or private stock stopping at the Roaring Springs day-use area can keep stock adjacent to this creek and increase contamination potential. As described previously, stock moving along trails have less potential to impact water quality compared to areas where they may be kept for longer periods. Therefore, these impacts would be minor adverse short term.

Increased erosion as discussed previously under soil resources is inevitable on Grand Canyon's Inner Canyon trails. This erosion is expected to increase turbidity in surface water. Impacts to water quality from erosion on park trails are expected to be adverse short term negligible.

Cumulative Effects Water resources have been previously impacted by loss of soil stabilizing vegetation, erosion, increased turbidity, and changes to water quality. Recently implemented, in-progress, and foreseeable future projects have potential to affect water resources include the South Rim Visitor Transportation Plan from ground disturbance and vegetation removal; exotic plant management activities from vegetation removal; routine trail maintenance to control erosion; and borrow pit use for trail maintenance from removal of vegetation and increased erosion. Water resources are considered and mitigation measures included in most projects to limit impacts such as erosion and water quality degradation. Therefore, when combined with Alternative A, cumulative impacts to water resources would be adverse minor long term.

Conclusion Alternative A implementation would result in moderate adverse short-term impacts from potential contamination of surface water and increased turbidity. Cumulative impacts would be minor adverse long term.

Impacts Alternative B Preferred Alternative

Elements Common to All Action Alternatives not expected to impact water quality include temporary trail closures due to weather and trail conditions, annual limits on rides, increased education of trail users, and continued use of stock for administrative functions.

Actions proposed under all Action Alternatives with potential to impact water quality include monitoring and use of an adaptive management strategy, continued trail maintenance, and relocation of the Indian Garden mule corral. Water quality monitoring would be completed as time and funding allow and could be used to inform any future decisions on stock use through an adaptive management strategy. If stock use were further limited for example, beneficial impacts to water quality would be expected due to decreased potential for contamination of water sources. Continued trail maintenance and efforts to reduce trail run-off and erosion would have beneficial long-term minor impacts on water resources. Relocation of the mule corral within the floodplain at Indian Garden would have long-term beneficial minor impacts on water resources.

Actions proposed under Alternative B also have potential to impact water quality, including elimination of commercial mule rides to Roaring Springs and limited commercial mule rides allowed on Bright Angel Trail. Both of these actions would limit amount of manure and urine near water sources. These impacts would be minor beneficial long term.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor beneficial impacts to water resources. As discussed under Alternative A, impacts have occurred in the past as a result of loss of vegetation, erosion, and changes to water quality. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to soils. Cumulative impacts under Alternative B would be minor beneficial long term.

Conclusion Alternative B implementation would result in minor adverse long-term impacts from potential surface water contamination and increased turbidity primarily along Bright Angel Trail. Minor beneficial long-term impacts would occur from elimination of commercial mule rides to Roaring Springs day-use area and relocation of Indian Garden mule barn. Cumulative impacts would be minor beneficial long term.

Impacts Alternative C South Kaibab/North Kaibab

Actions proposed under Alternative C with potential to impact water quality include elimination of commercial mule rides on Bright Angel Trail and continued commercial mule rides allowed on North Kaibab Trail. Elimination of stock use on Bright Angel Trail would have moderate beneficial impacts to water resources when compared to current use. Conversely, continued commercial mule rides to Roaring Springs day-use area would pose potential adverse impacts to water quality; however, these impacts would be minor - short term due to - low number of stock proposed (10 per day) and seasonality of commercial mule operations (153 days/year).

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor beneficial impacts to water resources. As discussed under Alternative A, impacts have occurred in the past as a result of loss of vegetation, erosion, and changes to water quality. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to soils. Cumulative impacts under Alternative C would be minor beneficial long term.

Conclusion Alternative C implementation would result in moderate beneficial long-term impacts from elimination of stock use from Bright Angel Trail and relocation of Indian Garden mule barn. Adverse impacts would be minor short term from continued commercial mule rides to Roaring Springs day-use area and potential surface water contamination. Cumulative impacts would be minor beneficial long term.

Impacts Alternative D Bright Angel/Uncle Jim

Actions proposed under Alternative D with potential to impact water quality include elimination of commercial mule rides to Roaring Springs day-use area and continued commercial mule rides on Bright Angel Trail. Elimination of stock use on to Roaring Springs would have minor beneficial impacts to water resources from decreased contamination potential. Conversely, continued commercial mule rides on Bright Angel Trail would pose potential moderate adverse impacts to water quality.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse impacts to water resources. As discussed under Alternative A, impacts have occurred in the past as a result of loss of vegetation, erosion, and changes to water quality. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to soils. Cumulative impacts under Alternative D would be minor adverse long term.

Conclusion Alternative D implementation would result in minor beneficial long-term impacts from elimination of stock use to Roaring Springs day-use area and Indian Garden mule barn relocation. Adverse impacts would be moderate from continued commercial mule rides on Bright Angel Trail and potential surface water contamination. Cumulative impacts would be minor adverse long term.

Impacts Alternative E Seasonal/Limited Use

Actions proposed under Alternative E with potential to impact water quality include seasonal stock use on Bright Angel Trail and elimination of commercial mule rides to Roaring Springs day-use area. Seasonal stock use on Bright Angel Trail would have minor beneficial impacts to water resources when compared to current use. Additionally, elimination of commercial mule rides to Roaring Springs would have minor beneficial impacts from reduced potential for surface water contamination.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor beneficial impacts to water resources. As discussed under Alternative A, impacts have occurred in the past as a result of loss of vegetation, erosion, and changes to water quality. Present and reasonably foreseeable future actions are designed to minimize adverse impacts to soils. Cumulative impacts under Alternative E would be minor beneficial long term.

Conclusion Alternative E implementation would result in minor beneficial long-term impacts from reduced potential for surface water contamination through elimination of stock use to Roaring Springs day-use area, seasonal and reduced stock use on Bright Angel Trail, and relocation of Indian Garden mule barn. Cumulative impacts would be minor beneficial long term.

Visitor Experience

Affected Environment

According to NPS Management Policies, enjoyment of park resources and values by people is part of the fundamental purpose of all park units (NPS 2006b). The NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks, and will maintain, within the parks, an open, inviting, and accessible atmosphere to every segment of society. Further, the NPS will provide opportunities for forms of enjoyment uniquely suited and appropriate to superlative natural and cultural resources found in parks. NPS 2006 Management Policies also state scenic views and visual resources are highly valued associated characteristics the NPS should strive to protect (NPS 2006b).

For the last five years, annual park visitation has averaged 4.3 million (NPS 2009a). The most common activities were sightseeing and scenic driving (90% of visitors partake in this activity), taking a self-guided rim walk (68%), shopping (50%), and backpacking or hiking (34%). Other popular activities include camping, white-water rafting, mule rides, photography, painting, lodging at Phantom Ranch, and enjoying wilderness settings in backcountry or front country social settings. While a small minority of visitors engage in stock operations, mule rides have been a part of the Grand Canyon experience for decades.

Commercial mule rides transport approximately 13,025 visitors into the canyon each year. In addition, approximately 2,507 people take commercial mule rides on the rim (see Table 11). Number of visitors that participated in commercial mule rides equals approximately 0.36% of total annual park visitation.

Table 11 Average annual commercial stock use (2002-2008)

Ride	Duration	Number of Rides
South Rim		
Plateau Point	All day	4,904
Phantom Ranch	Overnight	3,411
North Rim		
Ken Patrick to Uncle Jim Junction	One hour	2,362
Uncle Jim Point	Half day	145*
Supai Tunnel	Half day	4,218
Roaring Springs	All day	492

*Rides to Uncle Jim Point were very uncommon prior to 2009; trail maintenance was completed to encourage more commercial stock use

In addition to commercial stock use, approximately 49 private stock users access the Inner Canyon for overnight use each year. It is not known what level of day use occurs below the rim, but it is thought to be fairly low. Day and overnight stock use also occurs on North and South Rim.

In 2006, the average number of hikers on Inner Canyon trails was estimated at 450-800 hikers per day on Bright Angel Trail, 300-600 hikers per day on South Kaibab Trail, and 150-210 hikers per day on North Kaibab Trail (Backlund, et. al 2006).

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to visitor experience is based on how changes in stock operations would affect the visitor, particularly visitors' enjoyment of the park's primary resources. Thresholds for this impact assessment are

Negligible Visitors not affected or changes in visitor use and/or experience below or at level of detection. Any effects short term. Visitors not likely aware of effects associated with the alternative

Minor Changes in visitor use and/or experience detectable, although changes slight and likely short term. Visitors aware of effects associated with the alternative, but effects slight

Moderate Changes in visitor use and/or experience readily apparent and likely long term. Visitors aware of effects associated with the alternative and likely able to express an opinion about changes

Major Changes in visitor use and/or experience readily apparent and have substantial long-term consequences. Visitors aware of effects associated with the alternative and likely to express a strong opinion about changes

Duration *Short-term* A transitory effect or one that largely disappears over a period of hours or days

Long-term An effect lasting months or years

Impacts Alternative A No Action

Current stock use and mule operations directly impact visitor experience, both beneficially and adversely. Many visitors enjoy the presence of mules in South Rim corrals and on Corridor Trails. This use is often recognized by visitors as part of the Grand Canyon experience.

In addition to viewing mules, visitors have opportunities to ride mules on and from both North and South Rim. Commercial mule rides provide an opportunity to access the Inner Canyon, particularly to those visitors who would not be physically capable of hiking. Further, rides provide educational opportunities for visitors to learn about Grand Canyon history, geology, and other natural and cultural resources from mule guides.

Continuation of private overnight stock use in the Inner Canyon has beneficial moderate long-term impacts to visitor experience. Any adverse impacts from private stock use are considered negligible due to low amount of use.

Adverse impacts to visitor experience result primarily from mule waste on the trails, dust generated from stock use, trail conditions, congestion and crowding where mules and hikers congregate, and lack of trail etiquette. Waste, both urine and manure, accumulates on trails, and although some actions are taken by concessioners to remove manure from trails and drain urine pools, impacts to visitors from mule waste on trails continues to be a concern.

Dust generated by stock and trail conditions affect stock users and hikers and have negative impacts on visitor experience. Dust is particularly common during drier months when dirt is easily

kicked up by stock. Trail conditions from the high amount of use on Corridor Trails is of particular concern to park managers and a driving factor for this EA. Large numbers of stock on trails cause impacts including erosion, rutting, and multiple trailing.

Congestion occurs along Corridor Trails, specifically at Cinch Up locations on Bright Angel and North Kaibab Trails where commercial mule rides stop to check saddles and rider safety before proceeding. Congestion is also prevalent at Supai Tunnel on North Kaibab Trail where over 30 mules and riders, plus hikers can congregate at one time. It can be difficult to navigate around stock at this congested location and can pose safety concerns for visitors. Beyond the Cinch Up locations and Supai Tunnel, hikers sometimes get caught behind mules without opportunity to pass, and become frustrated and impatient. Mule guides are aware of this potential and attempt to allow hikers to pass when trail width allows.

Trail etiquette, particularly hikers' knowledge of stock and potential concerns with stock, can cause trail conflicts. For example, stock can be spooked by quick movements and loud noises which not all hikers understand. Further, on Corridor Trails, hikers are expected to yield to stock groups and stay to the inside of the trail for safety of hikers, stock, and riders. Signs are displayed at trailheads and along some trails to inform hikers of trail etiquette; however, concerns still exist. These adverse impacts described for Alternative A are moderate long term.

Stock use in less developed areas, such as Tuweep and on both North and South Rim dirt roads has less potential to impact visitors due to lower visitation to these areas in general. Any impacts in these areas are expected to be negligible.

Cumulative Effects Visitor experience in stock-use areas throughout the park has been impacted by noise, decreased visibility from smoke, traffic delays from construction, and overall aesthetics. These impacts are generally short term minor adverse. However, moderate beneficial long-term impacts such as improved access and quality of experiences throughout the park have also resulted.

Recently implemented, in-progress, and foreseeable future projects have potential to affect visitor experience include the South Rim Visitor Transportation Plan, Bright Angel Trailhead Area Design Plan, Concessions Improvements, Greenway Trail Phase III and V, Hermit Road Rehabilitation, Relocation of Stock Camp to Mather Campground, Backcountry Management Plan, and routine maintenance of trails. Visitor experience is considered and mitigation measures included in park projects to limit impacts to visitors. Therefore, when combined with Alternative A, cumulative impacts to visitor experience would be beneficial minor long term.

Conclusion Alternative A implementation would result in moderate adverse long-term impacts from mule waste on trails, dust generated from stock use, trail conditions, congestion and crowding where mules and hikers congregate, and lack of trail etiquette. Moderate beneficial impacts would result because visitors would continue to have opportunities to ride and view mules in the park. Cumulative impacts would be minor beneficial long term.

Impacts Alternative B Preferred Alternative

Elements Common to All Action Alternatives have potential to affect visitor experience. Tuweep commercial use would continue under all alternatives up to ten trips each year, similar to past use in this area. At Whitmore, no stock use would occur. Limiting commercial use at these locations would have minor beneficial impacts on visitors by minimizing any potential user conflicts or stock

waste on trails. Further, adverse impacts from lack of commercial ride opportunities would be negligible based on current demand and limited use at these remote locations.

Other elements including trail monitoring, use of an adaptive management strategy, trail maintenance and funding, temporary trail closures due to weather and trail conditions, removal of mule waste from the trails, education of trail users, implementation of annual use limits on rides, general retention of stock facilities, and continuation of administrative stock use also would affect visitor experience.

Monitoring and any resultant adaptive management actions (i.e., further limiting stock use on Corridor Trails, temporarily or permanently) would have beneficial and adverse impacts. The intent of adaptive management proposed in this document is to consider and weigh all impacts to trails, natural and cultural resources, visitor experience, and park operations to determine future actions. If further limits were placed on stock use, adverse impacts on visitor opportunity to access the Inner Canyon using stock would occur; however, this would also have beneficial impacts on visitor experience due to better trail conditions and less mule waste on trails. The intent of this strategy is to address all objectives outlined in Chapter 1 as much as possible.

Continued funding for and efforts on trail maintenance would have long-term beneficial impacts to visitors; however, some short-term adverse impacts could result from the trail work itself and associated noise and trail condition during reconstruction and maintenance activities.

Temporary trail closures would occur as necessary when trails are washed out or are impassable to stock and/or hikers. NPS would make efforts to open trails as quickly as possible to all users.

NPS would include specific language in concessioner operating plans and contracts to clean up mule waste from trails. Further, NPS staff would monitor effectiveness of clean-up efforts.

Increased education efforts proposed under *Elements Common to All Action Alternatives* would have beneficial minor long-term impacts on visitor experience from improved understanding of stock use in the park.

Annual use limits proposed under each Action Alternative are discussed more under each alternative and have varying impacts to visitor experience.

General retention of stock facilities has a negligible, slightly beneficial impact on visitor experience because it allows visitors to view stock in facilities such as corrals and mule barns and also provides interpretive opportunities.

Continued use of stock for NPS administrative activities would have negligible impacts on visitor experience. Administrative use of stock is approximately 2,304 mules or 4,608 one-way trips for all Corridor Trails. This adds to amount of overall Corridor Trail stock use, but is not expected to measurably impact visitor experience beyond that of concessioner mule operations. Further, this use supports cleaning and maintenance of Inner Canyon restrooms, trail work, and supply of Inner Canyon staff, all of which has an overall beneficial impact on visitor experience.

Elements Common to All Action Alternatives would have minor beneficial and adverse long term impacts.

Implementation of Alternative B would have impacts on visitor experience from annual use limits set for commercial mule rides for North and South Rim, changes in Inner Canyon stock use from South Rim, designation of an above-rim mule ride, and changes in stock use on North Kaibab and Uncle Jim Trails.

For South Rim, the annual number of commercial mule rides would not exceed 10,000 which is an increase of 1,685 rides from 8,315 current average commercial rides. This would result in a beneficial impact due to increased visitor opportunity. The difference in the rides under this alternative is that Bright Angel Trail rides would be reduced from 20 to no rides to Plateau Point daily; and from 20 to 10 rides to Phantom Ranch daily. Adverse impacts would occur from decreased Inner Canyon rides from South Rim. Beneficial impacts would also occur from decreased user conflicts, particularly on Bright Angel Trail, decreased mule waste, and anticipated improved trail conditions. Another beneficial impact to visitors would be availability of Phantom Ranch rooms for hikers.

Commercial mule rides would occur on a new above-rim ride that would begin at South Kaibab Trailhead barn and proceed along the rim east toward Shoshone Point. Up to 40 rides would be allowed daily. Beneficial impacts would occur from a new above-rim ride visitor opportunity. Indirect adverse impacts from this ride on visitor experience would include impacts to natural and cultural resources and development in a generally undeveloped area.

A majority of concessioner mules and mule operations would be moved to the South Kaibab Trailhead barn from the Village barn under this alternative. Improvements at South Kaibab Trailhead mule barn area are not expected to measurably impact visitor experience although some short-term adverse impacts could occur during construction activities. Because some mules would remain in the historic Grand Canyon Village barn, no measurable adverse impacts are expected from moving a majority of mule operations to South Kaibab Trailhead barn.

For North Rim, annual number of commercial mule rides would not exceed 8,000 which is an increase of 928 rides from 7,072 current average commercial rides. This would result in a beneficial impact due to increased visitor opportunity.

On North Kaibab Trail, mule rides would continue to Supai Tunnel up to 40 per day compared to the unlimited number of rides allowed in the past. No commercial mule rides would be offered below Supai Tunnel to Roaring Springs as previously allowed. In addition, no more than 20 rides would be allowed at Supai Tunnel at one time which is proposed to limit congestion at this location. Impacts from changes in rides on North Kaibab Trail are expected to be mostly beneficial. One adverse impact includes elimination of an opportunity to ride to Roaring Springs; however, because an average of three to four rides occurred daily, impacts would be considered negligible.

Under this alternative, up to 20 rides would be allowed to Uncle Jim Point daily, and 40 rides to Ken Patrick and Uncle Jim Junction. Beneficial impacts to visitor experience would occur from the opportunity for rides to these locations similar to current condition. Adverse impacts from high use levels on these trails would result in greater potential for user conflicts and increased mule waste on the trail.

Proposed installation of a composting toilet and retention of hitching rails at Uncle Jim Point would also impact visitor experience. Beneficial impacts would include less toilet paper scattered in the forest around Uncle Jim Point. Adverse impacts include development in an undeveloped area, diminished visual quality of the area, and increased trail use.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be moderate adverse long term and moderate beneficial long term.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate beneficial long-term impacts to visitor experience. As discussed under Alternative A, adverse impacts have occurred in the past as a result of noise, decreased visibility from smoke, traffic delays from construction, and overall aesthetics. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to visitor experience. Cumulative impacts under Alternative B would be moderate beneficial long term.

Conclusion Alternative B implementation would result in moderate adverse long-term impacts to visitors seeking commercial stock use opportunities from proposed reduction of Inner Canyon commercial mule rides available from South Rim; limits placed on commercial mule rides from and on North Rim, including elimination of commercial stock use below Supai Tunnel on North Kaibab Trail; and potential for continued conflicts and mule waste on park trails. Moderate beneficial long-term impacts to hikers are expected from active management of mule waste on trails; continued opportunities for visitors to ride mules in Grand Canyon, both commercially and privately; improved trail conditions on Corridor Trails; and increased education of park visitors. Cumulative impacts would be moderate beneficial long term.

Impacts Alternative C South Kaibab/North Kaibab

Implementation of Alternative C would have impacts on visitor experience from annual use limits set for commercial mule rides for North and South Rim, elimination of stock use on Bright Angel Trail, designation of an above-rim ride, reinstatement of rides to Roaring Springs on North Kaibab Trail, and changes in stock use on Uncle Jim Trail.

For South Rim, annual commercial mule rides would not exceed 12,000, an increase of 3,685 rides from 8,315 current average commercial rides. This would result in a beneficial impact due to increased visitor opportunity. The difference in rides under this alternative is that rides on Bright Angel Trail would cease; all rides would occur on South Kaibab Trail. Adverse impacts would occur from elimination of rides on Bright Angel Trail, specifically to Plateau Point. Inner Canyon rides would occur at 20 rides to Phantom Ranch each day to stay overnight, 10 rides to Cedar Ridge and back each day, and 20 rides from Phantom Ranch each day. This is an overall decrease in Inner Canyon rides from South Rim. Beneficial impacts would occur from decreased user conflicts, decreased mule waste, and improved trail conditions on Bright Angel Trail. Adverse impacts similar to those described in Alternative A would occur on South Kaibab Trail including increased mule waste and potential user conflicts, and deteriorated trail conditions particularly between the rim and Cedar Ridge.

An above-rim ride on South Rim, as described in Alternative B, would occur at up to 60 rides per day. Beneficial impacts would occur from this new above-rim ride opportunity for visitors. Indirect adverse impacts from this ride on visitor experience would include impacts to natural and cultural resources, and development in a generally undeveloped area.

Changes in location of concessioner stock operations would be the same as those described in Alternative B.

For North Rim, annual commercial mule rides would not exceed 6,000, a decrease of 1,072 rides compared to 7,072 current average commercial rides. This would result in an adverse impact due to decreased visitor opportunity.

On North Kaibab Trail, mule rides would continue to Supai Tunnel at up to 40 per day compared to the unlimited number of rides allowed in the past. Up to 10 commercial mule rides would be offered from the rim to Roaring Springs, an increase from the average 3 to 4 rides per day. Impacts from changes in rides on North Kaibab Trail are expected to be mostly beneficial due to increased visitor opportunities. Adverse impacts would occur from congestion at Supai Tunnel, and mule waste on the trails.

Under this alternative, up to 10 rides would be allowed to Uncle Jim Point daily, and 30 rides to Ken Patrick and Uncle Jim Junction. Beneficial impacts to visitor experience would occur from continued opportunity of rides to these locations, and decreased potential for user conflicts. Adverse impacts would occur from the decrease in rides available on these trails, and increased use of trail to Uncle Jim Point which could impact trail conditions and increase mule waste on this trail section.

Proposed removal of hitching rails and temporary toilet at Uncle Jim Point would also impact visitor experience. Beneficial impacts would include decreased development and disturbance in this area. Adverse impacts would include potential increases in human waste and toilet paper in the forest near Uncle Jim Point.

Overall impacts of Alternative C and Elements Common to All Action Alternatives would be moderate adverse long term and moderate beneficial.

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate beneficial long-term impacts to visitor experience. As discussed under Alternative A, adverse impacts have occurred in the past as a result of noise, decreased visibility from smoke, traffic delays from construction, and overall aesthetics. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to visitor experience. Cumulative impacts under Alternative C would be moderate beneficial long term.

Conclusion Alternative C implementation would result in moderate adverse long-term impacts of increased soil erosion and compaction on South Kaibab Trail, elimination of stock use on Bright Angel Trail, improvements at South Kaibab Trailhead, and decreased rides on Ken Patrick and Uncle Jim Trails. Beneficial impacts to hikers from elimination of stock use on Bright Angel Trail, and decreased trail mule waste and user conflicts, and reinstatement of rides to Roaring Springs on North Kaibab Trail would be moderate long term. Cumulative impacts would be moderate beneficial long term.

Impacts Alternative D Bright Angel/Uncle Jim

Implementation of Alternative D would have impacts on visitor experience from annual use limits set for commercial mule rides for North and South Rim, elimination of stock use on South Kaibab Trail, designation of an above-rim mule ride, and decreased stock use on North Kaibab Trail, and increased stock use on Uncle Jim Trail.

For South Rim, annual commercial mule rides would not exceed 8,000, a decrease of 315 rides from 8,315 current average commercial rides. This would result in a beneficial impact due to increased visitor opportunity. The difference in rides under this alternative is that rides on South Kaibab Trail would cease, all rides would occur on Bright Angel Trail. Adverse impacts would occur from elimination of rides on South Kaibab Trail. Rides would occur at 20 rides to Phantom Ranch or Plateau Point each day. This is an overall decrease in Inner Canyon rides from South Rim. Beneficial impacts would occur from decreased user conflicts and mule waste, and improved trail conditions on South Kaibab Trail. Adverse impacts similar to those described in Alternative A would occur on Bright Angel Trail including increased mule waste and potential user conflicts, and deteriorated trail conditions.

Impacts to visitor experience could also occur from implementation of an above-rim ride that would follow the existing temporary ride alignment from the Village, along Rowe Well Road, to the Abyss. This alignment has been used since October 2009, and provides opportunities for visitors to ride a mule to the canyon rim. Under this alternative, up to 40 rides would be available each day. Impacts from ride availability are beneficial.

For North Rim, annual commercial mule rides would not exceed 8,000, an increase of 928 rides compared to 7,072 current average commercial rides. This would result in a beneficial impact due to increased visitor opportunity.

On North Kaibab Trail, mule rides would continue to Supai Tunnel at up to 20 per day compared to the unlimited number of rides allowed in the past. No rides to Roaring Springs would occur. Impacts from changes in rides on North Kaibab Trail are expected to be beneficial due to decreased trail user conflicts and mule waste. Adverse impacts would occur from decreased visitor opportunities to ride into the canyon from North Rim, and elimination of rides to Roaring Springs.

Under this alternative, up to 20 rides would be allowed to Uncle Jim Point daily, and 50 rides to Ken Patrick and Uncle Jim Junction. Beneficial impacts to visitor experience would occur from increased opportunity of rides to these locations. Adverse impacts would occur from increased potential for user conflicts and mule waste on this trail.

Proposed installation of a composting toilet and retention of hitching rails at Uncle Jim Point would have impacts as described in Alternative B. Beneficial impacts would include less toilet paper scattered in the forest around Uncle Jim Point. Adverse impacts include development in an undeveloped area, diminished visual quality of the area, and increased use of the trail.

Overall impacts of Alternative D and Elements Common to All Action Alternatives would be moderate adverse long term and moderate beneficial.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate beneficial long-term impacts to visitor experience. As discussed under Alternative A, adverse impacts have occurred in the past as a result of noise, decreased visibility from smoke, traffic delays from construction, and overall aesthetics. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to visitor experience. Cumulative impacts under Alternative D would be moderate beneficial long term.

Conclusion Alternative D implementation would result in moderate adverse long-term impacts of increased soil erosion and compaction on Bright Angel Trail, elimination of stock use on South

Kaibab Trail, and decreased rides on North Kaibab Trail. Beneficial impacts from elimination of stock use on South Kaibab Trail and decreased mule waste and user conflicts on the trail, and increased number of mule rides on Ken Patrick and Uncle Jim Trails would be moderate long term. Cumulative impacts would be moderate beneficial long term.

Impacts Alternative E Seasonal/Limited Use

Implementation of Alternative E would have impacts on visitor experience from annual use limits set for commercial mule rides for North and South Rim, seasonal stock use on South Rim trails into the canyon, no designation of an above-rim ride, and limited commercial stock use from and on North Rim.

For South Rim, annual commercial mule rides would not exceed 6,000, a decrease of 2,315 rides from 8,315 current average commercial rides. This would result in an adverse impact due to decreased visitor opportunity. The difference in rides under this alternative is that stock use from South Rim, on both South Kaibab and Bright Angel Trails would only occur April through December; no stock use would occur January through March. April-December rides would occur at 20 rides to Phantom Ranch down the Bright Angel each day, and 20 rides from Phantom Ranch up South Kaibab Trail. Beneficial impacts would occur from decreased user conflicts and mule waste, and improved trail conditions on both South Kaibab and Bright Angel Trails.

For North Rim, annual commercial mule rides would not exceed 6,000, a decrease of 1,072 rides compared to 7,072 current average commercial rides. This would result in an adverse impact due to decreased visitor opportunity.

On North Kaibab Trail, mule rides would continue to Supai Tunnel at up to 10 per day compared to the unlimited number of rides allowed in the past. No rides to Roaring Springs would occur. Impacts from changes in rides on North Kaibab Trail are expected to be beneficial due to decreased user conflicts and mule waste on the trail. Adverse impacts would occur from decreased visitor opportunities to ride into the canyon from North Rim, and elimination of rides to Roaring Springs.

Under this alternative, up to 10 rides would be allowed to Uncle Jim Point daily, and 30 rides to Ken Patrick and Uncle Jim Junction, similar to current use. Beneficial impacts to visitor experience occur from continued opportunity of rides to these locations, potential decrease in mule waste and visitor conflicts on the trail.

Proposed removal of hitching rails and temporary toilet at Uncle Jim Point would also impact visitor experience. Beneficial impacts would include decreased development and disturbance in this area. Adverse impacts would include potential increases in human waste and toilet paper in the forest near Uncle Jim Point.

Overall impacts of Alternative E and Elements Common to All Action Alternatives would be moderate adverse long term and moderate beneficial.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate beneficial long-term impacts to visitor experience. As discussed under Alternative A, adverse impacts have occurred in the past as a result of noise, decreased visibility from smoke, traffic delays from construction, and overall aesthetics. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to visitor experience. Cumulative impacts under Alternative E would be moderate beneficial long term.

Conclusion Alternative E implementation would result in moderate adverse long-term impacts from decreased opportunities for mule rides on and from South Rim, elimination of stock use to Roaring Springs, and decreased rides on and from North Rim. Beneficial impacts from seasonal and limited stock use would result in decreased mule waste and user conflicts on the trail; improved trail conditions would be moderate long-term. Cumulative impacts would be moderate beneficial long term.

Park Operations

Affected Environment

Park operations refer to adequacy of staffing levels and quality and effectiveness of park infrastructure in protecting and preserving vital resources and providing for effective visitor experience. Infrastructure facilities include roads providing access to and within the park, housing for staff required to work and live in the park, visitor orientation facilities, administrative buildings, management-support facilities, and utilities such as phones, sewer, water, and electric. For this project, infrastructure with potential to be affected includes trails open to stock use, supply delivery to Phantom Ranch, and buildings used in stock operation support.

The park Superintendent is ultimately responsible for park operations management. In 2008, the park employed 445 full-time staff (NPS 2009a) to manage operations including visitor services and facilities, resource management and preservation, planning and environmental compliance, emergency medical services, law enforcement, search and rescue operations, fire center operations, air operations, facilities management and maintenance, and administrative duties. The divisions that would work on components of this project include Facilities Management (trails, facilities, monitoring), Visitor and Resource Protection (backcountry permits, Inner Canyon rangers), Concessions (contracts, commercial use authorizations), Interpretation (signage, information, learning), and Science and Resource Management (resource protection, monitoring) divisions.

The park's trail crew in the Facilities Management Division maintains all designated trails and routes, including Corridor Trails, Ken Patrick, and Uncle Jim Trails. Trail crew conducts routine trails maintenance and rehabilitation and is also responsible for maintaining toilets along these trails.

The Backcountry Information Center (BIC) manages the permit program for overnight use in the park's backcountry and on Corridor Trails. The permit program includes private stock campsites at Phantom Ranch, Cottonwood, and North Rim. BIC staff provides information to private stock groups on the park's website and through handouts at the BIC.

Canyon District rangers are responsible for visitor education, law enforcement, emergency medical response, and verifying backcountry permits for visitors staying overnight in the canyon.

The Concessions Division manages the park's concession contracts for commercial mule rides operating in the park. To do this, the division develops contracts, administers fees, oversees operations, and sets rates for services provided under contracts. The Concessions Division also issues commercial-use authorizations for stock rides at Tuweep, although the level of oversight for this type of permit is much lower than for contracts.

The Science and Resource Management division conducts, coordinates, and contracts for resource management and research activities, often in close cooperation with other park divisions,

cooperators, and tribes. In cooperation with park rangers, trail crew, and other park staff, Science and Resource Management staff design and implement projects to address resource concerns and impacts, including visitor impacts on vegetation, archeological sites, wildlife habitat, water quality, and trail condition.

Cost and funding is also considered part of park operations. Trail maintenance in particular is very expensive, and although not the only factor in determining park stock use levels, cost is considered.

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to park operations is based on how changes in stock use and mule operations would affect these resources, specifically along trails and in any construction activities. The thresholds for this impact assessment are as follows

Negligible A change in operations localized and barely perceptible or measurable. No measurable difference in operating costs from existing levels, and no change in financial balance between revenue sources and operating costs. Park operations not affected or effect at or below lower levels of detection; no appreciable effect on park operations

Minor A change in operations slight and localized, with few measurable consequences in existing park facilities. Additions or reductions in operations costs less than 15% of existing levels. Slight change in current staffing arrangements or operations required to reach a balance with funding

Moderate A change readily apparent, with measurable consequences and occurs inside and outside park boundaries. Additions or reductions in operating costs between 16% and 30% of existing levels. Changes required in park operations or result in a financial imbalance between available funding and annual operating costs

Major A change readily apparent, with measurable consequences over a regional area. Additions or reductions in operating costs more than 30% of existing levels. Changes require new administrative structures and/or result in a significant financial imbalance between available funding and annual operating costs

Duration *Short-term* A few days to one month

Long-term Greater than one month

Impacts Alternative A No Action

Current stock use and mule operations directly impact park operations through management of concession contracts for stock use, issuance of permits for private stock use, contact between park staff and stock users, and trail, campground, and restroom maintenance.

Impacts to park operations from management of concession contracts for stock use, issuance of permits for private stock use, and contact between park staff and stock users is negligible.

Trail maintenance is the primary impact on park operations due to the funding level needed to maintain Corridor Trails. As discussed in Chapter 1, the park spends $1.5 to $2 million dollars yearly to minimally maintain Corridor Trails. These trails are susceptible to erosion from natural events and from high use levels on all three trails: Bright Angel, South Kaibab, and North Kaibab.

Deferred maintenance costs are over $24 million, and this cost will continue to increase as trails deteriorate if actions are not taken to either reduce impacts to trails or substantially increasing the trail work amount and funding. Impacts to park operations under the No Action Alternative are adverse long term moderate.

Cumulative Effects Park operations have been impacted in the past by routine park functions such as maintenance, visitor and resource protection, administration, construction projects, and transportation planning. These actions have caused adverse and beneficial impacts. Adverse impacts include increased work, decreased efficiency and productivity, and increased cost. Beneficial impacts include projects and programs more efficient, productive, and cost effective.

Recently implemented, in-progress, and foreseeable future projects have potential to affect park operations include the South Rim Visitor Transportation Plan, Bright Angel Trailhead Area Design Plan, Concessions Improvements, Hermit Road Rehabilitation, Relocation of Stock Camp to Mather Campground, Backcountry Management Plan, and routine maintenance of trails. Park operations are considered and mitigation measures included in most projects to limit any adverse impacts. These impacts are adverse long term minor. Therefore, when combined with Alternative A, cumulative impacts to park operations would be adverse moderate long term.

Conclusion Alternative A implementation would result in moderate long-term adverse impacts from high deferred maintenance costs on Corridor Trails, and high costs to minimally maintain these trails. Cumulative impacts would be moderate adverse long term.

Impacts Alternative B Preferred Alternative

The following *Elements Common to All Action Alternatives* have little potential to affect park operations: continued Tuweep commercial use, no stock use on Whitmore Trail, removal of mule waste from trails, continued administrative stock use, and implementation of annual use limits on mule rides.

Other elements including trail monitoring and use of an adaptive management strategy, trail maintenance and funding, temporary trail closures due to weather and trail conditions, and increased education of trail users would affect park operations.

Monitoring and any resultant adaptive management actions (i.e., further limiting stock use on Corridor Trails, temporarily or permanently) would have beneficial and adverse impacts. The intent of adaptive management proposed in this document is to consider and weigh all impacts to trails, natural and cultural resources, visitor experience, park operations, etc., to determine future actions. If future actions are determined necessary, effect on park operations would be considered. If further limits were placed on stock use, for example, this would have minor beneficial impacts on park operations by further limiting trails impacts and allowing for a higher degree of trail maintenance. Monitoring of trail conditions and resource impacts would have minor adverse impacts on park operations because it would require Facility Management and Science and Resource Management staff to complete assessments. This work is not routine and would add to existing workloads.

Continued trail maintenance funding would have long-term adverse impacts on park operations due to the substantial amount required to maintain Corridor Trails. Temporary trail closures that would occur as necessary would also have adverse impacts on park operations from increased cost to reopen trails as quickly as possible.

Increased education efforts proposed under *Elements Common to All Action Alternatives* would have adverse minor long-term impacts on park operations from efforts and costs associated with development of educational materials.

Elements Common to All Action Alternatives would have minor beneficial and minor adverse long-term impacts on park operations.

Implementation of Alternative B would also have impacts on park operations from changes in number of commercial mule rides into the canyon from South Rim, designation of an above rim mule ride, changes in stock use on North Kaibab and Uncle Jim Trail, maintenance of trails and restrooms, and installation of composting toilet at Uncle Jim Point.

Proposed changes in number of rides going into the canyon from South Rim are expected to reduce the amount of trail maintenance required, particularly on Bright Angel Trail where the number of one-way mule trips would decrease from 14,541 to 4,015. On South Kaibab Trail, stock use would continue similar to current use. Impacts to park operations would be moderate beneficial long term when compared to current condition.

Implementation of a new above-rim ride along the rim to the east toward Shoshone Point would have minor adverse impacts to park operations from park staff time to develop trail alignment and implement mitigation measures. Trail development would need to be coordinated with Science and Resource Management staff to avoid sensitive resources along the proposed trail alignment. Further, if sensitive resources could not be avoided, Science and Resource Management staff would work to mitigate any adverse impacts.

A majority of concessioner mules and mule operations would be moved to South Kaibab Trailhead area from the Village barn under this alternative. Improvements at South Kaibab Trailhead barn are not expected to measurably impact park operations although some minor adverse impacts could occur during construction activities and from increased traffic associated with mule operations.

On North Kaibab Trail, the limit of 40 rides per day to Supai Tunnel and no rides to Roaring Springs would have beneficial impacts to park operations from decreased trail maintenance needs below Supai Tunnel. However, these impacts are expected to be negligible.

Under this alternative, up to 20 rides would be allowed to Uncle Jim Point daily, and 40 rides to Ken Patrick and Uncle Jim Junction. Adverse impacts would result from increased trail maintenance to Uncle Jim Point. Additionally, proposed installation of a composting toilet at Uncle Jim Point would require maintenance which would have some minor adverse impacts on park operations.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be minor adverse long term and moderate beneficial long term.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor beneficial long-term impacts to park operations.

As discussed under Alternative A, adverse and beneficial impacts have occurred in the past from increased work load, decreased efficiency and productivity, and increased cost to the park; and more efficient, productive, and cost effective projects and programs. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to park operations. Cumulative impacts under Alternative B would be minor beneficial long term.

Conclusion Alternative B implementation would result in minor adverse long-term impacts from proposed reduction of Inner Canyon commercial mule rides available from South Rim; limits placed on commercial mule rides from and on North Rim, including elimination of commercial stock use below Supai Tunnel on North Kaibab Trail; and needs for monitoring and resource protection. Moderate beneficial long-term impacts are expected from decreased trail maintenance costs on Corridor Trails. Cumulative impacts would be minor beneficial long term.

Impacts Alternative C South Kaibab/North Kaibab

Implementation of Alternative C would result in impacts to park operations from elimination of stock use from Bright Angel Trail, exclusive use of South Kaibab Trail for stock use, designation of an above-rim mule ride, changes in stock use on North Kaibab and Uncle Jim Trails, and maintenance of trails and restrooms.

One-way commercial mule trips on Bright Angel Trail would decrease from 14,541 to 0. Administrative stock use would continue on Bright Angel Trail to support Indian Garden staff, and restroom and trail maintenance. Impacts from decreased trail maintenance costs on this trail are expected to be moderate beneficial long term.

Increased commercial stock use on South Kaibab Trail from 11,205 to 32,850 one-way trips would have moderate adverse impacts to park operations from increased cost and trail maintenance.

Implementation of a new above-rim ride along the rim to the east toward Shoshone Point, and changes to the South Kaibab Trailhead mule barn area would have minor adverse impacts to park operations as described under Alternative B.

On North Kaibab Trail, the 40 rides per day to Supai Tunnel and 10 rides to Roaring Springs would have minor long-term adverse impacts to park operations from increased trail maintenance needs below Supai Tunnel.

Under this alternative, up to 10 rides would be allowed to Uncle Jim Point daily, and 30 rides to Ken Patrick and Uncle Jim Junction. Beneficial impacts would result from decreased trail maintenance needs to Uncle Jim Point. Additionally, temporary toilet and hitching rails at Uncle Jim Point would be removed and would not require maintenance or have impacts on park operations.

Overall impacts of Alternative C and Elements Common to All Action Alternatives would be moderate beneficial long term and moderate adverse long term.

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse long-term impacts to park operations. As discussed under Alternative A, adverse and beneficial impacts have occurred in the past from increased work load, decreased efficiency and productivity, and increased cost to the park, and more efficient, productive, and cost effective projects and programs. Present and reasonably

foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to park operations. Cumulative impacts under Alternative C would be minor adverse long term.

Conclusion Alternative C implementation would result in moderate adverse long-term impacts from increase of commercial stock use on the South Kaibab Trail, and allowance of commercial mule rides to Roaring Springs on North Kaibab Trail. Moderate beneficial long-term impacts are expected from decreased trail maintenance costs on Bright Angel, Ken Patrick, and Uncle Jim Trail. Cumulative impacts would be minor adverse long term.

Impacts Alternative D Bright Angel/Uncle Jim

Implementation of Alternative D would impact park operations from elimination of stock use from South Kaibab Trail, exclusive uses of Bright Angel Trail for stock use, designation of an above-rim ride, changes in stock use on North Kaibab and Uncle Jim Trails, and maintenance of trails and restrooms that support stock use.

One-way commercial mule trips on South Kaibab Trail would decrease from 11,205 to 0. Administrative stock use would continue on South Kaibab Trail to support restroom and trail maintenance activities. Impacts from decreased trail maintenance costs on this trail are expected to be moderate beneficial long term.

Increased commercial stock use on Bright Angel Trail from 14,541 to 24,850 one-way trips would have moderate adverse impacts to park operations from increased costs and trail maintenance.

Impacts to park operations would be minimal from implementation an above-rim ride that would follow the existing temporary ride alignment from the Village, along Rowe Well Road, to the Abyss.

On North Kaibab Trail, the 20 rides per day to Supai Tunnel, and no rides to Roaring Springs would have minor long-term beneficial impacts to park operations from decreased trail maintenance needs on the trail from the rim to Roaring Springs.

Under this alternative, up to 20 rides would be allowed to Uncle Jim Point daily, and 50 rides to Ken Patrick and Uncle Jim Junction. Minor adverse impacts would result from increased trail maintenance to Uncle Jim Point. Additionally, proposed installation of a composting toilet at Uncle Jim Point would require maintenance and have some minor adverse impacts on park operations.

Overall impacts of Alternative D and Elements Common to All Action Alternatives would be moderate beneficial long term and moderate adverse long term.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse long-term impacts to park operations. As discussed under Alternative A, adverse and beneficial impacts have occurred in the past from increased work load, decreased efficiency and productivity, and increased cost to the park; as well as more efficient, productive, and cost effective projects and programs. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to park operations. Cumulative impacts under Alternative D would be minor adverse long term.

Conclusion Alternative D implementation would result in minor adverse long-term impacts from increase of commercial stock use on Bright Angel Trail, and increased stock use on Ken Patrick and Uncle Jim Trails. Moderate beneficial long-term impacts are expected from decreased trail maintenance costs on South Kaibab and North Kaibab Trails. Cumulative impacts would be minor adverse long term.

Impacts Alternative E Seasonal/Limited Use

Implementation of Alternative E would have impacts on park operations from seasonal and limited stock use on Inner Canyon trails and continued maintenance of trails and restrooms that support stock use.

Stock use on Bright Angel and South Kaibab Trails would be allowed April through December; no private or commercial stock use would occur January through March. Seasonal use is designed to address trail maintenance and vulnerability during snow melt. The number of one-way mule trips on Bright Angel is expected to decrease from 14,541 to 6,050. One-way mule trips on South Kaibab Trail would increase from 11,205 to 12,050, including supply mules. Administrative stock use would continue on a limited basis January through March. Impacts from decreased trail maintenance costs on this trail are expected to be moderate beneficial long term.

On North Kaibab Trail, 10 rides per day to Supai Tunnel, and no rides to Roaring Springs would have minor long-term beneficial impacts to park operations from decreased trail maintenance on the trail between the rim and Roaring Springs.

Under this alternative, up to 10 rides would be allowed to Uncle Jim Point daily, and 30 rides to Ken Patrick and Uncle Jim Junction. Beneficial impacts would result from decreased trail maintenance to Uncle Jim Point. Additionally, temporary toilet and hitching rails at Uncle Jim Point would be removed and would not require maintenance or have impacts on park operations.

Overall impacts of Alternative E and Elements Common to All Action Alternatives would be moderate beneficial long term and no measurable adverse impacts.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate beneficial long-term impacts to park operations. As discussed under Alternative A, adverse and beneficial impacts have occurred in the past from increased work load, decreased efficiency and productivity, and increased cost to the park; as well as more efficient, productive, and cost effective projects and programs. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to park operations. Cumulative impacts under Alternative E would be moderate beneficial long term.

Conclusion Alternative E implementation would result in moderate beneficial long-term impacts from decreased commercial stock use on Corridor Trails, Ken Patrick and Uncle Jim Trails, and projected decreases in trail maintenance costs. Cumulative impacts would be moderate beneficial long term.

Socioeconomic Environment

About 4.3 million visitors travel to Grand Canyon National Park annually, making it Arizona's top tourist destination. June, July, and August are the busiest months, with March, April, May, September, and October being fairly busy as well. Complementing visitation are the 2,000 residents of Grand Canyon Village and the nearby community of Tusayan (just south of the south entrance). About 400 of these people are employed by the NPS, with many of the remainder working for one of the park's concessioners or the Tusayan businesses.

Visitors find a wide variety of guest services available at South Rim (North Rim has one lodge with two restaurants and livery services). Hotels, the most visible service (garnering the most revenue), range from the expensive El Tovar to more moderately-priced rooms at Maswik and Yavapai. If every room were filled to capacity, over 3,200 people could be accommodated (including those at Phantom Ranch). Illustrating the park's wide appeal, Xanterra South Rim, LLC reports a 98% occupancy rate March to October, (by comparison, Coconino County, Arizona, reports high season occupancies at 71%). Even when slower winter months are included (with some lodging facilities closed), occupancy rates still average 93% annually. In addition to hotels, visitors find about a dozen different restaurants and an equal number of gift shops available.

In 2008, visitors and employees collectively spent $88.6 million at South Rim's Xanterra facilities (gross receipts), plus another $12.8 million at North Rim's Delaware North's retail and food outlets, and $5.1 million at Grand Canyon Association bookstores. Lodging sales accounted for 36% of the total Xanterra South Rim, LLC revenue, with souvenirs accounting for 30%, and restaurant sales 28%. Mule rides and transportation account for most of the rest of the sales; visitors spend a little under $2 million per year on mule rides (NPS 2009b). In 2008, gross income for the current North Rim mule-ride concessioner, Canyon Trail Rides, was $433,975, and averaged $387,283 for 2004-2008 (NPS 2009d).

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to the socioeconomic environment is based on how changes in stock use and mule operations would affect concessioners and other businesses, visitor and employee spending, and employment. The thresholds for this impact assessment are as follows

Negligible Effects below detectable levels or detectable only through indirect means and with no discernible effect on the character of the social and economic environment

Minor Effects detectable, but localized in geographic extent or size of population affected and not expected to alter the character of the established social and economic environment

Moderate Effects readily detectable across a broad geographic area or segment of the community and could have an appreciable effect on the social and economic environment

Major Effects readily apparent, affect a large segment of the population, extend across the entire community or region, and likely have a substantial effect on the social and economic environment

Duration *Short-term* Impacts last five years or less

Long-term Impacts last longer than five years

Impacts Alternative A No Action

Direct impacts to the social and economic environment from stock use in Grand Canyon National Park include income generated by mule rides, number of people employed to support stock operations, visitor spending of those who participate in mule rides, and impacts to Phantom Ranch lodging. Indirect impacts could affect mule feed suppliers, and other external support for concessioner stock operations. However, these indirect impacts are expected to be negligible under all alternatives.

Under the No Action alternative, impacts to the social and economic environment would remain in current condition without any measurable changes. Concessioner income from mule rides could be impacted by the global economy and changes in visitor demand for mule rides, but is not expected to increase or decrease significantly when compared to current condition.

Visitor spending related to mule rides is generally unknown; however, the number of visitors who participate in mule rides is approximately 0.36% of all visitors to Grand Canyon National Park. Therefore, visitor spending in the park and in gateway communities is not expected to be measurably affected.

Continuation of mule rides on North and South Rim without any proposed changes would result in a sustained number of employees to support stock use and mule rides, including mule guides, packers or wranglers, and employees at Phantom Ranch.

Cumulative Effects Impacts have occurred on social and economic environment from construction projects. These actions have generally resulted in short-term minor beneficial impacts from increased job opportunities for specific construction projects.

Recently implemented, in-progress, and foreseeable future projects that have potential to affect the socioeconomic environment include the South Rim Visitor Transportation Plan, Bright Angel Trailhead Area Design Plan, Concessions Improvements, Hermit Road Rehabilitation, and Supai Camp Improvements. Impacts of these projects include economic output, employment, labor income, and housing. Socioeconomic environment is considered and mitigation measures included in park projects to limit adverse impacts. These overall impacts are beneficial minor short and long term. Therefore, when combined with Alternative A, cumulative impacts to socioeconomic environment would be beneficial minor long term.

Conclusion Alternative A implementation would result in minor long-term beneficial impacts from continued concessioner income, employment, and visitor spending related to stock use. Cumulative impacts would be minor beneficial long term.

Impacts Alternative B Preferred Alternative

In general, the *Elements Common to All Action Alternatives* have little potential to affect socioeconomic environment. Continued commercial use at Tuweep, and no stock use on Whitmore Trail would not have measurable impacts to local businesses, employment, or visitor spending. Use

at Tuweep is very low, between three and four commercial stock groups per year, and no stock use occurs on Whitmore Trail. Active mule waste removal from trails, continued administrative stock use, monitoring of trails and resources, increased education of trail users, and continued funding and accomplishment of trail maintenance is also not expected to impact socioeconomic environment.

Elements with potential to impact concessioners, employment, and visitor spending are use of an adaptive management strategy, temporary trail closures due to weather and trail conditions, and implementation of annual use limits on commercial mule rides.

Use of an adaptive management strategy, and any future changes to stock use in the park, would consider socioeconomic impacts, particularly the number of jobs affected and feasibility of commercial stock operations based on any proposed changes. It is expected that any future actions, such as additional stock use restrictions, would have minor to moderate adverse impacts from a direct decrease in number of jobs needed to support commercial mule operations.

Temporary trail closures due to weather or trail conditions would have some impacts on mule concessions and riders because no rides would occur during temporary trail closures. However, the NPS would work to open trails quickly and therefore closures would have short-term minor and adverse impacts to mule concessions.

Implementation of annual use limits has potential to impact socioeconomic environment, and is discussed for each alternative as limits vary.

Elements Common to All Action Alternatives would have minor to moderate adverse long-term impacts on socioeconomic environment.

Implementation of Alternative B would also have impacts on socioeconomic environment from the small allowance of growth in commercial mule ride number available on both North and South Rim, and improvements to the South Kaibab Mule barn.

On South Rim, mule rides would increase from current average annual use of 8,315 to 10,000. The type of rides proposed, however, is different than current. Only 10 rides would go to Phantom Ranch each day and up to 40 rides would occur each day on an above-rim ride. Mule rides are part of the overall South Rim hospitality contract, and represent a small amount of total income for the concessioner. Although this represents a significant reduction in Inner Canyon rides, it also provides a new type of ride above the rim. Because this new ride would be less expensive, less time-consuming, and accommodate heavier riders than Inner Canyon rides, it is expected to be popular. These changes are expected to have minor adverse impacts on concessioner income and number of jobs needed to support mule operations and Phantom Ranch. Impacts on visitor spending are expected to be negligible.

The proposed above-rim ride could also have indirect impacts on businesses offering similar services (e.g. horseback rides) outside the park. These impacts are expected to be minor, adverse and long term.

On North Rim, commercial mule rides would also be allowed a small increase from 7,072 on average each year to 8,000 annually. Elimination of rides to Roaring Springs would have some adverse impacts because this most expensive ride option generated a considerable amount of income for the concessioner. Under Alternative B, up to 40 rides would occur each day to Supai

Tunnel, 40 to Ken Patrick and Uncle Jim Junction, and 20 to Uncle Jim Point. The 8,000 ride limit would not allow for each of these three rides to be booked to capacity for all 153 days of the North Rim season. If rides were filled to 50% of maximum (i.e., average of 20 to Supai Tunnel, 10 to Uncle Jim Point, and 20 to Ken Patrick and Uncle Jim Junction each day) this would equal 7,650 rides per year which is 350 less than the limit. Further, based on current rates for these rides ($75 to Supai Tunnel, $75 to Uncle Jim Point, and $40 to Ken Patrick and Uncle Jim Junction) gross income under this scenario would be $466,650, up 7.5% compared to $433,975 in 2008. If rates were increased, based on comparable rates for similar rides outside the park area, overall income would also increase. Impacts to North Rim's concessioner are expected to be minor and beneficial from increased income opportunities.

Improvements at South Kaibab Trailhead barn, including expansion of facilities and restroom construction could have minor short-term beneficial impacts from availability of construction jobs. No long-term impacts are expected from this component of the alternative.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be moderate adverse long term and minor beneficial long term.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor beneficial short and long-term impacts to socioeconomic environment. As discussed under Alternative A, these beneficial impacts include increased income for concessioners, employment opportunities, and visitor spending. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to socioeconomic environment. Cumulative impacts under Alternative B would be minor adverse long term.

Conclusion Alternative B implementation would result in minor to moderate adverse long-term impacts from potential future reductions in stock use through use of an adaptive management strategy, and elimination of mule ride to Roaring Springs. Minor beneficial long-term impacts are expected from increased annual limits for commercial mule rides when compared to average annual use on both North and South Rim, and retention of jobs associated with stock use. Cumulative impacts would be minor adverse long term.

Impacts Alternative C South Kaibab/North Kaibab

Implementation of Alternative C would also have impacts on socioeconomic environment from the increased number of commercial mule rides allowed on and from both North and South Rim, and improvements to South Kaibab mule barn.

On South Rim, mule rides would increase from current average annual use of 8,315 to 12,000. Up to 20 rides would occur to Phantom Ranch each day on South Kaibab Trail, up to 10 to Cedar Ridge, and up to 60 each day on an above-rim ride. Although this represents a significant reduction in Inner Canyon rides, it also provides a new type of ride above the rim. Because this new ride would be less expensive, less time-consuming, and would accommodate heavier riders than Inner Canyon rides, it is expected to be popular. This increase in total rides is expected to have minor beneficial long-term impacts from increased concessioner income and potential increases in number of jobs needed to support mule rides.

The proposed above-rim ride could also have indirect impacts on businesses offering similar services (e.g. horseback rides) outside the park. These impacts are expected to be minor, adverse and long term.

On North Rim, commercial mule rides would also be allowed to increase from 7,072 on average each year to 10,000 annually. Under Alternative C, up to 40 rides would occur each day to Supai Tunnel, 10 to Roaring Springs, 30 to Ken Patrick and Uncle Jim Junction, and 10 to Uncle Jim Point. The 10,000 ride limit would not allow for each of these three rides to be booked to capacity for all 153 days of the North Rim season. If rides were filled to 70% of maximum (i.e., average of 28 to Supai Tunnel, 7 to Roaring Springs, 7 to Uncle Jim Point, and 21 to Ken Patrick and Uncle Jim Junction each day) this would equal 9,639 rides per year which is 361 less than the limit. Further, based on current rates for these rides ($75 to Supai Tunnel, $165 to Roaring Springs, $75 to Uncle Jim Point, and $40 to Ken Patrick and Uncle Jim Junction) gross income under this scenario would be $669,375, up 54% compared to $433,975 in 2008. If rates were increased, based on rates charged for comparable rides outside the park, overall income would also increase. Impacts to North Rim's mule concessioner are expected to be moderate beneficial from increased income opportunities and potential increases in jobs needed to support mule rides.

Overall impacts of Alternative C and Elements Common to All Action Alternatives would be minor to moderate adverse long term and moderate beneficial long term.

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor beneficial short and long-term impacts to socioeconomic environment. As discussed under Alternative A, these beneficial impacts include increased income for concessioners, employment opportunities, and visitor spending. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to socioeconomic environment. Cumulative impacts under Alternative C would be minor beneficial long term.

Conclusion Alternative C implementation would result in minor to moderate adverse long-term impacts from potential future reductions in stock use through use of an adaptive management strategy. Moderate beneficial long-term impacts are expected from increased annual limits for commercial mule rides when compared to average annual use on both North and South Rim, and potential increases in jobs associated with stock use. Cumulative impacts would be minor beneficial long term.

Impacts Alternative D Bright Angel/Uncle Jim

Implementation of Alternative D would have impacts on socioeconomic environment from the decrease in number of commercial mule rides allowed on and from South Rim, and increase in rides allowed on and from North Rim.

On South Rim, mule rides would decrease from current average annual use of 8,315 to 8,000. Up to 20 rides would occur to Phantom Ranch or Plateau Point each day on Bright Angel Trail, and up to 40 on an above-rim ride. This decrease in total rides is expected to have negligible impacts from decreased income for the concessioner. It is not expected that such a minor decrease would affect jobs associated with commercial mule rides or visitor spending.

The proposed above-rim ride could also have indirect impacts on businesses offering similar services (e.g. horseback rides) outside the park. These impacts are expected to be minor, adverse and long term.

On North Rim, commercial mule rides would also be allowed a small increase from 7,072 on average each year to 8,000 annually similar to those described for Alternative B. Up to 20 rides would be allowed each day to Supai Tunnel, 50 to Ken Patrick and Uncle Jim Junction, and 20 to Uncle Jim Point. The 8,000-ride limit would not allow for each of these three rides to be booked to capacity all 153 days of the North Rim season. If rides were filled to 50% of maximum for Ken Patrick and Uncle Jim (average 10 to Uncle Jim Point, and 25 to Ken Patrick and Uncle Jim Junction each day) and 80% filled to Supai Tunnel (average of 16 per day) this would equal 7,803 rides per year which is 197 less than the limit. Further, based on current rates for these rides ($75 to Supai Tunnel, $75 to Uncle Jim Point, and $40 to Ken Patrick and Uncle Jim Junction) gross income under this scenario would be $451,350, up 4% compared to $433,975 in 2008. If rates were increased, based on rates charged for comparable rides outside the park, overall income would also increase. Beneficial impacts to North Rim's concessioner from this income increase are expected to be negligible.

Improvements at the South Kaibab Trailhead mule barn, including facilities expansion and restroom construction could have minor short-term beneficial impacts from availability of construction jobs. No long term impacts are expected from this component of the alternative.

Overall impacts of Alternative D and Elements Common to All Action Alternatives would be minor to moderate adverse long term and negligible beneficial long term.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse short- and long-term impacts to socioeconomic environment. As discussed under Alternative A, these beneficial impacts include increased concessioner income, employment opportunities, and visitor spending. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to socioeconomic environment. Cumulative impacts under Alternative D would be minor adverse long term.

Conclusion Alternative D implementation would result in minor to moderate adverse long-term impacts from future potential reductions in stock use through use of an adaptive management strategy. Negligible beneficial long-term impacts are expected from increased annual limits for North Rim commercial mule rides, and increased income opportunities for the concessioner. Cumulative impacts would be minor adverse long term.

Impacts Alternative E Seasonal/Limited Use

Implementation of Alternative E would have impacts on socioeconomic environment from the increase in number of commercial mule rides allowed on and from both North and South Rim, and improvements to the South Kaibab mule barn.

On South Rim, mule rides would decrease from current average annual use of 8,315 to 6,000, a total decrease of 2,315. Up to 20 rides would occur to Phantom Ranch on Bright Angel Trail April through December; no commercial mule rides would occur January through March. No above-rim ride would be offered under this alternative. The decrease in total rides is expected to have adverse

minor impacts from decreased concessioner income and decreased jobs needed to support South Rim commercial mule rides.

On North Rim, commercial mule rides would also decrease from 7,072 on average each year to 6,000 annually. Under Alternative E, up to 10 rides would occur each day to Supai Tunnel, 30 to Ken Patrick and Uncle Jim Junction, and 10 to Uncle Jim Point. The 6,000-ride limit would not allow each of these three rides to be booked to capacity all 153 days of the North Rim season. If rides to Supai Tunnel were filled at 80% of maximum (average 8 rides per day) and Uncle Jim and Ken Patrick rides were filled at 75% (average 23 rides to Uncle Jim and Ken Patrick Junction and 8 to Uncle Jim Point) this would equal 5,967 rides per year, just 33 rides below the annual limit. Further, based on current rates for these rides ($75 to Supai Tunnel, $75 to Uncle Jim Point, and $40 to Ken Patrick and Uncle Jim Junction) gross income under this scenario would be $324,360, down 25% compared to $433,975 in 2008. If rates were increased, this overall decrease in income could be reduced. Impacts to the North Rim concessioner are expected to be adverse moderate based on decreased income and potential loss of jobs.

Improvements at the South Kaibab Trailhead mule barn, including facilities expansion and restroom construction could have minor short-term beneficial impacts from availability of construction jobs. No long term impacts are expected from this component of the alternative.

Overall impacts of Alternative E and Elements Common to All Action Alternatives would be moderate adverse long term and minor beneficial short term.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate adverse long-term impacts to socioeconomic environment. As discussed under Alternative A, these beneficial impacts include increased concessioners income, employment opportunities, and visitor spending. Present and reasonably foreseeable future actions are designed to minimize adverse impacts and maximize beneficial impacts to socioeconomic environment. Cumulative impacts under Alternative B would be moderate adverse long term.

Conclusion Alternative E implementation would result in moderate adverse long-term impacts from future reductions in stock use through use of an adaptive management strategy, and decreased number of rides and associated income and jobs, particularly to the North Rim concessioner. Beneficial impacts would result from availability of construction jobs to complete improvements at South Kaibab Trailhead barn; however, these would be minor short term. Cumulative impacts would be moderate adverse long term.

Wilderness Character

Affected Environment

Over 90% of Grand Canyon National Park is recommended for inclusion in the National Wilderness Preservation System. The Wilderness Act of 1964 required the Secretaries of Agriculture and Interior to evaluate land under their jurisdiction for possible wilderness classification. Grand Canyon's 1993 Final Wilderness Recommendation includes two units totaling 1,139,077 acres. Of this total, 1,109,257 are recommended for immediate wilderness designation; and 29,820 are recommended for designation as potential wilderness. Potential wilderness areas include places that do not qualify for immediate designation as wilderness due to temporary non-conforming or incompatible conditions.

The Corridor Trails lie within a non-wilderness corridor; however, Uncle Jim Trail, Whitmore Trail, and areas accessed from Tuweep lie in proposed wilderness.

The Wilderness Act and NPS Policy

Section 4 of the Wilderness Act describes authorized uses of wilderness areas. Subsection 4(a) declares, with specific legislative references, that the Wilderness Act shall be supplemental to the purposes for which national forests, parks, and refuges have been established.

Subsection 4(b) states in part, "Except as otherwise provided in this Act, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character." Thus, except for specified provisions in the legislation, wilderness areas shall be devoted to recreational, scenic, scientific, educational, conservation, and historical uses.

Subsection 4(c) prohibits certain uses (unless specifically provided elsewhere in the Act) inconsistent with wilderness preservation. With the exception of the minimum actions needed for administrative duties and emergency health and safety procedures, the Act prohibits temporary roads, motor vehicle use, motorized equipment or motorboats, landing of aircraft, mechanical transport, structures, and installations.

Chapter 6 of NPS Management Policies states in part: "The National Park Service will take no action that would diminish the wilderness eligibility of an area possessing wilderness characteristics until the legislative process of wilderness designation has been completed. Until that time, management decisions will be made in expectation of eventual wilderness designation. This policy also applies to potential wilderness, requiring it to be managed as wilderness to the extent that existing non-conforming conditions allow. The National Park Service will apply the principles of civic engagement and cooperative conservation as it determines the most appropriate means of removing the temporary, nonconforming conditions that preclude wilderness designation from potential wilderness."

NPS wilderness management policy requires management decisions be consistent with a minimum requirement concept. When determining minimum requirement, potential disruptions of wilderness character and resources will be considered. The minimum requirement concept applies to all administrative activities. The park has established minimum requirement protocols to document decisions related to administrative activities. This analysis is incorporated into analysis of impacts to wilderness character.

Defining Wilderness Character

According to the park's GMP, areas proposed for wilderness offer visitor opportunities for solitude and primitive recreation. An important provision in the GMP states: "The management of these areas should preserve wilderness values and character. Non-wilderness undeveloped areas should continue to serve primarily as primitive thresholds to wilderness. Visitors traveling through the canyon on the Colorado River should have the opportunity for a variety of personal outdoor experiences, ranging from solitary to social. Visitors should be able to continue to experience the river corridor with as little influence from the modern world as possible. The river experience should help visitors to intimately relate to the majesty of the canyon (NPS, 1995)." Visitor experience is discussed in other sections of this document.

Subsection 2(c) of the Wilderness Act defines wilderness as follows:

> A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain.

The same subsection 2(c) further defines wilderness as having the following characteristics:

> Undeveloped land retaining its primeval character in influence without permanent improvements or human habitation;
>
> Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
>
> Has outstanding opportunities for solitude or a primitive and unconfined type of recreation;
>
> May contain ecological, geological, scientific, educational, scenic, or historical value.

This EA adopts definitions and concepts developed through an interagency process to establish a framework for monitoring conditions related to wilderness character (Landres 2005). All wilderness areas, regardless of size, location, or any other feature, are unified by the statutory definition. These four qualities of wilderness are:

Untrammeled—wilderness is essentially unhindered and free from modern human control or manipulation. This quality pertains to actions that manipulate or control ecological systems.

Natural—wilderness ecological systems are substantially free from effects of modern civilization. In the context of stock use, this quality pertains to intended and unintended human-caused effects on natural and cultural resources conditions.

Undeveloped—wilderness is essentially without permanent improvements or modern human occupation. This quality pertains to presence and development level of trails, campsites and structures and facilities within the proposed wilderness.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation—wilderness provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including values of inspiration and physical and mental challenge. This quality pertains to visitor opportunities to experience a primitive setting that may include solitude and adventure.

Environmental Consequences

Intensity Level Definitions

Under each alternative, wilderness is considered and addressed through the description of impacts to wilderness character. As stated in the Wilderness Act of 1964, wilderness character is made up of qualities such as untrammeled, natural, undeveloped, and potential for primitive recreation /solitude. The impact analysis to follow is also the minimum requirement analysis (MRA). The actual MRA can be found in Appendix B. Additional sources of information on Grand Canyon wilderness used as a basis for this evaluation are as described above in the affected environment section.

Thresholds of change for intensity of impact to wilderness character are defined as

Negligible Impacts have no discernible effect on wilderness character. Natural conditions prevail. No permanent visual improvements or human occupation; outstanding opportunities for solitude or a primitive and unconfined type of recreation

Minor Impacts slightly detectable within limited areas of the wilderness. Natural conditions predominate. No permanent visual improvements or human occupation. While there might be short-term impacts within the wilderness, over the long term, outstanding opportunities for solitude or a primitive and unconfined type of recreation prevail, but may vary by season

Moderate Impacts readily apparent within limited areas of the wilderness. Apparent that humans have altered natural conditions within such areas. No permanent visual improvements or human occupation. Outstanding opportunities for solitude or a primitive and unconfined type of recreation restricted in limited areas and during limited times of year

Major Impacts substantially alter the wilderness resource throughout the wilderness area. Natural conditions substantially altered by humanity. Improvements made by people, while not permanent, long-term and part of the landscape. Outstanding opportunities for solitude or a primitive and unconfined type of recreation restricted throughout the wilderness

Duration *Short-term* Transitory or largely disappears over a period of hours or days

Long-term Months or years

Impacts Alternative A No Action

Stock use on the Uncle Jim Trail, Whitmore Trail, and in the Tuweep area may have direct effects on wilderness character from presence of people and stock. Stock use on Corridor Trails is not expected to impact wilderness character. Overall stock use would also have the following impacts to wilderness character

Untrammeled—Continuation of current commercial stock use in proposed wilderness areas would not result in manipulation or control of ecological systems in proposed wilderness. Therefore, negligible impacts would occur to the untrammeled nature of proposed wilderness.

Natural—Impacts to natural and cultural resources would continue as described in those sections of this document. Human and stock use would continue in proposed wilderness areas as described in this document. No ecological systems would be measurably affected by current stock use.

Undeveloped—Number and type of facilities and management activities in proposed wilderness would remain unchanged. The No Action Alternative does not include any construction in proposed wilderness; therefore, impacts to the undeveloped nature of proposed wilderness would be negligible.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation—Impacts to visitor use and experience would continue as described in this document. Proposed stock use would

not result in long-term impacts to natural sights and sounds, solitude, risk adventure, or other attributes of proposed wilderness. However, potential encounters with stock users could result in minor impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails). Impacts to outstanding opportunities would be short to long term minor.

Cumulative Effects Wilderness character in stock-use areas throughout the park has been impacted by use of mechanized equipment in and adjacent to proposed wilderness, maintenance of trails and campsites, general human presence and recreation, and aircraft overflights. These impacts are generally short term minor adverse.

Recently implemented, in-progress, and foreseeable future projects have potential to affect wilderness include the Backcountry Management Plan, routine maintenance of trails and restrooms, aircraft overflights, and fire management activities. Wilderness character is considered, mitigation measures included, and minimum requirement analyses completed for those projects that occur in proposed wilderness or have potential to impact wilderness character, in an effort to reduce any adverse impacts. Therefore, when combined with Alternative A, cumulative impacts to wilderness character would be adverse minor short term.

Conclusion Alternative A implementation would result in minor adverse short- and long-term impacts from potential encounters with stock users and impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails). Cumulative impacts would be minor adverse short term.

Impacts Alternative B Preferred Alternative

Continued commercial and private stock use on the Uncle Jim Trail and in the Tuweep area would have direct effects on wilderness character similar to Alternative A. In addition, installation of hitching rails and a composting toilet at Uncle Jim Point, located in proposed wilderness, would have additional impacts. Overall stock use would also have the following impacts to wilderness character

Untrammeled—Continuation of current commercial stock use in proposed wilderness areas would not result in manipulation or control of ecological systems in proposed wilderness. Therefore, negligible impacts would occur to the untrammeled nature of proposed wilderness.

Natural—Impacts to natural and cultural resources would continue as described in those sections of this document. Human and stock use would continue in proposed wilderness areas as described in this document. No ecological systems would be measurably affected by current stock use.

Undeveloped—The number of facilities and maintenance activities in proposed wilderness would increase due to installation of hitching rails and a composting toilet at Uncle Jim Point. Additional trail maintenance would also occur under this alternative to support increase stock use on Uncle Jim Trail and toilet maintenance. Impacts to the undeveloped nature of proposed wilderness would be moderate long term.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation—Impacts to visitor use and experience would continue as described in this document. Proposed stock use would not result in long-term impacts to natural sights and sounds, solitude, risk adventure, or other attributes of proposed park wilderness. However, potential encounters with stock users could result

in minor impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails). Impacts to outstanding opportunities would be short to long term minor.

Cumulative Effects Alternative B implementation, combined with past, present, and reasonably foreseeable future actions, would result in moderate adverse generally short-term impacts to wilderness character. As discussed under Alternative A, adverse impacts have occurred in the past through use of mechanized equipment in and adjacent to proposed wilderness, maintenance of trails and campsites, general human presence and recreation, and aircraft overflights. Mitigation measures are developed and minimum requirement analyses conducted for park projects to minimize adverse impacts to wilderness character. Cumulative impacts under Alternative B would be moderate adverse long term.

Conclusion Alternative B implementation would result in moderate adverse short- and long-term impacts from installation of new facilities in proposed wilderness, potential encounters with stock users, and impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails). Cumulative impacts would be moderate adverse and long term.

Impacts Alternative C South Kaibab/North Kaibab

Decreased commercial stock use on Uncle Jim Trail, removal of hitching rails and temporary toilet, and continued stock use in the Tuweep area would have direct effects on wilderness character. Overall stock use would also have the following impacts to wilderness character

Untrammeled—Continuation of current commercial stock use in proposed wilderness areas would not result in manipulation or control of ecological systems in proposed wilderness. Therefore, negligible impacts would occur to the untrammeled nature of proposed wilderness.

Natural—Impacts to natural and cultural resources would continue as described in those sections of this document. Human and stock use would continue in proposed wilderness areas as described in this document. No ecological systems would be measurably affected by current stock use.

Undeveloped—Number and type of facilities and management activities in proposed wilderness would remain unchanged. Alternative C does not include any new construction in proposed wilderness; however, routine trail maintenance of Uncle Jim Trail would continue. Impacts to the undeveloped nature of proposed wilderness would be minor long term.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation—Impacts to visitor use and experience would continue as described in this document. Proposed stock use would not result in long-term impacts to natural sights and sounds, risk adventure, or other attributes of proposed park wilderness. Some impacts to solitude in the Uncle Jim area would occur. In addition, potential encounters with stock users could result in minor impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails). Impacts to outstanding opportunities would be short to long term minor.

Cumulative Effects Alternative C implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse generally short-term impacts to wilderness character. As discussed under Alternative A, adverse impacts have occurred in the past by use of mechanized equipment in and adjacent to proposed wilderness, maintenance of trails

and campsites, general human presence and recreation, and aircraft overflights. Mitigation measures are developed and minimum requirement analyses conducted for park projects to minimize adverse impacts to wilderness character. Cumulative impacts under Alternative C would be minor adverse long term.

Conclusion Alternative C implementation would result in minor adverse short- and long-term impacts from potential encounters with stock users, impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails), and routine maintenance of the Uncle Jim Trail. Cumulative impacts would be minor adverse long term.

Impacts Alternative D Bright Angel/Uncle Jim

Increased commercial stock use on Uncle Jim Trail, hitching rails retention and composting toilet installation at Uncle Jim Point, and continued stock use in the Tuweep area would have direct effects on wilderness character. Overall stock use would also have the following impacts to wilderness character

Untrammeled—Continuation of current commercial stock use in proposed wilderness areas would not result in manipulation or control of ecological systems in proposed wilderness. Therefore, negligible impacts would occur to the untrammeled nature of proposed wilderness.

Natural—Impacts to natural and cultural resources would continue as described in those sections of this document. Human and stock use would continue in proposed wilderness areas as described in this document. No ecological systems would be measurably affected by current stock use.

Undeveloped—Number of facilities and maintenance activities in proposed wilderness would increase due to retention of hitching rails and composting toilet installation at Uncle Jim Point. Additional trail maintenance would also occur under this alternative to support increased stock use on Uncle Jim Trail and toilet maintenance. Impacts to the undeveloped nature of proposed wilderness would be moderate long term.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation—Impacts to visitor use and experience would continue as described in this document. Proposed stock use would not result in long-term impacts to natural sights and sounds, solitude, risk adventure, or other attributes of proposed park wilderness. However, potential encounters with stock users could result in minor impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails). Impacts to outstanding opportunities would be short to long term minor.

Cumulative Effects Alternative D implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse generally short-term impacts to wilderness character. As discussed under Alternative A, adverse impacts have occurred in the past through mechanized equipment use in and adjacent to proposed wilderness, maintenance of trails and campsites, general human presence and recreation, and aircraft overflights. Mitigation measures are developed and minimum requirement analyses conducted for park projects to minimize adverse impacts to wilderness character. Cumulative impacts under Alternative D would be moderate adverse long term.

Conclusion Alternative D implementation would result in moderate adverse short- and long-term impacts from potential encounters with stock users, impacts to sounds and sights (including

noise from people and stock and visual evidence of manure and urine on trails), and routine maintenance of Uncle Jim Trail. Cumulative impacts would be moderate adverse long term.

Impacts Alternative E Seasonal/Limited Use

Decreased commercial stock use on Uncle Jim Trail, removal of hitching rails and temporary toilet, and continued stock use in the Tuweep area would have direct effects on wilderness character. Overall stock use would also have the following impacts to wilderness character

Untrammeled—Continuation of current commercial stock use in proposed wilderness areas would not result in manipulation or control of ecological systems in proposed wilderness. Therefore, negligible impacts would occur to the untrammeled nature of proposed wilderness.

Natural—Impacts to natural and cultural resources would continue as described in those sections of this document. Human and stock use would continue in proposed wilderness areas as described in this document. No ecological systems would be measurably affected by current stock use.

Undeveloped—Number and type of facilities and management activities in proposed wilderness would remain unchanged. Alternative E does not include any new construction in proposed wilderness; however, routine trail maintenance of Uncle Jim Trail would continue. Impacts to the undeveloped nature of proposed wilderness would be minor long term.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation—Impacts to visitor use and experience would continue as described in this document. Proposed stock use would not result in long-term impacts to natural sights and sounds, risk adventure, or other attributes of proposed park wilderness. Some impacts to solitude in the Uncle Jim area would occur. In addition, potential encounters with stock users could result in minor impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails). Impacts to outstanding opportunities would be short to long term minor.

Cumulative Effects Alternative E implementation, combined with past, present, and reasonably foreseeable future actions, would result in minor adverse generally short-term impacts to wilderness character. As discussed under Alternative A, adverse impacts have occurred in the past through mechanized equipment use in and adjacent to proposed wilderness, maintenance of trails and campsites, general human presence and recreation, and aircraft overflights. Mitigation measures are developed and minimum requirement analyses conducted for park projects to minimize adverse impacts to wilderness character. Cumulative impacts under Alternative E would be minor adverse long term.

Conclusion Alternative E implementation would result in minor adverse short- and long-term impacts from potential encounters with stock users, impacts to sounds and sights (including noise from people and stock and visual evidence of manure and urine on trails), and routine maintenance of Uncle Jim Trail. Cumulative impacts would be minor adverse long term.

Public Health and Safety

Affected Environment

Park managers seek to provide a safe and healthful environment for visitors and residents in Grand Canyon National Park. The park recognizes existing stock operations have resulted in concerns with public health and safety including injuries to riders and stock, manure and urine on the trails, trail width where stock must pass each other, availability of shade and water for stock and people, need for restrooms to address human waste, and overall trail conditions.

Environmental Consequences

Intensity Level Definitions

Methodology used for assessing impacts to public health and safety is based on how changes in stock use and mule operations would affect health and safety, specifically along trails and in any construction activities. The thresholds for this impact assessment are as follows

Negligible A change in public health and safety not measurable or perceptible

Minor A change in public health and safety readily apparent, but with few measurable consequences

Moderate A change to public health and safety readily apparent with measurable consequences

Major A severely adverse or exceptionally beneficial change to public health and safety

Impacts Alternative A No Action

Under the No Action alternative, trails would continue to deteriorate posing safety concerns to hikers and stock users, and would result in adverse long-term minor impacts. Trail maintenance efforts would continue and have minor beneficial impacts on public health and safety.

Direct injuries to riders and stock would occur infrequently and all efforts would be made by NPS and concessioner staff to minimize potential for injuries. These impacts to public health and safety are not expected to be measurable based on these efforts to minimize injuries.

Manure and urine would continue to occur on the trails, and although it is unknown to what extent, this impacts public health and safety; it is expected impacts would be adverse minor.

Under current commercial stock operations, mule rides occur between the rim and Roaring Springs on North Kaibab Trail. From South Rim, mule rides travel down Bright Angel Trail to Phantom Ranch, and to and from Plateau Point. On South Kaibab Trail, mule rides travel up from Phantom Ranch, and supply mules travel to and from Phantom Ranch. The concessioner coordinates rides and supply mules so stock do not pass each other on Bright Angel, South Kaibab, or River Trails.

Potential exists for private and administrative stock to pass each other or pass commercial stock on Corridor Trails. Passing could be dangerous where trails are narrow and exposed. Private stock day-users are encouraged to contact the mule concessioner and Backcountry Information Center to

alert commercial and administrative stock users of private stock on the trails. Due to the limited amount of private stock use and coordination of NPS and concessioner stock trips, minimal impacts to public health and safety occur from stock passing on trails.

Shade and water availability for stock and people, particularly along Corridor Trails, is a concern for public health and safety. Under current operations, mule rides travel down Bright Angel Trail, and have access to shade and water at Indian Garden. On North Kaibab Trail, mule rides occur from the rim to Supai Tunnel and Roaring Springs where shade and water is available for mule riders. On commercial mule rides from Phantom Ranch to South Rim, there is limited shade and no water on South Kaibab Trail. These rides leave early from Phantom Ranch, and riders carry water for the ride out, limiting safety concerns. Impacts would be minor adverse short term.

At Uncle Jim Point, a concern with human waste was raised due to potential use increase by hikers and stock users. Human waste occurring in this area without a restroom has potential for minor adverse long-term impacts.

Some safety concerns exist at private stock use campsites at Phantom Ranch and Cottonwood. Both sites have a stock hitching rail, but no pens, and shade is limited. These impacts are minor adverse long term.

Cumulative Effects Impacts have occurred on public health and safety from construction projects and routine maintenance of trails and facilities. These actions have generally resulted in short-term adverse impacts and long-term beneficial impacts to public health and safety. The park is proactive in minimizing risks to visitors and employees, therefore there are also beneficial impacts of safety programs and plans in place to limit hazards.

Recently implemented, in-progress, and foreseeable future projects have potential to affect public health and safety include the South Rim Visitor Transportation Plan, Bright Angel Trailhead Area Design Plan, Concessions Improvements, Hermit Road Rehabilitation, Supai Camp Improvements, Greenway Phase V, and routine maintenance of trails. Public health and safety is considered and mitigation measures included in park projects to limit adverse impacts. These overall impacts are beneficial minor long term. Therefore, when combined with Alternative A, cumulative impacts to public health and safety would be negligible.

Conclusion Alternative A implementation would result in minor long-term adverse impacts from deteriorated trail conditions; mule manure and urine on trails; potential concerns with stock passing on narrow, exposed trail section; concerns with human waste at Uncle Jim Point; and concerns with Inner Canyon private stock camp infrastructure. Minor beneficial long-term impacts occur from continued trail maintenance efforts. Cumulative impacts would be negligible.

Impacts Alternative B Preferred Alternative

The following Elements Common to All Action Alternatives have little potential to affect public health and safety: continued commercial use at Tuweep, no stock use on Whitmore Trail, continued administrative stock use, monitoring trail conditions and resource impacts, and implementation of annual use limits on mule rides.

Other elements including use of an adaptive management strategy, continued trail maintenance and funding, temporary trail closures due to weather and trail conditions, removal of mule waste

from trails, continued duffel and drag-out service, and increased education of trail users would affect public health and safety.

Use of an adaptive management strategy would consider impacts to public health and safety particularly in regard to trail conditions. The intent of adaptive management proposed in this document is to consider and weigh all impacts to trails, natural and cultural resources, visitor experience, park operations, public health and safety, etc., to determine future actions. If further limits were placed on stock use, for example, this would have minor beneficial impacts on public health and safety by further limiting safety concerns with stock waste on trails and deteriorated trail conditions.

Continued trail maintenance would result in adverse and beneficial impacts to public health and safety. During trail maintenance activities, some short-term adverse impacts could result from trail condition and mechanized and hand-tool use. Overall, long-term moderate beneficial impacts to public health and safety would result from improved trail conditions.

Active removal of mule waste from trails would have beneficial long-term minor impacts to public health and safety.

Continued duffel and drag-out service between South Rim and Phantom Ranch would have indirect beneficial impacts on public health and safety by transporting people unable to hike up Corridor Trails to the rim, and by transporting food and supplies for hikers that would otherwise have to carry them. Limiting weight for hikers would limit safety concerns, particularly in the hottest months. These impacts would be minor beneficial.

Increased education efforts proposed would have beneficial minor long-term impacts on public health and safety as they are proposed to address trail etiquette and safety concerns of stock use.

Elements Common to All Action Alternatives would have moderate beneficial minor adverse short-term impacts on public health and safety.

Under Alternative B, impacts to public health and safety would result from decreased Inner Canyon mule rides occurring from South Rim, potential decreased trail maintenance on Corridor Trails, improvements to the South Kaibab Trailhead mule barn area, and installation of composting toilet at Uncle Jim Point.

Decreased commercial stock use on Bright Angel Trail from 14,541 to 4,015 one-way mule trips annually, is expected to result in moderate beneficial impacts to trail condition and public health and safety. On South Kaibab Trail, stock use would continue similar to current use, and impacts to trail condition would be negligible.

User conflicts, concerns with stock passing each other, and mule waste on trails would be decreased due to an overall decrease in rides to Phantom Ranch from South Rim.

A majority of concessioner mules and mule operations would be moved to the South Kaibab Trailhead barn from the Village mule barn under this alternative. Improvements at South Kaibab Trailhead mule barn area would involve minor construction which would result in some short-term minor adverse impacts to public health and safety.

On North Kaibab Trail, the limit of 40 rides per day to Supai Tunnel, and no rides to Roaring Springs would have minor beneficial impacts to public health and safety from decreased trail maintenance needs and improved trail conditions below Supai Tunnel.

Under this alternative, up to 20 rides would be allowed to Uncle Jim Point daily, and 40 rides to Ken Patrick and Uncle Jim Junction. Adverse impacts would result from increased trail maintenance needs to Uncle Jim Point; however, these impacts are expected to be negligible. Additionally, the proposed installation of a composting toilet at Uncle Jim Point would address human waste concerns, and would have minor beneficial impacts on public health and safety.

Overall impacts of Alternative B and Elements Common to All Action Alternatives would be minor adverse short term and moderate beneficial long term.

Cumulative Effects Implementation of Alternative B combined with past, present, and reasonably foreseeable future actions would result in moderate beneficial impacts to public health and safety. As discussed under Alternative A, beneficial impacts have occurred in the past as a result of various actions including routine maintenance of trails and facilities, and development of safety plans and programs. Some short-term adverse minor impacts have occurred from construction activities. Present and reasonable foreseeable future actions are carefully designed to minimize adverse impacts to public health and safety. Cumulative impacts under Alternative B would be beneficial moderate long term.

Conclusion Implementation of Alternative B would result in moderate beneficial long-term impacts to public health and safety from improved trail conditions, minimized potential for user conflicts, and installation of a composting toilet at Uncle Jim Point. Short-term adverse minor impacts during construction would occur at South Kaibab Trailhead mule barn and during trail maintenance. Cumulative impacts would be moderate beneficial long term.

Impacts Alternative C South Kaibab/North Kaibab

Under Alternative C, impacts to public health and safety would result from elimination of stock use on Bright Angel Trail, increased stock use on South Kaibab Trail, increased stock use on North Kaibab Trail, improvements to the South Kaibab Trailhead mule barn area, and removal of temporary toilet at Uncle Jim Point.

Elimination of commercial stock use on Bright Angel Trail would result in moderate beneficial impacts to the trail condition and public health and safety. On South Kaibab Trail, stock use would increase from 11,205 to 32,850 one-way mule trips per year. Impacts to public health and safety on South Kaibab Trail would be moderate adverse long term.

User conflicts, concerns with stock passing each other, and mule waste on trails would no longer exist on Bright Angel Trail, but would be increased on South Kaibab Trail. All commercial mule rides and supply mules would use South Kaibab Trail. Up to 10 rides would occur from the rim to Cedar Ridge and back to the rim each day, up to 20 rides would travel to Phantom Ranch from the rim, and up to 20 rides would travel from Phantom Ranch to the rim. In addition to rides, 12 supply mules would travel to Phantom Ranch and back each day.

Some concerns with trail steepness and water and shade availability for visitor mule riders exist. These impacts to public health and safety would be adverse long term minor.

A majority of concessioner mules and mule operations would be moved to the South Kaibab Trailhead area as described in Alternative B, and construction activities would result in some short-term minor adverse impacts.

On North Kaibab Trail, the limit of 40 rides per day to Supai Tunnel, and 10 rides to Roaring Springs would have minor adverse impacts to public health and safety from increased trail maintenance needs and diminished trail conditions below Supai Tunnel. Limiting number of stock at Supai Tunnel at one time to 20 would have beneficial impacts on public health and safety by addressing concerns with crowding in this location.

Under this alternative, up to 10 rides would be allowed to Uncle Jim Point daily, and 30 rides to Ken Patrick and Uncle Jim Junction. Beneficial impacts would result from decreased trail maintenance needs to Uncle Jim Point; however, these impacts are expected to be negligible. Additionally, proposed removal of the temporary toilet at Uncle Jim Point would add to human waste concerns in this location and would result in adverse long-term minor impacts.

Overall impacts of Alternative C and Elements Common to All Action Alternatives would be moderate adverse short term and moderate beneficial long term.

Cumulative Effects Implementation of Alternative C combined with past, present, and reasonably foreseeable future actions would result in minor beneficial impacts to public health and safety. As discussed under Alternative A, beneficial impacts have occurred in the past as a result of various actions including routine maintenance of trails and facilities, and development of safety plans and programs. Some short-term adverse minor impacts have occurred from construction activities. Present and reasonable foreseeable future actions are carefully designed to minimize adverse impacts to public health and safety. Cumulative impacts under Alternative C would be beneficial minor long term.

Conclusion Implementation of Alternative C would result in moderate beneficial long-term impacts to public health and safety from improved trail conditions on Bright Angel and Uncle Jim Trails and minimized potential for user conflicts. Short and long-term adverse moderate impacts would result from construction at South Kaibab Trailhead mule barn, maintenance of trails, increased stock use on South Kaibab Trail, and concerns with human waste at Uncle Jim Point. Cumulative impacts would be minor beneficial long term.

Impacts Alternative D Bright Angel/Uncle Jim

Under Alternative D, impacts to public health and safety would result from elimination of stock use on South Kaibab Trail, continued high levels of stock use on Bright Angel Trail, increased stock use on Ken Patrick and Uncle Jim Trails, and installation of a temporary toilet at Uncle Jim Point.

Elimination of commercial stock use on South Kaibab Trail would result in moderate beneficial impacts to trail condition and public health and safety. On Bright Angel Trail, stock use would increase from 14,541to 24,820 one-way mule trips per year. Impacts to public health and safety on Bright Angel Trail would be moderate adverse long term.

User conflicts, concerns with stock passing each other, and mule waste on trails would no longer exist on South Kaibab Trail, but would be increased on Bright Angel Trail. This is of particular concern along River Trail where supply mules and mule rides would need to pass one another. These impacts would be adverse minor.

On North Kaibab Trail, the limit of 20 rides per day to Supai Tunnel, and no rides to Roaring Springs would have minor beneficial impacts to public health and safety from decreased trail maintenance needs and improved trail conditions between the rim and Roaring Springs.

Under this alternative, up to 20 rides would be allowed to Uncle Jim Point daily, and 50 rides to Ken Patrick and Uncle Jim Junction. Minor adverse impacts would result from increased trail maintenance needs to Uncle Jim Point. Additionally, proposed installation of a composting toilet at Uncle Jim Point would address concerns with human waste in this location, and would result in beneficial long-term minor impacts to public health and safety.

Overall impacts of Alternative D and Elements Common to All Action Alternatives would be moderate adverse short and long term and moderate beneficial long term.

Cumulative Effects Implementation of Alternative D combined with past, present, and reasonably foreseeable future actions would result in minor beneficial impacts to public health and safety. As discussed under Alternative A, beneficial impacts have occurred in the past as a result of various actions including routine maintenance of trails and facilities, and development of safety plans and programs. Some short-term adverse minor impacts have occurred from construction activities. Present and reasonable foreseeable future actions are carefully designed to minimize adverse impacts to public health and safety. Cumulative impacts under Alternative D would be beneficial minor long term.

Conclusion Implementation of Alternative D would result in moderate beneficial long-term impacts to public health and safety from improved trail conditions on South and North Kaibab Trails, and minimized potential for user conflicts. Moderate adverse long-term impacts from maintenance of trails and increased stock use on Bright Angel Trail. Cumulative impacts would be minor beneficial long term.

Impacts Alternative E Seasonal/Limited Use

Under Alternative E, impacts to public health and safety would result from seasonal and limited stock use on Corridor Trails, and removal of the temporary toilet at Uncle Jim Point.

Seasonal mule use on Bright Angel and South Kaibab Trails would result in moderate beneficial impacts to trail condition and public health and safety. On South Kaibab Trail, stock use would increase from 11,205 to 12,050 one-way mule trips per year. On Bright Angel Trail, stock use would decrease from 14,541 to 6,050 one-way mule trips per year. User conflicts would not be of concern January through March when stock is not on these trails.

A majority of concessioner mules and mule operations would be moved to the South Kaibab Trailhead area as described in Alternative B and construction activities would result in some short-term minor adverse impacts.

On North Kaibab Trail, the limit of 10 rides per day to Supai Tunnel, and no rides to Roaring Springs would have minor beneficial impacts to public health and safety from decreased trail maintenance needs and improved trail conditions from the rim to Roaring Springs.

Under this alternative, up to 10 rides would be allowed to Uncle Jim Point daily, and 30 rides to Ken Patrick and Uncle Jim Junction. Beneficial impacts would result from decreased trail

maintenance needs to Uncle Jim Point; however, these impacts are expected to be negligible. Additionally, proposed removal of the temporary toilet at Uncle Jim Point would add to human waste concerns in this location, and would result in adverse long-term minor impacts.

Overall impacts of Alternative E and Elements Common to All Action Alternatives would be minor adverse short term and moderate beneficial long term.

Cumulative Effects Implementation of Alternative E combined with past, present, and reasonably foreseeable future actions would result in moderate beneficial impacts to public health and safety. As discussed under Alternative A, beneficial impacts have occurred in the past as a result of various actions including routine maintenance of trails and facilities, and development of safety plans and programs. Some short-term adverse minor impacts have occurred from construction activities. Present and reasonable foreseeable future actions are carefully designed to minimize adverse impacts to public health and safety. Cumulative impacts under Alternative E would be beneficial moderate long term.

Conclusion Implementation of Alternative E would result in moderate beneficial long-term impacts to public health and safety from improved trail conditions on Bright Angel, South Kaibab, North Kaibab, Ken Patrick, and Uncle Jim Trails, and minimized potential for user conflicts. Short- and long-term adverse minor impacts from construction at South Kaibab Trailhead mule barn, maintenance of trails, and concerns with human waste at Uncle Jim Point. Cumulative impacts would be moderate beneficial long term.

Unacceptable Impacts

As described in Purpose and Need, the NPS must prevent any activities that would impair park resources and values. The impact threshold at which impairment occurs is not always readily apparent. Therefore, the NPS will apply a standard that offers greater assurance that impairment will not occur. The NPS will do this by avoiding impacts it determines unacceptable. These are impacts that fall short of impairment, but are still not acceptable in a particular park environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether associated impacts on park resources and values are acceptable. Virtually every human activity taking place in a park has some degree of effect on park resources or values, but that does not mean the impact is unacceptable or a particular use must be disallowed. To determine if unacceptable impacts could occur to park resources and values, impacts of proposed actions in this EA were evaluated based on monitoring information, published research, and professional expertise, and compared to the guidance on unacceptable impacts provided in Management Policies 1.4.7.1 that defines unacceptable impacts as impacts that, individually or cumulatively, would

- Be inconsistent with a park's purposes or values, or
- Impede attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- Create an unsafe or unhealthful environment for visitors or employees, or
- Diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- Unreasonably interfere with
  - Park programs or activities, or
  - An appropriate use, or

- The atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations in the park
- NPS concessioner or contractor operations or services

By preventing unacceptable impacts, park managers also ensure the proposed use of park resources will not conflict with conservation of those resources. In this manner, park managers ensure compliance with the Organic Act's separate mandate to conserve park resources and values. Using the bulleted guidance above, the following text analyzes potential for unacceptable impacts for all alternatives carried forward in this Environmental Assessment.

- All alternatives are consistent with the park's purposes and values. The park was established to preserve, protect, interpret, and research Grand Canyon and surrounding landscape. If no changes to stock use occurred (No Action), park operations would continue in their current manner, becoming more inefficient over time due to resources being expended for maintenance of trails. However, these inefficiencies would not impede the park from maintaining its purposes and values as established in its enabling legislation. If changes to stock use were implemented under Alternative B (Preferred), C, D, or E, park operations would be improved, consistent with the park's enabling legislation. No alternative would interfere with overall preservation of park natural and cultural resources
- No alternative impedes attainment of the park's desired future, and while Alternative A (No Action) would delay this action, changes to stock use and mule operations to address trail conditions could still be considered in the future. Alternative B (Preferred), C, D, and E would address user conflicts, trail conditions, and visitor experience consistent with the GMP
- Under all alternatives, visitors would continue to have opportunities to enjoy, learn about, or be inspired by park resources and values. Alternative A (No Action) would maintain visitor use and experience exactly as it is now. Alternative B (Preferred), C, D, and E would enhance visitor use and experience through addressing trail conditions and user conflicts, while still providing commercial mule rides into the Inner Canyon
- All alternatives address stock use and mule operations that do not unreasonably interfere with park programs, an appropriate use, the natural atmosphere, or concessioner activities. Alternative A (No Action) would not involve changes to current stock use or construction-related activities, thereby maintaining current atmosphere. During construction activities to improve the South Kaibab Trailhead mule barn under Alternatives B (Preferred) and C, there would be short-term temporary visitor disturbance as a result of noise, dust, and construction equipment; however, inconveniences would be limited to the construction period only

Overall, analysis of effects on natural and cultural resources, park operations, public health and safety, socioeconomic environment, and visitor experience indicates there are no major adverse effects under any alternative; effects were analyzed as minor to moderate. Based on this, and the above analysis, there would be no unacceptable impacts from any alternative.

Impairment

NPS Management Policies 2006 require analysis of potential effects to determine whether actions would impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid or minimize, to the greatest degree practicable, adversely impacting park resources and values.

However, laws do give the NPS management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill park purposes, as long as the impact does not constitute impairment of affected resources and values. Although Congress has given the National Park Service management discretion to allow certain impacts in park, that discretion is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. Prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An impact to any park resource or value may, but does not necessarily, constitute impairment, but an impact would be more likely to constitute impairment when there is a major or severe adverse effect on a resource or value whose conservation is

- necessary to fulfill specific purposes identified in the park's establishing legislation or proclamation;
- key to the park's natural or cultural integrity; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. The NPS threshold for considering whether there could be impairment is based on whether an action would have major (or significant) effects. This EA identifies less than major effects for all resource topics. Guided by this analysis and the Superintendent's professional judgment, there would be no impairment of park resources and values from implementation of any alternative.

CONSULTATION AND COORDINATION

Internal Scoping

Internal scoping was conducted by an interdisciplinary team of Grand Canyon National Park professionals. Interdisciplinary team members met July 13, August 13, 24, and 31, September 9 and 29, 2009, and communicated by e-mail throughout the planning process to discuss the purpose and need for the project; various alternatives; potential environmental impacts; past, present, and reasonably foreseeable projects that may have cumulative effects; and possible mitigation measures. Over the course of the project, team members have conducted individual site visits to view and evaluate proposed changes. Results of the team meetings were used in preparation of this environmental assessment.

External Scoping

External (public) scoping was conducted in May and June, 2009 to generate input on EA preparation, the scope of issues needing to be addressed, and public concerns, and to provide an opportunity for the public to talk directly with NPS representatives.

Agency Consultation

The U.S. Fish and Wildlife Service responded to the public scoping outreach on June 16, 2009 and identified the proposed project may have impacts to special status species including the endangered southwestern willow flycatcher, Mexican spotted owl, California condor, and sentry milk vetch. The park's wildlife biologist and Section 7 coordinator reviewed the project and considered potential impacts to listed and special status species (see Impact Topics Dismissed in Chapter 1). However, based on project activities and inclusion of mitigation measures for special status species, the park's wildlife biologist and Section 7 coordinator determined implementation of any alternative would result in a no effect determination on special status species and therefore no further consultation with U.S. Fish and Wildlife Service is required.

The park is developing a programmatic agreement to fulfill responsibilities of the National Historic Preservation Act Section 106. It was determined this type of documentation would be appropriate given the lack of details for design of project components including specific alignment of a potential above-rim trail and improvements and expansion of the South Kaibab Trailhead barn, as proposed in the Preferred Alternative. The park did contact the State Historic Preservation Officer (SHPO) during internal scoping to initiate Section 106 consultation, and will be working with the SHPO to complete the programmatic agreement.

Native American Consultation

All affiliated Native American tribes were contacted at the beginning of this project to determine if there were any ethnographic resources in the project area, and if the Tribes wanted to be involved in the environmental compliance process, including the Havasupai Tribe, Hopi Tribe, Hualapai Tribe, Kaibab Band of Paiute Indians, Las Vegas Paiute Tribe, Navajo Nation, Paiute Indian Tribe of Utah, Pueblo of Zuni, San Juan Southern Paiute Tribe, White Mountain Apache, and Yavapai-Apache Nation. A letter was sent May 21, 2009. No responses were received from affiliated Native American tribes on the project. However, these tribes will be contacted to determine their interest in participating in the development of a programmatic agreement for this project.

Environmental Assessment Review and List of Recipients

This environmental assessment will be released for public review in March 2010. To inform the public of EA availability, the NPS will publish and distribute a press release to various agencies, tribes, and members of the public on the park's mailing list. Copies of the environmental assessment will be provided to interested individuals on request. Copies of the document will also be available on the internet at http://parkplanning.nps.gov/grca.

This EA is subject to a 45-day public comment period. During this time, the public is encouraged to submit their written comments to the National Park Service address provided at the beginning of this document. Following the close of the comment period, all public comments will be reviewed and analyzed, prior to release of a decision document. The National Park Service will issue responses to substantive comments received during the public comment period, and will make appropriate changes to the environmental assessment as needed.

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Preparers (developed EA content)

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REFERENCES

National Park Service Director's Orders referenced in this document are available online at www.nps.gov/applications/npspolicy/DOrders.cfm

Director's Order 12 Conservation Planning, Environmental Impact Analysis, and Decision-Making

Director's Order 28 Cultural Resources Management

Executive Orders referenced in this document are available online at www.archives.gov/Federal-register/executive-orders

Executive Order 11990 Protection of Wetlands

Executive Order 11988 Floodplain Management

Executive Order 12898 General Actions to Address Environmental Justice In Minority Populations and Low-Income Populations

Secretarial Orders referenced in this document are available online at

Secretarial Order 3175 Indian Trust Assets and Tribal Lands www.usbr.gov/mp/ccao/newmelones/RMP/RIR/5.0-Indian_Trust_Assets.pdf

General References

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National Park Service Organic Act, 1916, 16 U.S.C. 1 2 3, and 4 www.planning.nps.gov/document/organic_act.pdf
Secretary of the Interior's Standards for the Treatment of Historic Properties, 36 CFR 68 www.nps.gov/history/hps/tps/standguide/

Acronyms

ACE	American Conservation Experience
ARRA	American Recovery and Reinvestment Act
BIC	Backcountry Information Center
BMP	Backcountry Management Plan
BP	Before Present
CCC	Civilian Conservation Corps
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CREC	Coconino Rural Environment Corps
CUA	Commercial Use Authorization
DO	Director's Order
DOE	Determination of Eligibility
EA	Environmental Assessment
EIS	Environmental Impact Statement
FMSS	Facility Management Software System
FONSI	Finding of No Significant Impact
GMP	General Management Plan
GRCA	Grand Canyon National Park
MRA	Minimum Requirement Analysis
MSO	Mexican Spotted Owl
NEPA	National Environmental Policy Act
NPS	National Park Service
NRCS	Natural Resources Conservation Service
SHPO	State Historic Preservation Officer
SOP	Standard Operating Procedure
SRVTP	South Rim Visitor Transportation Plan
SWWF	Southwestern Willow Flycatcher
USFWS	U.S. Fish and Wildlife Service

Appendix A – Private Stock Use Information

Current information for private stock use in Grand Canyon National Park is provided here and can be accessed online at http://www.nps.gov/grca/planyourvisit/private-stock.htm. This information would be updated as needed based on future decisions on stock use.

Grand Canyon

Private Stock Use

Equines (horses, mules, and burros) are allowed on a few designated Grand Canyon National Park trails. Llamas, goats, and other private stock are prohibited. Both in-state and out-of-state residents are required to bring a current health certificate with negative Coggins test for each equine. Riders accept responsibility for their personal safety. Notify park rangers immediately of any animal injury or fatality. Owners are responsible for the removal of dead or injured animals. Tree savers must be used when stock is tied to trees.

Starting May 1, 2009 and lasting two to four years, the South Kaibab Trail will undergo reconstruction. During this time the South Kaibab Trail will be closed to all stock use. Due to increased equine use, the National Park Service is requesting that all users contact Xanterra livery prior to riding on the Bright Angel Trail. Livery management can be reached by calling 928-638-2526, extension 6095. As usual all riders should check in at the Backcountry Information Center by phone (928-638-7875) or in person prior to riding. While in the canyon, please carry and follow the guidance presented in this document and the regulations provided with your backcountry use permit.

Trails open to equines

South Rim
- Bright Angel Trail
- River Trail between South Kaibab and Bright Angel along the Colorado River
- Plateau Point Trail from Indian Garden
- All primitive roads

North Rim (Kaibab Plateau)
- North Kaibab Trail
- Ken Patrick Trail
- Uncle Jim Trail
- Arizona Trail
- All primitive roads

Go with the flow

Bright Angel Trail
Please contact Xanterra Livery Management prior to riding on the Bright Angel Trail: 928-638-2526, extension 6095.

North Kaibab Trail
Downhill: prior to 7:00 a.m.
Uphill:
Phantom Ranch to Supai Tunnel: anytime
Supai Tunnel to Trailhead:
after 2:30 p.m. only; to increase safety, private horse users must depart Supai Tunnel after the Canyon Trail Ride mules; ascending riders may wish to stage at Roaring Springs- plan on departing no earlier than 1:30pm.

Winter use
Caulked shoes are required when snow or ice is present or anticipated on trails, generally December through March.

If your group meets a string of mules, the mule string has the right-of-way. Find a safe place to get as far off the trail as possible. If there is no safe place to yield right-of-way, you must backtrack to a suitable location and allow the mule string to pass.

Trailhead parking

South Rim
Day use parking is available in the dirt parking lot below and south of El Tovar Hotel by the railroad tracks (Lot D). Overnight riders should use the pull-through spaces in Lot E near the Backcountry Information Center.

North Rim
Stop by the Backcountry Information Center and inquire about using the CC Hill road (gated). Parking is extremely limited at the North Kaibab trailhead. Do not block traffic.

Day use

Though day use of trails does not require a permit, please check in with the Backcountry Information Center prior to riding. See feed and water suggestions below.

South Rim – also check in with Xanterra Livery Management prior to riding

- *Plateau Point*: Bright Angel Trail to Plateau Point and return via the Bright Angel Trail

North Rim

- North Kaibab Trail to Roaring Springs and return
- Ken Patrick Trail
- Uncle Jim Trail

Overnight use

Party size: Maximum group size is 12 (combination of riders and stock).

Pack strings: A rider may lead no more than five head. Pack stock must be led, tied together in single file. Loose herding is not allowed. Maximum of one pack animal per non-rider.

South Rim Horse Camp: Located at Mather Campground with two stock sites available for reservation. Each site has two pens, picnic tables, fire pits, water available on site (frost free spigot), water troughs and feeders in each pen. Rest rooms nearby. No electricity. Cost is $25.00 per site per night. Six equines and four people per site. Reservations up to six months out through www.recreation.gov (a backcountry permit is not required).

Contact the Backcountry Information Center:

Mail
P.O. Box 129
Grand Canyon, AZ 86023

Telephone
928-638-7875
1:00 p.m. – 5:00 p.m. MST
Monday – Friday
Fax: 928-638-2125

Internet
www.nps.gov/grca/
click on
"Backcountry Hiking"

Email
grca_bic@nps.gov

Permits: For overnight use, the sites listed below require a permit. This permit can be obtained from the Backcountry Information Center. Permit requests can be made on the first of the month, four months prior to the proposed start date. Backcountry permit fees: $10 for the permit plus $5 for each person AND each equine per night. For example, a permit for three riders and five horses to camp one night would cost $50—$10 for the permit + $40 for the impact fee (8 x $5). To obtain a permit request form or for more information, contact the Backcountry Information Center or visit the park's website.

North Rim Horse Camp: (open mid-May to mid-Oct) Located ¼ mile from the North Kaibab trailhead and has a pit toilet, potable water, and a small holding pen on site. At least one person must camp with the stock.

Inner Canyon Stock Sites: Two inner canyon campgrounds accept one equine group per night. Bright Angel Campground lies at the bottom of the canyon near the Colorado River/Phantom Ranch; Cottonwood Campground is along the North Kaibab Trail. Reserved through the Backcountry Information Center. Riders entering the canyon must check in at the Backcountry Information Center.

Phantom Ranch: Guests bringing equines and staying at the commercial facilities at Phantom Ranch must have at least one member of their group camp with their animals. A backcountry use permit for Bright Angel Campground is required.

Feed and water

To prevent the introduction of nonnative plants into the park, only certified weed free forage (hay, straw, mulch) can be used in the park. Stock groups must be prepared to display proof of certification tags. No forage can be taken beyond a trailhead into the backcountry. Pelletized feed, hay cubes and grain products can be used in the backcountry. Grazing of stock is not permitted.

Prevent the spread of noxious weeds by cleaning stock trailers and the hooves, coat, mane and tail of stock before entering the park. Also feed weed free forage or processed feed to stock for a few days before.

Feed should be carefully stored. Rodent-proof, lightweight storage containers are recommended, as paper and cloth are ineffective against determined squirrels and mice. If feed is not kept in containers, use a long rope to hang feed from pack poles.

Water stock whenever possible. Water is available at the Indian Garden day-use area (no overnight use), and Bright Angel and Cottonwood Campgrounds. Animals can also be watered directly from natural water sources *where streams cross maintained trails*: Pipe Creek on the lower Bright Angel Trail, Wall Creek on the North Kaibab Trail, and seasonally where the Tonto Trail crosses upper Pipe Creek. Equines are not allowed in streams above or below trail crossings. Use collapsible canvas buckets to carry water from other sources.

Weed-free feed sources:

Arizona
www.arizonacrop.org/NWFF&M/Grower's%20list.html

California
www.cdfa.ca.gov

Colorado
wildlife.state.co.us/LandWater/WeedFreeForage.htm

Nevada
agri.nv.gov/nwac/PLANT_WFHProducers.htm

Utah
ag.utah.gov/news/publications/documents/Weed-Free-List.pdf

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Appendix B – Minimum Requirement Analysis

INTRODUCTION

No portion of Grand Canyon National Park has been designated as wilderness. Nevertheless, *NPS Management Policies* 2006 state, "For the purposes of these policies, the term 'wilderness' will include the categories of suitable, study, proposed, recommended, and designated wilderness. Potential wilderness may be a subset of any of these five categories. The policies apply regardless of category (NPS 2006b)". Management Policies continue, "The National Park Service will take no action that would diminish the wilderness suitability of an area possessing wilderness characteristics until the legislative process of wilderness designation has been completed. Until that time, management decisions pertaining to lands qualifying as wilderness will be made in expectation of eventual wilderness designation. This policy also applies to potential wilderness, requiring it to be managed as wilderness to the extent that non-conforming conditions allow (NPS 2006b)."

In accordance with *NPS Management Policies* 2006:
All management decisions affecting wilderness must be consistent with the minimum requirement concept. This concept is a documented process used to determine whether administrative activities affecting wilderness resources or the visitor experience are necessary, and how to minimize impacts. The minimum requirement concept will be applied as a two-step process that determines:

- Whether the proposed management action is appropriate or necessary for the administration of the area as wilderness and does not pose a significant impact to wilderness resources and character; and
- The techniques and types of equipment needed to ensure that impact to wilderness resources and character is minimized

In accordance with this policy, superintendents will apply the minimum requirement concept to the context of wilderness management planning, as well as to all other administrative practices, proposed special uses, scientific activities, and equipment use in wilderness (NPS 2006b).

NPS Management Policies also require the NPS to apply the minimum requirement concept to authorized commercial activities in wilderness areas.

This appendix includes the Minimum Requirement Analysis (MRA) for the installation of a restroom and hitch rails at Uncle Jim Point to support stock use.

GRCA MINIMUM REQUIREMENT ANALYSIS

Installation of a restroom and hitching rails at Uncle Jim Point

PART A: Is this action necessary to manage the area as wilderness?

DESCRIPTION OF PROPOSED ACTION: Installation of restroom at Uncle Jim Point to address concerns with human waste and installation of hitching rails to support commercial stock trips in this location.

1. Describe Special Provisions of Wilderness Legislation. Is there a special provision in wilderness legislation (The Wilderness Act or others) that allows consideration of actions involving Section 4(c) uses?

Cite law and section: No portion of Grand Canyon National Park has been designated as wilderness; therefore, no special wilderness legislative provisions apply.

Section 4 of the Wilderness Act generall describes authorized uses of wilderness areas. Subsection 4 (c) of the Act states: "…except as necessary to meet minimum requirement for the administration of the area for the purpose of the Act…there shall be no use of motorized vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area."

Subsection 4(d)(5) of the Wilderness Act states that commercial services may be authorized and performed within designated wilderness areas "to the extent necessary for activities that are proper for realizing the recreational or other wilderness purposes of the areas."

2. Describe Requirements of Other Legislation, Policy, and Guidance. Does taking action conform to and implement relevant standards and guidelines and direction contained in other legistation, policy, management plans, species recovery plans, tribal government agreements, and/or other interagency agreements?

Explain and cite law, policy, etc.:
Refer to Chapter 1 – Relationship to Other Plans and Policies

3. Describe Options Outside of proposed wilderness. Can this action be accomplished outside GRCA wilderness?

☐ **Yes** ☒ **No** **Explain:** Stock use occurs in a number of areas throughout the park, including on the Ken Patrick and Uncle Jim Trail in proposed wilderness. The specific action is proposed at Uncle Jim Point and cannot be completed outside GRCA's proposed wilderness.

4. Describe how the action would contribute to the preservation of wilderness character: How would the action contribute to the preservation of wilderness character as described by the components below?

Untrammeled (Wilderness is ideally unhindered and free from modern human control or manipulation): See Chapter 3, Wilderness Character section

Undeveloped (Wilderness has minimal evidence of modern human occupation or modification): See Chapter 3, Wilderness Character section

Natural (Wilderness ecological systems are substantially free from the effects of human use, e.g. visitation and/or management activities): See Chapter 3, Wilderness Character section

Outstanding opportunities for solitude or a primitive and unconfined type of recreation (Wilderness provides opportunities for people to experience natural sights and sounds, solitude, risk, adventure and other attributes): See Chapter 3, Wilderness Character section

5. Describe the effects to the public purposes of wilderness: How would this action support the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation and historical use?

Explain:
The proposed action would not hinder the recreation, scenic, scientific, education, conservation or historical use of proposed wilderness in Grand Canyon. As stated in subsection 4(b) of the Wilderness Act, "[W]ilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use." Commercial stock trips provide recreational and educational opportunities. Additionally, the EA identifies opportunities for education.

PART A DECISION: Is it necessary to take this action?

☒ **Yes** ☐ **No**

Explain: The Purpose and Need section of Chapter 1 of this EA determines that stock use is an appropriate use in the park. Uncle Jim Point is a popular destination for vistors engaging in mule rides and day hikes. Installation of facilites at Uncle Jim Point may be necessary to address human waste impacts, and to confine and/or minimize stock use impacts to vegetation and soils in the area.

PART B: Determine the Minimum Tool - *HOW the action will be done*

Describe alternative actions to accomplish the proposed action:

This EA describes and analyzes five alternatives for stock use and associated improvements in the park. Descriptions of the alternatives are contained in Chapter 2, and the analysis is contained in Chapter 3. The range of alternatives includes varying levels of commercial mule rides, ride locations, improvements to barns and infrastructure, and other variables.

Alternative B proposes installation of two facilities (composting toilet and hitch rail) to support commercial mule rides.

Alternative 1: Installation and maintenance of a vault toilet and hitch rail at Uncle Jim Point.

Placement of a composting toilet and a hitching rail would have direct impacts on soils, vegetation, and would involve ground disturbance which would result in minor, long-term, adverse impacts to biological and physical resources. Confining stock use to the hitching area would mitigate social trailing and erosion and result in beneficial impacts to biological and physical resources. Additional beneficial impacts may include decreased human waste due to placement of toilets and decreased impacts to trees previously used for hitching cable.

Installation of a restroom would decrease the amount of human waste near Uncle Jim Point and result in beneficial impacts to visitor experience.

Routine maintenance of the toilets would be completed without mechanized equipment and would include stirring the toilet and adding materials to encourage composting. Emptying toilets would be completed with the use of mechanized transport or mules similar to the non-wilderness cross canyon corridor.

As stated in Chapter 3, Wilderness Character section, placement of these facilities would have moderate adverse short and long-term impacts in proposed wilderness. Under the Public Health and Safety analysis in Chapter 3, placement of a restroom would result in minor beneficial long-term impacts.

Alternative 2: Do not install vault toilet and retain hitch rail at Uncle Jim Point.

The removal of the temporary toilet placed in summer 2009, and continued trail rides and day hiking, without toilet facilities would result in accumulation of human waste and associated litter at Uncle Jim Point. The lack of toilet facilities and would have direct impacts on soils, vegetation and would involve ground disturbance from cat-holing and development of social trails. Adverse impacts to biological and physical resources would be moderate and long term.

It is expected that this area will receive high levels of use by commercial mule riders and hikers. Lack of toilet facilities may have an adverse impact to visitor experience due to potential encounters with human waste evidence and litter.

PART B DECISION:

The Preferred Alternative (Alternative B) proposes commercial and private stock use in a number of areas throughout the park and the installation of a restroom and hitch rails at Uncle Jim Point.

As stated in Chapter 1, the NPS has determined that stock use is necessary and appropriate to accomplish public educational goals and to provide opportunities for public recreation in a relatively primitive and unconfined setting.