

## CHAPTER 3 AFFECTED ENVIRONMENT

### INTRODUCTION

Chapter 3 describes conditions of those impact topics (Soundscape, Wilderness Character, Ethnographic Resources, Visitor Use and Experience, Wildlife, Special Status Species, and Socioeconomic Environment) potentially affected by Alternatives to manage air-tour flight operations and routes in the Grand Canyon National Park Special Flight Rules Area. The Affected Environment for this EIS includes the entire Special Flight Rules Area as described in Chapter 1's Scope of the Analysis. However for some topics, the Study Area is larger than the Special Flight Rules Area because impacts from air-tour management actions extend beyond the SFRA boundary. Discussion of each topic includes an overview of information and issues relevant to management of air-tour flight operations.

Impact topic descriptions provided in this Chapter serve as the baseline from which to compare potential effects of management actions considered in this EIS. Topics presented in this Chapter, and their organization, correspond to the impact analysis in Chapter 4, Environmental Consequences. Specific locations in the SFRA referred to in this Chapter are depicted in Map 2.1.

### SOUNDSCAPE

This section provides an overview of Grand Canyon's affected Soundscape, the foundation for evaluating effects of Alternatives in Chapter 4 of this EIS. Natural Soundscape a national park resource, and provides a description of both natural and existing Soundscape in this section as they form the affected environment baseline for Chapter 4's impact analysis.

#### Soundscape Characteristics

**Soundscape** is defined by the NPS as the aggregate of all sounds in an area, both natural and human-made; the park's total acoustic environment. Contributing human-made sounds include cars traveling on roads, tourist buses idling, aircraft flying, visitors talking, hotel air conditioners humming, and so forth.

**The natural Soundscape** is the subset of the total Soundscape composed completely of natural sounds without human-made sounds (NPS 2006d). Physical and biological components such as wind, water, weather, birds, and insects create the natural Soundscape. The natural Soundscape can vary considerably among locations or times in a single location. At one end of the natural spectrum may be sounds associated with a severe thunderstorm; at the other, the absence of perceptible sound. Between these extremes an array of sound conditions varies moment to moment, season to season. These variations result from contributions of wind and its interaction with vegetation and irregular terrain; water as a result of movement in streams, rivers, rapids, and waterfalls; animals, whose sound can be nearly continuous, such as insects, or intermittent, such as birds and coyotes; and, more rarely, geological activity in the movement of earth and rock, such as landslides or rock falls.

**Noise** is sound that can degrade or mask the natural Soundscape. Sound can be perceived as noise due to loudness, frequency, duration, and occurrence at unwanted times or from an unwanted source, or because it interrupts or interferes with a desired activity. In a national park setting, noise is a subset of human-made sounds that may adversely affect park resources or visitor experiences by modifying or intruding on the natural Soundscape or by impeding or masking natural sounds (NPS 2006d). Noise may vary in character moment to moment, day to night, and season to season. Noise can distract visitors from enjoying park resources, purposes, and values; affect traditional cultural properties and the tranquility of historic park settings; and affect wildlife use patterns and daily life activities.

**Sound** is usually measured in a logarithmic scale using units called decibels (dB). Sound is composed of various frequencies, but the human ear does not respond to all frequencies. The A-weighted decibel scale (dBA) takes this into account by emphasizing frequencies between 1 kilo Hertz (kHz) and 6.3 kHz to simulate the relative response of human hearing. As an example, Table 3.1 shows a range of A-weighted decibel levels for recognizable sounds. The Soundscape also includes many sounds humans cannot hear, some of which must be measured using metrics other than A-weighted decibels.

**TABLE 3.1 COMMON SOUND LEVELS**

Sound Sources Measured in Parks	Other Common Sound Sources	dBA
Volcano crater, Haleakala National Park	Human breathing at 3m	10
Leaves rustling, Canyonlands National Park	Whispering	20
Crickets at five meters, Zion National Park	Residential area at night	40
Conversation at five meters, Whitman Missions National Historic Site	Busy restaurant	60
Snowcoach at thirty meters, Yellowstone National Park	Curbside of busy street	80
Thunder, Arches National Park	Jackhammer at 2m	100
Military jet at one hundred meters AGL, Yukon-Charley Rivers National Preserve	Automobile horn at 1m	120

Sound level of busy street (80 dBA), American Speech-Language Hearing Association, at <http://www.asha.org/public/hearing/disorders/noise.htm>

Whisper/normal breathing (20 dBA/10 dBA), residential area at night (40 dBA), automobile horn (Berger and Kladden 2005)

Busy restaurant (60 dBA): [http://www.engineeringtoolbox.com/sound-power-level-d\\_58.html](http://www.engineeringtoolbox.com/sound-power-level-d_58.html), and

<http://www.hearingclearly.com/audiograms-sound/>; Jackhammer: <http://www.hearingclearly.com/audiograms-sound/>

**Human hearing** can usually perceive differences in sound levels of 3 dBA. A 10 dBA increase in sound level is typically perceived as being twice as loud, and a 10 dBA decrease as half as loud (Minnesota Pollution Control Agency 1999). For example, a 70 dBA sound level would be perceived by an average person as twice as loud as a 60 dBA sound. Individual dBA levels for different noise sources cannot be directly added to provide a combined sound level. For example, two noise sources producing equal dBA levels at a given location would produce a combined Average Sound Level 3 dBA greater than either sound alone. When two noise sources differ by 10 dBA, the combined Average Sound Level would be 0.4 dBA greater than the louder source alone (USFS 2007a).

Many factors affect how an individual responds to noise. Primary acoustical factors include sound level, its frequency and duration, whether the sound is steady or varying in frequency and sound level, and whether the sound carries information of interest to the individual. Non-acoustical factors also play a role in how an individual responds to sound. These factors vary from past experience and individual adaptability to the predictability of when a noise may occur. The listener's activity also affects how he/she responds to noise (Mestre Greve Associates 2005).

### **Natural Soundscape and Natural Quiet**

The concept of **natural quiet** as applied to Grand Canyon is discussed in Chapter 1. Natural quiet is synonymous with the terms **Natural Soundscape** and the more technical **natural ambient sound**; natural ambient sound is the more appropriate term because nature is often not quiet (i.e., thunderstorms, wind, etc.). Natural Soundscape protection in national parks is required by law and policy.<sup>20</sup> Grand Canyon is noted for its rich sound environment and unusual and noticeable natural quiet. A management objective in Grand Canyon National Park's 1995 General Management Plan states, "Protect the natural quiet and solitude of the park, and mitigate or eliminate the effects of activities causing excessive or unnecessary noise in, over, or adjacent to the park."

An important part of the NPS mission is preserving park resources and values unimpaired, including natural Soundscapes (NPS 2006b Section 1.4.6). As defined by NPS Management Policies 2006, Section 4.9, park natural Soundscape resources encompass all natural sounds that occur in parks, including the physical capacity for transmitting natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. Natural sounds occur within and beyond the range of sounds humans can perceive, and they can be transmitted through air, water, and solid materials. Management policies require NPS to preserve, to the greatest extent possible, the natural Soundscapes of the national parks, and to restore to the natural condition wherever possible those park Soundscapes that have become degraded by unnatural sounds (i.e., noise). The policy also requires NPS to protect natural Soundscapes from unacceptable impacts. According to NPS Management Policies 2006, Section 1.4.7.1, these are impacts that, individually or collectively, would unreasonably interfere with the atmosphere of peace and tranquility, or the natural Soundscape maintained in Wilderness and natural, historic, or commemorative park locations.

<sup>20</sup> The 1975 Grand Canyon National Park Enlargement Act, the 1987 National Parks Overflights Act, the 1995 Grand Canyon General Management Plan, the National Parks Air Tour Management Act of 2000, and NPS Management Policies 2006 (Sections 1.4.6, 1.4.7.1, 4.9, and 8.2.3)

In addition to being considered a park resource and value, natural sounds are also a key contributor to the visitor experience (e.g., visitors listening to elk bugling or waterfalls or simply sitting quietly watching sunrise or sunset). Thus, Soundscape preservation and noise management are important components of achieving the NPS mission of preserving park resources unimpaired for the enjoyment of future generations.

NPS Management Policies 2006, Section 4.9, requires the NPS identify what levels and types of unnatural sound constitute acceptable impacts on park natural Soundscapes, and take action to prevent or minimize all noise that through frequency, magnitude, or duration adversely affects natural Soundscape or other park resources or values, or that exceeds levels identified through monitoring as being acceptable to or appropriate for visitor uses at monitored sites (NPS 2006d). Grand Canyon offers a wide range of natural and human-influenced Soundscapes that vary widely in a complex interaction of factors such as sound source, distance, park location, timing, and physical conditions (such as weather and terrain). For example, sound conditions are very different between remote backcountry locations and the visitor center parking lot.

### Natural Ambient Sound Levels

**Natural ambient sound levels** include all natural sounds in a given area, excluding all mechanical, electrical and other human-caused sounds.

**Existing ambient sound levels** include all natural and non-natural sounds.

To assess progress in substantial restoration of natural quiet, Grand Canyon National Park has been the subject of numerous studies, investigations, and monitoring efforts to identify and characterize natural ambient and existing sound levels throughout the park.<sup>21</sup> These studies show natural ambient sound levels vary considerably throughout the SFRA by location and time, but there are areas with similar acoustic qualities (i.e., acoustic zones) that correspond to major vegetation types in the area. Map 3.1 shows acoustic zones corresponding to major SFRA vegetation types, along with natural ambient sound levels corresponding to these acoustic zones.

Maps 3.1 and 3.2 show the 127 SFRA Location Points<sup>22</sup> used in noise modeling referred to in Table 3.2 and Chapter 4's impact analysis.<sup>23</sup>

Additionally, Map 3.1 shows natural ambient sound levels that form the basis of the Percent Time Audible calculations performed in Chapter 4's noise modeling; dBA values shown are based on best available data in 2005 (the Base Year for data used in noise modeling (including aircraft operations) for this EIS).<sup>24</sup> The 2005 natural

<sup>21</sup> Studies include Ambrose 2006, HMMH 1993, NPS 2007c, NPS 2007d, NPS 2008a

<sup>22</sup> As further described in Appendix D, 127 Location Points were selected by the NPS for EIS noise modeling. NPS selected 25 Location Points (GC008-GC033) corresponding to monitoring sites where acoustic data was collected. Other named points were selected as representative locations for visitor experience and/or park resources (e.g., Wilderness Character, Ethnographic Resources, and Wildlife). Additionally, Location Points GRID01 through GRID36 were selected based on a ten-kilometer grid to provide spatial coverage throughout the park

<sup>23</sup> Chapter 4's impact analysis is based, to large extent, on noise modeling results conducted for this EIS by the Department of Transportation, Volpe Center, using FAA's Integrated Noise Model (INM). See Appendix D for further discussion of the noise model and modeling performed for this EIS. As part of noise modeling, both a Location Point analysis and a Contour Analysis were performed. Contour Analysis involved additional GIS analysis of modeling results to provide percentages of the entire park and SFRA within specified results for Percent Time Audible and Average Sound Level from the model. Location Point results were calculated directly in noise model software using geographical coordinates of the points, and represent specific points rather than broad areas (e.g., the point may be at the bottom of a narrow canyon which would probably not be similar to results from a point on a nearby ridge). Contour data represents broad areas rather than specific points (i.e., data for a specific point within a contour area may not show the same result as the contour area due to size and level of resolution of contour area). The analyses are used together in considering the complex noise environment in Grand Canyon

<sup>24</sup> Base Year 2005 is the Base Year for noise modeling in this EIS. The best available data as of the end of 2005 is used as the base for noise modeling for the Alternatives. Since 2005, the 2005 database has been checked against data from subsequent years, and although there are some differences, given all factors contributing to those differences, the 2005 database has proven consistent enough to continue as a reasonable base for evaluating impacts of the Alternatives in this EIS

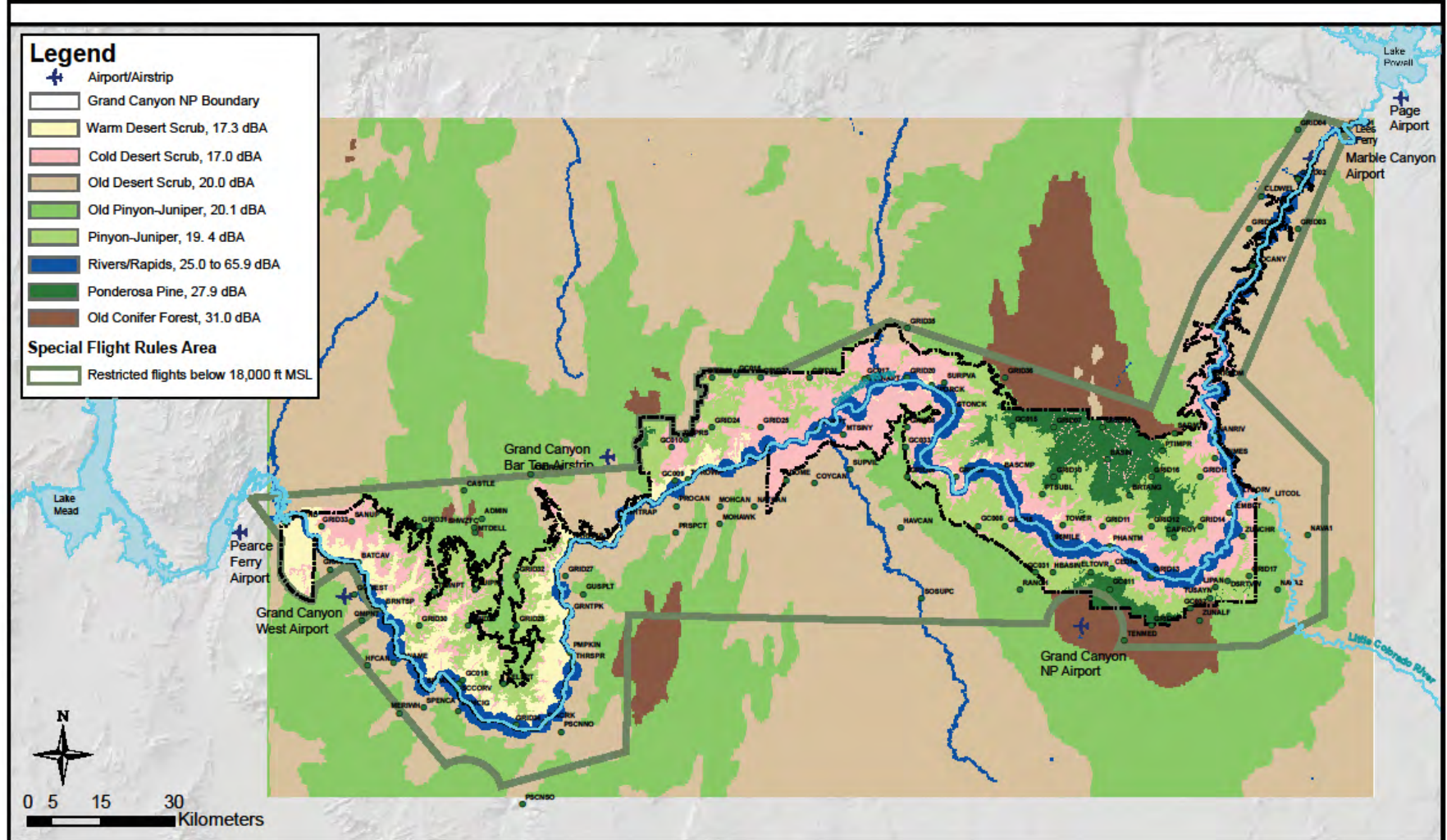
1 ambient data are shown for the four most common park vegetation types: piñon-juniper (33% of the park), cold  
2 desert scrub (30% of the park), warm desert scrub (12% of the park), and ponderosa pine forests (10% of the park)  
3 (NPS 2007d). A river/rapids acoustic zone is also shown in Map 3.1 with a range of sound levels related to the  
4 Colorado River in GCNP (the river/rapids area shown is approximately 12% of the park). In addition, there are three  
5 vegetation types shown on Map 3.1 outside GCNP (i.e., old piñon-juniper woodland, old desert scrub, and old  
6 conifer forest).

7  
8 Table 3.2 shows, under the heading Natural Ambient Used in EIS Noise Modeling, natural ambient sound levels  
9 from Map 3.1 were adjusted<sup>25</sup> for use in EIS noise modeling. The 2005 database was used to ensure consistency and  
10 avoid the very substantial time and expense needed to re-run noise modeling for already-modeled Alternatives as  
11 new data accrued and new Alternatives were developed.

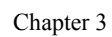
12  
13 During EIS preparation, park staff collected additional data on natural ambient sound levels and human noise  
14 sources in Grand Canyon's backcountry areas (NPS 2006a, 2007c and 2007d). Results of the backcountry sound  
15 monitoring are shown in Table 3.2 under the heading Updated Natural Ambient. Chapter 4's noise modeling results  
16 are interpreted with differences between 2005 and updated data sets in mind.  
17

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<sup>25</sup> As noted in Table 3.2, 10dB were added to natural ambient levels in approximately one-third of the park as explained further in Chapter 4, Methodology and 64 Federal Register 3969. Park Management Zones are an important part of context for some impact topics. As described in Chapter 3, Visitor Use and Experience, park Management Zones considered in this EIS are Wilderness, Non-Wilderness, and Developed. In general, impact analyses take into consideration that more noise sources are present and that more noise impact from all sources (including aircraft) is accepted in the Developed Zone (about 2% of the park) than other zones based on zone management objectives. Noise modeling for this EIS uses a Dual-zone System (Audibility and Detectability) that generally addresses different management objectives for different park Management Zones. Specifically, for Detectability Zone areas (approximately 66% of the park), natural ambient sound levels were used directly in computing audibility in the noise model. For areas in the Noticeability Zone (approximately 34% of the park), 10 dB were added to natural ambient sound levels in the noise model to account for factors such as increased visitor activity and presence of non-natural sound sources. For reasons explained in the 1999 Federal Register Notice, when NPS and FAA agreed to use the Dual-zone System for modeling at GCNP, the Developed Zone (including South and North Rim developed areas), GCNP's West End, and Marble Canyon are in the Noticeability Zone

**Map 3.1 Natural Ambient Sound Levels and Location Points**

3





**TABLE 3.2 NATURAL AMBIENT SOUND LEVELS BY LOCATION POINT**

<b>Location Point Name</b>	<b>Point ID<sup>a</sup></b>	<b>Vegetation/Ambient Type<sup>bc</sup></b>	<b>Natural Ambient Used in EIS Noise Modeling (dBA)<sup>de</sup></b>	<b>Updated Natural Ambient<sup>f</sup> (dBA)</b>
96 Mile Camp	96MILE	River/rapids	25.0 to 65.9	Same
NPS Administration site*	ADMIN	Old PJ	20.1 (+ 10 dBA)*	20.0
Andrus Canyon*	ANDRUS	Old PJ	20.1 (+ 10 dBA)*	20.0
Bass Camp	BASCMP	River	25.0 to 65.9	Same
The Basin	BASIN	CDS	17.0	18.2
Bat Cave*	BATCAV	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Burnt Springs Canyon*	BRNTSP	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Bright Angel Point	BRTANG	Ponderosa	27.9	22.8
Cape Royal	CAPROY	Ponderosa	27.9	22.8
Castle Peak*	CASTLE	Old PJ	20.1 (+ 10 dBA)*	20.0
Cedar Ridge	CEDRIG	PJ	19.4	20.0
Cliff Dwellers Lodge	CLDWEL	WDS	17.3	18.5
Coyote Canyon	COYCAN	ODS	20.0	Same
Diamond Creek*	DIACRK	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Desert View*	DSRTVW	PJ	19.4 (+ 10 dBA)*	20.0
El Tovar*	ELTOVR	Ponderosa	27.9 (+ 10 dBA)*	22.8
Pasture Wash	GC008	CDS/PJ	17.0 to 19.6	18.2 to 20.0
Tuweep	GC009	WDS	17.3	18.5
Tuweep	GC010	CDS	17.0	18.2
South Rim*	GC011	Ponderosa	27.9 (+ 10 dBA)*	22.8
Rainbow Plateau	GC015	Ponderosa	27.9	22.8
Hancock Knolls	GC016	PJ	19.4	20.0
1 km W of Kanab Point	GC017	CDS	17.0	18.2
Separation Canyon*	GC018	WDS	17.3 (+ 10 dBA)*	18.5
Eremita Mesa	GC031	PJ	19.4	20.0
1.5 km SE of Moran Point*	GC032	PJ	19.4 (+ 10 dBA)*	20.0
Fossil Canyon	GC033	PJ	19.4	20.0
Grand Canyon West*	GCWEST	ODS	20.0 (+ 10 dBA)*	Same
Granite Gorge*	GRAGOR	ODS	20.0 (+ 10 dBA)*	Same
Grid Location Point 1*	GRID01	River/Rapids or ODS	25.0 to 65.9, or 20.0 (+ 10 dBA)*	Same
Grid Location Point 2*	GRID02	River/Rapids or ODS	25.0 to 65.9, or 20.0 (+ 10 dBA)*	Same
Grid Location Point 3*	GRID03	ODS	20.0 (+ 10 dBA)*	Same
Grid Location Point 4*	GRID04	ODS	20.0 (+ 10 dBA)*	Same
Grid Location Point 5*	GRID05	ODS	20.0 (+ 10 dBA)*	Same
Grid Location Point 6	GRID06	CDS/Ponderosa	17.0 to 27.9	18.2 to 22.8
Grid Location Point 7	GRID07	Ponderosa	27.9	22.8
Grid Location Point 8	GRID08	CDS	17.0	18.2
Grid Location Point 9	GRID09	CDS/WDS	17.0 to 17.3	18.2 to 18.5
Grid Location Point 10	GRID10	Ponderosa	27.9	22.8
Grid Location Point 11	GRID11	CDS	17.0	18.2
Grid Location Point 12	GRID12	PJ	19.4	20.0
Grid Location Point 13	GRID13	River/Rapids	25.0 to 65.9	Same
Grid Location Point 14	GRID14	PJ	19.4	20.0
Grid Location Point 15	GRID15	CDS/PJ	17.0 to 19.4	18.2 to 20.0
Grid Location Point 16	GRID16	PJ/Ponderosa/PJ	19.4 to 27.9	20.0 to 22.8
Grid Location Point 17	GRID17	PJ	19.4	20.0
Grid Location Point 18	GRID18	PJ	19.4	20.0
Grid Location Point 19*	GRID19	Ponderosa/Old Conifer Forest	27.9 or 31.0 (+ 10 dBA)*	22.8
Grid Location Point 20	GRID20	River/Rapids	25.0 to 65.9	Same
Grid Location Point 21	GRID21	CDS	17.0	18.2
Grid Location Point 22	GRID22	CDS	17.0	18.2
Grid Location Point 23	GRID23	CDS/PJ	17.0 to 19.4	18.2 to 20.0
Grid Location Point 24	GRID24	PJ	19.4	20.0

**TABLE 3.2 NATURAL AMBIENT SOUND LEVELS BY LOCATION POINT**

<b>Location Point Name</b>	<b>Point ID<sup>a</sup></b>	<b>Vegetation/Ambient Type<sup>bc</sup></b>	<b>Natural Ambient Used in EIS Noise Modeling (dBA)<sup>de</sup></b>	<b>Updated Natural Ambient<sup>f</sup> (dBA)</b>
Grid Location Point 25	GRID25	CDS	17.0	18.2
Grid Location Point 26	GRID26	PJ/Old PJ	19.4 or 20.1	20.0
Grid Location Point 27*	GRID27	ODS	20.0 (+ 10 dBA)*	Same
Grid Location Point 28*	GRID28	Old PJ	20.1 (+ 10 dBA)*	20.0
Grid Location Point 29*	GRID29	CDS/PJ	17.0 to 19.4 (+ 10 dBA)*	18.2 to 20.0
Grid Location Point 30*	GRID30	PJ	19.4 (+ 10 dBA)*	20.0
Grid Location Point 31*	GRID31	Old PJ	20.1 (+ 10 dBA)*	20.0
Grid Location Point 32*	GRID32	Old PJ	20.1 (+ 10 dBA)*	20.0
Grid Location Point 33*	GRID33	CDS	17.0 (+ 10 dBA)*	18.2
Grid Location Point 34*	GRID34	River	25.0 to 65.9 (+ 10 dBA)*	Same
Grid Location Point 35	GRID35	ODS	20.0	Same
Granite Peak*	GRNTPK	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Gus Plateau*	GUSPLT	Old PJ	20.1 (+ 10 dBA)*	20.0
Havasupai Point	HAVAPT	River/Rapids	25.0 to 65.9	Same
Havatah Canyon	HAVCAN	ODS	20.0	Same
Hermit Basin*	HBASIN	PJ	19.4 (+ 10 dBA)*	20.0
Horse Flat Canyon*	HFCAN	ODS	20.0 (+ 10 dBA)*	Same
Kanab Point	KANAPT	CDS/PJ	17.0 to 19.4	18.2 to 20.0
Kelly Point*	KELLPT	Old PJ	20.1 (+ 10 dBA)*	20.0
Lipan Point*	LIPAN	PJ	19.4 (+ 10 dBA)*	20.0
Little Colorado	LITCOL	ODS	17.0	18.2
Little Colorado River	LTCORV	River/Rapids	25.0 to 65.9	Same
Marble Canyon Dam Site*	MARBDM	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Meriwitca*	MERIWH	ODS	17.0 (+ 10 dBA)*	Same
Mohawk Canyon	MOHAWK	ODS	17.0	Same
Mohawk Canyon	MOHCAN	ODS	17.0	Same
Mt. Dellenbaugh*	MTDELL	Old Conifer Forest	31.0 (+ 10 dBA)*	22.8
Mt. Sinyala	MTSINY	CDS	17.0	18.2
Nankoweap Mesa	NANMES	CDS	17.0	18.2
Nankoweap River	NANRIV	River/Rapids	25.0 to 65.9	Same
National Canyon	NATCAN	ODS	17.0	Same
Navajo 1	NAVA1	ODS	17.0	Same
Navajo 2	NAVA2	Old PJ	20.1	20.0
North Canyon*	NOCANY	CDS	17.0 (+ 10 dBA)*	18.2
Jackson Canyon*	NONAME	ODS	20.0 (+ 10 dBA)*	Same
Parashant Wash*	PARWAS	River	25.0 to 65.9 (+ 10 dBA)*	Same
Phantom Ranch	PHANTM	WDS	17.3	18.2
Pumpkin Springs*	PMPKIN	River/rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Prospect Canyon	PROCAN	ODS	20.0	Same
Prospect Canyon	PRSPCT	ODS	20.0	Same
Peach Spring Canyon N*	PSCNNO	ODS	20.0 (+ 10 dBA)*	Same
Peach Spring Canyon S*	PSCNSO	ODS/Old PJ	20.0 or 20.1 (+ 10 dBA)*	20.0
Point Imperial	PTIMPR	Ponderosa	27.9	22.8
Point Sublime	PTSUBL	PJ	19.4	20.0
Quartermaster Point*	QMPNT	ODS	17.0 (+ 10 dBA)*	Same
The Ranch	RANCH	Old PJ	20.1	20.0
Saddle Mountain*	SADMTN	Old Conifer Forest	31.0 (+ 10 dBA)*	22.8
Sanup*	SANUP	CDS	17.0 (+ 10 dBA)*	18.2
Separation Canyon 1km N of Colorado River*	SCCORV	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Spencer/Meriwitca Canyons*	SCMCIG	ODS	20.0 (+ 10 dBA)*	Same
Separation Canyon at Colorado River*	SEPARC	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same



**TABLE 3.2 NATURAL AMBIENT SOUND LEVELS BY LOCATION POINT**

<b>Location Point Name</b>	<b>Point ID<sup>a</sup></b>	<b>Vegetation/Ambient Type<sup>bc</sup></b>	<b>Natural Ambient Used in EIS Noise Modeling (dBA)<sup>de</sup></b>	<b>Updated Natural Ambient<sup>f</sup> (dBA)</b>
Shivwits Fire Camp*	SHWZFC	Old Conifer Forest	31.0 (+ 10 dBA)*	22.8
South Canyon*	SOCAN	CDS	17.0 (+ 10 dBA)*	18.2
South Supai Canyon	SOSUPC	ODS	20.0	Same
Spencer Canyon*	SPENCA	ODS	20.0 (+ 10 dBA)*	Same
Stone Creek	STONCK	River/Rapids	25.0 to 65.9	Same
Suicide Point*	SUIPNT	Old PJ	20.1 (+ 10 dBA)*	20.0
Supai Village	SUPVIL	ODS	20.0	Same
Surprise Valley	SURPVA	CDS	17.0	18.2
Temple Butte	TEMBUT	CDS	17.0	18.2
Three Springs*	THRSRPR	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Toroweap Overlook	TOROWP	WDS	17.3	18.5
Tower of Ra	TOWER	PJ	19.4	20.0
Tusayan Museum *	TUSAYN	PJ	19.4 (+ 10 dBA)*	20.0
Twin Point*	TWINPT	ODS	20.0 (+ 10 dBA)*	Same
Tuweep Ranger Station	TWPRS	CDS	17.0	18.2
Upper Deer Creek	UPDRCK	WDS	17.3	18.5
West End*	WESEND	WDS	17.3 (+ 10 dBA)*	18.5
Whitmore Rapids*	WHTRAP	River/Rapids	25.0 to 65.9 (+ 10 dBA)*	Same
Zuni Alpha	ZUNALF	Old Conifer Forest	31.0	22.8
Zuni Charlie	ZUNCHR	CDS	17.0	18.2

<sup>a</sup>Point ID shows identification codes for Location Points, and are the same codes shown in Map 3.1. The codes were also used in EIS noise modeling

<sup>b</sup>As shown also in Map 3.1, River/Rapids Location Points have a dBA range because the database used for River/Rapids did not identify which points are close to large noisy rapids and which are near quieter running water. Some other Location Points show a range because the point is on the edge of two vegetation/ambient types

<sup>c</sup>Codes used for vegetation/ambient types are ponderosa pine forest (Ponderosa); piñon-juniper woodland (PJ); old piñon-juniper woodland (Old PJ); warm desert scrub (WDS); cold desert scrub (CDS); old desert scrub (ODS); old conifer forest (Old Conifer Forest); River/Rapids

<sup>d</sup>In the column Natural Ambient Used in EIS Noise Modeling, the values shown were used in EIS audibility calculations in the integrated noise model (INM), and are based on best available data in 2005, with the following exception: points identified with an asterisk (\*) had 10 dBA added in the noise model calculation as shown in the table and as explained in Footnote 20 and Chapter 4, Methodology

<sup>e</sup>dBA is A-weighted decibels. A-weighting is commonly used where human hearing is important as it emphasizes the same portions of the sound frequency spectrum as does the human ear

<sup>f</sup>Updated values are from 2007 monitoring reports (NPS 2007c, NPS 2007d), except for River/Rapids which those studies did not update. Also, ODS was not updated since the vegetation map outside the park was not split into cold and warm desert scrub, and there was no new data to update ambient for those areas. However, Old Conifer Forest and Old PJ vegetation types were known to the NPS EIS team to be essentially the same vegetation respectively as Ponderosa and PJ inside the park. So natural ambient values for Old Conifer Forest and Old PJ were updated to the same as the Ponderosa and PJ vegetation types inside the park

<sup>g</sup>For noise modeling purposes, 10 dBA was added to 2005 natural ambient sound levels for Location Points marked with an asterisk (\*), as part of dual-zone modeling explained in Footnote 29 and Chapter 4, Methodology

### Existing Noise Environment (Existing Ambient Soundscape)

As mentioned above, Soundscape can include both natural and non-natural (i.e., human) components. The above discussion described natural Soundscape, which NPS policy considers the baseline condition against which current conditions in a Soundscape will be measured and evaluated (NPS 2006b, 8.2.3). However, NPS policy (NPS Director's Order 2, Park Planning) also requires NPS to divide the park into Management Zones, and to define zone management objectives in such a way that different types and levels of impact are considered acceptable in different zones. In the case of Soundscape, the zone definition for the Developed Zone (approximately 2% of the park) allows many more human noise sources, and considers much more noise impact acceptable than in the Wilderness Zone (approximately 94% of the park), with the Non-Wilderness Zone (approximately 4% of the park) in between the other two but closer to Wilderness Zone than Developed Zone objectives.

During summer and winter 2007 to 2008, NPS monitored sound in GCNP frontcountry areas (NPS 2008a). Existing ambient sound levels in Table 3.3 are  $L_{50}$  (median)<sup>26</sup> sound levels at those sites, and include natural sounds plus non-natural sounds (i.e., human-caused noise), including aircraft overflights.

**TABLE 3.3 EXISTING AMBIENT SOUND LEVELS (NATURAL PLUS NON-NATURAL) FOR SUMMER AND WINTER AT SELECTED GCNP FRONTCOUNTRY LOCATIONS 2007–2008<sup>a</sup>**

Location <sup>b</sup>	$L_{50}$ (Median) Sound Levels (dBA) <sup>c</sup> 7a.m – 7p.m.		$L_{50}$ (Median) Sound Levels (dBA) <sup>c</sup> Midnight-Midnight		Activity Type
	Summer	Winter	Summer	Winter	
Mather Campground	41.3	37.9	39.7	34.1	Campground
Village Loop Rd, West End	56.6	55.8	51.6	51.2	High-use Area
Yaki Point	31.8	29.0	31.4	26.8	Overlook
South Kaibab Trailhead	35.4	32.3	36.7	30.4	Overlook/Trailhead
Mather Point Parking Lot	52.3	52.9	48.1	46.5	Overlook
Desert View Drive, Mile 251	41.3	32.6	36.9	28.7	Road
Bright Angel Trail, 3.7 Mile	23.7	22.3	27.3	21.3	Corridor Trail
Desert View, Parking Lot	47.3	40.2	41.9	36.1	High-use Area
South Rim, Residential Area (NPS)	36.7	36.3	35.2	34.7	Residential
North Kaibab Trailhead	42.7	NA	50.5	NA	Trailhead
North Rim Campground	35.9	NA	34.8	NA	Campground
Cape Royal	27.3	NA	27.9	NA	Overlook
Point Imperial	31.4	NA	32.0	NA	Overlook
North Rim Entrance Road	37.3	25.5	33.2	24.1	Road
Tuweep Campground/Overlook	28.3	22.7	30.7	21.6	Campground

Source: NPS 2008a

<sup>a</sup>With the exception of the Bright Angel Trail, 3.7 Mile location, all frontcountry locations in this table are in the Developed Zone as defined for this EIS

<sup>b</sup>Locations shown in these tables are not necessarily the same location as any Location Points with similar name in Table 3.2 due to different times Location Points (Map 3.2) were selected and studies conducted

<sup>c</sup> $L_{50}$  dBA values represent sound pressure level, in A-weighted decibels, of all sounds (L) (natural plus non-natural) exceeded 50% of the time during the studied time period (i.e., the median)

During busy visitation periods in Developed Zones, it can be difficult to find times and places when and where natural Soundscape is not affected by human noise sources to some extent, even if aircraft are excluded as a human noise source. However, even the Developed Zone is diverse enough that natural Soundscape can be experienced unaffected by human noise sources some times in some places, especially if aircraft are excluded. The studies cited above (NPS 2007 c,d) along with a later study (NPS 2008a) determined natural ambient sound levels when human noise sources were not present, and when they were. Study results, in terms of both natural and human sounds, are shown in Tables 3.3 to 3.6. Results show types of human noise sources and times when human noise sources were present were generally much more numerous in the Developed Zone than in the Wilderness Zone. Results also show there are probably no places, even in the most remote portions of the Wilderness Zone, where aircraft noise does not affect natural Soundscape at least some of the time.

In the GCNP frontcountry study (NPS 2008a), non-natural sounds (vehicles, buildings operations, construction, and maintenance) were audible nearly all the time during the day at high-use frontcountry sites, and about half the day at low-use frontcountry sites. It should be noted that frontcountry sites are less than 6% of the park. Sound levels were loudest in high-use areas such as Village Loop Road, near the popular Bright Angel Lodge and Hermit Road interchange. Sound levels were lowest in less visited areas, such as below the rim 3.7-miles down Bright Angel

<sup>26</sup> In acoustics,  $L_x$  values are called exceedance values because they are values exceeded x percent of the time of interest.  $L_{50}$  values in these tables are values exceeded 50% of the time during the measurement period(s) at the site. As such,  $L_{50}$  values are also the median value of the data

Trail. Winter sound levels were lower than summer levels in park frontcountry and backcountry areas. In frontcountry areas, vehicles were the single sound source contributing most to higher sound levels and higher percent time non-natural sounds were audible (Table 3.4). At low-use frontcountry sites, aircraft were the single source contributing the most non-natural sounds to the Soundscape (Table 3.5). At backcountry sites, aircraft contributed almost all non-natural sounds (Table 3.6).

In high-use frontcountry areas, non-natural sounds were audible 79.5% of the 24-hour day in summer, and 72.9% in winter. In low-use frontcountry areas, non-natural sounds were audible 42.1% of the 24-hour day in summer, and 31.2% in winter. At locations with the highest number of visitors and activities, human-caused sounds were audible nearly 100% of the time summer and winter. The most common audible human-caused sounds were vehicle-related (driving, idling, horns, and alarm systems). Other audible human-caused sounds were aircraft, people (talking, walking), buildings (doors, air conditioners, and heating units), ground-care activities (trash can lids), other mechanized sounds (generators), and domestic animals. The most common natural sounds in both high-use and low-use frontcountry areas were wind-related (wind through vegetation) and birds and insects (primarily in summer). Other audible natural sounds included mammals, water (rain, snow), and thunder.

Outside GCNP within the SFRA, sound sources in NPS, USFS, BLM, and tribal lands are expected to be similar to ambient conditions presented in Tables 3.3 to 3.6 for similar frontcountry and backcountry sites in the park.

**TABLE 3.4 AVERAGE PERCENT TIME AUDIBLE OF SOUND SOURCES HIGH-USE FRONTCOUNTRY AREAS**

Audible Sound Sources		Percent Time Audible 7a.m.-7p.m.		Percent Time Audible Midnight-Midnight	
		Summer	Winter	Summer	Winter
No Sound Audible		0.1	1.2	0.5	4.3
Total Aircraft		14.1	22.1	11.7	19.6
	Aircraft	0.9	1.5	0.5	0.8
	Jet Aircraft	9.0	17.7	8.7	17.0
	Propeller Aircraft	2.1	1.2	1.2	0.8
	Helicopter	2.3	1.9	1.3	1.0
Total Road Vehicles		77.1	66.3	58.5	46.1
Total Non-Natural		92.1	88.2	79.5	72.9
	People	40.5	18.7	28.3	10.9
	Building Sounds	3.9	0.6	10.4	4.6
Total Natural		81.4	65.8	82.4	63.1
	Wind	36.3	41.6	45.3	48.0
	Water (rain, snow)	2.0	15.5	2.6	12.6
	Thunder	1.4	0.0	0.8	0.0
	Bird	70.2	28.5	46.9	16.9
	Insect	7.3	5.3	17.9	7.2

Source: NPS 2008a

### Noise Effects Associated with Aircraft Overflights

Although GCNP includes a wide variety of human noise sources, aircraft sound is the dominant human noise source present in the park because, unlike any other noise source, aircraft move quickly over the entire park while most other noise sources are confined to limited areas such as developed areas or roads. Natural Soundscapes throughout GCNP are affected by aircraft noise from a variety of overflight sources. These include high-altitude, commercial jet traffic; military aircraft traffic; general aviation; NPS administrative operations, such as emergency response and facility maintenance; and commercial air tours. In the 1987 Overflights Act (Public Law 100-91), Section 3(a), Congress found that “[n]oise associated with aircraft overflights at the Grand Canyon National Park is causing a significant adverse effect on the natural quiet and experience of the park.”

**TABLE 3.5 AVERAGE PERCENT TIME AUDIBLE OF SOUND SOURCES AT TWO LOW-USE FRONTCOUNTRY AREAS (BRIGHT ANGEL TRAIL AND TUWEEP CAMPGROUND)**

Audible Sound Sources		Percent Time Audible 7a.m.-7p.m.		Percent Time Audible Midnight-Midnight	
		Summer	Winter	Summer	Winter
No Sound Audible		0.3	13.4	0.3	21.9
Total Aircraft		30.3	36.9	23.3	25.7
	Aircraft	4.4	0.8	2.8	0.5
	Jet Aircraft	19.7	32.2	16.5	23.3
	Propeller Aircraft	5.8	2.6	3.8	1.3
	Helicopter	0.3	1.5	0.2	0.7
Total Road Vehicles		4.5	1.3	3.3	0.6
Total Non-Natural		53.5	47.5	42.1	31.2
	People	29.3	13.1	21.6	6.5
	Building Sounds	1.1	0.2	1.6	0.1
Total Natural		94.1	57.8	96.6	59.0
	Wind	74.7	45.0	62.9	51.3
	Water (rain, snow)	1.9	0.0	0.9	0.0
	Thunder	0.0	0.0	0.0	0.0
	Bird	52.6	29.1	42.3	16.5
	Insect	28.0	3.4	59.2	1.9

Source: NPS 2008a

**TABLE 3.6 PERCENT TIME AUDIBLE FOR NON-NATURAL AND NATURAL SOUNDS, DAYTIME HOURS (7A.M.-7P.M.), FOR SUMMER 2006 REPLICATE AND 2005 ORIGINAL SITES**

Site	Non-Natural Sounds 2006 (2005)	All Aircraft 2006 (2005)	Jets 2006 (2005)	Propeller and/or Helicopter 2006 (2005)	Natural Sounds 2006 (2005)
Ponderosa Pine	34.7 (47.7)	34.7 (36.7)	30.5 (21.8)	3.3 (11.9)	99.6 (99.8)
Piñon-Juniper*	NA (51.9)	NA (49.4)	NA (43.0)	NA (4.9)	NA (95.1)
Cold Desert Scrub	43.2 (40.0)	43.0 (39.4)	39.2 (33.6)	2.8 (4.2)	89.6 (95.0)
Warm Desert Scrub	38.5 (33.4)	38.4 (33.1)	32.7 (22.2)	3.5 (9.7)	99.8 (92.9)

\*No recordings were available for the 2006 piñon-juniper site due to monitoring equipment problems

Source: NPS 2007d

As shown in Table 3.4, at high-use frontcountry sites road vehicles were the greatest audible non-natural sound source, followed by aircraft (jets, propeller planes, and helicopters). At low-use frontcountry sites (Table 3.5), total aircraft sounds were by far the most frequent non-natural sound source (NPS 2008a).

While aircraft are still audible in most frontcountry areas (high commercial jet traffic at all locations plus air tour aircraft in some locations), at many frontcountry locations aircraft sounds were often masked by the higher sound levels of road vehicles and other sources. Many aircraft sounds occur in the same frequency bands as motor and vehicle sounds, which tend to add to the masking effect. In addition, while aircraft were more audible in winter than summer, this is not due to a higher number of flights, but rather due to lower existing ambient sound levels in winter allowing aircraft to be audible more often (NPS 2008a).

At all of the backcountry sites (Table 3.6), almost all non-natural sounds were caused by aircraft during daytime hours (NPS 2007d). At all sites, natural sounds were heard a majority of the time (89.6% to 99.8% of daytime

hours), despite non-natural sounds audible 33.4% to 51.9% of daytime hours.<sup>27</sup> Aircraft (specifically jets and propeller planes) were the only non-natural sounds heard at all backcountry sites. Commercial high altitude jet aircraft were audible at all frontcountry and backcountry locations in all three Management Zones (Developed, Non-Wilderness, and Wilderness). Even at locations in Flight-free Zones, air tour aircraft are often audible due to the distances aircraft noise can travel in the Grand Canyon environment.

See Chapter 4 for a discussion of current impacts from aircraft overflights in Alternative A, No Action.

## WILDERNESS CHARACTER

### Introduction

The 1964 Wilderness Act defines Wilderness as

*A Wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of Wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.*

The 1964 Wilderness Act does not set expectations for Soundscape conditions in Wilderness areas. However, Wilderness Character is expressed through suitability criteria in section 6.2.1.1 of Management Policies (NPS 2006b) used by the NPS to determine whether lands are eligible for Wilderness designation.

Management Policies also directs that

*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.*

### Grand Canyon National Park Wilderness

Ninety-four percent of GCNP has been proposed for inclusion in the National Wilderness Preservation System (NPS 1993). The GCNP Proposed Wilderness is primarily inner canyon and rim areas, and does not include developed areas or the Cross-Canyon (trail) Corridor. Map 3.3 shows areas proposed for Wilderness designation in relation to current air-tour routes.

The 1993 Final GCNP Wilderness Recommendation included two units totaling 1,139,077 acres. Of this, 1,109,257 acres were proposed for immediate Wilderness designation; and 29,820 acres were proposed for designation as Potential Wilderness. Potential Wilderness areas include places that do not qualify for immediate designation as Wilderness due to temporary, nonconforming, or incompatible conditions. GCNP Proposed Wilderness are in the park's GMP-defined Natural Zone, managed to conserve natural resources and ecological processes and to provide for their use and enjoyment by the public in ways that do not adversely affect these resources and processes (NPS Management Policies).

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<sup>27</sup> Percent Time Audible in Tables 3.3 to 3.6 often adds to more than 100%, because more than one sound source was audible at the same time during measurement periods. However, although natural sounds can often be heard in the presence of non-natural sounds (e.g., aircraft), the natural Soundscape is adversely impacted whenever a non-natural sound is present

GCNP Proposed Wilderness is defined by the following qualities consistent with the 1964 Wilderness Act

- **Untrammeled** Ecological systems unhindered and free from modern human control or manipulation

- **Natural** Ecological systems are substantially free from effects of modern civilization

- **Undeveloped** Without permanent improvements or modern human occupation. This quality pertains to the presence and development level of trails, structures, and facilities in the park's backcountry areas

- **Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation**

People can experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge. This quality pertains to visitor opportunities to experience a primitive setting that may include solitude and sights and sounds of nature on its own terms

### Designated and Proposed Wilderness Outside the Park

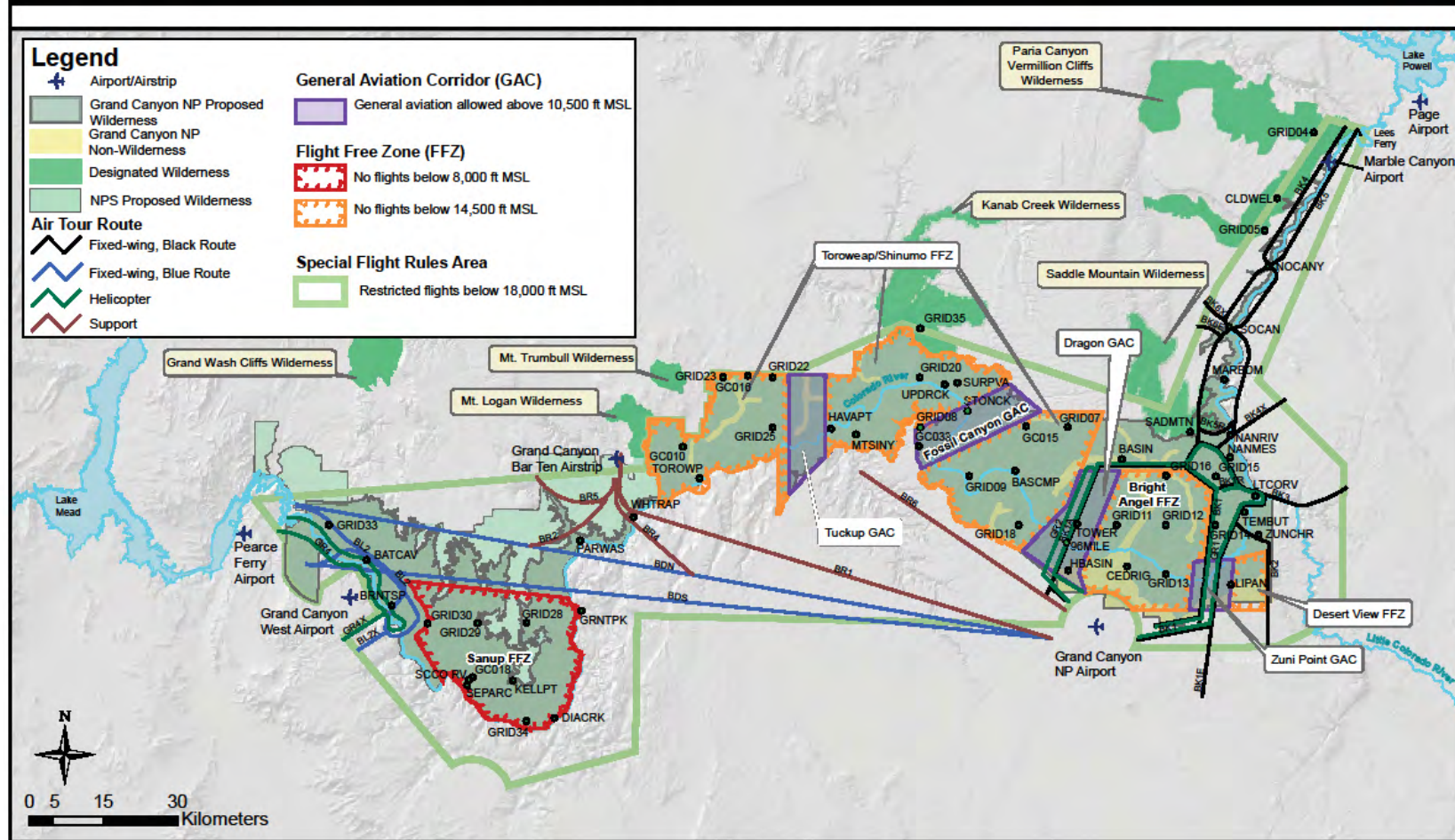
There are six Designated Wilderness areas in the Study Area, and seven Proposed Wilderness areas adjacent to GCNP and/or in the SFRA. These areas are included in the Study Area, as depicted on Map 3.3. For example, Mount Logan and Mount Trumbull are outside the SFRA, and several others are mostly outside the SFRA, but within the Study Area.

#### Proposed Wilderness Areas

Grand Canyon-Parashant National Monument Wilderness Areas	GCPNM NPS-managed portion contains seven Proposed Wilderness areas totaling 190,475 acres. GCPNM's BLM-managed portion contains designated wilderness of 93,109 acres. Total BLM and NPS Designated and Proposed Wilderness Areas total 283,584 acres
	These proposed lands would continue to be managed as Wilderness as required by NPS Management Policies and Director's Order 41, Wilderness Preservation and Management. No actions would be taken by the NPS that diminish Wilderness eligibility of these areas until the legislative process of Wilderness designation has been completed

#### Designated Wilderness Areas

Paria Canyon-Vermilion Cliffs Wilderness	This 112,500-acre Wilderness is managed by the BLM, and is located at the northeast section of the SFRA predominantly west of Marble Canyon
Saddle Mountain Wilderness	This 40,539-acre Wilderness is located in the Kaibab National Forest managed by the USFS, and is located west of Marble Canyon, abutting the Kaibab Plateau's eastern edge. The Nankoweap Rim forms the southern boundary (USFS 2007b)
Kanab Creek Wilderness	This Wilderness is also located in the Kaibab National Forest, totals 75,300 acres, and is jointly managed by the BLM, which administers 6,700 acres, and the USFS, which manages 68,600 acres. The entire Wilderness is located north of the canyon rim above Kanab Canyon and abuts Kaibab Plateau's western edge. The Wilderness contains Kanab Creek, the largest tributary canyon system on Grand Canyon's north side (BLM 2006)
Mount Trumbull Wilderness	This BLM-managed 7,880-acre Wilderness is located in the Grand Canyon-Parashant National Monument just north of Grand Canyon (BLM 2006)
Mount Logan Wilderness	This BLM-managed 14,650-acre Wilderness lies in the Grand Canyon-Parashant National Monument north of Grand Canyon and east of Whitmore Canyon
Grand Wash Cliffs Wilderness Area	This remote, BLM-managed 37,030-acre Wilderness is a 12-mile long stretch of Grand Wash Cliffs in Grand Canyon-Parashant National Monument north of Grand Canyon

**Map 3.3 Wilderness Areas with Current Flight Routes\***

\*Current flight routes correspond to Alternative A



## **ETHNOGRAPHIC RESOURCES**

### **Introduction**

In this document, Ethnographic Resources include traditional cultural properties, tribal concerns, and various intangible and tangible resources valued by GCNP-associated native people.

Ethnographic Resources may include traditional arts and native languages, structures with historic associations, natural materials, sacred or ceremonial places, and spiritual concepts and subsistence activities supported by special places in the natural world. Ethnographic Resources may also include archeological sites and other physical evidence of human activity considered important to a culture for historic, traditional, religious, or other reasons. Ethnographic Resources are the foundation of traditional societies, and form the basis for their cultural continuity.

Traditional cultural properties are defined as a property associated with cultural practices or beliefs of a living community rooted in that community's history or important in maintaining its cultural identity. American Indian groups in the Grand Canyon region recognize certain tangible properties as important in their traditional tribal histories. These traditional cultural properties may or may not correspond to archeological sites. Traditional cultural properties are Ethnographic Resources eligible for listing in the National Register of Historic Places (NPS 2006b).

The term historic properties refers to cultural resources listed in, or eligible for listing in, the National Register of Historic Places. For this EIS, potentially eligible and unevaluated resources (that is, Ethnographic Resources that have not been evaluated for National Register of Historic Places eligibility) would be afforded the same level of protection as listed or eligible historic properties.

Sacred places are natural and cultural resources having established religious meaning and as locales of private ceremonial activities (Management Policies 5.3.5.3.2).

Because American Indians have a strong concern for privacy and protection of traditional cultural properties, site-specific descriptions of cultural sites or details of traditional practices are not included in this EIS.

Some native people believe that the Grand Canyon region was their place of origin or that they have occupied this area from time immemorial. As recorded by archeological research, human history in the Colorado Plateau Region extends back nearly 12,000 years, a time that has been divided into four broad periods: Paleoindian, Archaic, Formative, and Historic. All periods are represented in Grand Canyon. The presence of Paleoindian peoples is suggested by very limited evidence, while later Archaic occupations are sparse but include campsites, rock art, and diagnostic artifacts such as split-twist figurines dating to 3,000 to 4,000 years before present.

Most prehistoric sites in the eastern Grand Canyon are associated with the Formative period (circa AD 500-1200) and typically include Puebloan characteristics: an economy based on farming and trading and villages with similar architectural styles. Populations diminished after the early 1200s as some prehistoric peoples moved eastward. These prehistoric peoples are believed to be ancestors of modern Puebloan peoples. The ancestors of the Pai (Havasupai, Hualapai, and Yavapai), Paiute, and Puebloan peoples occupied the Grand Canyon area as far back as AD 1300 (Euler 1979), and Pai peoples are thought to have occupied downstream areas along the Colorado River as early as AD 700 (Gilpin and Phillips 1998).

### **Status of Ethnographic Resources Information**

The topic of archeological resources has been dismissed from discussion in this EIS (see Chapter 1). However, because of the role archeological sites play in the cultural history and traditional cultural practices of the American Indian groups associated with GCNP, they are briefly discussed as part of the area's Ethnographic Resources.

Numerous archeological investigations and ethnographic studies have been completed in GCNP, but only about 5% of the park has been formally surveyed for cultural sites. Areas that receive heavy visitor use or management that have been surveyed include the Colorado River corridor, the southern extension of the Walhalla Plateau on North Rim (Walhalla Glades), portions of Grand Canyon Village, the Cross-Canyon Corridor, and segments of Desert View Drive.

Most archeological work has been project-specific, but an archeological overview of the park was completed by Ahlstrom et al. in 1993. Coder (2000) prepared an introduction to the park's prehistory. Other recent publications include Fairley et al. (1994) which documents sites along the Colorado River between Glen Canyon Dam and Separation Canyon. A synthesis of cultural resources data was conducted in 2000 (Neal and Gilpin 2000).

Ethnographic studies include Euler's 1979 publication on 4,000 years of human history in the Grand Canyon, T.J. Ferguson's ethnohistory of the Hopi people (1998), and Richard E. Hart's 1995 publication on the Zuni and Grand Canyon.

The Hualapai Tribe, acting as its own Tribal Historic Preservation Office, inventoried historic properties in the Hualapai Reservation, and produced three reports that identified and evaluated traditional cultural properties, including a Draft preliminary report dated November 2, 1998, and two final ethnographic study reports dated March 31 and December 3, 1999. These ethnographic studies focused on major canyons, critical and sensitive areas, and the most accessible areas closest to proposed flight patterns over Hualapai tribal lands.

Summaries of Hualapai traditional cultural properties along the Colorado River include Jackson (1997), Jackson et al. (2001, 2002), Glassco (2003a and 2003b), and Stevens (1996).

Roberts et al. (1995) described Navajo history and cultural resources of Grand Canyon.

An ethnographic resource inventory and assessment for the Colorado River corridor was conducted for the Paiute by Stoffle et al. (1994).

Plants play an important role in traditional cultural practices and ceremonies. Several reports document ethnobotanical resources in the Study Area and include a report on monitoring of Hualapai ethnobotanical resources by Phillips and Jackson (1997). To help protect culturally sensitive plants, several tribes, including the Hopi Tribe, Hualapai Tribe, Navajo Nation, Pueblo of Zuni, and Southern Paiute Consortium, conducted ethnobotanical studies along the Colorado River in Grand Canyon to determine where such plants are located. A list of the plants identified by these groups except the Pueblo of Zuni is on file at the park; the Pueblo of Zuni list is confidential (NPS 2005a).

### **Tribal History and Ethnographic Resources and Concerns**

A number of Federally recognized American Indian tribes in the region attach cultural significance to historic properties located in GCNP, and have expressed or claimed cultural affiliation and/or ancestral ties to the park. Tribes with close cultural ties to Grand Canyon include

- Havasupai Tribe
- Hopi Tribe
- Hualapai Tribe
- Kaibab Band of Paiute Indians
- Las Vegas Tribe of Paiute Indians
- Moapa Band of Paiute Indians
- Navajo Nation
- Pueblo of Zuni
- Paiute Indian Tribe of Utah (representing the Shivwits Band of Paiutes)
- San Juan Southern Paiute Tribe
- Yavapai-Apache Nation (representing the White Mountain Apache, San Carlos Apache, and Tonto Apache Tribes)

#### **Havasupai Tribe**

The Yuman-speaking Havasupai Indians (the *Havasu 'Baaja'* or people of the blue-green waters) are one of 14 bands of Pai Indians, and the only tribe that resides in Grand Canyon. The Havasupai share a common language and ancestry with two other local Pai tribes, the Hualapai and Yavapai-Apache. Once, Yuman speakers occupied the lower Colorado River valley and adjacent areas in western Arizona, as well as southern California, northern Baja California, and northwestern Sonora. Yuman speaking groups who inhabited the area along the Colorado River from the Bill Williams River in northwestern Arizona to Grand Canyon were known as Upland Yumans, or Pai (the

people). When these peoples were first encountered by Euroamericans, there were three major Pai groups, made up of 14 bands. Each band occupied distinct but overlapping ranges.

An 1880 Executive Order restricted the Havasupai Tribe to 38,000 acres; this was further reduced to around 500 acres in 1882. At the time of establishment of GCNP in 1919, the Havasupai Tribe was restricted to a 518-acre, 5-mile-wide, 12-mile-long corridor in a side canyon (Havasupai Canyon). Congress reallocated 185,000 acres of the original hunting grounds to the Tribe in 1975 as part of the Grand Canyon Enlargement Act. Havasupai Canyon and areas to the east and west lie in the Tribe's reservation, which also includes land on the Coconino Plateau from the Little Colorado River west to the Aubrey Cliffs, and from the vicinity of Bill Williams Mountain northward to the Colorado River. The Havasupai Reservation borders the park on the west and south. Today, there are approximately 700 enrolled tribal members living in the village of Supai at the bottom of the canyon.

The native flora and fauna of the canyon and the adjacent Coconino Plateau are traditionally important to the Havasupai for both economic and traditional cultural purposes. Historically, the Havasupai hunted and gathered wild foods over a large area, at a great altitudinal range, from the bottom of the canyon to more than 7,000 feet MSL. During the winter, the Havasupai subsisted by using plateau regions, dividing into bands, extended family, or family units, and returning to areas belonging to these groups. They hunted all over the Coconino Plateau, and collected mescal (*Fabaceae*) and edible wild plants such as agave (*Agavaceae*) on canyon benches.

In summer, they moved into brush and mud-covered wicki-ups (small structures or shelters constructed of wood poles) in Havasupai Canyon where they irrigated crops of squash, beans, and corn. In the late summer, the Havasupai gathered to collect piñon nuts. Bright Angel Trail, Hermit Basin Trail, Mystic Springs Trail, and other long-established trails used by the Havasupai and other native people to access the plateau were rebuilt during the 1890s by Anglos. Moqui Trail was a trade route between the Hopi mesas and Havasupai Canyon, but had been almost completely abandoned by 1910 (FAA 2000b). Many of these trails led to water sources, including Rain Tank (now part of Grand Canyon National Park Airport), used as a subsistence camp and water stop during long-distance travel. A route east from Rain Tank passes through Long Jim Canyon. An area near Hance Trailhead is known to be sacred to the Havasupai people (FAA 2000b). Indian Garden was the home of several Havasupai families until well into the 20th century, and remains important to the native people. The Havasupai creation story tells that "this region is the place where they began, and has always been home to their ancestors" (FAA 2000b). The Havasupai consider themselves traditional guardians of Grand Canyon, and revere the Colorado River as the backbone of their lifeline (NPS 2005a).

In the 1930s the National Park Service constructed residences at the area known as Supai Camp west of Grand Canyon Village on South Rim, and relocated Havasupai tribal members who had been living at Indian Garden and around Grand Canyon Village to those residences. The NPS, in developing the camp, established a residential area for use of the Havasupai people living and working on South Rim. The total number of residences originally constructed at Supai Camp is unclear, but currently four historic cabins, one community building-turned-residence, and one community bathroom and laundry facility exist in this location. Many updates to Supai Camp were completed in 2010, including connecting facilities to the park's wastewater treatment plant, installation of overhead utilities including electricity and telephone, and construction of three duplexes with additional units to be constructed as funding becomes available. Existing housing units are being rehabilitated to meet health and safety codes, including connections to water and sewer. Road expansion and improvements will occur to allow safe, year-round access to Supai Camp. The Havasupai Tribe and NPS have a general agreement to recognize historic use and occupancy of Supai Camp by tribal members. Under terms of this agreement, the Tribe is allowed to use and occupy the Camp for 50 years, from June 2, 2008, the date of signature, to June 2, 2058. Upon expiration of this term, the general agreement will automatically renew for an additional 50 years.

### Hopi Tribe

Hopi traditions tell their place of origin was through the *Sipapuni*, a travertine dome located in the Little Colorado River gorge, outside GCNP. According to Hopi tradition, some of their clans migrated into Grand Canyon, a claim supported by archeological investigations that found Hopi use of the canyon since about AD 700. These early peoples (*Hisatsinom* or people of long ago) lived in small pit-house settlements where they cultivated crops such as corn, beans, and cotton. They occupied a large area that extended roughly from Grand Canyon to Navajo Mountain. The first substantial settlement in the Hopi Mesa area came about AD 700.

1 Eventually, masonry structures replaced pit houses, small clusters of families consolidated into larger villages in the  
2 Black Mesa area of Arizona, and by the AD 1500s, the Hopi had developed a complex social organization, elaborate  
3 ceremonial cycles, and advanced agricultural systems that used mesa runoff to irrigate crops. In 1540, the Hopi were  
4 encountered by part of the Coronado Entrada, and later, by Spanish explorers and missionaries. Over the next four  
5 centuries the Hopi strove to retain their traditions and lands.

6  
7 Contact with the U.S. Government began during the mid-1800s, and the first Hopi Indian agent was appointed in  
8 1870. A 2.5-million-acre Hopi Reservation was established by Executive Order in 1882. Today, the Hopi  
9 Reservation is surrounded by the Navajo Reservation, and is bisected by Dinnebito and Polacca Washes as they  
10 drain toward the Little Colorado River. Population on the reservation is about 6,946 people, and its economy is  
11 based largely on small-scale farms and livestock raising (Tiller 2005).

12  
13 Grand Canyon is very significant to the cultural and traditional life of the Hopi people, and they continue to use the  
14 canyon for important ceremonial and ritual purposes. Some of their most sacred sites are inside and adjacent to the  
15 park, such as the Hopi Salt Mines (by the Colorado River, but closed to public use). The Hopi people consider  
16 Grand Canyon to be their place of emergence into the present world, and the source of their life.

17  
18 The canyon's archeological sites, shrines, springs, places where medicinal herbs are found, and other sacred places  
19 are significant because they help perpetuate Hopi life and culture by providing a vital physical and spiritual link  
20 between the past, present, and future. Springs have spiritual importance, and may have provided holy water used by  
21 Spanish priests at Oraibi and Awatovi Catholic missions. Traditional cultural properties also include elements of art  
22 appearing on rocks, the Mount Trumbull area near Tuweep, archeological sites, shrines, and pilgrimage routes. The  
23 Hopi also believe Grand Canyon is dangerous, requiring proper spiritual preparation and respectful demeanor (NPS  
24 1995). Unintentional disrespect of visitors to these various cultural sites is believed to have the potential to erode the  
25 spiritual well-being of all people.

### 26 27 **Hualapai Tribe**

28 Hualapai Tribe ancestral lands covered millions of acres in and around Grand Canyon, with the Colorado River's  
29 rugged canyons marking the northern boundary. Origin stories link the Hualapai to a place on the west bank of the  
30 Colorado River (McGuire 1983). Archeological evidence suggests the Hualapai are related to the Cerbat branch of  
31 the prehistoric Upland Patayan tradition, found in the Grand Canyon area as early as AD 655.

32  
33 Franciscan missionary Francisco Garcés met the Hualapai during his 1776 expedition, who apparently remained  
34 isolated from Euroamerican incursions for another three quarters of a century until encountered by U.S. Army  
35 explorations seeking a railroad route through Arizona. Conflict between the Hualapai and Anglo road builders,  
36 settlers, and miners resulted in internment of the Hualapai during the 1870s. When the Hualapai returned to their  
37 homeland, they found much of the area occupied by non-Indians. The land had been overgrazed during Hualapai  
38 absence, destroying many of the native plants and making the land unproductive (McGuire 1983).

39  
40 A 900,000-acre reservation was established in 1883 along South Rim of Grand Canyon and the Colorado River on a  
41 portion of ancestral lands. One third of the reservation is on the Coconino Plateau, and two-thirds is at a lower  
42 elevation of the Hualapai Plateau. The terrain covers a wide elevation span, from 7,000 feet MSL on the plateaus to  
43 2,000 feet at the base of Grand Canyon. The reservation extends along 108 miles of the Colorado River, from River  
44 Mile (RM) 165 to RM 273. Most of the Hualapai Reservation is undeveloped. By tribal law, development of any  
45 kind is prohibited in canyons considered sacred to the Hualapai people. Non-Hualapai may not enter these canyons.  
46 *Hualapai* means People of the Tall Pines, and this vegetative cover is found on the central and eastern portions of  
47 the reservation near the canyon rim.

48  
49 The Hualapai Tribe manages its lands for wildlife protection, cultural resources preservation, and forestry. The Tribe  
50 has set aside an area along the southern rim of Grand Canyon for tourism and recreation such as sightseeing,  
51 hunting, and river rafting, etc. This area includes Grand Canyon West Airport (FAA 2000b).

52  
53 Approximately 1,800 people reside on the Hualapai Reservation, including about 1,000 enrolled tribal members out  
54 of the 2,200 total enrolled tribal memberships. Most live in the tribal capital, Peach Springs, situated on Highway 66  
55 on the southern edge of the reservation.

1 The Hualapai people also revere the Colorado River, considering it “the backbone of their lifeline” (NPS 2005a).  
2 The river (*Ha'yitad*) is a significant physical and spiritual landmark, and some canyons (such as Meriwitica  
3 Canyon) along the river are also considered sacred. Names of sacred canyons in Grand Canyon are derived from  
4 important historical events recounted through oral traditions (NPS 1995).

5  
6 Like the Havasupai, the Hualapai traditionally moved seasonally between canyon and plateau, and hunted game,  
7 gathered seeds, and cultivated gardens wherever water was available. Their major wild vegetation foods were  
8 derived from cactus fruit and seeds of grasses. Desert bighorn (*Ovis canadensis*) were one of the Hualapai's prime  
9 sources of survival, along with other animals such as mule deer (*Odocoileus hemionus*), chuckwalla (*Sauromalus*  
10 spp.), elk (*Cervus elaphus*), cottontail rabbits (*Sylvilagus spp.*), and pronghorn (*Antilocapra americana*). They  
11 captured eagles, hawks, and, falcons. Significance is accorded to these and other species because of their historically  
12 great importance to the Hualapai for food and use in ceremonies.

13  
14 The Hualapai also identified plants of special concern traditionally used for food, medicinal purposes, and  
15 ceremonies. These include ponderosa pine (*Pinus ponderosa*), piñon pine (*Pinus edulis*), Gooding's willow (*Salix*  
16 *gooddingii*), sage brush (*Artemisia tridentata*), agave (*Agave spp.*), mesquite (*Prosopis spp.*), and other species  
17 known only to the Hualapai. Minerals of importance are also used for several purposes, and include hematite, used  
18 for ceremonial activities (FAA 2000b).

19  
20 The Hualapai continue to use traditional ceremonial sites, and regularly monitor the condition of six traditional  
21 cultural properties located near heavily visited areas. These include Diamond Creek, Bridge Canyon, Spencer  
22 Canyon, Travertine Canyon, Travertine Falls, and Burnt Springs Canyon. The Hualapai Tribe has documented  
23 numerous traditional cultural properties within the Lower Colorado River gorge (Glassco 2003b; NPS 1995). Based  
24 on ethnographic studies documenting archeological and ethnographic sites, the Hualapai identified about 40  
25 traditional cultural properties they feel are especially critical and sensitive (FAA 2000b).

## 26 27 **Navajo Nation**

28 There is no clear agreement on when the Athabaskan-speaking ancestors of the people now known as the Navajo  
29 migrated into the American southwest. However, archeological and linguistic evidence suggests Navajo ancestors  
30 came into this area between AD1000 and AD1525 (Brugge 1983). Their traditional homeland is symbolized by four  
31 sacred mountains: Blanca Peak and La Plata Mountains in Colorado, Mount Taylor in New Mexico, and San  
32 Francisco Peaks in Arizona. However, their use area extended beyond these landmarks.

33  
34 Navajo views of the origin of their people and their world begin with a journey upward through a subterranean  
35 domain, encountering world after world, before emerging onto the surface of a fifth world at a place centered in  
36 Navajo sacred geography and history, and bounded by the four sacred mountains. This is a created world that is the  
37 responsibility of Navajo people to care for by means of careful stewardship and ceremonies (Gill 1983).

38  
39 Historic records document Navajo peoples presence in the Grand Canyon area by at least AD 1600. When first  
40 encountered by Spanish explorers, the large and powerful Athabaskan-speaking group in the Grand Canyon vicinity  
41 was called *Apache de Nabajó*. These semi-nomadic people planted maize and other crops but also moved to other,  
42 more distant areas for hunting, trading, and mineral procurement. Over the next three centuries, the Navajo came to  
43 occupy the region east of the Colorado River and north of the Little Colorado River, farming, grazing livestock,  
44 gathering plants, hunting, and performing traditional cultural activities in the canyon vicinity.

45  
46 After AD 1600, a number of factors affected Navajo culture, including European influences such as introduction of  
47 sheep and metalworking, the arrival of Puebloan refugees during and after the Pueblo Revolt of 1680, and conflict  
48 with New Mexicans and other groups. U.S. military decisions led to what is known as the Long Walk to Bosque  
49 Redondo (Fort Sumner) in the winter of 1864, in which thousands of Navajo were forcibly removed from their land.  
50 After their return in 1868, the Navajo found that the reservation decreed by treaty contained no more than ten  
51 percent of the land they had occupied earlier. Over the more than 150 years since that time, numerous changes have  
52 been made in the reservation boundaries, so that today it occupies more than 17 million acres (Tiller 2005).

53  
54 The Navajo Nation borders GCNP on the east, stretching from Lees Ferry to the park's southern boundary, south of  
55 Desert View. The Cameron and Gap-Bodaway Chapters (local government divisions) are adjacent to the park. As of

2005, the Navajo Reservation population was estimated at 180,462 (Tiller 2005), with greater than 255,000 enrolled members of the Navajo Nation.

The Navajo view the Colorado and Little Colorado Rivers as sacred female and male entities, respectively, and these rivers and their engulfing canyons provide protection to the Navajo people. These sacred beings are inseparable from the larger sacred landscape of which they are an integral part. Canyon visits must be preceded by ceremonial rituals. Secret sacred places must be visited and rituals performed whenever one goes into the canyon. Salt mined from the canyon is sacred, and proper ceremonies must be observed to obtain it (NPS 2005a).

Sacred sites and traditional use areas include ancestral village sites, shrines, plant collection areas, and places where prayers are offered or herbs gathered. The Navajo have a tradition of using park resources for sacred purposes such as the gathering of medicinal herbs and rock salt. Nuts and berries are routinely harvested from the park. Many areas of traditional cultural and economic significance to the Navajo are in the park, and the many trails used to access the canyons are used for both sacred and secular uses (NPS 1995).

### **Southern Paiute**

The Southern Paiute include the San Juan Southern Paiute Tribe, the Kaibab Band of Paiute Indians, the Paiute Indian Tribe of Utah (representing the Shivwits Band of Paiutes), the Las Vegas Tribe of Paiute Indians, and the Moapa Band of Paiutes (Nuwuvi). These are separate tribes; however, their beliefs, ties to Grand Canyon, and concerns are similar. Therefore, they are discussed as one people, the Southern Paiute (FAA 2000b).

Archeological evidence of Southern Paiute use of the area indicates they have lived in northern Arizona, Nevada, and southern Utah for hundreds of years, from as early as AD 1150. Their language, Uto-Aztecan, is related to languages spoken by peoples living in Great Basin and southward to Mexico, and the Southern Paiute share a common heritage with Paiute tribes in the surrounding states.

For the last several hundred years, the San Juan Southern Paiute Tribe has lived in an area east of the Grand Canyon bounded by the San Juan and Colorado Rivers, and were recorded in the area when John Wesley Powell boated the Colorado in 1869. A traditional boundary for the Southern Paiute in Grand Canyon extends from the junction of the Paria and Colorado Rivers downstream to Kanab Creek (FAA 2000b). This area is part of *Puaxant Tuvip*, a larger sacred land that the Southern Paiute believe was given to them with the “supernatural mandate to protect and manage...” (NPS 1995). The Paiute practiced limited agriculture and horticulture, leaving evidence of irrigated gardens of maize, beans, and squash near permanent water sources.

The first European contact with the Southern Paiute occurred when Fathers Escalante and Domínguez came across the people during the Spaniards’ failed attempt in 1776 to locate an overland route to the California missions. Over the next 75 years, numerous Southern Paiute women and children were taken and sold as slaves. The Old Spanish Trail, cut through Southern Paiute territory during the 1830s and 1840s, contributed to loss of Southern Paiute lifeways and territory. In the mid-1800s, Mormon settlers occupied Paiute water sources, creating a dependency relationship with the Tribe. By the early part of the 20th century, most of the Southern Paiute ancestral territory had been lost to incoming settlers. The Kaibab-Paiute Reservation is located in northwestern Arizona, about 23 miles northwest of Grand Canyon, in rolling grasslands and mesa country. Tribal enrollment is 212 members. The Shivwits Paiute, with about 233 enrolled members, have a reservation near St. George, Utah. The San Juan Southern Paiute Tribe, a newly recognized tribe of approximately 265 members, does not occupy a land base, and most members live in two separate communities, Willow Springs near Tuba City and a second community near Paiute Canyon/Navajo Mountain. Subsistence farming of a small number of crops and livestock husbandry, along with sale of hand-woven traditional baskets, help support tribal economy. The Moapa Band of Paiutes (population 295) resides on the Moapa River Reservation, situated in the upper Muddy Valley in northeast Clark County, Nevada, 55 miles northeast of Las Vegas (Tiller 2005).

To the Paiute people, Grand Canyon’s symbolic landscape is filled with places to farm, hunt, gather, live, and worship. The Colorado River and Grand Canyon are seen as a homeland where their people have lived and died for over a thousand years. This sacred land for the Paiute, *Puaxant Tuvip*, is full of culturally meaningful human artifacts and natural elements such as water, minerals, animals, plants, artifacts, and burials, each having their own human-like life force (NPS 1995).

1 The living natural environment is perceived as liking certain types of human interactions and disliking other  
2 behaviors. In return for proper human behavior, the Colorado River and canyon feed, protect, and support Southern  
3 Paiute (and other human) life and culture. Grand Canyon itself is a source of great power and has a powerful  
4 spiritual aspect. For example, those wishing to become medicine men go to high places along the rim to learn to  
5 sing, a form of prayer. Seeps, springs, falls, and rock formations may be sacred to the Southern Paiute, and often are  
6 part of Southern Paiute Pilgrimage routes (NPS 1995; Stoffle and Van Vlack 2006).

7  
8 Modern Southern Paiute continue to use canyon resources in traditional ways. In particular, because of overgrazing  
9 in other areas, some plants and herbs necessary for medicine and food are only available in Grand Canyon. Native  
10 flora used by the Paiute include 32 families encompassing at least 96 species of edible plants, including cacti,  
11 grasses, berries, piñon, and juniper. Many more plants are used for medicinal purposes.

### 12 **Yavapai-Apache Nation**

13 The Yavapai-Apache Indian Nation reflects the amalgamation of these two historically and linguistically distinct  
14 tribes. The Yavapai-Apache Reservation is located south of Grand Canyon in Yavapai County, Arizona. Today the  
15 tribe has about 159 members occupying a little less than 1,500 acres.

16  
17  
18 The term Yavapai-Apache includes the White Mountain Tribe, San Carlos Tribe, Yavapai-Apache Nation, and  
19 Tonto Apache Tribe. The Yavapai and Apache have lived in central and western Arizona for many centuries, using a  
20 migratory hunting and gathering subsistence pattern that may have included lands now occupied by the park.  
21 Traditionally, the Western or Tonto Apache (Dilzhe'e) used lands south, east, and north of the Upper Verde River,  
22 while the Yavapai (Wipukyipaya) used country south, west, and north of the river (their traditional areas  
23 overlapped).

24  
25 Until the discovery of gold in central Arizona in the 1860s, the Yavapais had little contact with Euroamericans. As  
26 settlers and gold seekers began to encroach onto their lands, conflicts increased. Eventually, in 1871, General  
27 George Crook ordered all the "roving Apaches" to a reservation or be considered hostile. To enforce this order, a  
28 large band of Yavapais was killed by the military in the Salt River Canyon (Tiller 2005). Warfare with the U.S.  
29 military ended with establishment of a 900-mile square military reserve in 1871. However, a presidential order in  
30 1875 rescinded the reserve, and all the people (both Yavapai and Apache) were forcibly marched to the San Carlos  
31 agency near Phoenix. Beginning in the early 1900s small family groups, survivors of the removal effort, drifted back  
32 to their traditional home country. A tiny reservation was established in 1909 at Camp Verde, followed by later  
33 designation of additional parcels that make up the present reservation.

34  
35 Praying for one another, especially to encourage good health, is a crucial feature of Yavapai religion.  
36 Individuals also may call on various forces of nature for help, and they feel the land that sustains them is sacred.

### 37 **Pueblo of Zuni**

38 Although they do not currently reside in or near Grand Canyon, the Zuni retain ancestral ties to Grand Canyon.  
39 Their area of traditional use lies between the San Francisco Peaks on the south and portions of the Little Colorado  
40 River on the north. Like the Hopi, the Zuni believe they entered this world through Grand Canyon before beginning  
41 their journey through the canyons of Arizona and New Mexico, finally settling at Zuni. Written accounts suggest the  
42 origin place is near the main Colorado River, south of its confluence with the Little Colorado at Ribbon Falls (NPS  
43 2005a). Archeological sites, traditional cultural properties, and other sacred locations along the Colorado River  
44 corridor and Little Colorado River are important to Zuni traditional and cultural values, providing important spiritual  
45 linkages to the place of emergence for the Zuni people (NPS 1995).

46  
47  
48 The Zuni and their ancestors occupied the Colorado and Little Colorado River valleys for more than 2,000 years.  
49 They first encountered Europeans when Francisco de Coronado stopped at Zuni in 1540; the first Spanish mission  
50 was established at Zuni in 1629. Following the 1848 Treaty of Guadalupe Hidalgo, the U.S. assumed control of New  
51 Mexico, including the 15.2 million-acre Zuni aboriginal territory (Tiller 2005).

52  
53 The U.S. Government policy of encouraging non-Indian settlement of the West led to Zuni loss of control of about  
54 nine million acres. Additional losses resulted when the Atlantic Pacific Railroad bisected Zuni territory, and when  
55 tens of millions of board feet of timber were cut from the Zuni Mountains, resulting in severe environmental



1 damage. Eventually, the Zuni received some compensation, both for land and land rehabilitation. Presently, more  
2 than 9,500 tribal members occupy the 463,271-acre Zuni Reservation (Tiller 2005).

3  
4 Archeological sites, traditional cultural properties, and other sacred locations along the Little Colorado River and  
5 Colorado River corridors are important to Zuni traditional and cultural values, providing important spiritual linkages  
6 to the place of emergence for the Zuni people. The Pueblo of Zuni considers Grand Canyon the place of emergence  
7 into the present world. Soil, rocks, water, plants, and other materials are gathered for ceremonies conducted to  
8 ensure rainfall for crops and a balanced universe. They pray and leave offerings at various locations. Water from the  
9 bottom of Grand Canyon carried in sacred gourds has special significance to Zuni ceremonies and special meaning  
10 to the Zuni people. The Zuni pray not only for their own lands but for all people and all lands (NPS 1995). Trails  
11 used by the Zuni for traditional cultural purposes also carry special meaning and are cared for by means of particular  
12 blessings and prayers. Thus, the Zuni people have important concerns about the ancient Zuni Trail from their village  
13 to the bottom of Grand Canyon (NPS 1995).

#### 14 **Aircraft Overflights Concerns for Traditional Cultural Practices and Properties**

15  
16 American Indian groups usually do not make a distinction between secular and sacred. Their religion is an  
17 inextricable part of their lives, integrated into all other traditional aspects of their culture. Places of worship and  
18 veneration may be natural features such as mountains, springs, rivers, and canyons. Grand Canyon and the river  
19 within are valued by the native people as a type of reference point in their beliefs, and the natural features form a  
20 crucial part of their world view.

21  
22 In most cases, it is difficult to separate traditional cultural properties and their uses from subsistence activities  
23 because to most native people, the physical world and spiritual world are tightly interrelated and cannot be  
24 separated. Traditional cultural properties and traditional activities potentially affected by actions proposed by  
25 Alternatives for managing aircraft overflights may include sacred sites (sometimes with an archeological  
26 component); ancestral habitations; shrines; burials; ceremonial plant gathering; healing ceremonies; sites where  
27 prayers are offered; hunting; trails; traditional cultural activities that include prayer, song, vision quest, and  
28 pilgrimages by foot and through dreams; and even the husbandry of livestock and other subsistence uses. For tribal  
29 practices to be successful, the site, habitat, or particular resource and its context must remain undisturbed.

30  
31 Human burials are also of special concern to American Indians, and burial areas are considered sacred places.

32  
33 In addition to specific locations and resources, American Indians in the area feel many broader attributes such as the  
34 canyons, water, minerals, plants, and animals of Grand Canyon are of traditional sacred importance. Tribal oral  
35 traditions reveal a strong spiritual relationship to Grand Canyon as a whole.

36  
37 The following excerpt from the Colorado River Management Plan (NPS 2005a) aptly illustrates this broad view of  
38 Ethnographic Resources in the Grand Canyon area

39 *On a broader scale, the whole river corridor can be viewed as an ethnographic landscape in which*  
40 *American Indians have for millennia farmed, hunted, gathered plants and minerals, and performed rituals.*  
41 *Ancient trails, remnants of stone structures, traces of fields, and prayer objects enshrined in travertine and*  
42 *sAlternative Are enduring evidence of a subtly altered landscape. Integral to this landscape are the*  
43 *animals, plants, and minerals traditionally used and valued by American Indians.*

44  
45 During a Bureau of Reclamation project related to Glen Canyon Dam operations, five tribes identified cultural  
46 resources of importance in the river corridor. A total of 324 known archeological sites were identified as traditional  
47 cultural properties by one or more tribal groups (NPS 1995; Glassco 2003a). Of these 324 sites and traditional  
48 cultural properties, the Hopi Tribe identify with 256 sites, the Hualapai Tribe with 118, the Pueblo of Zuni with 99,  
49 the Navajo Nation with 31, and the Southern Paiute Consortium with two.

50  
51 Tribal members have strong expectations of quiet at traditional cultural sites. When practitioners are engaged in  
52 ceremonies at traditional cultural sites, quiet is needed for proper performance of traditional activities. For example,  
53 lengthy prayers are memorized and passed down orally from one spiritual leader or practitioner to another,  
54 generation by generation. Remembering the correct words, song, or prayer sequence is crucial to success of the  
55 prayers, and any interruption can have negative results.

Many prayers are tied to a specific time and place, and special ceremonies may mark special times of year such as the solstice. Ceremonies may accompany the coming of age of children. Traditional hunting and plant gathering often incorporate prayer and quiet contemplation. Prayers may be offered for healing while gathering medicinal herbs from special places. Traditional cultural activities are believed essential to restoration or maintenance of the health of individuals and the well-being of the tribal community. If such ceremonies are interrupted visually or by intrusive sound, the activities may be unsuccessful. If practitioners are unable to conduct their ceremonies or pray at a particular time and in a particular place, the prayers may not have the desired effect.

For the Hualapai, traditional cultural and ceremonial activities undertaken at traditional cultural properties depend on an uninterrupted viewshed and a clear line of sight for prayers to travel uninterrupted from one site to another. If aircraft flights are too low to the ground, flights may block prayers. Practitioners feel that failure to complete these traditional cultural obligations appropriately can lead to dire consequences.

### **Privacy for Traditional Cultural Practitioners**

Flights visible from the ground during ceremonies or prayers can be highly disruptive of traditional cultural practices by introducing an intrusive visual element.

Tribal members have strong expectations of privacy from outsiders, and are concerned about passengers viewing or photographing private ceremonies from the air. The Hualapai have stated that disclosure of the location or character of the traditional cultural properties and associated archeological sites would likely result in vandalism, theft, desecration, and unauthorized public visitation of these sites.

Many practitioners worship at personal shrines or other places in private, and require solitude to successfully complete their worship. Often tribal traditional cultural practices are the secret, exclusive province of a practitioner, and are shared only in prescribed ways with specified individuals having particular relationships with the practitioner. Holders of traditional American Indian beliefs may even feel misfortune may come to those who share this information with inappropriate parties. Even knowledge not considered secret is likely to be private to the native community. Noise from helicopters or other aircraft can intrude on these communications with holy beings, interrupting prayers, invading privacy, and causing distress to the practitioners.

The Hualapai indicate quiet, privacy, and natural viewscape of traditional cultural properties on the Hualapai Reservation are important characteristics of these sites, and are considered to contribute to their eligibility for listing in the National Register of Historic Places (FAA 2000b). Members of other tribes have expressed similar concerns.

### **Overflights and Areas of Traditional Cultural Significance**

Some park areas carry great traditional cultural importance to several tribes. In these areas, overflights could be considered sacrilegious. One area of particular concern to multiple tribes is the confluence of the Colorado and Little Colorado Rivers.

### **Special Circumstances by Tribe**

The FAA's 2000 EA for Special Flight Rules contains an extensive discussion of the tribal consultation process and documentation of consultation with tribes (see Section 3.6.4 and Appendix H of that document). In 1996, the Hualapai Tribal Historic Preservation Officer assumed responsibilities of the State Historic Preservation Officer, including those for Section 106 of the National Historic Preservation Act, for the Hualapai Reservation.

In March 1998, the Hualapai entered into an agreement whereby the Hualapai Department of Cultural Resources would conduct ethnographic and archeological studies to identify traditional cultural properties on the Hualapai Reservation in areas potentially affected by the proposed special flight rules. Over the next two years, these resources were recorded, and the data used to provide FAA with information on sensitive sites. Data from those studies are still relevant and are considered in this EIS.

## **National Register of Historic Places**

As described above, the Colorado River, Grand Canyon, the landscape within which these occur, and numerous park resources are considered sacred by many American Indian communities. Within this larger landscape are sites, resources, and locations that are, in some cases, of traditional significance to all tribes, and to only some tribes in other cases. These traditional cultural properties are important in maintaining the cultural identity of American Indian communities (FAA 2000b).

These traditional cultural properties are tangible properties potentially eligible for listing on the National Register of Historic Places due to their association with beliefs and cultural practices rooted in history. In this EIS, all traditional cultural properties identified by tribes are considered potentially eligible for the National Register pending completion of Section 106 consultation.

## **VISITOR USE AND EXPERIENCE**

### **Introduction**

GCNP receives approximately 4.5 million visitors annually, and annual visitation has remained relatively unchanged for more than a decade (NPS 2006c). Visitor experience is directly related to park significance statements presented in the General Management Plan (NPS 1995). That is, visitors come to GCNP to enjoy resources the park was established to protect and preserve. Visitor experience can be summarized by

- Scenic qualities and scientific values represented by vistas of internationally significant geological forms, a variety of ecosystems, night-sky viewing, and Class I air quality that allows appreciation of these resources
- Natural quiet and solitude available in a place with unusual and noticeable natural quiet, along with access to numerous sites for solitude
- Spiritual/inspirational qualities of the canyon's natural, cultural, and scenic resources coupled with the landscape's vastness
- Recreational opportunities offered by the diversity of park resources and settings in the park's undeveloped and developed areas

Most visitors come in summer (39%) followed by spring (27%) and fall (23%). Only 11% visit in winter. Visitors come from all 50 U.S. states, the District of Columbia (D.C.) Puerto Rico, and 41 foreign countries. A total 83% originate in the U.S. while 17% are international visitors. Among U.S. residents, California is the source of the most visitors at 12.2%, followed by residents of Arizona at 9%. Over 58% of Grand Canyon visitors are visiting for the first time (Northern Arizona University 2005).

Most visitors view the park along South and North Rims in developed areas and access corridors. Of the 4.5 million GNCP annual visitors, approximately 90,000 stay overnight in the backcountry, while approximately 25,000 run the river (NPS 2005b, NPS 2005a).

For most visitors, visiting Grand Canyon is the primary reason for their trip (Northern Arizona University 2005). Visitors to developed areas most often sight-see, take scenic drives, take a guided walk to the rim, and shop (University of Idaho 2003). For some visitor categories, specifically river users and fall backcountry visitors, natural quiet is almost as important a reason for visiting Grand Canyon as viewing the scenery. Enjoying natural quiet is extremely important to many visitors (Baumgartner et al. 1994).

### **Management Zones**

Three Management Zones modified from the GCNP General Management Plan (NPS 1995) are used in this EIS to discuss a range of visitor experiences. These include the 1) Wilderness Zone, 2) Non-Wilderness Zone, and 3) Developed Zone (see Map 3.4).

In the Wilderness Zone, visitors can expect a remote experience with little or no infrastructure, amenities, or services, and opportunities for solitude and primitive, unconfined recreation. The Non-Wilderness Zone offers access to less crowded park areas where an infrastructure level higher than the Wilderness Zone provides basic

services and wayfinding. Corridor trails are often considered transitional areas between developed and nondeveloped areas. The Developed Zone includes visitor centers, major roads, and most visitor services. The frontcountry, while not a formally designated zone, provides a common description for the park's developed areas and transition to Non-Wilderness or Wilderness Zones including main developed areas, viewpoints, and trailheads. Descriptions of the three park zones follow.

**Wilderness Zone** Includes remote backcountry areas and the Colorado River Corridor. Backcountry use areas fall in three subzones: Threshold, Primitive, or Wild. These backcountry Management Zones are based on type and amount of use, current resource conditions, and opportunities for solitude. Threshold subzones are backcountry areas with designated camping, compared to more remote Primitive and Wild subzones with at-large camping and fewer encounters with other visitors. The Colorado River experience varies by season. During summer months, there may be up to 60 trips on the river at one time with visitors traveling on motorized and oar-powered rafts. During non-summer use periods, there are as few as ten trips on the river at one time, and motors are prohibited to enhance opportunities for a Wilderness experience. Backcountry and river use are managed through permit systems and are limited by season and backcountry use area (subzone).

**Non-Wilderness Zone** Includes the Cross-Canyon Corridor, the Tuweep area, and forested areas on North and South Rims. The Cross-Canyon Corridor consists of Bright Angel, South Kaibab, and North Kaibab Trails. There are developed campgrounds, ranger stations, water, and composting toilets in the Non-Wilderness Zone. Unpaved road corridors in the Non-Wilderness Zone provide access to scenic overlooks, dispersed camping areas, and Wilderness trailheads. The Tuweep area is in a remote section of western Grand Canyon. Facilities are limited to a ranger station, undeveloped campground, and composting toilets. Day use in the Non-Wilderness Zone is unlimited. Overnight use is managed by permit.

**Developed Zone** Developed areas on South Rim include Grand Canyon Village, scenic roads west to Hermits Rest and east to Desert View, and a number of scenic overlooks, visitor services, and amenities. On North Rim, the Developed Zone includes the highway corridor to North Rim Village, roads to Cape Royal and Point Imperial, camper services, lodging, and other visitor amenities. Tuweep ranger station, its water catchment system, out-buildings, and the area between these facilities, the campground, and the unpaved road into Tuweep are considered Developed Zone. Also included in the Developed Zone is Phantom Ranch bounded on the east and west by canyon walls, on the north by the hiker dorm, and south by the Colorado River.

## GROUND-BASED VISITORS

### Frontcountry Use

Map 3.5a-c and Table 3.8 presents distribution of visitor days. The majority of visitors experience GCNP from the frontcountry. Frontcountry generally includes the Developed Zone and transitions at overlooks and trailheads between Developed and Non-Wilderness Zones. Frontcountry visitors experience highest densities of, and encounters with, other visitors, including sights and sounds of vehicles such as buses, trucks, and automobiles.

### Backcountry Use

**Day Hikers** While most visitors view the canyon from rim overlooks, a considerable portion (303,958) day-hike into the backcountry. The visitor experience for the day hiker unfolds in two phases. The first phase is the sense of arrival and viewing the canyon, and all visitors participate in this experience. The second phase is exploring the canyon below the rim. Visitors below the rim on a short or long day-hike experience different canyon views, come in closer contact with the canyon's natural resources, and move away from the rim's developed setting and associated sounds and crowds.

Day-use accounts for a large portion of backcountry use along trails accessible from South and North Rim developed areas (NPS 2006a). Seven primary trails used by day hikers are shown in Table 3.7.

**TABLE 3.7 PRIMARY TRAILS USED BY DAY HIKERS**

South Rim	North Rim
Grandview	Widforss
Hermit	Ken Patrick
Bright Angel Trail	North Kaibab Trail
South Kaibab Trail	

The three corridor trails are most used by day hikers. The busiest trail is Bright Angel, with number of day hikers averaging 464 to 787 per day. South Kaibab is the next most used, with 302 to 567 hikers per day, and North Kaibab receives 146 to 208 hikers daily. The other trails received one to 76 visitors per day. The busiest day is Saturday, and mid-day sees the most traffic on the trails.

**Overnight Hikers** NPS visitation statistics show Grand Canyon visitors spent about 90,000 person-days in the backcountry (each person multiplied by number of days in the backcountry), with about 51,000 of those in the Cross-Canyon Corridor campgrounds and about 39,000 in proposed Wilderness (Map 3.5a-c and Table 3.8). This represents 20% of the total 1.2 million overnight stays reported (including concession lodging and campgrounds, and NPS campgrounds) (NPS 2006c). Going on a hike deep into the canyon is wonderful way to experience some of the park's rich natural beauty and immense size. Even for avid hikers, hiking Grand Canyon is very different from, and more demanding than, most other hiking experiences. Hiking beyond the canyon rim into the backcountry offers hikers a powerful and inspiring landscape that, through its immense size, can overwhelm the senses.

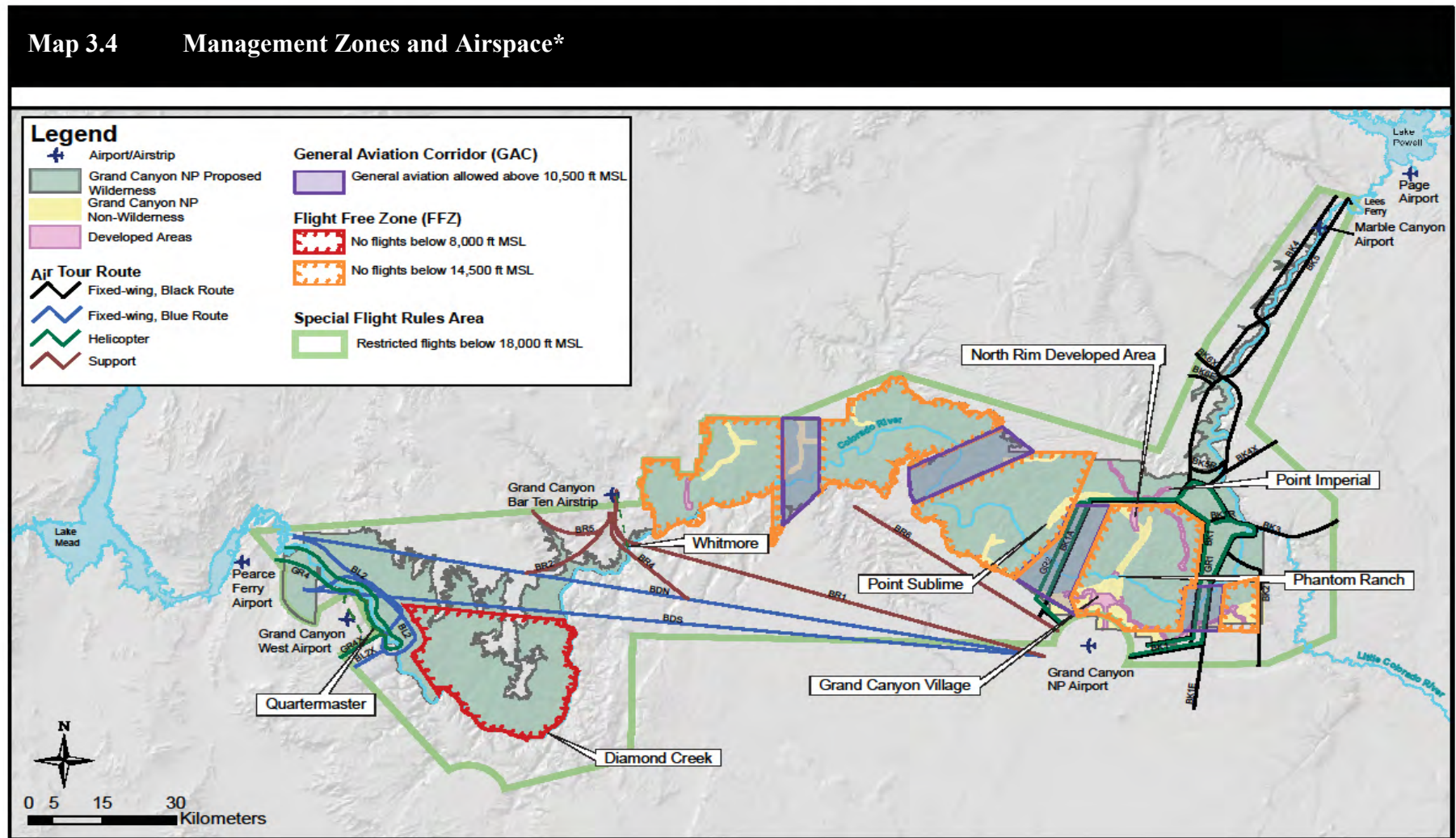
**River Runners (Motorized and Non-Motorized)** A river trip through Grand Canyon is one of the most sought-after backcountry experiences in the country, and nearly 25,000 visitors run the river annually between Lees Ferry and Diamond Creek, for a total 228,986 person-days (i.e., each person multiplied by number of days on the river), plus an estimated additional 300,000 or more user-days between Diamond Creek and Lake Mead National Recreation Area<sup>28</sup> (Map 3.5a-c and Table 3.8) (NPS 2005a). The 277-mile Colorado River section in the park provides a unique combination of thrilling whitewater adventure and magnificent vistas of remarkable geologic landscape. Most visitors begin their trips at Lees Ferry, below Glen Canyon Dam, and most trips end at Diamond Creek or on Lake Mead National Recreation Area. Visitors participate on an outfitter-guided (commercial) trip or a self-guided (noncommercial) trip. River trips are both motorized (40%) and non-motorized (60%). Noncommercial trips are 90% non-motorized and 10% motorized. Commercial-service providers offer river trips to private groups and individuals, both motorized (72%) and non-motorized (28%). River trips vary from one day to several weeks.

**Whitmore Helicopter Exchanges** Some commercial outfitters offer river trips that include helicopter transport in or out of the canyon near RM187. The Whitmore helicopter pad is on Hualapai tribal lands adjacent to the river. This use is allowed under the 1987 Overflights Act (P.L. 100-91).

**Hualapai Tribe One-Day River Tours** The NPS and Hualapai Tribe share an approximate 108-mile boundary along the river corridor. The Hualapai Tribe provides commercial river tours beginning at Diamond Creek and ending near the Quartermaster use area where visitors helicopter from tribal lands. Overnight tours continue to Lake Mead National Recreation Area.

<sup>28</sup> Many river users between Diamond Creek and Lake Mead are not required to obtain permits, so only estimates of user-days in that section are available

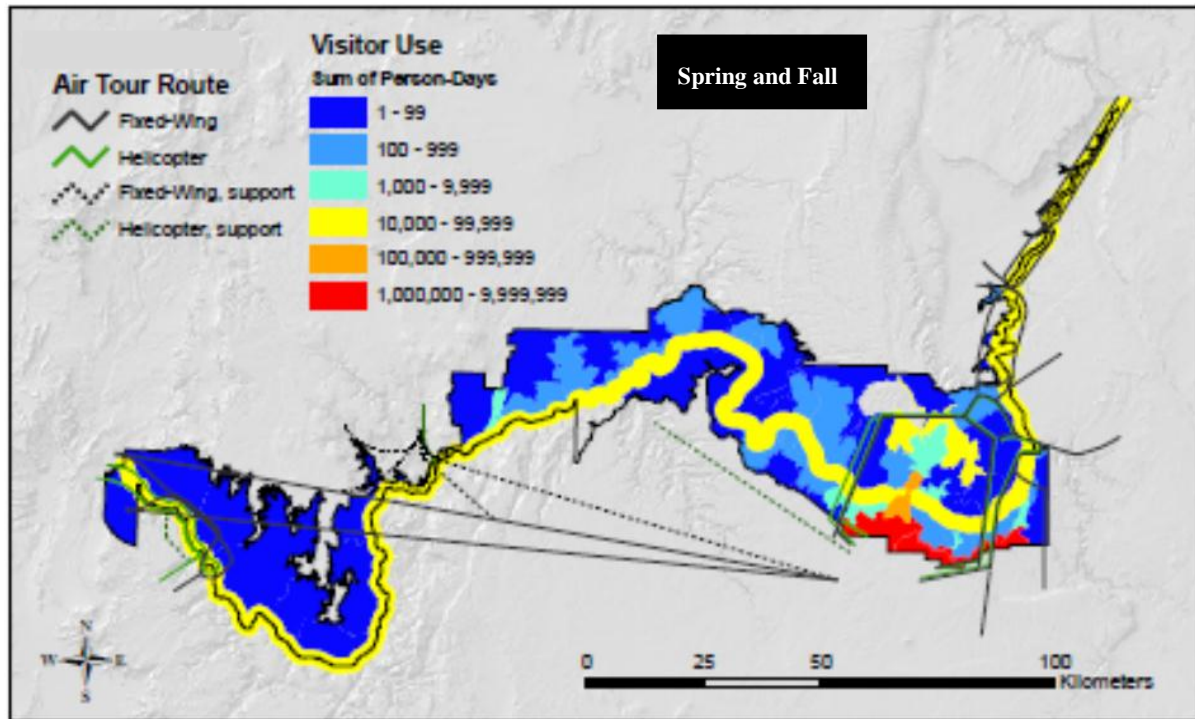
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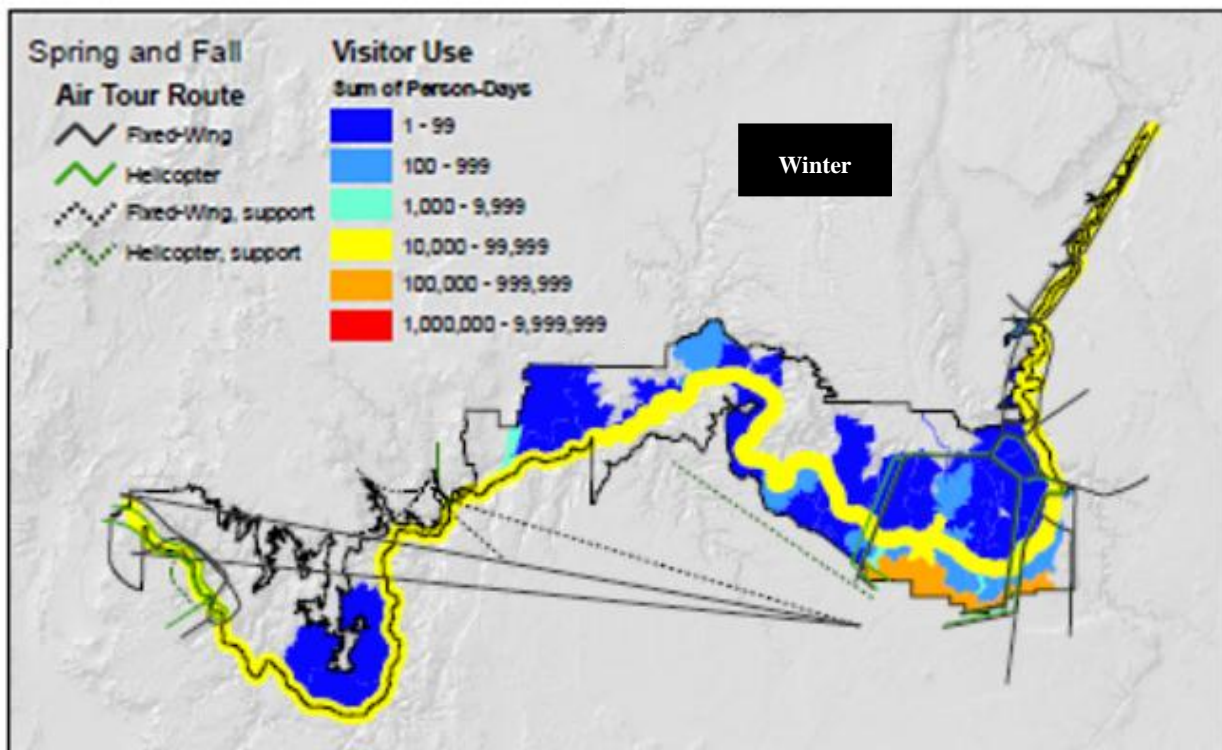
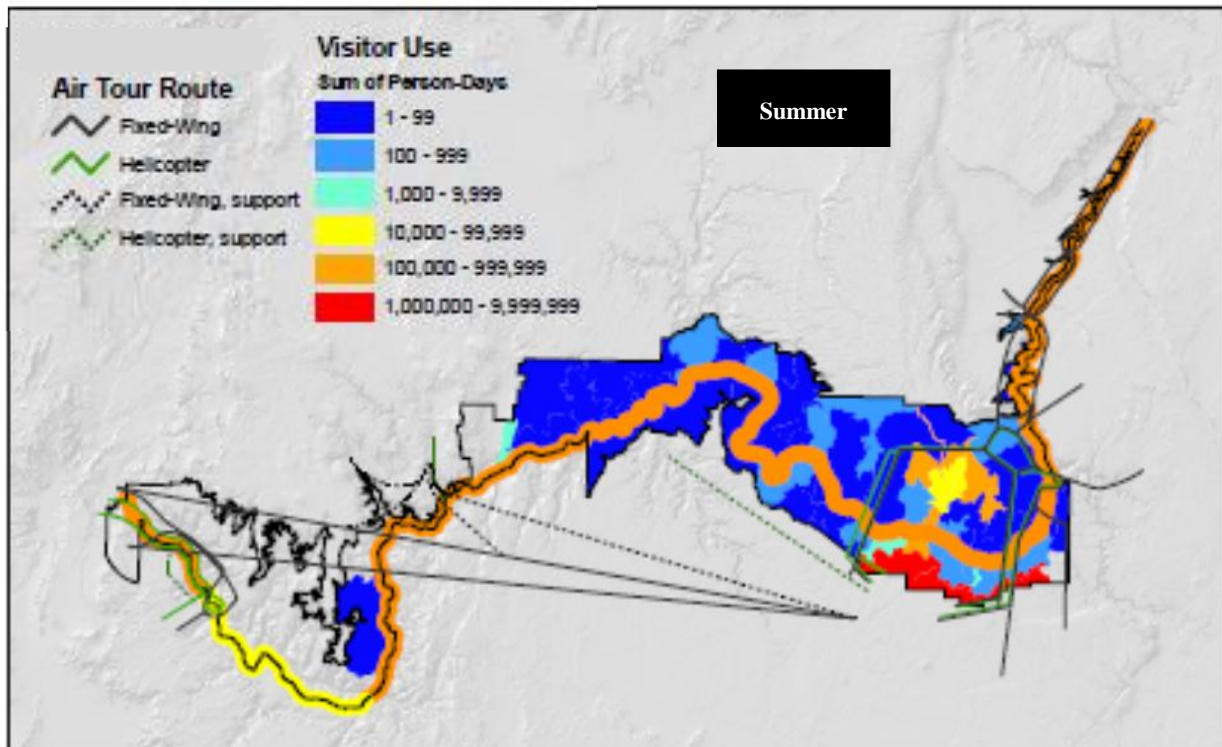
\*Routes shown correspond to current air tour routes (Alternative A)

**Map 3.5a Visitor Use and Air-Tour Routes**



Map 3.5b and c

Visitor Use and Air-Tour Routes, continued



**TABLE 3.8 SEASONAL PERSON-DAYS**

Seasonal Person-Days	Front-country <sup>a</sup> South Rim	Front-country <sup>a</sup> North Rim	Colorado River			Back-country <sup>d</sup>	Day-hikers <sup>e</sup>
			Lees Ferry to Diamond Creek <sup>b</sup>	Diamond Creek to Quartermaster <sup>c</sup>	Quartermaster to Lake Mead <sup>c</sup>		
<b>Spring and Fall</b> March/April & September/October	1,700,723	94,973	70,583	28,832	98,388	43,953	92,369
<b>Summer</b> May-August	2,373,967	352,918	124,316	39,168	104,040	30,237	164,612
<b>Winter</b> November-February	830,051	0	34,087	14,416	49,184	15,366	46,977
<b>Annual Total</b>	4,904,741	447,891	228,986	82,416	251,592	89,556	303,958

<sup>a</sup>Frontcountry numbers are based on 2005 entrance gate data adjusted to exclude local traffic and business deliveries. Overnight guest counts from lodges and campgrounds are included

<sup>b</sup>Estimated user-days based on the 2006 Colorado River Management Plan EIS Alternative H (pg. 60) for calendar year 2007 and later

<sup>c</sup>Maximum allowable user-days based on the 2006 Colorado River Management Plan EIS Alternative 4 (pg. 89); does not include continuation river trips from Lees Ferry past Diamond Creek or Grand Canyon West Elevator Flight river trips

<sup>d</sup>User-nights based on 2005 backcountry permit data; use without permits is not reflected

<sup>e</sup>Estimates based on data collected for the NPS in 2004 by the University of Illinois

### Other Federal Lands in the Study Area

#### Grand Canyon-Parashant National Monument

1,048,316 acres in Mohave County  
808,744 acres BLM-administered lands  
208,447 acres NPS-administered lands  
23,205 acres Arizona State Trust lands  
7,920 acres private lands (BLM 2008c)

#### Vermilion Cliffs National Monument

279,566 acres BLM-administered lands  
13,438 acres Arizona State Trust lands  
683 acres private lands (BLM 2008b)

#### BLM Arizona Strip Field Office

Encompasses roughly 1.98 million acres located in both Coconino and Mohave Counties, including  
1,679,896 acres BLM-administered lands  
170,165 acres Arizona State Trust lands  
130,962 acres private lands (BLM 2008a)

These public lands provide a wide range of recreation opportunities including vehicular exploration, sightseeing, backcountry hiking, and backpacking. Exploring or sightseeing constitutes the primary activity for many visitors, and can involve various modes of transportation, such as sports-utility vehicle, equestrian, small aircraft, walking, off-highway vehicle, hiking, motorcycle, bicycle, sedan, or motor home.

These areas, as well as the Kaibab National Forest discussed below, contain existing and proposed Wilderness in or adjacent to the SFRA. Wilderness activities and experiences include hiking, backpacking, and outstanding opportunities for solitude and primitive, unconfined recreation.

Due to the remote nature of the area and dispersed nature of most recreation activities, it is difficult for managing agencies to obtain actual numbers of visits. Estimated visitation to the three areas is presented in Table 3.9.

**TABLE 3.9 RECREATION VISITS BY YEAR, NEARBY AREAS**

Year	Arizona Strip BLM	Parashant BLM	Parashant NPS	Vermillion BLM
1999	114,252	13,093	---	39,704
2000	120,150	12,058	---	39,702
2001	125,472	12,949	---	41,884
2002	118,745	14,280	---	39,934
2003	112,475	25,298	8,880	45,329
2004	112,846	44,233	9,180	39,093

Source: BLM, Arizona Strip Field Office Resource Management Plan

While visitor use has typically peaked during spring and fall months, improved navigation technologies, outdoor gear, transportation modes, and attraction site promotion have contributed to visitation increases in winter and summer months (BLM 2008a).

The Kaibab National Forest is administered by the U.S. Forest Service and, overall, receives over 600,000 visits a year (USFS 2010). Recreational activities include mountain biking, camping and cabin use, hiking, horse riding, hunting, target shooting, outdoor learning, picnicking, boating, fishing, snowshoeing, and skiing.

The North Kaibab Ranger District is adjacent to, and a portion contained in, the SFRA. Recreational visitors to the district are generally of two categories: visitors whose primary destination is Grand Canyon National Park, but who stop in the district for some period of time, and those who visit the district to hunt game or gather fuel wood. Other activities, most notably mountain biking, are popular in the district, but visitors participating in these activities are not as common as those visiting Grand Canyon, hunting game, or gathering fuel wood. Visitation fluctuates widely with the seasons, as North Rim and Highway 67 close for the winter (USFS 2010).

#### **Air-tour Visitors**

Based on flight data, aircraft capacity data, and load factors specific to location and aircraft type, an estimated 423,000 passengers took air tours in the SFRA. About half flew fixed-wing and half helicopter tours. Over 58% of all air-tour passengers took East End tours, and the remaining 42% flew West End routes.

The following information was provided in interviews with Grand Canyon air-tour operators conducted as part of this EIS (Harvey 2007a). On GCNP's West End, air-tour visitors tend to be international, with many coming from Asia and the Pacific Basin. These visitors tend to travel in larger groups and generally participate in day trips over Grand Canyon and to the Hualapai Reservation as part of a longer Las Vegas area trip. These groups come to Las Vegas year-round and do not have seasonal travel patterns East End visitors do. Asian travelers make up 60 to 90% of passengers for Las Vegas-based operators.

Comparatively, on GCNP's East End, air-tour visitors tend to come from the U.S., other North American and European countries, especially England and Germany. At Tusayan-based operators, 35 to 50% of air-tour passengers are international. East End visitors are more likely to be couples or families and include a large percentage of small groups that arrive by car or camper and spend at least one night in the local area. The bulk of visitation to the East End occurs during summer months and school vacations when U.S. families have time to travel with children. Also visiting East End are Asian visitors that have taken a flight from Las Vegas through the SFRA as part of a day trip.

Several operators reported serving customers of all ages, including young families; however, the majority of operators fly tours mainly made up of adults 40 to 65 years of age. The elderly do not make up a large portion of business for any tour operator. Only a small percentage of air-tour visitors are disabled; operators reported not more than 1 to 2% of all passengers were handicapped. Air-tour customers can generally be described as having higher-end incomes, although those in middle-income ranges also take air tours.

According to tour operators, key air-tour selling points include canyon views/other scenery and amount of time spent flying over Grand Canyon. Customers appear to enjoy that they can see a large Grand Canyon area, including

special features, in a short period. Other selling points are the variety of accompanying tours packaged with flights, quality of customer service and, for some, Las Vegas proximity.

### Importance of Natural Quiet

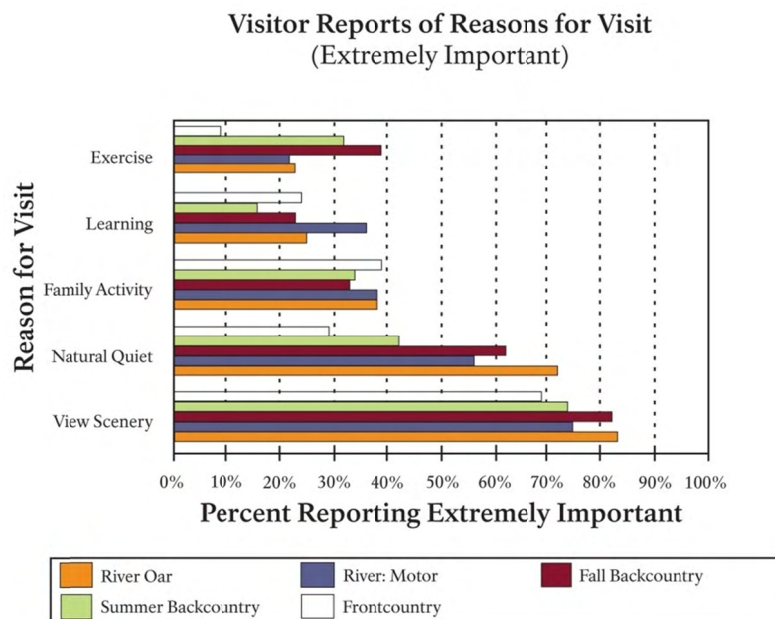
National park visitors often indicate an important reason for visiting is to enjoy the relative quiet parks can offer. Americans surveyed in 1998 (NPS 2003) were asked to identify some of the most important reasons for having national parks. Seventy-two percent said, "Providing opportunities to experience natural peace and the sounds of nature." This ranked as the fifth most common response. In studies of visitor preferences, respondents consistently rate many natural sounds, such as birds, animals, wind, and water, as very pleasing. As a result, presence of unwanted, uncharacteristic, or inappropriate sounds can interfere with or alter the Soundscape resource and degrade visitor experience.

Experiencing natural quiet and associated events such as solitude are part of the park's purpose and significance, and Grand Canyon is recognized as a place with unusual and noticeable natural quiet. Many surveys have shown natural quiet an important part of the recreational experience, and recreational users have stated in numerous research reports that escaping noise and enjoying nature's sounds are among the most important reasons for visiting natural environments (Driver et al. 1991).

A mail survey was conducted of randomly sampled Grand Canyon visitors. These visitors were categorized as frontcountry visitors, summer backcountry visitors, fall backcountry visitors, river users in motorized boats, and river users in oar-powered boats (Baumgartner et al. 1994). Figure 3.1 shows how these visitors ranked various reasons for their canyon trip. Five of these categories, representing the response range, are shown for those who rated their reasons as extremely important.

For some visitor categories, specifically river users and fall backcountry visitors, natural quiet is almost as important a reason for visiting Grand Canyon as viewing scenery. Enjoying natural quiet is extremely important to many Grand Canyon visitors.

**FIGURE 3.1 VISITOR REPORTS OF EXTREMELY IMPORTANT REASONS FOR VISITING GRAND CANYON**



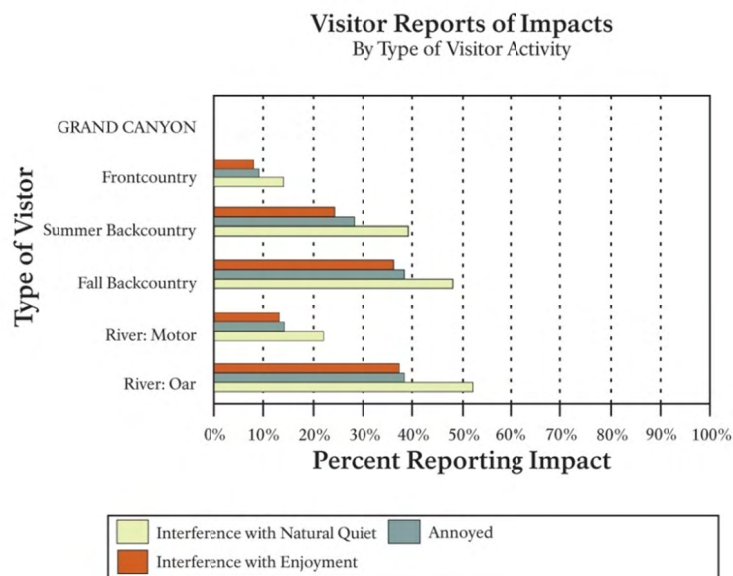
Source: NPS 1994

## Visitor Responses to Air-tour Noise

NPS and FAA have conducted data collection of dose-response measurements to characterize how visitors feel about sound of aircraft overflights. Dose-response studies measured visitor noise reactions by statistically relating noise amount visitors were exposed to (dose) with visitor noise responses as expressed by degree they were annoyed or that noise interfered with park enjoyment. The research measured park aircraft sound levels and asked visitors, “Were you bothered or annoyed by aircraft noise during your visit to the site,” and “How much did the sound from aircraft interfere with your enjoyment of the site?” Simultaneous measurement of aircraft sound levels and visitor surveys permitted an improved understanding of dose-response relationships that estimate what percent of people are affected by a given level of aircraft overflight sound (Anderson et al. 1993). For tour-aircraft overflights, sound measure that best predicts visitors’ reactions is percent of time aircraft are audible. Even when aircraft are audible for relatively low percentages of time, some visitors notice the aircraft, and believe the sound has interfered with their appreciation of natural quiet (NPS 1994).

Results, summarized on Figures 3.2 and 3.3, show visitors have very different sensitivity to aircraft sound depending on their park location. Backcountry hikers and oar-powered river users reported greatest sensitivity. As presented in the 1995 Report to Congress, for a given aircraft-sound level, considerably fewer visitors at frontcountry overlook sites reported annoyance or interference with natural quiet than backcountry or oar-powered river visitors. For visitors to short-hike sites, 30 to 40% can be expected to report moderate to extreme interference with their appreciation of natural quiet when aircraft are audible 10% of the time (NPS 1994). Backlund et al (2008) found in 2005 that 32% of overnight backcountry visitors felt there were too many aircraft flying over the backcountry. Though many factors likely influence sensitivity, it is likely that as visitors pursue activities that take them away from their cars and other visitor activities, they are likely to be more sensitive to mechanized sounds, including the sound of overflights from tour aircraft.

**FIGURE 3.2 VISITOR REPORTS OF IMPACT**



Source: NPS 1994

In 2005, the U.S. Department of Transportation’s Volpe Center<sup>29</sup> conducted a noise/visitor response study and combined this with results of all known aircraft noise response data previously collected in national parks (Volpe

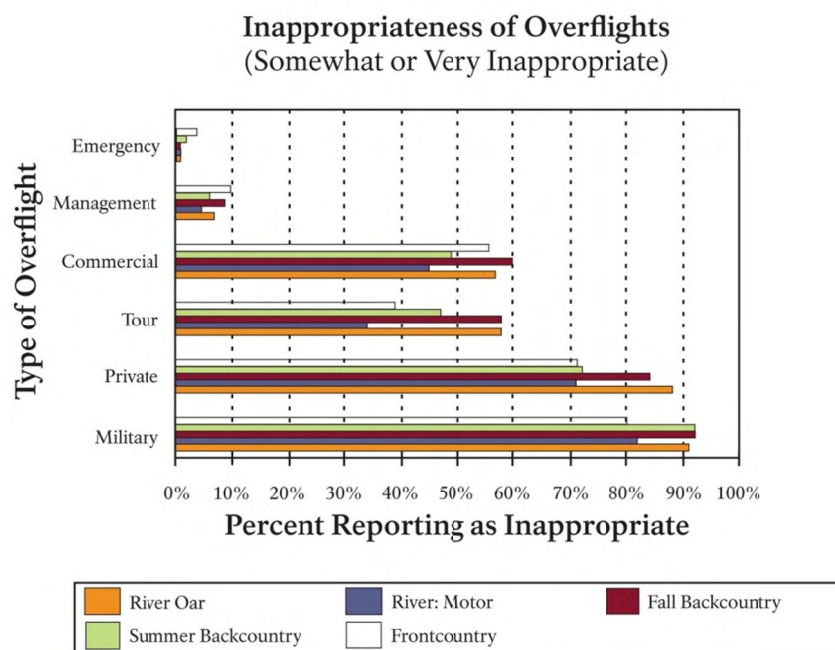
<sup>29</sup> U.S. Department of Transportation, Volpe National Transportation Systems Center online at <http://www.volpe.dot.gov>



2005). This effort revealed perception differences between overlook users and those on short hikes. The study found those on hikes in the four national park units studied were much more likely to hear and be annoyed by presence of aircraft noise (Table 3.10). In comparing respondents at overlooks to those on short hikes, a substantial difference existed in percentage who reported hearing aircraft when they were present, 37% and 66%, respectively, and a greater percentage of short-hike visitors expressed some level of annoyance (Volpe 2005). While the results do not indicate whether visitors on short hikes were, on average, exposed to more aircraft noise than visitors at overlooks, they do indicate a greater sensitivity by those on short hikers to noise exposure. This is consistent with findings of differing perceptions between backcountry and frontcountry park users (Baumgartner and McDonald, 1994).

Anderson, et al, (1993) reported that at the same national park units, including GCNP, at short-hike sites about 22% of visitors were annoyed when aircraft were audible 20% of the time. Similarly, about 5% were annoyed at overlooks when aircraft were audible 20% of the time.

**FIGURE 3.3 VISITORS REPORTING INAPPROPRIATENESS OF OVERFLIGHTS**



Source: NPS 1994

**TABLE 3.10 OVERVIEW OF RESPONSES TO AIRCRAFT NOISE DOSE**

Percentage of Respondents who	Overlook	Short Hike
Were exposed to aircraft noise	94%	89%
Reported hearing aircraft when exposed to aircraft noise	37%	66%
Reported moderate to extreme annoyance when exposed to aircraft noise	9%	26%
Reported very or extreme annoyance when exposed to aircraft noise	2%	12%

Source: Volpe 2005

Table 3.11 also presents visitor responses to both air-tour aircraft and high-altitude jets. Forty-five percent of overlook visitors and 77% of hikers reported hearing aircraft noise that included tour aircraft and high-altitude jets. While visitors on short hikes expressed greater annoyance to aircraft noise, both groups appear to be more sensitive to air-tour aircraft than to high-altitude jets.

Overall, research results consistently conclude that increased exposure to aircraft noise resulted in an increased diminishment of visitor enjoyment, and that visitors farther from park development (e.g. on short hikes or in the

backcountry) have an increased sensitivity to equivalent noise doses compared with visitors in developed park settings (e.g. at overlooks).

**TABLE 3.11 OVERVIEW OF RESPONSES TO TOUR AIRCRAFT AND JETS BY VISITORS TO GCNP**

	Overlook Visitors		Short Hike Visitors	
	Tour Aircraft plus Jet	Jet Only	Tour Aircraft plus Jet	Jet Only
Number of respondents	785	150	1,122	50
Percent who reported hearing aircraft	45	17	77	55
Percent who reported moderate to extreme annoyance from noise	11	4	30	10
Percent who reported very or extreme annoyance from noise	3	1	14	6

Source: Volpe 2005

## WILDLIFE

### Introduction

Grand Canyon is a valuable wildlife resource due to the park's size, elevation range, and associated habitat variety. The park wildlife database lists 90 mammals, 355 birds, and 56 amphibian and reptile species. GCNP's diverse vegetation associations provide suitable conditions for both habitat generalists and specialists. Wildlife occurrence can generally be grouped in habitats defined by vegetation: mixed-conifer (spruce-fir and mixed-conifer types), ponderosa pine, piñon-juniper, shrub-grass, and riparian. Many wildlife species are habitat generalists, using ecosystems from desert scrub through coniferous forest to meet basic requirements. Some species are habitat specialists, requiring specific vegetation composition and structural components to supply their needs. Appendix E provides a habitat list with common species found in the park. The following focuses on information regarding park wildlife; however, the information also pertains to areas outside the park in the SFRA that support the same habitats. Information presented below is predominantly based on park documents and references cited therein (NPS 2010b, NPS 2005a).

Analysis focuses on those wildlife groups most likely to be affected by commercial air-tour operations. As discussed in Chapter 2, it is unlikely invertebrates would be detectably affected by air-tour operations, thus, they are not considered for further analysis in this EIS. In addition, bats are not considered for further analysis as they are not active during air-tour flight times, and thus would not be affected. Special-status species are considered separately as the next impact topic.

### Reptiles and Amphibians

Approximately 56 reptile and amphibian species reside in GCNP, the majority along the river corridor or in upland desert and riparian sites. Highest densities and diversity occur in riparian areas due to abundant vegetation and invertebrate food sources. Sixteen reptiles species have been identified along the Colorado River (Carpenter 2003). Reptiles commonly associated with the river corridor include Western whiptail lizards (*Cnemidophorus spp.*), tree lizards (*Urosaurus ornatus*), desert spiny lizards (*Sceloporus magister*), and Grand Canyon pink rattlesnakes (*Crotalus atrox*). Little is known about herpetofauna that inhabit the park's forested communities. A variety of lizards and snakes inhabit plateau coniferous forests especially in piñon-juniper woodlands and ponderosa pine forests. Common lizard species found on the plateau area include the greater short-horned lizard (*Phrynosoma hernandesi*), northern plateau lizard (*Sceloporus undulatus elongatus*), and northern sagebrush lizard (*Sceloporus graciosus graciosus*). Great Basin gopher snake (*Pituophis catenifer deserticola*) is common in ponderosa pine forests, piñon-juniper woodlands, and desert scrub. Primarily found on South Rim, the Sonoran gopher snake (*Pituophis catenifer affinis*) occurs in predominantly scrub to piñon-juniper woodlands.

Amphibians are not well-represented in the park generally due to arid conditions; few amphibians inhabit plateaus. Tiger salamanders (*Ambystoma tigrinum*) inhabit areas around pools, marshes, and water tanks in meadows in North Rim ponderosa pine to spruce-fir forests. Great Plains toad (*Bufo cognatus*) and Great Basin spadefoot toad (*Spea*



*intermontana*) can be found in riparian areas or in ponderosa pine forests. Rocky Mountain (*Bufo woodhousii*) and red-spotted toads (*Bufo punctatus*) are found in inner canyon riparian areas along the river and perennial tributaries.

### Birds

Grand Canyon's striking elevational and topographic diversity creates complex mosaics of vegetation types, providing diverse habitat for bird species. Riparian habitats along the river in the park provide breeding habitat, migratory stopover sites, and wintering areas for birds throughout the year. Over 370 bird species have been recorded in the Grand Canyon region, approximately 250 of which are from the river corridor (NPS 2010a). Some species are year-round residents such as canyon wren (*Catherpes mexicanus*), wild turkey (*Meleagris gallopavo*), and American dipper (*Cinclus mexicanus*), but most are migrants that use the river seasonally for breeding or as a travel corridor, or are from other canyon habitats and use the river corridor during nonbreeding or migratory seasons. Other species that breed in the canyon and are present through most of the summer include song sparrow (*Melospiza melodia*), house finch (*Carpodacus Mexicanus*), and Bell's vireo (*Vireo bellii*). Waterfowl have been found to be more abundant in winter than in other seasons and are particularly abundant in the canyon's upper reaches between Lees Ferry and the Colorado/Little Colorado River confluence.

In plateau areas, a number of bird species are generalists and occupy a variety of habitats (ponderosa pine, ponderosa-mixed-conifer transition, mixed-conifer, and meadow). Generalist forest species such as broad-tailed hummingbird (*Selasphorus platycercus*), plumbeous vireo (*Vireo plumbeus*), brown creeper (*Certhia americana*), and evening grosbeak (*Coccothraustes vespertinus*) have been found in all forest types from ponderosa pine to spruce-fir forests. Breeding warbler diversity in ponderosa pine is second only to the Colorado River corridor, which has four breeding species. Secondary cavity nesters (e.g., violet-green swallow (*Tachycineta thalassina*), pygmy nuthatch (*Sitta pygmaea*), western bluebird (*Sialia mexicana*), brown creeper, and white-breasted nuthatch (*Sitta carolinensis*) are also an important component of the ponderosa pine forest bird community.

Several raptors are closely associated with ponderosa pine, including the rare northern goshawk (*Accipiter gentilis*), red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), great horned owl (*Bubo virginianus*), and northern pygmy owl (*Glaucidium californicum*). The northern goshawk breeds in high, forested mountains and plateaus across Arizona (usually above 6,000 feet); primary potential goshawk habitat in the park is in North Rim mixed-conifer and ponderosa pine habitats. As of 2007, 18 northern goshawk territories are identified in North Rim forests, and four in South Rim forests. The northern pygmy owl also occurs in ponderosa pine, but hunts during the day or at dusk (Brown, et al. 1987). Flammulated owls (*Otus flammeolus*) are migratory and occur in dry, montane coniferous forests in central and western North America.

Golden eagles (*Aquila chrysaetos*) are usually found in open country, prairies, arctic and alpine tundra, open wooded country and barren areas, especially in hilly or mountainous regions. They nest on rock ledges, cliffs, or in large trees; however, nesting golden eagles are very rare in Grand Canyon (Ward 2009). They commonly hunt in early morning and early evening.

### Small Mammals

A number of small mammals are habitat generalists using ecosystems including desert scrub, coniferous forests, and riparian areas. Deer mice (*Peromyscus maniculatus*) and western harvest mice (*Reithrodontomys megalotis*) are common throughout the park, and serve as important prey species for many predators. The deer mouse is the only rodent that depends directly on the riparian zone for its existence. Botta's pocket gopher (*Thomomys bottae*) inhabits South Rim and North Rim's warmer West End. They use desert scrub, piñon-juniper and ponderosa pine forests wherever suitable soil exists for digging. The brush mouse (*Peromyscus boylii*) uses a variety of park habitats, preferring piñon-juniper forests, riparian areas, rocky slopes, and shrublands, and sometimes spruce-fir forests. Mexican woodrat (*Neotoma mexicana*), bushy-tailed woodrat (*Neotoma cinerea*), and Mexican vole (*Microtus mexicanus*) occur only on South Rim. The bushy-tailed woodrat occurs in piñon-juniper woodlands or ponderosa pine forests, but is restricted to suitable rocky areas. The Mexican woodrat inhabits rocky areas in ponderosa pine, frequently along rim edges and sometimes into the piñon-juniper belt. They often use the same habitat as rock squirrels (*Spermophilus variegates*). Mexican voles prefer areas that tend to be drier with sparse grass. The Uinta chipmunk (*Tamias umbrinus*), least chipmunk (*Tamias minimus*), golden-mantled ground squirrel (*Spermophilus*

1 *lateralis*), and Nuttall's cottontail (*Sylvilagus nuttallii*) are found only on North Rim. Shrews and voles occur in  
2 most habitats on the plateau ranging from rocky slopes to grassy meadows.

### 4 **Carnivores**

6 Most predators are highly mobile, hunting in habitats throughout GCNP. Eleven terrestrial mammalian carnivore  
7 species occur in the park. These include mountain lion (*Puma concolor*), black bear (*Ursus americanus*), coyote  
8 (*Canis latrans*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), badger (*Taxidea taxus*), raccoon  
9 (*Procyon lotor*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale gracilis*), ringtail (*Bassariscus astutus*),  
10 and long-tailed weasel (*Mustela frenata*). Mountain lions occur throughout Arizona and can be found in any habitat,  
11 including riparian areas. Black bears are thought to exist in very low densities on North and South Rims, and are  
12 reported sporadically on South Rim. Raccoons are likely restricted to lower elevations along the river and in more  
13 developed South Rim areas. Ringtails are primarily found along canyon rims and in developed areas. Skunks are  
14 found in South Rim piñon-juniper and ponderosa pine forests and are probably present on North Rim; striped skunks  
15 occur in the canyon below 4,400 feet.

17 Coyotes are common throughout the park and appear particularly common on South Rim. Bobcats are commonly  
18 found throughout the park in desert and wooded areas, especially along the piñon-juniper belt. Badgers uncommonly  
19 occur in grasslands, piñon-juniper, and ponderosa pine forests on both rims. In Arizona, long-tailed weasels occur  
20 from the Kaibab Plateau south along the Mogollon Rim and in scattered mountain ranges in eastern Arizona. Long-  
21 tailed weasels are active year-round and are primarily nocturnal.

### 23 **Ungulates**

25 Ungulates such as mule deer and elk occupy zones seasonally. Both elk (*Cervus elaphus*) and mule deer (*Odocoileus*  
26 *hemionus*) are found on South Rim and use piñon-juniper and ponderosa pine forests for food and shelter. Mule deer  
27 occupy a variety of habitats from ponderosa pine forests to chaparral scrub, but tend to avoid large openings and  
28 mature forest with closed canopy. Mule deer occur on both North and South Rims and along the river corridor. On  
29 North Rim, mule deer depend on the piñon-juniper zone for essential winter forage, and move into ponderosa pine,  
30 mixed-conifer, and spruce-fir during spring, summer, and fall. Deer begin migrating into mixed-conifer forest in  
31 early May and remain there and in spruce-fir until late September. Desert bighorn (*Ovis Canadensis*) prefer rough,  
32 rocky, sparsely vegetated habitat characterized by steep slopes, canyons, and washes. They descend to the river for  
33 forage. Bighorn are commonly seen on rocky cliffs along the Colorado River, and occasionally seen on plateaus near  
34 rims.

### 36 **Ambient Soundscape, Aircraft Overflights, and Wildlife**

38 Wildlife both create and are affected by sound in their environment. Soundscape is an integral part of an animal's  
39 habitat. Wind, weather and storm activity, water, mammals, birds, insects, and occasional geologic events all  
40 contribute to the natural ambient Soundscape. Natural ambient sound levels are substantially affected by vegetation  
41 and topography, which greatly vary throughout Grand Canyon. Non-natural sounds, such as those created by low-  
42 level air-tour overflights, high-elevation aircraft noise, miscellaneous motor sounds, and other human-caused  
43 sounds, have become a regular part of the park's Soundscape.

45 All habitats that support park wildlife are subject to aircraft noise. Higher elevations generally experience more  
46 aircraft noise because they are closer to the source (i.e., aircraft). Where West End helicopter tours travel below the  
47 canyon rim or into side canyons, lower elevations could experience more aircraft noise. Low frequency wind sounds  
48 have potential to mask aircraft sounds in some situations, especially in ponderosa pine forests (Ambrose 2006).

50 Altitudes and areas where air tours most often occur are such that potential for noise or visibility effects on wildlife  
51 are increased, and thus, indicate areas where existing conditions may present noise and visual impacts to wildlife. In  
52 the 1995 Report to Congress, the complexity of determining effects on wildlife due to various factors that influence  
53 an individual's response was presented. The report discusses differences in stimuli perception based on physical  
54 environment and psychological attributes of the animal at the time of its exposure. The report states: "Some habitats  
55 enhance stimuli associated with aircraft overflights. The sound and visual stimuli associated with aircraft have  
56 different effects in an open desert than in a forest where trees can obscure the sight and may reduce the sound of

aircraft." In addition, the report surmised that "...the relationship between aircraft and animals is clear in that the closer an aircraft is, the greater the probability that an animal will respond...."

The 1995 Report to Congress discussed physiological and behavioral responses to overflights including accidental injury, reproductive and energy losses, and habitat avoidance and abandonment. Physiological responses to aircraft overflights would vary depending on noise characteristic and species, with reactions ranging from mild annoyance to panic. Behavioral responses similarly vary between and within a species due to age, sex, prior exposure, etc.

Some research has been conducted in the park focusing on effects of aircraft on wildlife. Bighorn were shown to be sensitive to helicopter noise during winter resulting in reduced foraging efficiency. The effect from helicopter noise decreased in spring when sheep migrated to lower elevations, creating greater distance between them and the helicopters (Stockwell and Bateman 1987, Stockwell et al. 1991).

Air tours are not conducted to specifically afford viewing opportunities of any particular wildlife species or habitat. Aircraft striking wildlife is a relatively uncommon event. Direct conflict between wildlife and aircraft overflights is most often associated with bird strikes. FAA's Airports Division has wildlife hazard records dating to 1990. Since that time there have been four wildlife incidents recorded for Grand Canyon Airport: in 1990, 1998, and 2000 aircraft struck sparrows, crows, and a common raven, respectively. In 1992 an aircraft struck an elk (NPS 2008a).

## SPECIAL-STATUS SPECIES

### Introduction

Special-status species and their critical habitats include the following categories

- Federally listed, proposed, or candidate
- State-listed, proposed, or candidate
- Tribally listed, proposed, or candidate

The U.S. Fish and Wildlife Service only formally considers Federally listed species in Biological Assessments and subsequent Biological Opinions. However, the NPS uses a broader approach that considers all species with listing status at Federal, state, and tribal levels. As a result, some species not addressed in previous Biological Assessments and Opinions, such as American peregrine falcon, are included in this analysis.

Several threatened and endangered species in the SFRA would not be affected by the Alternatives, and are not analyzed; see Chapter 1, Impact Topics Considered and Dismissed from Detailed Analysis. Table 3.12 provides a list of three special-status bird species evaluated in this EIS.

**TABLE 3.12 SPECIAL STATUS SPECIES WITH POTENTIAL TO BE AFFECTED BY AIRCRAFT OVERFLIGHTS**

Common Name	Scientific Name	Listing Status				Other <sup>e</sup>	Designated Critical Habitat in GRCA
		Federal <sup>a</sup>	State <sup>b</sup>	Navajo <sup>c</sup>	GCNP		
American peregrine falcon	<i>Falco peregrinus anatum</i>		WSC	--	--	SSC	No
California condor <sup>d</sup>	<i>Gymnogyps californianus</i>	E, XN	WSC	--	--		No
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T	WSC	G3	--		Yes

<sup>a</sup>Federal status: E = Endangered; T = Threatened; C = Candidate; XN = Experimental, non-essential

<sup>b</sup>State status: WSC = Wildlife of special concern in Arizona

<sup>c</sup>Navajo endangered species list: G1 = No longer occurs on Navajo Nation lands; G2 = Prospect of survival or recruitment is in jeopardy; G3 = Prospect of survival or recruitment is likely to be in jeopardy in the foreseeable future. Navajo status determination is not used by any other affiliated Grand Canyon tribes

<sup>d</sup>Condors are managed as Federally endangered in the park

<sup>e</sup>Peregrine falcons are managed as a Species of Special Concern (SSC) as they were formerly listed as Threatened; see Appendix E

## Species Profiles

### American Peregrine Falcon

After 29 years on the U.S. Fish and Wildlife Service List of Endangered and Threatened Wildlife Species, peregrine falcon (*Falco peregrinus anatum*) was removed from the list August 25, 1999. This, however, does not end NPS concern for the species. Arizona lists peregrine falcon as Wildlife of Special Concern. Peregrine falcons are known to tolerate noise and disturbance more than other avian species (Palmer et al. 2003, Ellis 1991 in NPS 1999).

However, as a conservative approach, the peregrine was retained for full evaluation to analyze potential for aircraft overflights to affect this species in Grand Canyon.

Peregrine falcons often nest high on cliff faces that afford them access to an open sky to pursue their primary prey: birds and bats (White et al. 2002).

Importance of the Grand Canyon peregrine population was first documented in 1991 with submission of a final report to the NPS covering an extensive survey conducted during the 1988 and 1989 field season by Bryan T. Brown (Brown 1990). This survey documented 58 peregrine pairs in the park, and speculated there may be upwards of 100 pairs. This study was duplicated in 1998 and 1999 with similar results (Ward 2000).

A USFWS monitoring plan must consider the Arizona peregrine population, and the population portion in the SFRA has received particular attention, as the Arizona population contributes more to recovery goals than any other state in the Recovery Plan (USFWS 1984).

### California Condor

Condors are members of the New World vulture family, feeding exclusively on carrion such as deer, cattle, rabbits, and large rodents. Using thermal updrafts, condors can soar and glide at up to 50 miles per hour and travel 100 miles or more per day seeking food while expending little energy. When not foraging, condors spend most of their time perched at a roost. Cliffs, tall conifers, and snags serve as roost sites (NPS 2007b). An experimental, nonessential<sup>30</sup> California condor population was introduced into northern Arizona December 1996, and the Arizona Game and Fish Department (AZGFD) now lists the California condor as a Species of Special Concern. In GCNP, the experimental population is managed as threatened.

As of June 30, 2010 there are 74 California condors in the southern Utah/northern Arizona area, including six breeding pairs in the northern Arizona area that includes Grand Canyon. The first wild-reared chick in the program's history, and likely the first chick in Arizona in 100 years, fledged November 2003. Since then, five chicks have fledged in the park.

Condors create nesting sites in rock formations such as caves, crevices, and potholes (USFWS 2002a in NPS 2005a). Courtship begins in December, and breeding pairs lay a single egg between late January and early April. Eggs hatch after approximately 56 days, and young condors take their first flight at approximately six months. Young condors may be dependent on parents through the following breeding season (USFWS 1996). Their preferred roosting habitat consists of rock cliffs, snags, and live conifer stands where they can rest, preen, and socialize. Condors prefer the river corridor in winter.

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<sup>30</sup> Under the Endangered Species Act section 10(j), California condors released into northern Arizona are designated a nonessential experimental population, meaning condors will be treated as a threatened population for section 9 purposes (protection from take). For the purposes of section 7 (interagency consultation), the birds will be treated as a species *proposed* for listing--except on NPS and National Wildlife Refuge System lands, where the birds will be treated as if threatened. Nonessential experimental designation enables the USFWS to develop special management regulations more flexible than rules applying to endangered species, which helps ensure such land uses as forest management, agriculture, mining, livestock grazing, sport hunting, and non-consumptive outdoor recreation will not be restricted. The proposal to reintroduce condors in the Vermilion Cliffs area as an experimental population appeared in the January 2, 1996, Federal Register. After notices were published in local newspapers, the USFWS held 59 meetings (including 2 public hearings) in the vicinity to further explain the proposal and gather public comments. The comment period was extended several times until April 1, 1996.  
<http://www.fws.gov/endangered/bulletin/96/condors.html>

All northern Arizona condors are fitted with radio transmitters allowing field biologists to monitor their movements. Monitoring data indicate condors are using habitat throughout the park, concentrating in Marble Canyon, Desert View to Grand Canyon Village, the Village to Hermits Rest, and North Rim's Bright Angel Point. A growing number of condors typically begin visiting the Marble Canyon portion of the Colorado River corridor in February, March, and April (Peregrine Fund 2003 in NPS 2005a). Condors have been observed at Phantom Ranch.

### **Mexican Spotted Owl (MSO)**

The Mexican spotted owl was listed as threatened in 1993 (58 FR 14248), and a recovery plan was issued in 1995 (USFWS 1995). It also is listed as a Species of Concern by Arizona and the Navajo Nation. Critical habitat for the owl, designated February 2001 (66 FR 8530–8553), includes over 75,000 acres of mixed-conifer habitat on North Rim and over 31,000 additional acres of designated Protected Activity Centers (PAC) in the park's canyon habitat.

Presence of MSO in the park was confirmed in 1992 field surveys. Additional survey results in subsequent years suggest owls occupy rugged canyonland terrain. Owl detections indicate they use side canyons and small Douglas fir stringers below the rim. Currently, 41 Draft PAC have been designated in the park, for a total of 31,000 acres. No nests are known to occur on Grand Canyon plateaus, but owls have infrequently been found to forage on North and South Rim plateaus in close proximity to the rim (Bowden et al. 2008).

MSO breed sporadically and do not nest every year. Eggs are laid in late March or, more typically, early April. Incubation begins shortly after the first egg is laid and is performed entirely by the female. MSO incubation is assumed to be 30 days. Eggs usually hatch in early May, with nestlings fledging four to five weeks later, and then dispersing late August to mid-September (Ganey 1988).

MSO monitoring as a condition of the USFWS permit since 2001 reported 18 PACs adjacent to or directly under current air-tour routes (NPS 2008d). Currently, East End flight routes traverse seven PACs. In addition, the majority of air-tour flights occur during the MSO breeding period March 15 to August 30 (NPS 2008d).

### **Bird Strikes**

Since 2000, there have been no reported bird strikes of California condor or Mexican spotted owl species in the vicinity of Grand Canyon National Park Airport. The FAA's Air Traffic Control and Airports Divisions have both confirmed this data. Since 1990, when the FAA began recording wildlife hazard incidents at Grand Canyon Airport, there have been no recorded strikes of special-status species birds (NPS 2008d). Bird strikes associated with SFRA air-tours are known to occur; one recent example having occurred in August 2009 (<http://www.nationalparkstraveler.com/2009/08/tour-helicopter-en-route-grand-canyon-makes-emergency-landing-after-bird-strike>).

### **Existing Noise Conditions and Special-Status Species**

Concerns regarding effects of commercial air-tour operations on special-status species relate to noise, in-flight collisions, and visual disturbance from aircraft. Based on previous Biological Opinions; consultation with Federal, state, and tribal agencies; scoping comments; and a preliminary assessment of potential for species to be affected by air-tour overflights, special-status species fully evaluated in this EIS include the American peregrine falcon, California condor, and Mexican spotted owl.

## **SOCIOECONOMIC ENVIRONMENT**

### **Introduction**

Four major socioeconomic issues are addressed in this affected environment section and subsequently analyzed in the environmental consequences section of this EIS. Selection and identification of these issues was based on agency and public scoping results, along with NPS guidelines for addressing socioeconomic issues as part of NEPA compliance. Each of the four major socioeconomic issues are defined and described below.

1. **Air-tour Industry** This EIS addresses existing conditions and economic impacts to changes in the air-tour industry that operates over GCNP. This industry would be affected by flight rules and regulations changes such as Alternative routes, operation hours, or quiet-technology equipment. Effects to industry were raised during

scoping. Most air-tour flights occur in the East End, although there are also trans-canyon flights and air tours operating on West End. Tribal-related air tours are discussed separately below

**2. Affected Tribes and Tribal-related Air Operations** Two tribes are currently directly affected by air-tour activity. The Hualapai Reservation facilitates air tours on the park's West End as part of its tourism industry, and experiences aircraft noise in certain areas. The Havasupai receive visitors via helicopter, and also experience other aircraft noise according to scoping comments. A third tribe, the Navajo Nation, is considering entering the air-tour business on the park's East End. Federally recognized tribes are afforded special consideration under government-to-government requirements, government trust responsibilities, and environmental justice considerations based on ethnic and income qualifications described in the subsequent affected environment section

**3. General-aviation Operations** General-aviation aircraft currently fly over the park according to existing rules and regulations governing non-tour flight operations. Effects of EIS Alternatives on general-aviation operations were raised during agency scoping and by the Grand Canyon Working Group. General-aviation operators could be affected by closures or other changes to existing general-aviation corridors or minimum-flight altitudes over Flight-free Zones

**4. Regional Economics and Park Values** This topic responds to dollar-denominated economic and fiscal effects stemming from changes in air-tour and ground-based park visitor patterns and visitor experience. The affected environment describes economic and fiscal conditions in gateway communities surrounding the park, and current effects of the park and air-tour activities on the region using the most up-to-date data available at time of analysis. Intrinsic, non-dollar effects related to park values expressed by visitors and non-visitors are also addressed under this topic. Regional impacts and intrinsic park values were evident among scoping comments. Also, regional business, local tax base, and economic effects must be addressed according to NPS guidelines for NEPA compliance

## **Air-tour Industry**

Data and information on air-tour operators and operations provided in the following sections were obtained from a variety of sources and reflect several different time periods. FAA provided a full year of data on operations May 1, 1997 to April 30, 1998 and also provided data on peak-period operations from July and August 2005. In addition to FAA data, each operator provided substantial information on its existing conditions and operations during interviews with Harvey Economics in spring 2007 and fall 2008. The most current information available at the time of analysis was used for this discussion whenever possible; however, 2005 baseline information is included for several components for consistency with other impact topics.

### **Profile of the Grand Canyon Air-tour Industry**

**Air-tour Operators** As of June 2010, 13 commercial air-tour operators provided scenic air tours over Grand Canyon, with most air-tour operators based in Tusayan, Arizona; Las Vegas, Nevada and the surrounding area (North Las Vegas and Henderson, Nevada). Other operators base in Santa Fe, New Mexico, and Deer Valley, Arizona. In addition to flying tours from those places, some air-tour operators also offer flights from Page and Sedona, Arizona, and Boulder City, Nevada. Table 3.13 shows air-tour operators that made up the Grand Canyon air-tour industry in 2006, and their locations. These air-tour companies run the gamut from small operators offering a few basic flight options to large operators offering varieties of helicopter and fixed-wing tours.

**Air Tours Offered by Operators** Tour operators offer a variety of tours over the park on both fixed-wing aircraft and helicopters. Tours range from short, air-only excursions to longer trips that include flights and ground-based activities such as river trips, meals, horseback riding, and other tours. Air tours provide views of the Colorado River and a variety of other natural features.

In addition to Grand Canyon air tours, many operators conduct tours over other national parks, monuments, recreation areas, and/or other attractions. Therefore, in many cases, an operator's resources (planes, employees) are devoted to providing tours over several locations, not only Grand Canyon. For operators conducting air tours over several locations, business and revenues are generated from a larger number of operations than just Grand Canyon

tours. The socioeconomic discussion of commercial operations (excluding tribal operations) included in this EIS pertains only to air-tour operations conducted over Grand Canyon and in the SFRA.

**TABLE 3.13 GRAND CANYON AIR-TOUR OPERATORS 2006**

Operator*	Location
Air Grand Canyon, Inc.	Tusayan, AZ
Aviation Ventures, Inc. / Vision Air	North Las Vegas, NV
Southwest Safaris	Santa Fe, NM
Grand Canyon Airlines	Tusayan, AZ
Heli USA	Las Vegas, NV
King Airlines, Inc.	Henderson, NV
Las Vegas Helicopters	Las Vegas, NV
Maverick Airstar, LLC	Tusayan, AZ
Maverick Helicopters	Las Vegas, NV
Papillion Airways, Inc.	Tusayan, AZ
Serenity Helicopters	Las Vegas, NV
Sundance Helicopters	Las Vegas, NV
Westwind Aviation	Deer Valley, AZ

Source: Norman Elrod, Federal Aviation Administration, 2010

\*Air-tour operators with allocations to fly in the SFRA as of March 8, 2006

According to tour operators, key air-tour selling points include canyon views/other scenery and amount of time flying over the canyon. Customers appear to enjoy seeing a large canyon area, including special features, in a short period. Other selling points are variety of accompanying tours packaged with flights, quality of customer service and, for some, proximity to Las Vegas. As with some of the passenger demographic information, these passenger-use insights were obtained from air-tour operators. Operators are assumed to be generally familiar with their passengers through conversations that occur throughout the tour experience.

**Air-tour Routes** Current air-tour routes over GCNP include designated fixed-wing and helicopter routes over East and West Ends, and two trans-canyon routes that allow operations between the Las Vegas area and Grand Canyon National Park Airport. Map 2.2 and Table 2.1 show current designated air-tour routes over the park. Current routes are described in detail in Chapter 2, Alternative A.

Many fixed-wing aircraft and helicopter routes on the park's East End are routed around Bright Angel and Desert View Flight-free Zones through Zuni Point and Dragon Corridors. Fixed-wing air tours also operate in the Marble Canyon area on the SFRA's East End. West End air-tour routes include fixed-wing and helicopter routes generally located west-northwest of Sanup Flight-free Zone, but within the SFRA. Trans-canyon routes are north of the Sanup Flight-free Zone. Current route locations are shown on Map 2.2.

No air-tours routes exist through Fossil Canyon or Tuckup General Aviation Corridors.

As of 2007, most Las Vegas-based operators used West End air-tour routes, and several fixed-wing operators used Blue Direct trans-canyon routes. Operators based in Tusayan or other Arizona locations generally used air-tour routes in Zuni Point and Dragon Corridors.

**Air-tour Prices** A wide variety of air-tours are offered by operators ranging from short flights lasting less than an hour to all day trips that include one or more flights, meals, and other activities. Several operators also offer multi-day trips in which scenic flights make up only a small portion of the overall trip.

Air-tours prices cover a wide range. Factors affecting tour price include departure point (generally the Las Vegas area or Grand Canyon National Park Airport), flight length, and addition of other activities to the tour package. Tours leaving Las Vegas are more expensive and generally include round-trip transportation to and from local hotels. Flight-only tours range about \$100 to about \$400, depending on where the flight originates. More common

are tour packages including land-based activities in addition to a flight or flights. These tours cover a wide price range depending on included activities and can cost up to several hundred dollars. Following is a sample of air-tour prices based on the most current information available at the time of analysis

Operator Location	Tour	Flight time	Price
Tusayan	air-only fixed-wing tours	40 to 60 minutes	\$109 to \$120 per person
Tusayan	air-only helicopter tours	25 to 50 minutes	\$130 to \$235 per person
Las Vegas	air-only fixed-wing tours	several hours (door to door)	\$150 to \$200 range per person
Las Vegas	air-only helicopter tours	several hours (door to door)	\$200 and \$400 per person
Other Locales (example Sedona)		2-½ to 3 hours	\$500 to \$600 per person

**Seasonality and Curfews** Air tours take place year-round, although spring and summer experience more air visitors than fall or winter. About 60% of all air tours occur May to September (FAA 2000c). On the park's East End, between 65% and 75% of air tours take place during summer months (FAA 2007).

East End air-tour overflights are subject to seasonal curfews (designated times of day when air-tour aircraft are legally restricted from flying). As of 2007, the East End curfew was 6 p.m. to 8 a.m. May through September, and 5 p.m. to 9 a.m. October to April. Trans-canyon flights may leave the Las Vegas area as early as 7 a.m. to get to the park airport when the East End curfew lifts at 8 a.m. in summer. There are no curfew restrictions for flights on the park's West End.

On the East End, outside of curfew, air tours operate throughout the day in summer unless grounded due to inclement weather. In winter, operators may choose not to conduct tours during all allowed hours due to limited demand or poor weather. On the West End, winter weather is not as much a concern as on the East End, and there is greater year-round demand. West End flights fly throughout summer, and according to demand through winter.

**Aircraft Used for Overflights** Air-tour operations use a wide range of aircraft. Fixed-wing aircraft used by air-tour operators include single-engine Cessna's that hold three passengers, and larger deHavilland Twin Otters that hold 19 passengers. Helicopters used by air-tour operators include models that hold four to six passengers. Table 3.14 shows types and numbers of different aircraft used for air tours over Grand Canyon in 2005, and their maximum passenger capacity.

Air-tour operators used 133 different aircraft for commercial flights in 2005. Fixed-wing aircraft accounted for about 40% of the total air-tour fleet, and helicopters accounted for the remaining 60%. Although some changes occur in aircraft types and number used for tours and other operations over time, information provided in Table 3.14 generally represents 2007 aircraft conditions (Harvey Economics 2007).



**TABLE 3.14 AIRCRAFT USED FOR AIR TOURS 2005**

Type of Aircraft		Number of Aircraft	Maximum Capacity
Beechcraft 1900	Fixed Wing	2	19 passengers
Cessna 182	Fixed Wing	2	3 passengers
Cessna 206	Fixed Wing	2	5 passengers
Cessna 207	Fixed Wing	10	6 passengers
Cessna 208	Fixed Wing	5	9 passengers
Cessna 402	Fixed Wing	8	9 passengers
De Havilland Twin Otter (DHC-6) or Vistaliner (DHC-6-300) <sup>a</sup>	Fixed Wing	18	19 passengers
Dornier 228	Fixed Wing	5	19 passengers
Piper 31-350	Fixed Wing	1	9 passengers
Aerospatiale 350	Helicopter	36	6 passengers
Bell 206-B	Helicopter	3	4 passengers
Bell 206-L	Helicopter	18	6 passengers
Bell 407	Helicopter	4	6 passengers
Eco-Star 130 (EC-130) <sup>b</sup>	Helicopter	19	6 passengers
<b>Total</b>		<b>133</b>	

Source: Federal Aviation Administration, Peak Day JulAug-Dat05.xls; Norman Elrod, March 14, 2007; Harvey Economics 2007

<sup>a</sup>Vistaliner is a Twin Otter aircraft modified to meet quiet-technology standards.

<sup>b</sup>Eco-Star 130 helicopter is a quiet-technology aircraft

**Quiet-technology Aircraft** Some aircraft used for commercial air tours have incorporated technology to reduce noise emitted during flight calculated on a per passenger basis. Procedures for determining Grand Canyon National Park quiet-technology aircraft designation status for different aircraft are defined in Part 93, Chapter I, Title 14, Code of Federal Regulations and a Final Rule published by FAA in the Federal Register on March 29, 2008. Designation of GCNP quiet-technology aircraft is generally based on measured flyover sound level of an aircraft and seating configuration. Table 3.15 shows aircraft types designated GCNP quiet-technology aircraft.

**TABLE 3.15 DESIGNATED GCNP QUIET-TECHNOLOGY AIRCRAFT MODELS**

		Aircraft Type
Piper PA-18-150	Cessna 208	Fixed Wing
Vistaliner (DHC - 6QP)	Cessna 425	
Dornier 228	Cessna TR 182	
McDonnell-Douglas 900	Bell 407 (with Quiet Cruise Kit)	Helicopter
Whisper Jet S-55QT	ECO-Star 130	

Source: FAA Advisory Circular AC-93-2, June 2006, with appendices updated December 2008

As shown in Table 3.15, Vistaliner and EC-130 models are used for Grand Canyon air tours. Although used extensively by the NPS for administrative flights such as search and rescue, the MD 900 model is not used for air tours due mainly to issues associated with lift capability. Examples of quiet-aircraft technology include addition of a fourth blade to propellers and turbine-driven engines (compared to piston-driven) for the Vistaliner. ECO-Star helicopters are quieter than other models since tail rotors are enclosed in a shell. Of the six helicopter operators offering tours over the park, two operate a full fleet of EC-130s, three have fleets partially made of EC-130s, and one operator does not use any quiet-technology aircraft. Of the seven fixed-wing operators, one operator flies only quiet-technology aircraft, three do not use any quiet-technology aircraft, and remaining operators have mixed fleets including quiet technology and non-quiet-technology.

**Flight Allocations** Total number of non-tribal air tours allowed in the SFRA has an annual allocation of 93,971 flights per year. This annual allocation applies to air tours only, not to transportation or repositioning flights by tour operators. Each air-tour operator is allocated a set number of flights through Zuni Point and Dragon Corridors, and a set number of flights in the SFRA outside Zuni Point and Dragon Corridors. Each operator's annual flight allocations in these areas are based on total number of air tours they reported to the FAA May 1, 1997 to April 30, 1998. Currently, air-tour operators can use their flight allocation throughout the year, without any cap on maximum number of tours flown per day. Table 3.16 shows annual allocation held by each air-tour operator as of March 2006.

**TABLE 3.16 TOTAL ALLOCATIONS HELD BY GRAND CANYON AIR-TOUR OPERATORS, 2006**

Operator	Total Allocation	Operator	Total Allocation
Air Grand Canyon, Inc.	3,135	Maverick Helicopters	7,680
Aviation Ventures, Inc./Vision Air	3,471	Papillion Airways, Inc.	34,690
Southwest Safaris	13	Sundance Helicopters	2,587
Eagle Canyon Airlines/Scenic Airlines	21,355	Vista Helicopters/Silver State Helicopters	1,220
Grand Canyon Airlines	3,168	Westwind Aviation	2,985
Heli USA	2,556	Subtotal	91,250
King Airlines, Inc.	1,924	FAA Held Allocations	2,721
Las Vegas Helicopters	1,026	<b>Total</b>	<b>93,971</b>
Maverick Airstar, LLC	5,440		

Source: Gene Kirkendall, Federal Aviation Administration, 2006

**Number of Air Tours Flown By Location** Table 3.17 shows total number of non-tribal air tours flown over the park 2000 through 2005 by aircraft type and location.

**TABLE 3.17 NUMBER OF AIR TOURS FLOWN BY LOCATION 2000 THROUGH 2005**

East End			West End			Total	
Year	Fixed Wing	Helicopter	Total	Fixed Wing	Helicopter	Total	Flights
2000	8,021	34,366	42,387	24,975	4,506	29,481	71,868
2001	10,037	21,512	31,549	16,198	3,221	19,419	50,968
2002	6,463	19,909	26,372	12,681	3,392	16,073	42,445
2003	6,795	22,827	29,622	12,229	3,735	15,964	45,586
2004	6,800	28,626	35,426	13,089	4,562	17,651	53,077
2005	7,803	31,234	39,037	10,504	7,379	17,883	56,920

Source: Federal Aviation Administration, Quarterly Tables-PP.xls, obtained February 2007

Blue Direct trans-canyon flights are included in West End fixed-wing flights

Helicopter tours account for the majority of flights on the park's East End, and comprised about 68% of all air tours in 2005. Fixed-wing tours account for the majority of flights on the West End and comprised about 32% of all flights in 2005.

The total number of air tours flown decreased from about 72,000 in 2000 to about 42,500 in 2002, which may partly result from the decline in travel after the 2001 September 11<sup>th</sup> attacks. Number of air tours rose after 2002 until reaching about 57,000 in 2005. Overall, helicopter flights followed this same pattern, totaling about 39,000 in 2000, decreasing to about 22,000 in 2002, and increasing to 39,000 in 2005. Fixed-wing flights decreased from about 33,000 in 2000 to about 19,000 in 2002 and 2003. In 2004, number of fixed-wing flights increased to almost 20,000, but in 2005 decreased to about 18,300. The overall decrease in fixed-wing flights during this period was mainly due to a decrease in West End fixed-wing flights.

**Number of Air Tours and Passengers Flown by Route** Table 3.18 presents total number of air tours flown by route type May 1, 1997 to April 30, 1998, in 2005, and number of passengers flown for each route type for the same time periods.

**TABLE 3.18 NUMBER OF AIR TOURS AND PASSENGERS BY ROUTE TYPE 1997-1998 AND 2005**

Route	Type of Aircraft	Number of Air Tours		Passengers	
		1997/1998	2005	1997/1998	2005
Blue Routes	Fixed Wing	38,114	10,500	363,434	136,300
Black Routes	Fixed Wing	11,426	7,800	94,286	71,810
East End Green Routes	Helicopter	32,797	31,240	145,797	174,280
West End Green Route	Helicopter	7,922	7,380	38,340	41,030
<b>Total</b>		90,260	56,920	641,860	423,420

Source: Regulatory Evaluation, Regulatory Flexibility Analysis, International Trade Impact Assessment, and Unfunded Mandates Assessment; Final Rule; Commercial Air Tour Limitation in the Grand Canyon National Park Special Flight Rules Area, Office of Aviation Policy and Plans, Federal Aviation Administration, January 2000, FAA Docket No. FAA-1999-5927-280; Federal Aviation Administration, Peak Day JulAug-Dat05.xls; Norman Elrod, personal communications, March 2007; Harvey Economics, 2007

Air-tour passenger estimate is based on number of air tours flown by type of aircraft, aircraft capacity, and estimates of aircraft load factors by route.

Table 3.19 shows estimated number of air tours by route for 2005. On the park's west side, each air-tour operation flew only one of the air-tour routes (Blue-2 or Blue Direct routes) during each tour. However, on the east side many air-tour flights flew more than one route during the same tour. For example, all east side fixed-wing flights used Black-1, but a large portion of those flights also used Black-1A during the same air tour. Therefore, number of air tours by route shown in Table 3.19 does not reflect number of complete air tours flown in 2005.

**TABLE 3.19 ESTIMATED NUMBER OF AIR TOURS BY ROUTE 2005<sup>a</sup>**

Route	Number of Air Tours	Type of Aircraft	Location
Blue-2	4,078	Fixed Wing	West side
Blue-2X <sup>b</sup>	0	Fixed Wing	West side
Blue Direct North	6,411	Fixed Wing	Trans-canyon
Blue Direct South	16	Fixed Wing	Trans-canyon
Black-1	7,800	Fixed Wing	East side
Black-1A	6,127	Fixed Wing	East side
Black-2	336	Fixed Wing	East side
Black-3	280	Fixed Wing	East side
Black-4	747	Fixed Wing	East side
Black-4X	303	Fixed Wing	East side
Black-5	104	Fixed Wing	East side
Black-6E	0	Fixed Wing	East side
Black-6W	0	Fixed Wing	East side
Green-1	9,232	Helicopter	East side
Green-1A	8,559	Helicopter	East side
Green-1R	673	Helicopter	East side
Green-2	30,558	Helicopter	East side
Green-4	7,379	Helicopter	West side
Green-4X <sup>b</sup>	0	Helicopter	West side

Source: Federal Aviation Administration, Peak Day JulAug-Dat05.xls; Federal Aviation Administration, Quarterly Tables-PP.xls; Harvey Economics, 2007

<sup>a</sup>Actual number of tours flown by route was not available for the full 2005 year. Estimates in this table were created using flight data from July and August 2005, and total flight numbers by quarter for 2005 exit routes to Grand Canyon West Airport and the Hualapai Reservation

<sup>b</sup>Flights using these routes are Hualapai supported tours and not a designated commercial tour

### Hualapai Exempt Flights

Several operators also offer helicopter and fixed-wing tours that land on the Hualapai Reservation, and include options for additional land or river-based activities. These flights typically depart from the Las Vegas area and land at Grand Canyon West Airport using Green-4X and Blue-2X routes to exit the SFRA. A small number of fixed-wing flights also depart from Grand Canyon National Park Airport and land at Grand Canyon West. Air tours conducted in support of the Hualapai Tribe are exempt from annual allocations and daily caps to which other tours are subject. This exemption is the result of concerns regarding potential impacts flight limitations would have on the Tribe's economic development (Federal Register, Vol. 65, No. 65). These flights are accounted for separately from commercial tours described. Table 3.20 presents number of Hualapai exempt flights 2000 through 2005.

**TABLE 3.20 HUALAPAI EXEMPT FLIGHTS 2000 TO 2005**

Year	Fixed Wing Flights	Helicopter Flights	Total
2000	846	16,172	17,018
2001	2,244	14,886	17,130
2002	2,767	14,594	17,361
2003	3,364	20,579	23,943
2004	4,893	23,534	28,427
2005	3,443	28,559	32,002

Source: Federal Aviation Administration, Quarterly Tables-PP.xls, obtained February 2007

Total number of Hualapai exempt flights has increased annually since 2000. The majority of these flights are helicopter tours which, in 2005, made up over 89% of all Hualapai exempt flights. About 198,000 passengers flew

on Hualapai exempt flights in 2005. This estimate is based on number of flights flown by aircraft type, aircraft capacity, and an estimate of occupied seats on each flight.

**Non-Tour Flights** Aircraft operations in the SFRA are also conducted for purposes other than air tours. Air-tour-related operations include transportation of people and/or equipment, aircraft repositioning, maintenance, and training flights with the majority being transportation or repositioning flights as shown in Table 3.21 for 2005. Transportation flights typically include the return leg of a round-trip flight between the Las Vegas area and Grand Canyon National Park Airport. Repositioning flights are movement of empty aircraft from one airport or airstrip to another to meet operational needs. Maintenance and training flights generally account for less than 1% of total non-air-tour flights. Additionally, administrative flights are conducted in support of the NPS and other agencies, and support flights are conducted for Havasupai Tribal operations.

Non-tour transportation and repositioning flights may occur on any designated Black, Blue, or Green flight route over Grand Canyon. They may also occur on Brown routes (support routes used for transporting people, equipment, or other supplies to various points in or near the park). Brown routes are used for flights between Grand Canyon National Park Airport and Supai Village, and flights between Bar Ten airstrip and the Las Vegas area, Grand Canyon National Park Airport, or other places outside the park. Non-air-tour operations are not restricted by annual allocations regulating air tours; however, noise from these operations is considered in this EIS as part of analyses.

**TABLE 3.21 TRANSPORTATION AND REPOSITIONING FLIGHTS 2005**

Flight Type	Number of Flights
Transportation	12,525
Repositioning	2,216
<b>Total</b>	<b>14,741</b>

Source: Federal Aviation Administration, Peak Day Jul Aug- Dat05.xls; Federal Aviation Administration, Quarterly Tables-PP.xls; Harvey Economics 2007

Table estimates were created using flight data from July/August 2005 and total flight numbers by quarter for 2005

**Historical Operator Trends** Both number of air-tour operators and number of air tours flown over Grand Canyon have decreased since detailed data collection began in 1997-1998. Number of operators flying over Grand Canyon decreased from 40 in 1987 to 24 in 1997-1998 to 13 operators in 2007. Consolidation of the Grand Canyon air-tour industry may be the result of several factors (FAA 2007)

- Regulations to the Grand Canyon air-tour industry over recent years and uncertainty created by the prospect of additional regulation may have caused some operators to leave the industry. Marginal operators, whose main business focus may not have been Grand Canyon flights or who flew a very limited number of air tours over Grand Canyon, may have been deterred from continuing operations in the face of regulations. For example, SFRA creation required air-tour businesses to operate under Part 135 of Federal Aviation Regulations, rather than Part 91 as several small operators had previously
- The Grand Canyon air-tour industry might have become a mature industry. Operators may have seen demand for services reach its peak, and are seeing a more stable demand. As shown by Tables 3.16 and 3.17, total number of air tours flown each year has been less than the annual allocation allowed by the FAA in every year since 2000. If additional air tours were in demand, it is expected operators would accommodate additional customers. Therefore, it appears the market for non-tribal-related air tours over the park is in balance with operations. Although total number of commercial air tours flown has increased since 2002, operators have not reached the level flown 1997 to 1998 based on the most current data available at the time of analysis
- Additionally, there are several barriers to entry to this industry, making it difficult for any new operators to begin air-tour operations over Grand Canyon
  - Start-up costs of air-tour operations are high since aircraft and other equipment required to provide tours are expensive
  - The annual flight allocation system does not allow additional air tours over Grand Canyon above a set limit. Almost all annual allocations have been assigned to existing operators, although the FAA does hold some additional allocations

**Employment and Income Generated from the Grand Canyon Air-tour Industry** The air-tour industry employs pilots, mechanics, office administrators, and other types of jobs to conduct business. In addition to people directly employed by air-tour operators, others are indirectly involved with the industry including hotels tour-booking agents, and advertising and marketing professionals. Table 3.22 shows total number of people directly employed by air-tour operators, by location, in 2007.

Wages for those directly employed by air-tour operators generally range about \$30,000 to \$50,000 annually, including full-time and part-time employees. Employment supported by the air-tour industry provides income to workers and indirectly provides revenue to local businesses as a result of employee and operator spending.

**TABLE 3.22 EMPLOYEES OF THE GRAND CANYON AIR-TOUR INDUSTRY BY LOCATION 2007**

Location	Number of Operators at Location	Employees
Las Vegas/ North Las Vegas, NV	8	880
Grand Canyon National Park Airport/ Tusayan, AZ	3	293
Henderson, NV	1	10
Phoenix/ Deer Valley, AZ	1	20
Grand Canyon West, Hualapai Reservation, AZ	1	24
Boulder City, NV	1	10
Page, AZ	1	5
Sedona, AZ	1	5
Santa Fe, NM	1	2
San Diego, CA	1	2
<b>Total</b>		<b>1,251</b>

Source: Harvey Economics 2007

Employee information was not provided for one operator

Several operators have employees at more than one location

### Financial Characteristics of Air-tour Operators Revenues

FAA reports between May 1, 1997 and April 30, 1998, air tours over Grand Canyon generated almost \$100 million in gross revenue (\$99.3 million). Tours in fixed-wing aircraft accounted for over 70% of all revenue generated by air tours, with helicopter tours accounting for just under 30% (FAA 2000c).

Revenues varied widely for air-tour operators flying over the park in 2006. (Revenue data was collected from most operators during individual interviews conducted by Harvey Economics in April 2007. For operators that did not provide financial data, Harvey Economics estimated gross revenues based on passenger data, operations by aircraft type, and available price information. As discussed previously, tour operators differ from one another with respect to fleet size and type, operations number, tours types, customer types flown, and other factors. These differences resulted in a wide range of reported and estimated revenues for 2006. Gross revenues resulting from tours over the park, including those that landed at Grand Canyon West, ranged about \$45,000 to about \$64.5 million for individual operators in 2006. According to operator interviews with Harvey Economics (April 2007), total gross revenue of air-tour operators from tours flown over the park in 2006 was \$203,123,000.

Substantial air-tour price increases explain total revenue increases in light of reduced flight operations compared with 1997-1998.

Total net revenue, defined as gross revenues less gross operating costs, for 2006 was not provided for several operators and could not be estimated from available data. Net revenue for other operators, resulting only from Grand Canyon-related operations, ranged about \$1.3 million in profit to about \$700,000 loss in 2006. The differences in net revenues are due to specific operating characteristics of individual operators.

Marketing of Grand Canyon air tours is an industry of its own and operator revenues are affected by the amount of money dedicated to marketing of tours. For example, a portion of each tour price for some operators goes to other

companies or groups involved in selling tours. Commissions to booking agents or other tour sellers generally run 10 to 20% of gross revenues.

**Operating Costs** FAA developed estimates of variable operating costs including crew, fuel, oil, and maintenance costs for air-tour operators May 1, 1997 to April 30, 1998. Operating costs were estimated for each aircraft type along each air-tour route separately, with estimates of total operating costs for the industry of \$29.2 million (FAA 2000c). Estimates of operating costs May 1997 through April 1998 are presented in 1998 dollars and have not been adjusted to reflect current dollars.

Only about half the 2007 air-tour operators provided information on various operating costs. Of operators that provided these financial data, total operating costs resulting from Grand Canyon-related operations ranged about \$1 million to about \$24 million per operator in 2006. These reported costs include wages, aircraft rental, insurance, fuel, maintenance, commissions to booking agents, advertising, landing fees, and other miscellaneous expenses. The percentage of operating costs that fall into each of these categories varies based on specific operations of individual tour providers.

**Debt Service** Total debt and annual debt service also varies for these tour operators. For reporting operators, total debt ranged \$4.5 million to over \$35 million, and annual debt service ranged about \$230,000 to about \$2.2 million in 2006 (Harvey Economics 2007) (These figures are based on a small number of air-tour operators. The majority of operators chose not to provide this information and therefore the actual range of total debt and annual debt service may differ from what is reported here). Difference in debt among operators results from a number of factors, from purchases of new aircraft to purchases of competing air-tour companies. Most operators obtain short-term loans (seven to ten years) for purchase of new aircraft, although several operators are able to finance these purchases themselves.

**Fleet Replacement and Expansion** As a result of hours flown, aircraft require periodic maintenance or replacement. Operators generally reported conducting scheduled aircraft overhauls and replacement of key parts rather than purchasing new aircraft to replace older ones. However, many of these same operators also reported plans to purchase additional aircraft within the next year or two to expand their fleet (Harvey Economics 2007). These operators generally plan to acquire one or two new aircraft at a time. Several of these operators plan on purchasing quiet-technology aircraft; these are generally operators that already have some quiet-technology aircraft in their fleet. Other operators may purchase non-quiet-technology aircraft similar to their fleet. Helicopter operators reported plans to purchase a greater number of aircraft in the near future than fixed-wing operators. This is consistent with the increasing number of helicopter tours flown over the park since 2002, and the large percentage of total tours that are helicopter operations, as shown in Table 3.17.

**Overall Financial Condition of Air-tour Operators** Overall financial condition of air-tour operators can generally be described as adequate. Most operators have experienced positive net revenues in recent years, although one operator reported a net loss, and other operators reported losses for specific portions of their tour operations in 2006. The majority of operators do have some amount of overall debt; however, they seem able to manage that debt. As discussed above, some operators are planning to purchase additional aircraft in the future, which will be debt-financed.

#### **Profile of Airports Serving Grand Canyon Air-tour Operators**

Nine airports provide services and support to air-tour companies flying over Grand Canyon. These facilities range from small, local airports to major international airports and are owned by various public entities including cities, counties, and the state of Arizona. Table 3.23 lists airports (and ownership) from which non-tribal-related fixed-wing and helicopter tours took-off or landed in 2006.

Several operators moved their base of operations from one airport or airstrip to another over the years for a variety of reasons. Other operators plan a future move. Location changes are expensive, requiring a considerable amount of planning and preparation, and generally occur only if absolutely necessary. For example, McCarran International Airport will soon require all air-tour operations leave that location to find another base of operations. These changes do occur from time to time, affecting use of various airports and airstrips. A large portion of flights taking off or landing at Grand Canyon National Park Airport are related to the Grand Canyon air-tour industry, while at other

airports, such as McCarran International Airport and Santa Fe Municipal Airport, percentage of total flights related to the air-tour industry is quite small. Following is a description of primary airports used by air-tour operators in 2006, including air-tour industry impacts on each.

**TABLE 3.23 AIRPORTS USED BY THE GRAND CANYON AIR-TOUR INDUSTRY 2006**

Airport	Owner
Grand Canyon National Park Airport, AZ	State of Arizona
McCarran International Airport, NV	Clark County, NV
North Las Vegas Airport, NV	Clark County, NV
Henderson Executive Airport, NV	Clark County, NV
Boulder City Municipal Airport, NV	Boulder City, NV
Page Municipal Airport, AZ	City of Page, AZ
Deer Valley Airport, Phoenix, AZ	City of Phoenix, AZ
Sedona Airport, AZ	Yavapai County, AZ
Santa Fe Municipal Airport, NM	City of Santa Fe, NM

Source: Air-tour operators 2007

**Grand Canyon National Park Airport** Owned and operated by the Arizona Department of Transportation, Grand Canyon National Park Airport is located six miles south of Grand Canyon National Park, near Tusayan. This airport is the fourth<sup>31</sup> most active commercial-service airport in Arizona. The air-tour industry makes up a measurable part of Grand Canyon National Park Airport operations, with air-tour operators conducting tours over Grand Canyon and other nearby sites. In 2002, commercial air tours made up about 28% of Grand Canyon National Park Airport's total operations (ADOT 2005). Six operators offer tours from Grand Canyon National Park Airport

**McCarran International Airport, North Las Vegas Airport, and Henderson Executive Airport** Clark County Department of Aviation operates the Clark County Airport System, made up of these three airports plus two additional airports and an airfield. The Clark County Department of Aviation operates as an enterprise fund, separate from the county. Where data are available, the three airports are discussed separately; however, revenue and expenditure information is only available at the department level. Air tours make up a much smaller operations portion of these airports than Grand Canyon National Park Airport. A large portion of operations at North Las Vegas Airport and Henderson Executive Airport are non-commercial, private-operator flights. Seven operators offer tours from these three airports

**Boulder City Municipal Airport** Three air-tour operators (one fixed-wing and two helicopter-tour operators) fly tours out of Boulder City Municipal Airport. This airport has only been in operation since the early 1990s and has a much smaller number of total operations than Grand Canyon National Park Airport or Clark County airports. Grand Canyon air tours make up only a small portion of flights at this airport

**Page Municipal Airport** One Grand Canyon air-tour operator offers flights out of Page Municipal Airport. In addition to air tours, operations at the Page Airport include other commercial air service, general-aviation and military flights, and cargo transport. Grand Canyon air tours make up only a small portion of flights at this airport

**Deer Valley Airport** Deer Valley Airport is a reliever airport for Phoenix's Sky Harbor International Airport and the busiest general-aviation airport in the United States (City of Phoenix 2010). These airports are part of the City of Phoenix's Department of Aviation, an enterprise fund that does not receive funding from the

<sup>31</sup> According to the March 2010 Arizona Office of Tourism Airport Passenger Volume Report available at <http://www.azot.gov/documents/Airports%20March%202010.pdf>, Arizona's busiest airports include 1) Phoenix Sky Harbor, 2) Tucson International, 3) Phoenix-Mesa Gateway, 4) Grand Canyon National Park Airport and 5) Laughlin-Bullhead City International



city. The same operator that offers flights out of Page Municipal Airport also offers flights out of Deer Valley Airport. This is the only Grand Canyon operator offering flights from Deer Valley. Air tours over Grand Canyon are a small part of total operations at Deer Valley Airport

**Sedona Airport** One Grand Canyon helicopter-tour operator offers flights out of Sedona Airport. The majority of this operator's tours are offered from other airports; only a few are offered from Sedona Airport

**Santa Fe Airport** One Grand Canyon air-tour operator offers flights out of Santa Fe Airport. This operator holds only a few allocations for Zuni Point and Dragon Corridors and these operations made up less than 0.1% of the airport's total operations in 2005-2006

**Takeoffs and Landings** Table 3.24 shows number of air-tour take-offs and landings at each airport serving Grand Canyon air-tour operators in 2005.

**TABLE 3.24 AIR-TOUR TAKE-OFFS AND LANDINGS 2005**

	GCNP Air-tour Take-offs		GCNP Air-tour Landings	
	Fixed Wing	Helicopter	Fixed Wing	Helicopter
Grand Canyon National Park Airport, AZ	9,861	33,652	14,318	33,212
McCarran International Airport, NV	0	3,477	0	3,477
North Las Vegas Airport, NV	6,667	0	2,202	0
Henderson Executive Airport, NV	1,268	0	1,268	0
Boulder City Municipal Airport, NV	0	1,341	0	1,341
Page Municipal Airport, AZ	109	0	8	0
Phoenix Deer Valley Airport, AZ	79	0	389	0
Sedona Airport, AZ	4	0	0	0
Valle Airport, private, AZ	13	0	0	0
Kayenta Airport, Navajo Nation, AZ	13	0	0	0
Scottsdale Airport, AZ	50	0	0	0
Monument Valley Airport, AZ	239	0	8	0
Las Vegas Strip, NV	0	142	0	142
Peach Springs Airstrip (Hualapai), AZ	4	0	113	0
Whitmore Helipad (Hualapai), AZ	0	0	0	439
<b>Total</b>	<b>18,307</b>	<b>38,613</b>	<b>18,307</b>	<b>38,613</b>

Source: Federal Aviation Administration, Peak Day JulAug-Dat05.xls; Federal Aviation Administration, Quarterly Tables-PP.xls; Harvey Economics 2007

Data do not include Hualapai exempt flights. Air-tour operations landing at Grand Canyon West Airport or at Hualapai helicopter landing pads along the Colorado River are discussed as part of the earlier Hualapai exempt flights discussion

Take-offs and landings at Bar-10 are not included here since they are not air tours

Data for the full year 2005 was extrapolated using flight data from July and August 2005 and total flight numbers by quarter

## Passenger Demographics

May 1, 1997 to April 30, 1998 about 642,000 passengers took air tours over Grand Canyon. Just over 70% of all passengers took tours in fixed-wing aircraft, with just under 30% of all passengers taking helicopter tours (FAA 2000c) (Number of air-tour passengers does not include those flying on Hualapai exempt flights). In 2005, an estimated 423,000 passengers took air tours. About half of these passengers flew on fixed-wing tours and half flew helicopter tours. Over 58% of all air-tour passengers took tours over the East End; the remaining 42% of passengers flew on West End routes.

Air-tour visitors are further characterized in Visitor Use and Experience.

## Affected Tribes and Tribal-related Air Operations

### Hualapai Reservation

The Hualapai Reservation is located along 108 miles of the southern banks of the Colorado River and the park, to the west of the Havasupai Reservation down to Peach Springs, Arizona, which serves as the Hualapai Tribal Capital. The unincorporated town of Peach Springs is located in Mohave County along Route 66. The reservation encompasses about one million acres in Mohave and Coconino Counties and a very small portion of Yavapai County. Map 1.1 includes the reservation.

Community facilities on the reservation include elementary, middle and high schools, general store, service station, senior citizens center, gift shops, hunting lodge, training center, gymnasium, community center, rodeo arena, ball fields, laundromat, dialysis treatment center, emergency fire station, health clinic, and juvenile detention center (Arizona Department of Commerce 2005b). The nearest bank is in Kingman, about 50 miles from Peach Springs. Law enforcement is provided by a tribal police force that employs 12 officers (Hualapai Police Department 2006).

### Hualapai Demographic Profile

**Hualapai Population** As of 2005, there were an estimated 2,156 total enrolled members in the Hualapai Tribe, and in 2005, 1,608 persons lived on the reservation (University of Arizona 2007). In 2005, the estimated Peach Springs population was 713, or about 44% of the reservation population. Between 1990 and 2005, reservation population increased about 96%. Often, a portion of those enrolled in a particular tribe live off the reservation. Table 3.25 provides population data for the Hualapai Reservation, Mohave and Coconino Counties, and the state of Arizona. Trust lands, small parcels outside the Reservation, are included in the Census Data. In 2000, 18 of the 1,608 population lived on these lands.

**TABLE 3.25 POPULATION OF HUALAPAI RESERVATION, COCONINO AND MOHAVE COUNTIES 1990, 2000, AND 2005**

Population	1990	2000	Change	2005	Change
Hualapai Reservation	822	1,353	65%	1,608	19%
Coconino County	96,591	116,320	20%	130,530	12%
Mohave County	93,497	188,032	101%	188,035	0%
<b>Arizona</b>	3,665,228	5,130,632	40%	5,939,292	16%

Source: 1990 data from 2000 Census population finder, accessed at [www.census.gov](http://www.census.gov)

2005 Data, Office of Health Systems Development, Arizona Department of Health Services, Hualapai Tribe Primary Care Area and Mojave County and Coconino County, Statistical Profile 2006b

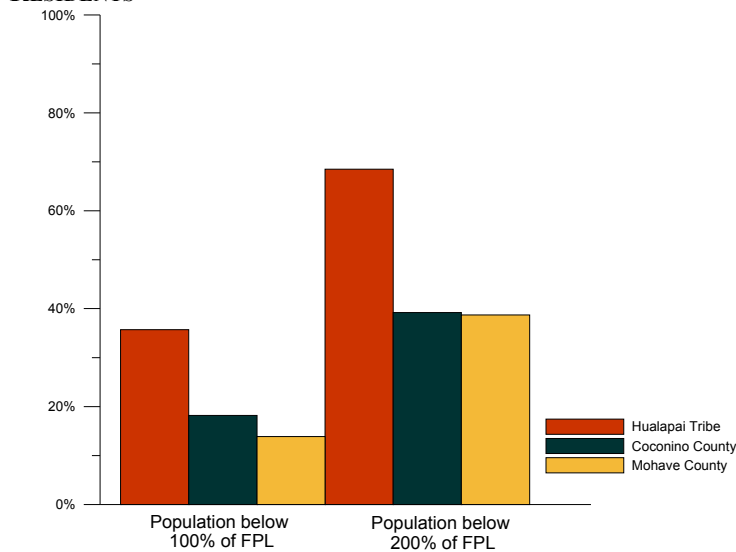
As of 2007, there were an estimated 2,000 enrolled Hualapai, of which 1,400 lived on the reservation, along with 200 non-Hualapai. Despite its recent growth, the Hualapai Reservation is sparsely populated. The population density on the reservation in 2005 was 1.0 person per square mile, as compared to 13.1 for the county and 53.2 for the state of Arizona.

### Hualapai Economic Profile

Principal economic activities on the Hualapai Reservation are cattle ranching, governmental activities, tourism, and traditional and modern folk arts (Arizona Department of Commerce 2005b).

**Hualapai Income** According to the 2000 Census, per capita income for Hualapai Reservation residents was \$8,147; median annual household income for the 358 households was \$19,833. Almost 60% of households had income of less than \$24,999. Public assistance income or Supplemental Security Income was received by just over 27% of households. Almost 3.5% of households had income of more than \$100,000 in year 2000 (U.S. Census Bureau 2000b). Figure 3.4 provides the percent of Hualapai and Coconino and Mohave County residents below the Federal Poverty Level (FPL) and below 200% of the FPL in 2006. (In 2006, the U.S. Department of Health and Human Services calculated the poverty level as \$9,800 for one person and \$3,400 for each additional person in a family. For example, the FPL for a family of four is \$20,000 annually.)

**FIGURE 3.4 POVERTY LEVEL OF HUALAPAI RESERVATION AND COCONINO AND MOHAVE COUNTY RESIDENTS**



Source: Arizona Department of Health Service, Division of Public Health Services. Hualapai Tribe Primary Care Area Statistical Profile, 2006b

**Hualapai Employment** Almost 99% of employed residents worked on the reservation in 2000. The population of the Hualapai Reservation 16 years or older grew from 499 to 867 between 1990 and 2000, a 74% increase. In 1990, the civilian labor force of the population was 296, or about 60% of that population, which represents the labor participation rate. In 2000, 391 of 867 residents over the age of 16 were in the labor force, representing a 15 point drop in the labor participation rate to a relatively low 45%. Among other possibilities, this may indicate unemployment data are understated as some workers may have stopped looking for employment and thus are no longer counted in the workforce.

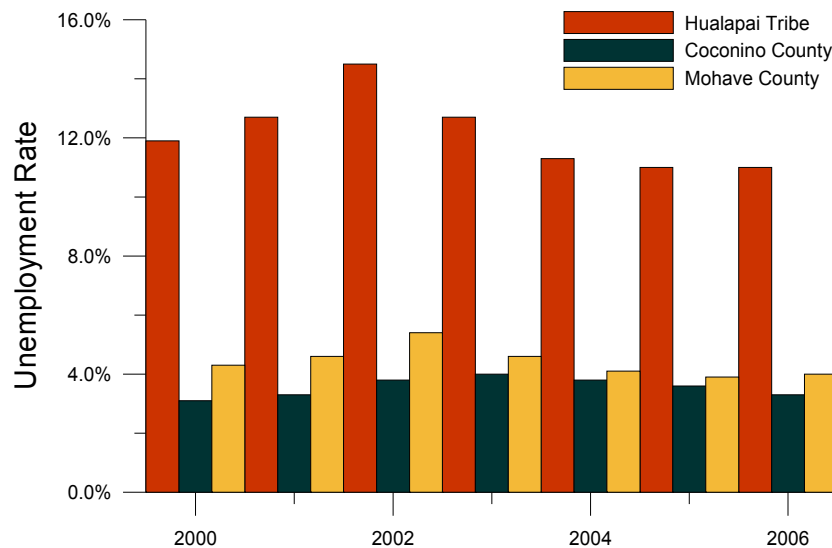
Despite the fact that unemployment may be understated on the reservation, it is still high as compared to Coconino and Mohave Counties. Figure 3.5 provides unemployment percentages for the Hualapai Tribe, and Coconino and Mohave Counties, 2000 through 2006.

Unemployment rates appear stable, and employment on the reservation is steadily growing.

**Hualapai Employment by Occupation and Industry** Distribution of workers by occupation on the reservation was similar to Mohave and Coconino Counties in 2000, with roughly three-quarters of employment in traditionally white-collar occupations. About 60% of Hualapai Reservation workers were employed by government as compared to 28% and 13% for Coconino and Mohave Counties, respectively (U.S. Census Bureau 2006b). Consistent with the percentage of government workers on the reservation, more than half of employees work in educational, health and social services, and public administration industries.

Tourism-related employment is extensive. Industries associated with tourism, such as retail trade, accommodation, and food services account for more than 210 employees. These activities are mostly within the Grand Canyon Resort Corporation.

**FIGURE 3.5 UNEMPLOYMENT RATES FOR HUALAPAI TRIBE, COCONINO AND MOHAVE COUNTIES, 2000 THROUGH 2006**



Source: Arizona Department of Economic Security, Research Administration, CES/LAUS Unit, Arizona Unemployment Statistics Program, Special Unemployment Report  
Average of monthly numbers, 2006, does not include December. County data does not include reservations

### ***Hualapai Tourism Sector***

Development of tourism on tribal land is important to the Hualapai. Their location in Grand Canyon along the banks of the Colorado River is a natural resource that provides an economic advantage that helps off-set other disadvantages, such as lack of larger population centers near the reservation.

The Hualapai Tribe owns and operates several tourist-oriented ventures, mostly under the organization of the Grand Canyon Resort Corporation. Opened in February 1988, Grand Canyon West is a large tourist-oriented facility located on the Hualapai Reservation about 120 miles east of Las Vegas and almost 250 miles from Grand Canyon National Park's Visitor Center at South Rim. Grand Canyon West encompasses about 9,000 acres and is 60 miles from Peach Springs. Grand Canyon West offers one and two-day rafting trips, Hummer vehicle tours, all inclusive trips from Las Vegas, the Hualapai Market, an Indian Village, the Hualapai Ranch, and horseback riding. Tour prices vary from about \$30 per person up to \$500 or more per person, depending on activity. As a part of a contractual agreement, Grand Canyon Resort Corporation is required to provide 15% of its revenues to the Tribe, or a minimum of \$600,000 annually to the Tribe's general fund (FAA 2000a).

Admission to Grand Canyon West is \$49.95 per person, with additional charges for various activities. In March 2007, Grand Canyon West opened the Grand Canyon Skywalk, a horseshoe-shaped glass-bottom walkway more than 4,000 feet above the canyon floor that extends 70 feet into the canyon. The cost was initially \$25 per person. In addition, construction of a 6,000-square-foot visitor center, which will include a museum, movie theater, gift shop, restaurants and lounges, and event facilities, is underway. The Tribe hopes Grand Canyon West will eventually draw many visitors each year. Plans include an RV park, gas station, small grocery store, and a tram to the Canyon floor (Grand Canyon Resort Corporation 2007). The Hualapai River Runners offer one and two-day river rafting trips down the Colorado River on motorized river rafts. The GCNP Colorado River Management Plan regulates the number of people on these rafting trips to 156 passengers per day. The Hualapai also offer short (15 to 20-minute) pontoon boat tours in the Quartermaster Canyon area. The Colorado River Management Plan limits these river passengers to 600 per day.

Hualapai Lodge, which opened in 1997, is also owned by the Tribe. The lodge has 60 rooms, a restaurant and gift shop. The Tribe also sells hunting permits through Wild Life Hunting and produces and sells t-shirts, hats, and mugs through the Hualapai Arts and Crafts Enterprise (Northern Arizona University 2007b).

Tourism provides about \$5 million in income and almost half the jobs on the reservation each year. Tourism contributes about 90% of the Tribe's budget each year.

### ***Hualapai Tribal-related Air Tours***

Air-tour operations are an important piece of the overall tourism economy for the Hualapai. Tribal officials estimate as much as 87% of total reservation visitors are air-tour related. Besides moving visitors onto the reservation, air tours land at Quartermaster Canyon, and other flights move visitors to the bottom of the canyon for boat tours (these are known as Elevator Flights or Over the Edge tours). Four helicopter companies operated on the reservation in 2007, providing air tours as arranged through the Hualapai Tribe.

Air tours land at both Grand Canyon West Airport and along the Colorado River. In 1997, along with conversion from a private-use to a public-use airport, a Federally funded airport renovation and runway resurfacing were completed. After that time, air tours to the reservation increased significantly. Like most air-tour operations, events of September 11, 2001 resulted in a decrease in flights, but operations gradually returned and then surpassed pre 9/11 levels. Between May 1, 1998 and April 30, 1999, five airplane and four helicopter operators conducted 10,700 air tours with 55,700 passengers to the reservation. These air-tour operations at Grand Canyon West provide income to the Tribe from landing fees, ground tours, and meals provided to passengers, trespass fees, and lease payments. More than 60% of the tribal budget can be attributed to air tours. Table 3.26 illustrates volume of air-tour flights in support of the Hualapai 2000 to 2005. These operations include flights that landed at Grand Canyon West Airport and those that landed at the multiple landing pads near Quartermaster Canyon. The majority of commercial air tours that land at Grand Canyon West Airport or at Quartermaster Canyon fly the Green-4 (helicopter) route or the Blue-2 (fixed-wing) routes in the SFRA (Aircraft can also access Grand Canyon West Airport from outside the SFRA.)

**TABLE 3.26 AIR-TOUR OPERATIONS IN SUPPORT OF THE HUALAPAI TRIBE 2000-2005**

Year	Fixed Wing Flights	Helicopter Flights	Total
2000	846	16,172	17,018
2001	2,244	14,886	17,130
2002	2,767	14,594	17,361
2003	3,364	20,579	23,943
2004	4,893	23,534	28,427
2005	3,443	28,559	32,002

Source: Federal Aviation Administration

The number of air tours in support of the Hualapai has further increased in recent years due to additional attractions on the reservation and increased marketing by the Hualapai. The Hualapai collect about \$3 million per year in charges and fees from various operators that land on the reservation. (These charges and fees are only a portion of total Hualapai revenues.) In addition to tours shown in Table 3.26, between 25,000 and 27,000 Over the Edge flights are provided each year.

### ***Hualapai Fixed-Base Operations***

The Hualapai own four fixed-base operations: Grand Canyon West Airport, Grand Canyon West 1 Heliport, Grand Canyon West 2 Heliport, and 183 Mile Heliport. This does not include their numerous helipads near the Colorado River used for transporting river passengers in and out of the canyon and for helicopter tours based out of Grand Canyon West or the Las Vegas area.

### ***Havasupai Reservation***

The Havasupai Reservation encompasses about 188,000 acres at the western edge of Grand Canyon's South Rim in Coconino County. Most reservation residents live in Supai Village, and are governed by a seven-member tribal

council. Peach Springs, on the Hualapai Reservation, is the nearest town. The Havasupai Reservation is quite remote and can be reached only by foot, horseback, or helicopter. If not traveling by helicopter, tourists park at Hualapai Hilltop and take an eight-mile trail to the village. Map 1.1 includes the Havasupai Reservation.

The isolated nature of this reservation makes it quite different from most communities and other reservations. For example, according to the 2000 Census, no workers used a car, truck, or van to get to work. About 64% walked, and the balance used other means, possibly a horse. Seventy-seven percent of households did not have a vehicle available to them. Less than 15% of owner-occupied housing units had a mortgage (U.S. Census Bureau 2000a).

Community facilities on the reservation include a school (kindergarten through eighth grade), community building and tribal offices, library, senior center, a community playing field, basketball court, rodeo grounds, museum and cultural center, silkscreen studio, campground, lodge, café, and the Havasupai Trading Company (Arizona Department of Commerce 2005a). Law enforcement is provided by the Bureau of Indian Affairs.

### ***Havasupai Demographic Profile***

**Havasupai Population** Presently, there are roughly 650 enrolled members of the Havasupai Tribe. In 2005, the estimated Havasupai Reservation population was 555 persons (Havasupai Tribe 2007). Between 2000 and 2005, Havasupai Reservation population increased about 10%. Table 3.27 provides population data for the Havasupai Reservation, Coconino County, and the state of Arizona.

**TABLE 3.27 POPULATION HAVASUPAI RESERVATION, COCONINO COUNTY, AND ARIZONA, 1990, 2000 AND 2005**

Population	1990	2000	Change	2005	Change
Havasupai Reservation	N/A	503	N/A	555	10%
Coconino County	96,591	116,320	20%	130,530	12%
Arizona	3,665,228	5,130,632	40%	5,939,292	16%

Source: 1990 and 2000 Census population finder, accessed at [www.census.gov](http://www.census.gov) and Office of Health Systems Development, Arizona Department of Health Services, Havasupai Tribe Primary Care Area and Coconino County, Statistical Profile, 2006a  
1990 Census data for the Havasupai Reservation was not available

Reservation residents are relatively young in relation to Coconino County residents. In 2005, almost 80% of reservation residents were 44 years of age or younger as compared to 73% for Coconino County.

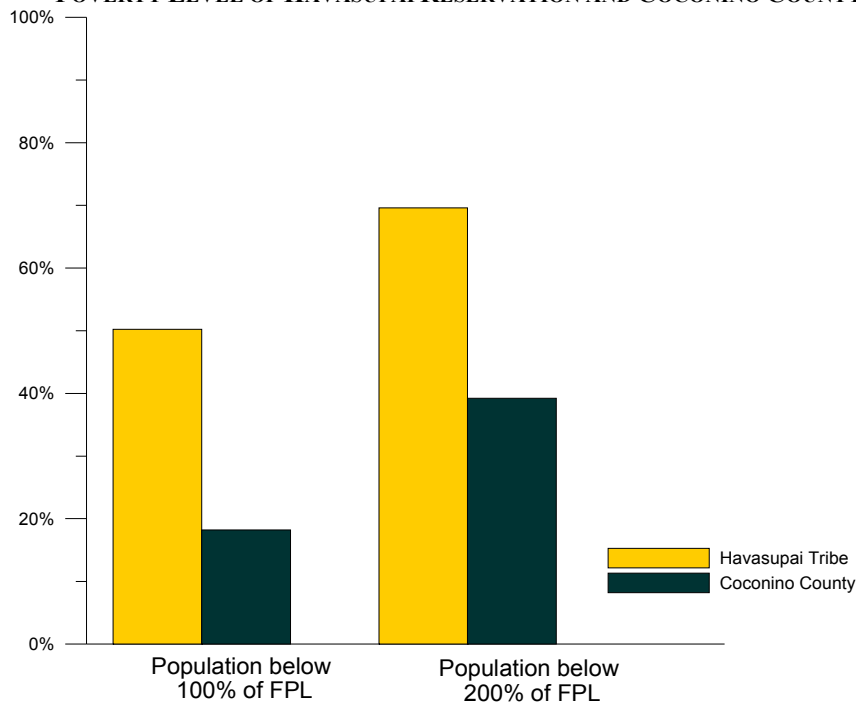
### ***Havasupai Economic Profile***

The principal economic activity on the Havasupai Reservation is tourism; more than 12,000 guests visit the reservation each year (Arizona Department of Commerce 2005a). The dramatic nature of the landscape with its deep canyons and beautiful waterfalls make it very attractive to certain tourists.

**Havasupai Income** According to the 2000 Census, per capita income for Havasupai Reservation residents was \$7,422; median annual household income for the 117 households was \$20,114. Almost 60% of households had income of less than \$24,999. Public assistance income or Supplemental Security Income was received by about 18% of households. More than 5% of households had income of more than \$100,000 in year 2000 (U.S. Census Bureau 2000b).

Figure 3.6 provides the percent of Havasupai and Coconino County residents below the Federal poverty level and below 200% of the Federal Poverty Level in 2006.

**Havasupai Employment** In 2000, the Havasupai Reservation population 16 years or older was 267. Of this group, 95 were in the labor force, for a low labor force participation rate of about 36%. The labor force participation rate for Coconino County was almost 69%. The reservation's isolation and resulting limited employment opportunities may result in an understatement of unemployment numbers.

**FIGURE 3.6 POVERTY LEVEL OF HAVASUPAI RESERVATION AND COCONINO COUNTY RESIDENTS**

Source: Arizona Department of Health Service, Division of Public Health Services. Havasupai Tribe Primary Care Area Statistical Profile 2006a

Although unemployment may be understated on the reservation, it is still high compared to Coconino County. Figure 3.7 provides unemployment percentages for the Havasupai Tribe and Coconino County, 2000 through 2006. Havasupai unemployment rates appear to be stabilizing, and employment is slowly increasing.

#### **Havasupai Employment by Occupation and Industry**

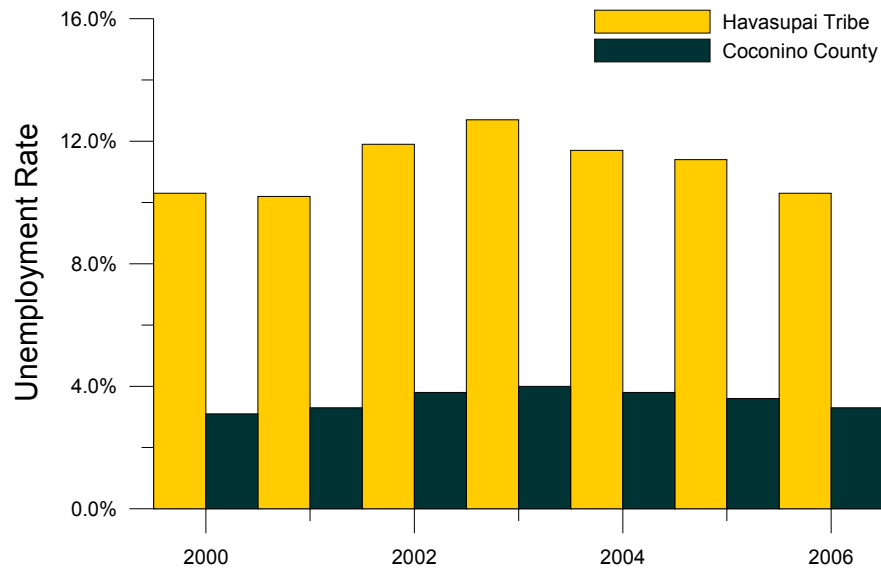
An estimated 95% of employed residents work on the reservation since commuting in or out is quite difficult.

As compared with Coconino County, about 15% more employees on a reservation worked in service occupations in 2000. The majority of reservation and Coconino County employment was in traditionally white-collar occupations. About 50% of Havasupai Reservation workers were employed by government as compared to 28% in Coconino County (U.S. Census Bureau 2000b). The largest employer on the reservation is the Tribe itself (Inter Tribal Council of Arizona, Inc. 2007). Consistent with a tourism-driven economy, tourism-related industries provide another 25% of employment. Other industries, such as manufacturing and transportation, may also be indirectly related to the tourism industry.

#### ***Havasupai Tourism Sector***

Tourism development on tribal land is crucial to the Havasupai Tribe as its remote location makes industries impractical. The reservation's spectacular scenery is appealing to certain tourists undeterred by the difficulty getting there. The entrance fee is \$35 per adult and \$17.50 for children under 12.

In addition to the natural beauty of the reservation's canyons and waterfalls, the Tribe has invested in several ventures designed to attract tourist dollars. The Tribe owns a lodge with 24 guest rooms near Havasu Falls. It also owns and operates a cafe, post office, grocery store, tourist office, museum and cultural center, silk-screening studio (Northern Arizona University 2007a), primitive campground, and horseback tours.

**FIGURE 3.7 UNEMPLOYMENT RATES FOR HAVASUPAI TRIBE AND COCONINO COUNTY 2000-2006**

Source: Arizona Department of Economic Security, Research Administration, CES/LAUS Unit, Arizona Unemployment Statistics Program, Special Unemployment Report  
 Average of monthly numbers, 2006 does not include December. County data does not include reservations

By arrangement with the Tribe, air-tour operators offer two helicopter trips per day to the reservation. Besides transportation, visitors use these flights in conjunction with hiking and other activities.

### ***Havasupai Tribal-related Air Tours***

The Havasupai do not currently conduct air-tour operations.

### **Navajo Reservation**

The Navajo Nation (see Map 1.1) covers roughly 27,000 square miles in Arizona, Utah, and New Mexico. There are 110 Chapters within the Nation, which is governed by three branches of government: Executive, Legislative, and Judicial headquartered in Window Rock, Arizona. The Cameron Chapter of the Navajo Nation is elaborated in this section as the Chapter may develop air tours and air-tour-related fixed-based operations.

The Cameron Chapter was certified as an entity of the Navajo Nation in 1955 and occupies about 240,000 acres in Coconino County. This Chapter is part of the Bennett Freeze Area, a region disputed between the Navajo Nation and Hopi Tribe. The Bennett Freeze law (section 10(f) of Public Law 93-531, commonly known as the Bennett Freeze) prohibited construction, development, and repair on these lands. In early 2007, the Freeze was lifted, but the impacts of the Freeze still affect Chapter residents.

Community facilities include a pre-school and elementary school, several churches, and 11 businesses. Law enforcement is provided by the Tuba City Chapter. The nearest medical facility is Tuba City Indian Medical Center about 26 miles away (Cameron Chapter 2007).

### ***Navajo Demographic Profile***

**Navajo Population** In 2001, there were 255,543 total enrolled members in the Navajo Nation, making it the largest U.S. tribe (Navajo Nation 2007). Requirements for enrollment vary tribe to tribe, and enrolled members are not necessarily residents of Navajo Nation lands. **TABLE 3.28** provides population data for the entire Navajo Reservation, Cameron Chapter, Coconino County, and the state of Arizona.



**TABLE 3.28 POPULATION NAVAJO RESERVATION, CAMERON CHAPTER AND ARIZONA, 1990 AND 2000**

Population	1990	2000	Change
Navajo Nation	148,451	180,462	22%
Cameron Chapter	N/A	1,231	N/A
Coconino County	96,591	116,320	20%
<b>Arizona</b>	<b>3,665,228</b>	<b>5,130,632</b>	<b>40%</b>

Source: 1990 data from 2000 Census population finder, at [www.census.gov](http://www.census.gov)  
 The estimated population of the Arizona portion of the Nation in 2005 was  
 113,056 residents (Arizona Department of Health Services 2006c)

### ***Navajo Economic Profile***

Principal economic activities on the Navajo Nation are sheep and cattle ranching, coal and uranium mining, weaving, jewelry making, and traditional arts. Tourism is also very important. Many parks, monuments, and museums attract tourists each year (Arizona Department of Commerce 2005c).

**Navajo Income** According to the 2000 census, per capita income for Navajo Nation residents was \$7,269; median annual household income for the 47,761 households was \$20,005. Almost 60% of households had income less than \$24,999. Public assistance income or Supplemental Security Income was received by almost 31% of households. Almost 2% of households had income of more than \$100,000 (U.S. Census Bureau 2000b).

Per capita income for Cameron Chapter residents was \$6,055; median annual household income for the 314 households was \$18,864. About 27% of households received public assistance or Supplemental Security Income. None of the households had income over \$100,000.

Figure 3.8 provides the percent of Navajo Nation, Cameron Chapter and Coconino County residents who were below the Federal Poverty Level in 2000.

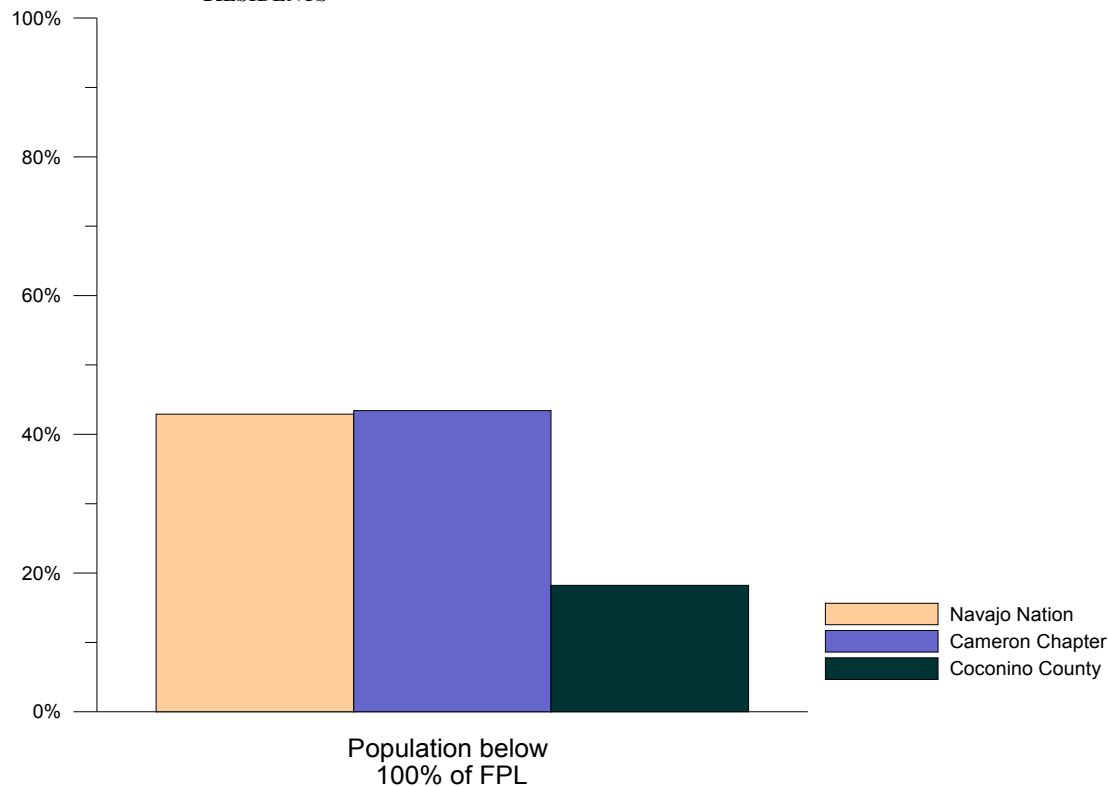
**Navajo Employment** In 2000 the civilian labor force on the Navajo Nation was 51,330 persons. The population over age 16 was 114,966; 33 residents were in the Armed Forces. Thus, about 45% of residents age 16 and over were in the labor force. In the Cameron Chapter, about 42% of the 841 residents over 16 were in the labor force, a relatively low figure. In Coconino County, almost 70% of residents over age 16 were in the labor force.

Although reservation unemployment may be understated, it is still high compared to Coconino County. Figure 3.9 provides unemployment percentages for the Navajo Nation, and Coconino and Mohave Counties 2000 through 2006

**Navajo Employment By Occupation And Industry** Service occupations provided the largest percent of employment for workers in the Cameron Chapter. In the Navajo Nation and Coconino County, management and professional occupations provided the largest employment percentage. In Coconino County, traditionally white-collar occupations provided almost 80% of all jobs as compared to about 66% for both the Navajo Nation as a whole and the Cameron Chapter. About 29% of Cameron Chapter workers were employed by government as compared to 44% on the Navajo Nation and 28% in Coconino County (U.S. Census Bureau 2000b).

Percent employment in the construction industry in the Cameron Chapter was more than double that of the entire Navajo Nation, and more than three times that of Coconino County. Retail trade and arts, entertainment, recreation, accommodation, and food services accounted for almost 40% of all employment for the Cameron Chapter, indicating a reliance on tourism. The largest employers within the Cameron Chapter are the Cameron Trading Post with approximately 50 employees and the Cameron Chapter House with approximately 11 workers.

**FIGURE 3.8 POVERTY LEVEL OF NAVAJO NATION, CAMERON CHAPTER, AND COCONINO COUNTY RESIDENTS**



Source: Arizona Department of Health Service, Division of Public Health Services. Navajo Tribe Primary Care Area Statistical Profile 2006c

Even so, unemployment rates on the Navajo Reservation appear to have stabilized and employment is gradually increasing.

### ***Navajo Tourism Sector***

The Little Colorado River Gorge Tribal Park is located in the Cameron Chapter. No fees are charged for park entrance; however, a visitor center is available that provides information and permits for various activities. The park includes two overlooks with picnic tables and native vendors selling handmade crafts, as well as numerous hiking and backpacking trails. The Cameron Chapter does not operate any formal tourist attractions.

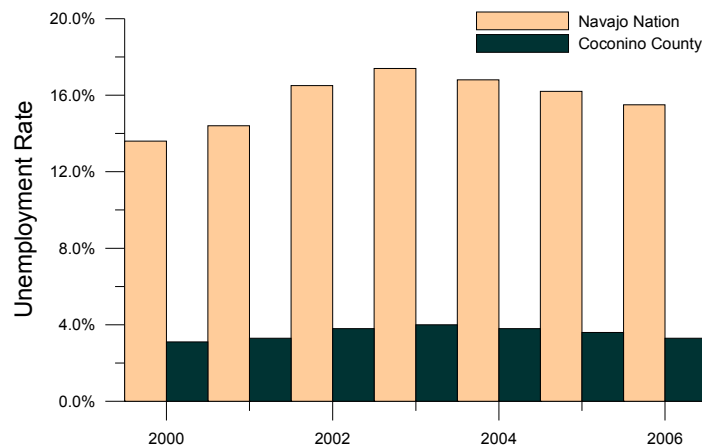
### ***Navajo Tribal-related Air Tours***

The Navajo Nation, including the Cameron Chapter, does not currently conduct air-tour operations.

### **General-Aviation Operations**

#### **General-Aviation Corridors**

Four general-aviation corridors currently exist in the SFRA. These are: Zuni Point Corridor, Dragon Corridor, Fossil Canyon Corridor, and Tuckup Corridor. General-aviation corridors allow aircraft to fly across Grand Canyon between various Flight-free Zones. Required altitudes in corridors are lower than required to fly over Flight-free Zones. Current flight altitudes are the same for all four general-aviation corridors. Northbound flights may occur at 11,500 feet MSL or 13,500 feet MSL. Southbound flights may occur at 10,500 feet MSL or 12,500 feet MSL. Each corridor is described in Chapter 2, Alternative A, and shown on Map 2.2.

**FIGURE 3.9 UNEMPLOYMENT RATES FOR NAVAJO NATION AND COCONINO COUNTY 2000-2006**

Source: Arizona Department of Economic Security, Research Administration, CES/LAUS Unit, Arizona Unemployment Statistics Program, Special Unemployment Report  
Navajo Nation data includes only Arizona data. Average of monthly numbers, 2006 does not include December. County data does not include reservations

### Flight-free Zones

Four Flight-free Zones exist in the SFRA: Sanup, Toroweap/Shinumo, Bright Angel and Desert View. Flight-free Zones are described in Chapter 2, Alternative A, and shown on Map 2.2. Flights may currently occur over the Sanup Flight-free Zone at altitudes greater than 7,999 feet MSL and over the Toroweap/Shinumo, Bright Angel, and Desert View Flight-free Zones at altitudes greater than 14,500 feet MSL.

### General-aviation Aircraft

A variety of types of general-aviation aircraft fly over GCNP at different locations and altitudes based on points of take-off and destination, as well as on mechanical aircraft capabilities. For example, single-engine piston aircraft can fly at altitudes up to 14,500 feet MSL and turbo-charged engines up to 21,000 feet MSL (Harvey Economics 2006). Examples of general-aviation single-engine piston aircraft types are shown in Table 3.29.

**TABLE 3.29 EXAMPLES OF SINGLE-ENGINE PISTON AIRCRAFT**

Aircraft Manufacturer	Model Types
Beech	A23; A45; B19; C24R; D35; F33A
Cessna	C120; C150L; C170A; C182E
Maule Air Inc.	MX-7-160; MXT-7-180A
Mooney	M20C; M20J; M20M Bravo; M20R
Piper	PA-12; PA22-135; PA-24-260B

Source: [www.planequest.com](http://www.planequest.com)

Only a small portion of all single engine piston aircraft types that could be used for general aviation purposes are shown

### General-Aviation Operations

On the Peak Day of the Base Year (August 8, 2005), there were a total of four general-aviation flights flying within the SFRA. These flights occurred on a Beech Baron, a Cessna Conquest, and on other unidentified general-aviation single-engine aircraft. The Peak Day for total SFRA flights may or may not represent Peak Day operations for general-aviation flights. No information is available on annual number of general-aviation flights in the SFRA.

## REGIONAL ECONOMICS AND PARK VALUES

This section discusses local and regional communities affected by park operations and park-related tourist activities. Current economic and demographic conditions of local communities and the relevant region are presented and the role of tourism in these economies is discussed. The value of the park to visitors and non-visitors is also discussed.

### Regional Economics

#### *Local Communities and Region Influenced by Grand Canyon National Park Visitation*

Visitors to Grand Canyon, including those participating in air tours over Grand Canyon, also spend time and money in local communities outside the park, dining in restaurants, purchasing souvenirs in local shops, and staying overnight in hotels, motels, and other accommodations. These local communities, also known as gateway communities, are made up of businesses that rely on tourism as a source of income and employment for residents and local governments. Economies of many of these small communities are based on tourism and may be affected by any visitation changes resulting from changes to local overflight activity. Gateway communities to the national park include

- **City of Williams** Known as the Gateway to the Grand Canyon (Arizona Department of Commerce 2007b), Williams is located south of Grand Canyon on Highway 64, which leads to park's South Rim entrance. Williams is west of Flagstaff on Highway 40. The Grand Canyon Railway operates scenic train rides between Williams and Grand Canyon
- **City of Flagstaff** Located on Interstate 40, Flagstaff is centrally located between Grand Canyon and other tourist attractions. Highway 64, the major road leading to South Rim is west of Flagstaff. Flagstaff offers many tourist amenities to visitors including hotels, restaurants and shopping
- **Tusayan** A small town located on Highway 64 a few miles south of the park's South Rim entrance, Tusayan comprises hotels, restaurants, and other tourist amenities. Grand Canyon National Park Airport is located south of Tusayan. Many of the commercial air-tour flights depart from this airport
- **Grand Canyon Village** Although not technically a gateway community since it is located in the park, Grand Canyon Village is home to many accommodations and food service establishments. The Village also provides housing for NPS and concessionaire employees and their families (FAA 2000b)
- **City of Page** Originally a temporary camp for construction workers building Glen Canyon Dam, Page now offers a resort area located on GCNP's northeast end, on U.S. Highway 89 (Arizona Department of Commerce 2007a). Page offers amenities to tourists visiting Grand Canyon, Lake Powell, and other nearby attractions
- **Town of Fredonia** Located along the Arizona Strip, north of the Colorado River and south of the Arizona-Utah border, Fredonia is often referred to as the gateway to Grand Canyon's North Rim. Due to its location, Fredonia is a "warehousing point for expedition outfitters and guides," mainly related to river trips (Arizona Department of Commerce 2007c)

All gateway communities described above are in Coconino County and are shown on Map 1.1.

In addition to Grand Canyon, Coconino County is home to many other scenic and tourist attractions, including Oak Creek Canyon, and Sunset Crater, Wupatki, and Navajo National Monuments. Coconino County offers many visitor amenities, and a large portion of its economy is based on tourism. The county also includes several reservations including the Hualapai, Havasupai, and Navajo, discussed separately.

#### *Demographic and Economic Characteristics of Gateway Communities*

**Gateway Communities Population** Population of gateway communities and Coconino County are presented in Table 3.30 with growth rates since 1990. Data for the state of Arizona are provided for comparison.

Gateway communities have grown less than the state in terms of annual growth since 1990. This slower growth may be because the tourism base of these communities is largely stable but not expanding. Tusayan is surrounded by Federal land and has limited private land for expansion. Additionally, Page and Fredonia are more remotely located to the north. Flagstaff has grown more than any of the gateway communities, likely due to a more diversified economic base.

All gateway communities experienced slower growth 1990 to 2000. During recent years, growth rate increased for all gateway communities except Grand Canyon Village and Fredonia, which lost population 2000 to 2005.

**TABLE 3.30 POPULATION OF GATEWAY COMMUNITIES, COCONINO COUNTY, AND ARIZONA 1990–2005**

Year	Williams	Flagstaff	Tusayan	GCV <sup>a</sup>	Page	Fredonia	Coconino County	Arizona
1990	2,532	45,857	555	1,499	6,598	1,207	96,591	3,665,228
2000	2,842	52,894	562	1,460	6,809	1,036	116,320	5,130,632
2001	2,885	57,700	n.a.	n.a.	6,970	1,070	122,770	5,295,929
2002	2,910	59,160	n.a.	n.a.	7,050	1,090	125,455	5,438,159
2003	2,895	60,750	n.a.	n.a.	7,100	1,095	128,275	5,577,784
2004	2,950	61,505	n.a.	n.a.	7,095	1,110	130,070	5,739,879
2005	3,145	61,185	620	1,610	7,110	1,110	130,530	5,939,292
<b>1990-2000</b>								
Total Growth	12.2%	15.3%	1.3%	-2.6%	3.2%	-14.2%	20.4%	40.0%
Avg. Annual Growth	1.2%	1.4%	0.1%	-0.3%	0.3%	-1.5%	1.9%	3.4%
<b>2000-2005</b>								
Total Growth	10.7%	15.7%	10.3%	10.3%	4.4%	7.1%	12.2%	15.8%
Avg. Annual Growth	2.0%	3.0%	2.0%	2.0%	0.9%	1.4%	2.3%	3.0%

Source: U.S. Census Bureau, American Factfinder, Census 2000, [www.census.gov](http://www.census.gov) and Arizona Department of Economic Security, Population Statistics Unit, [www.workforce.az.gov](http://www.workforce.az.gov). 1990 Tusayan population comes from Special Flight Rules in the Vicinity of Grand Canyon National Park Final Supplemental EA Feb 2000

<sup>a</sup>Grand Canyon Village

**Gateway Communities Households and Home Value** Number of households in gateway communities and Coconino County are presented in Table 3.31. Also shown are median homes values in these areas. Information for the state of Arizona is provided for comparison.

Number of households in all gateway communities grew slower than the rest of Coconino County and statewide. As with the slower population growth, the slower growth in households is likely due to the tourism-based economy and remoteness of many communities. After accounting for inflation, gateway community housing values have exhibited substantial increases.

**Gateway Communities Household and Per Capita Income** Median household income and per capita income in gateway communities and Coconino County are presented in Table 3.32. Income growth 1990 to 2000 is shown. Information for the state of Arizona is provided for comparison.

After adjustment for inflation, statewide median household income increased by about 9% 1990 to 2000. Median household income in Williams increased by a smaller percentage, and in Grand Canyon Village median household income increased by about 22%. After adjustment for inflation, per capita income for all gateway communities except Grand Canyon Village increased by a larger percentage than the state of Arizona.

**TABLE 3.31 NUMBER OF HOUSEHOLDS AND MEDIAN HOME VALUE FOR GATEWAY COMMUNITIES, COCONINO COUNTY, AND ARIZONA 1990 AND 2000**

	Williams	Flagstaff	Tusayan	GCV <sup>a</sup>	Page	Fredonia	Coconino County	Arizona
1990	946	14,417	NA	527	2,041	375	29,918	1,368,843
2000	1,057	19,306	222	651	2,342	359	40,448	1,901,327
Total Growth	11.7%	33.9%	NA	23.5%	14.7%	-4.3%	35.2%	38.9%
Average Annual Growth	1.1%	3.0%	NA	2.1%	1.4%	-0.4%	3.1%	3.3%
1990 Median Value	\$98,935	\$137,867	NA	NA	\$140,005	\$82,904	\$126,111	\$121,684
2000 Median Value	\$116,247	\$186,598	NA	NA	\$160,637	\$90,286	\$165,157	\$140,586
Growth	17.5%	35.3%	NA	NA	14.7%	8.9%	31.0%	15.5%

Source: U.S. Census Bureau, American Factfinder, Census 1990, Tables P003 and HO61A, Census 2000, Tables P15 and H76, [www.census.gov](http://www.census.gov); Harvey Economics 2007. 1990 Tusayan population from Special Flight Rules in the Vicinity of Grand Canyon National Park Final Supplemental EA, Feb 2000. Median home values adjusted for inflation and expressed in 2006 constant dollars

<sup>a</sup>Grand Canyon Village

**TABLE 3.32 MEDIAN HOUSEHOLD INCOME AND PER CAPITA INCOME FOR GATEWAY COMMUNITIES, COCONINO COUNTY, AND ARIZONA, 1990 AND 2000**

Year	Williams	Flagstaff	Tusayan	GCV <sup>a</sup>	Page	Fredonia	Coconino County	Arizona
1990 Median HH Income	\$37,606	\$45,822	NA	\$41,090	\$65,201	\$40,805	\$42,158	\$44,463
2000 Median HH Income	\$38,750	\$44,351	\$41,690	\$50,246	\$56,039	\$36,163	\$45,676	\$48,425
Change	3.0%	-3.2%	NA	22.3%	-14.1%	-11.4%	8.3%	8.9%
1990 Per Capita Income	\$16,340	\$18,594	NA	\$21,859	\$19,942	\$13,215	\$17,081	\$21,733
2000 Per Capita Income	\$19,370	\$22,252	\$19,864	\$23,787	\$22,316	\$15,890	\$20,463	\$24,208
Growth	18.5%	19.7%	NA	8.8%	11.9%	20.2%	19.8%	11.4%

Source: U.S. Census Bureau, American Factfinder, Census 1990, Tables P080A and P114A, Census 2000, Tables 53 and 82, [www.census.gov](http://www.census.gov); HE, 2007

Median household income and per capita income values adjusted for inflation and expressed in 2006 constant dollars

<sup>a</sup>Grand Canyon Village

**Gateway Communities Employment** Average 2006 employment and unemployment information for gateway communities, Coconino County, and Arizona is presented in Table 3.33. These average data account for the seasonal nature of employment in many of these communities.

**TABLE 3.33 EMPLOYMENT FOR GATEWAY COMMUNITIES, COCONINO COUNTY, AND ARIZONA, 2006**

	Williams	Flagstaff	Tusayan	GCV <sup>a</sup>	Page	Fredonia	Coconino County	Arizona
Labor Force	1,700	34,869	447	1,274	4,337	522	69,054	2,948,618
Employed	1,624	33,716	439	1,257	4,150	488	65,747	2,823,795
Unemployed	76	1,153	8	17	187	34	3,307	124,823
Unemployment Rate	4.5%	3.3%	1.8%	1.3%	4.3%	6.5%	4.8%	4.2%

Source: Arizona Department of Economic Security, Special Unemployment Report, 2006, [www.workforce.az.gov](http://www.workforce.az.gov)

<sup>a</sup>Grand Canyon Village

Unemployment rates for gateway communities range 1.3% to 6.5%. Low unemployment in Tusayan and Grand Canyon Village may be the result of seasonal residents not part of the year-round labor force or are not looking for jobs in the off-season. The lower unemployment rate in Flagstaff is likely the result of employment opportunities other than those related to tourism. Fredonia had a relatively high unemployment rate, which might be due to its remoteness.

The Coconino County unemployment rate in Table 3.33 includes reservations. Excluding reservations, average 2006 unemployment rate for Coconino County was 3.3% (Arizona Department of Economic Security).

Table 3.34 shows employment by industry for gateway communities, Coconino County, and Arizona for 2000. A large percent of regional residents are employed in tourism-related industries. About 69% of Tusayan residents and 60% of Grand Canyon Village residents are employed in the arts, entertainment, recreation, accommodation, and food service industries. In Williams, about 30% of residents are employed in those industries. Comparatively, only about 10% of Arizona residents are employed in entertainment, recreation, accommodation, and related industries. Retail trade accounts for another large portion of regional employment.

Table 3.35 shows establishments and total sales for industries in several gateway communities and Coconino County. Limited data was available for Tusayan, Grand Canyon Village, and Fredonia at the zip-code level.

Many establishments in these gateway communities are related to travel and tourism, including retail trade; arts, entertainment, and recreation; and accommodation and food service. A large amount of sales in these places can also be attributed to tourism-related industries.

### ***Role of Tourism in the Regional Economy***

Tourism plays a major role in the regional economy. The Grand Canyon and the many other northern Arizona tourist attractions attract millions of visitors each year. These visitors often spend several days or more in the area, injecting money into local economies. Visitor spending from park visitors and visitors to other attractions in the area have a noticeable impact on the regional economy.

**Grand Canyon National Park Visitor Spending** In 2005, ground-based visitors who entered GCNP spent a total \$359 million in Coconino County<sup>32</sup> (spending for river running, overflights and other special uses were not fully covered in visitor survey spending reports. Air-tour visitors who did not enter the park as ground-based visitors were not included in total park visitation.) About \$146 million was spent inside the park and \$213 million in gateway and other county communities. About \$101 million was spent by park visitors on lodging including hotels and camping, and about \$67 million was spent on food services including restaurants and bars. Another \$70 million was spent by visitors on admissions and recreational activities. In addition to lodging, restaurants, admissions, and recreational activity, \$121 million was spent by park visitors on a variety of other items, including gas/oil, other transportation expenses, groceries, souvenirs or other trip-related expenses. Eighty-four percent of total spending by park visitors was done on South Rim.

The average amount of money spent per party varied by type of visitor, ranging from \$43 per party per night for backcountry campers to \$412 per party per night for river runners. Table 3.36 shows average per party per night spending for seven different types of visitors as well as total spending for all visitors.

Although river runners spent the most money per night, visitors staying overnight in accommodations outside the park accounted for the largest portion of total visitor spending. Table 3.36 also shows visitors staying outside the park in hotels spent the most party-nights in the area.

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<sup>32</sup> Harvey Economics applied methodologies and information in Economic Impacts of Grand Canyon National Park Visitor Spending on the Local Economy 2003 to 2005 visitor data to calculate 2005 impacts of visitor spending. The original research was conducted by Daniel Stynes and Ya-Yen Sun of Michigan State University as part of the National Park Service Social Science Program

**TABLE 3.34 EMPLOYMENT BY INDUSTRY FOR GATEWAY COMMUNITIES AND COCONINO COUNTY 2000**

	Williams		Flagstaff		Tusayan		GCV <sup>a</sup>		Page		Fredonia		Coconino County	
Industry	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%	Emp.	%
Agriculture, forestry, fishing, hunting	51	3.8%	276	0.9%	15	4.1%	7	0.7%	0	0.0%	15	3.8%	739	1.3%
Mining	4	0.3%	50	0.2%	0	0.0%	0	0.0%	29	0.9%	0	0.0%	218	0.4%
Construction	96	7.2%	1,574	5.4%	0	0.0%	44	4.1%	187	5.5%	57	14.4%	4,265	7.7%
Manufacturing	75	5.6%	1,567	5.4%	0	0.0%	7	0.7%	83	2.4%	34	8.6%	2,881	5.2%
Wholesale trade	28	2.1%	448	1.5%	0	0.0%	2	0.2%	43	1.3%	2	0.5%	910	1.6%
Retail trade	117	8.8%	4,219	14.4%	13	3.6%	97	9.0%	470	13.8%	64	16.2%	7,308	13.2%
Transportation, warehousing, utilities	113	8.5%	952	3.3%	37	10.2%	43	4.0%	601	17.7%	20	5.1%	2,991	5.4%
Information	35	2.6%	441	1.5%	4	1.1%	4	0.4%	41	1.2%	0	0.0%	851	1.5%
Finance and insurance	21	1.6%	590	2.0%	0	0.0%	4	0.4%	74	2.2%	0	0.0%	1,056	1.9%
Real estate, rental, and leasing	19	1.4%	620	2.1%	8	2.2%	1	0.1%	107	3.2%	0	0.0%	1,111	2.0%
Professional, scientific, and related services	66	5.0%	2,000	6.8%	5	1.4%	30	2.8%	104	3.1%	15	3.8%	3,290	5.9%
Education, health, and social services	157	11.8%	9,136	31.3%	15	4.1%	92	8.6%	713	21.0%	70	17.7%	14,918	26.9%
Arts, entertainment, and recreation	18	1.4%	751	2.6%	12	3.3%	188	17.5%	192	5.7%	7	1.8%	1,757	3.2%
Accommodation and food services	383	28.8%	3,753	12.8%	238	65.7%	454	42.2%	490	14.4%	46	11.6%	7,278	13.1%
Other services	49	3.7%	1,053	3.6%	0	0.0%	26	2.4%	115	3.4%	40	10.1%	2,183	3.9%
Public administration	<u>96</u>	<u>7.2%</u>	<u>1,793</u>	<u>6.1%</u>	<u>15</u>	<u>4.1%</u>	<u>77</u>	<u>7.2%</u>	147	4.3%	26	6.6%	3,754	6.8%
<b>Total</b>	1,328	100%	29,223	100%	362	100%	1,076	100%	3,396	100%	396	100%	55,510	100%

Source: U.S. Census Bureau, American Factfinder, Census 2000, Table P49, www.census.gov

<sup>a</sup>Grand Canyon Village



1 **TABLE 3.35 NUMBERS OF ESTABLISHMENTS AND SALES FOR GATEWAY COMMUNITIES AND COCONINO COUNTY 2002**

Description of Industry/Sector <sup>b</sup>	Williams		Flagstaff		GCV <sup>a</sup> /Tusayan	Page		Fredonia	Coconino County	
	Number	Sales	Number	Sales	Number	Number	Sales	Number	Number	Sales
		(1,000's)		(1,000's)			(1,000's)			(1,000's)
Manufacturing	z	z	68	\$623,237	NA	z	z	3	100	\$820,219
Wholesale trade	3	D	80	\$673,716	3	13	D	1	118	\$739,367
Retail trade	27	\$36,112	367	\$1,025,847	16	48	\$132,200	7	671	\$1,503,194
Information	2	NA	34	NA	4	9	NA	NA	63	NA
Real estate, rental, leasing	4	\$1,605	117	\$80,493	1	16	\$4,830	NA	181	\$105,027
Professional, scientific, technical	1	D	217	\$86,070	NA	12	D	1	284	\$103,771
Administration and related services	1	D	88	\$47,660	5	18	\$4,817	1	153	\$70,457
Educational services	z	z	16	\$1,820	1	2	D	NA	25	\$3,682
Health care and social assistance	6	D	282	\$429,249	3	15	\$26,838	3	339	\$534,082
Arts, entertainment, recreation	4	D	37	\$22,849	2	27	D	1	97	\$118,277
Accommodation and food service	38	\$23,164	256	\$232,884	13	50	\$55,078	5	455	\$475,917
Other services	7	\$856	149	\$75,777	NA	28	\$10,889	1	220	\$97,283

2 Source: U.S. Census Bureau, 2002 Economic Census, www.census.gov and U.S. Census Bureau, Zip Code Business Patterns, 2002

3 Abbreviations: z= too small for publication, D=withheld to avoid disclosure, NA= not applicable

4 <sup>a</sup>GCV is Grand Canyon Village5 <sup>b</sup>Information for several sectors is not published for all locations. Sales, receipts, or shipments data have been adjusted for inflation and are reported in constant 2006 dollars

**TABLE 3.36 AVERAGE SPENDING FOR GCNP VISITORS BY TYPE 2005**

Type of Visitor	Number of Party Days/ Nights (thousands)	Average Spending per Party Day/Night	Total Spending (millions)
Day Trip	380.9	\$114	\$43.4
In-Park Hotel	203.4	\$338	\$68.8
In-Park Camp	127.8	\$98	\$12.5
Backcountry Camper	92.8	\$43	\$4.0
Outside Park Hotel	683.2	\$272	\$185.8
Outside Park Camp	147.6	\$97	\$14.3
River Runners	72.4	\$412	\$29.8
<b>Total</b>	<b>1,708.2</b>	<b>\$201</b>	<b>\$358.7</b>

Source: Harvey Economics calculated party days/nights and total spending in 2005 based on information and methodologies included in Economic Impacts of GCNP Visitor Spending on the Local Economy, 2003 by Daniel Stynes and Ya-Yen Sun, Michigan State University 2005, and 2005 visitation data from the NPS Public Use Statistics Office, <http://www2.nature.nps.gov/stats/>

Air-tour visitors are excluded if they did not also enter the park in another way

Table 3.37 shows total economic impact of park visitors to the local region in 2005. Direct economic effects of visitor spending accrue to tourism-related businesses that sell directly to park visitors. Secondary effects relate to businesses that provide goods and services to directly impacted businesses and also include spending by households that earn income (directly or indirectly) from visitor spending. Therefore, the total economic impact of visitor spending is greater than just visitor spending itself.

**TABLE 3.37 TOTAL ECONOMIC IMPACT OF GCNP VISITORS ON COCONINO COUNTY 2005**

	Sales (millions)	Personal Income (millions)	Employment
Direct Effects	\$317	\$119	6,006
Secondary Effects	\$139	\$48	1,922
Total Impact	\$456	\$167	7,928

Source: Harvey Economics calculated direct and secondary effects of visitor spending in 2005 based on information and methodologies included in Economic Impacts of GCNP Visitor Spending on the Local Economy 2003 by Daniel Stynes and Ya-Yen Sun, Michigan State University 2005

Total impacts include direct effects and secondary effects

Direct effects are less than total visitor spending since only the retail and wholesale margins on visitor purchase accrue to the local economy

**Travel Impacts on Coconino County** In 2006, Coconino County taxable sales for several tourism-related sectors totaled over \$1.5 billion. However, not all sales from these sectors are directly related to tourist visitation; local residents and businesses also spend money on goods and services in the county, especially in the retail sector. The majority of taxable sales for lodging are due to visitors. Table 3.38 shows taxable sales in Coconino County for the following sectors: food services, amusement, retail, and accommodations.

After adjustment for inflation, taxable sales decreased for the restaurant/bar, amusement, and lodging sectors Fiscal Year (FY) 2001 to FY2003. The decrease in sales in tourism-related industries is likely due to impacts on travel related to the September 11, 2001 attacks. These industries saw sales increases by FY04. Retail sales, which include purchases made by residents and businesses as well as tourists, were probably less affected by September 11<sup>th</sup> events.

**TABLE 3.38 TAXABLE SALES TOURISM-RELATED SECTORS IN COCONINO COUNTY 2000-2006 IN MILLIONS**

Year	Restaurant/Bar	Amusement	Retail	Hotel/Motel	Total	Annual Growth
FY <sup>a</sup> 2000	\$274	\$34	\$924	\$210	\$1,441	NA
FY 2001	\$276	\$34	\$939	\$200	\$1,448	0.5%
FY 2002	\$271	NA	\$957	\$184	NA	NA
FY 2003	\$268	\$31	\$975	\$178	\$1,452	NA
FY 2004	\$278	\$36	\$972	\$191	\$1,478	1.8%
FY 2005	\$288	\$42	\$973	\$192	\$1,496	1.2%
FY 2006	\$314	\$42	\$1,027	\$204	\$1,587	6.1%

Source: Arizona Department of Revenue, Annual Reports, 2000 through 2006, Table 11

<sup>a</sup>FY indicates Fiscal Year; for example, the FY05 represents July 1, 2004 to June 30, 2005

Taxable sales have been adjusted for inflation and reported in constant 2006 dollars

Travel-related spending in Coconino County by visitors totaled \$865 million in 2005 (Arizona Office of Tourism 2006). An addition \$2.5 million travel spending was due to resident air travel and travel arrangements.

Table 3.39 shows direct travel spending, broken down by segment, by visitors in Coconino County 2000 through 2005.

**TABLE 3.39 TOTAL DIRECT TRAVEL SPENDING IN COCONINO COUNTY 2000 TO 2005 IN MILLIONS**

	2000	2001	2002	2003	2004	2005
Lodging	\$230.2	\$207.8	\$202.9	\$207.3	\$217.8	\$228.0
Food and Beverage	\$216.5	\$202.6	\$206.7	\$214.0	\$220.7	\$227.6
Food Stores	\$46.2	\$44.8	\$45.0	\$45.3	\$45.4	\$44.7
Ground Trans. and Gas	\$54.8	\$51.7	\$48.7	\$57.4	\$66.0	\$77.8
Arts, Entertainment and Recreation	\$129.1	\$123.5	\$124.5	\$129.3	\$133.9	\$133.1
Retail Sales	\$169.3	\$156.5	\$152.6	\$151.1	\$148.9	\$148.1
Air Transportation	<u>\$0.0</u>	<u>\$0.0</u>	<u>\$2.0</u>	<u>\$3.2</u>	<u>\$2.5</u>	<u>\$2.6</u>
Total Visitor Spending	\$846.3	\$786.9	\$782.4	\$807.7	\$835.3	\$862.1
Other Travel <sup>a</sup>	\$4.3	\$4.0	\$2.1	\$1.2	\$2.4	\$2.5
Total Direct Travel Spending	\$850.6	\$790.9	\$784.6	\$808.9	\$837.5	\$864.6

Source: Arizona Office of Tourism, Arizona Travel Impacts, 1998-2005, prepared by Dean Runyan Associates, April 2006

<sup>a</sup>Includes resident air travel and travel arrangement

At the time of study completion, 2005 data was preliminary

All data have been adjusted for inflation and reported in constant 2006 dollars

Visitors spent the most money on lodging and food services. Spending on ground transportation and gas was a small part of overall visitor spending, but increased as a percentage of total visitor spending in 2004 and 2005.

Visitors staying overnight in hotels or motels accounted for almost 70% of all visitor spending in Coconino County. Day travelers accounted for another 12%. Travelers staying in private homes (visiting county residents), campgrounds, or vacation homes accounted for smaller portions of overall visitor spending.

In 2005, travel spending in Coconino County generated over \$222 million in total direct industry earnings, over half of which was in the accommodation and food services industries. Coconino County travel spending generated about 10,700 jobs, most in the accommodation and food services industries and the arts, entertainment, and recreation industries.

In addition to providing revenue to local businesses and income to employees, travel spending also provides revenue to local governments through a variety of tax sources including sales taxes, lodging taxes, and other tourism-related

taxes. In 2005, travel spending in Coconino County resulted in generation of about \$24 million local taxes, and \$31 million dollars in state taxes (Arizona Office of Tourism 2006). The state imposes a 5.6% sales tax on most business activities, and Coconino County has a 0.925% general sales tax. Incorporated cities in the county impose additional sales taxes and many also have lodging taxes of 2.0 to 4.5% (Arizona Department of Commerce 2007d).

### **Grand Canyon Air-tour Industry Impacts on the Regional Economy and Las Vegas**

An FAA report includes an estimate of the larger impact of air tours (FAA 2000c). In that report, the U.S. Air Tour Association estimates that “for each dollar spent on an air tour of the Grand Canyon, an additional \$1.50 in air-tour-related revenue is generated, suggesting a Grand Canyon National Park air tour multiplier of 2.5.” As indicated in the FAA report, the estimated \$100 million revenues generated May 1997 to April 1998 would have resulted in an additional \$150 million revenue generated in other air-tour-related businesses. Applied to the \$192.6 million of revenues for 2006, that multiplier indicates an additional \$289 million in revenue generated by other air-tour-related businesses.

### **Las Vegas Demographic and Economic Conditions and the Role of Grand Canyon Air Tours**

#### **Las Vegas Population and Households**

Between 1990 and 2005, Las Vegas experienced rapid growth. During this time, city population more than doubled, growing at an average annual rate of 5.1%. The number of Las Vegas households grew at a similar rate 1990 to 2005. Table 3.40 shows the population and number of households in Las Vegas in 1990, 2000, and 2005.

**TABLE 3.40 POPULATION AND HOUSEHOLDS IN LAS VEGAS 1990, 2000, AND 2005**

Year	Population	Annual Growth	Households	Annual Growth
1990	258,295	NA	99,735	NA
2000	478,434	6.4%	176,750	5.9%
2005	545,147	2.6%	204,688	3.0%
<b>Total Growth</b>		111.1%		105.2%

Source: US Census Bureau, American Factfinder, 1990 Census, 2000 Census, and 2005 American Community Survey, [www.census.gov](http://www.census.gov)

Las Vegas experienced faster annual growth 1990 to 2000 and slower growth 2000 to 2005. In 2005, median Las Vegas home value was \$285,200, more than double the 1990 median home value, after adjustment for inflation.

#### **Las Vegas Income**

In 2005, the median household income for Las Vegas residents was \$47,900, and per capita income was \$24,900 (U.S. Census Bureau 2005). Household and per capita incomes for Las Vegas residents are similar to statewide income levels.

#### **Las Vegas Employment**

January to November 2006, the Las Vegas unemployment rate ranged 3.7% to 4.7%, similar to statewide levels. In November 2006, 296,344 Las Vegas residents were a part of the labor force, and 284,023 people were employed. The unemployment rate was 4.2% (U.S. Department of Labor 2007). Table 3.41 shows employment of Las Vegas residents by industry.

Over a quarter of employed residents worked in the arts, recreation, accommodation, and food service industries. Las Vegas is a well-known tourist destination; therefore, a large portion of the activity in these industries is likely tourist-related visitation to the city and surrounding area.

**TABLE 3.41 EMPLOYMENT BY INDUSTRY FOR LAS VEGAS RESIDENTS 2005**

Industry	Number Employed	Percent
Agriculture, forestry, fishing and hunting, and mining	344	0.1%
Construction	34,773	13.5%
Manufacturing	6,589	2.6%
Wholesale trade	7,741	3.0%
Retail trade	28,371	11.1%
Transportation and warehousing, and utilities	8,998	3.5%
Information	5,436	2.1%
Finance and insurance, and real estate and rental and leasing	20,167	7.9%
Professional, scientific, management, and administrative services	26,210	10.2%
Educational services, health care, and social assistance	31,502	12.3%
Arts, entertainment, recreation, accommodation, and food services	67,181	26.2%
Other services, except public administration	12,157	4.7%
Public administration	7,237	2.8%
<b>Total</b>	<b>256,706</b>	<b>100%</b>

Source: U.S. Census Bureau, 2005 American Community Survey, [www.census.gov](http://www.census.gov)

**Role of Tourism to the Las Vegas Economy** A large part of the Las Vegas economy is based on tourism (University of Nevada Las Vegas 2010)

- Over 38 million people visited Las Vegas in 2005, spending over \$36 billion. In 2006, visitation increased to almost 39 million people
- Occupancy rate of hotel rooms in Las Vegas was about 90% in 2006, and the city had over 43 million occupied room nights
- Las Vegas gross gaming revenue exceeded \$10.6 billion in 2006

Over 60% of visitors reported going to Las Vegas for vacation or pleasure, and about 17% for conventions, corporate meetings, or other business events. Other reasons for visiting Las Vegas included friends/relatives, gambling, special events, or other (Las Vegas Convention and Visitors Authority 2005).

Las Vegas is located in Clark County, which collects a 7.75% sales and use tax. As of November 2006, 2006 year-to-date taxable sales in Clark County amounted to \$14.7 billion (Nevada Department of Taxation 2006). Several Las Vegas revenue sources, such as room taxes and gaming taxes, are dependent on visitors. Las Vegas collected about \$4.1 million in room taxes in 2006, out of almost \$402 million of total taxes collected (City of Las Vegas 2006).

**Las Vegas Air-tour Operations** Seven of the 14 air-tour operators that offer air tours over Grand Canyon base in Las Vegas. Operations of these businesses (flights offered, employment opportunities, financial conditions) have been discussed as part of the profile of the air-tour industry. Operators based in Las Vegas rely on tourists visiting Las Vegas for a large portion of their business.

Grand Canyon is one attraction that lures visitors to the Las Vegas area; however, air tours over Grand Canyon are only a small part of the overall Las Vegas tourist draw and are a small portion of the overall tourist economy.

## **PARK VALUES**

As a unique feature, Grand Canyon has both non-monetary and monetary values to people who visit and to those who appreciate its existence, but may never see it in person. Grand Canyon's intrinsic and existence (non-use) values are discussed below. Intrinsic value includes values park visitors ascribe to their park visit beyond actual expenditures. This is also referred to as consumer surplus, use benefits, or visitor day values. In general, intrinsic values are easier to estimate as they are at least partially based on existing visitor data and survey information collected as part of various studies. Non-use values are more difficult to estimate, although certain survey techniques have been applied in other locations.

## Intrinsic Value of Grand Canyon National Park

GCNP visitors place a value on the park based on direct use of its resources. Park use may include viewing from overlooks, hiking on trails, camping, or participating in a river trip. No studies have been done specifically on Grand Canyon use value; however, an FAA report related to commercial air-tour limitations provides some Grand Canyon use estimates based on studies done in other locations (FAA 2000c).

FAA used the benefit transfer method to create these estimates. FAA took existing economic studies with detailed site-specific information that identified use values for visitors to other places and applied those data to Grand Canyon visitors. Table 3.42 shows the 1998 visitation data and intrinsic use values used by FAA to derive an estimated intrinsic value for the park to visitors in 1998.

**TABLE 3.42 ESTIMATED INTRINSIC USE VALUE OF GRAND CANYON NATIONAL PARK 1998**

Visitor Type	Total Visitor Days	Use Value per Visitor Day	Total Use Value
Backcountry	92,097	\$37.13	\$3,419,562
River	66,938	\$92.44	\$6,187,749
Other	5,314,491	\$48.72	\$258,922,002
<b>Total</b>	5,473,526		\$268,529,312

Source: Federal Aviation Administration, Docket No. FAA-1999-5927-280

Intrinsic use value for backcountry visitors was taken from a national study of outdoor recreation; intrinsic use value for river runners from the Final EIS for Glen Canyon Dam Operations; and use value for other visitors was obtained from an analysis of recreation at Bryce Canyon National Park. As a weighted average, data suggest an intrinsic value of about \$49 per day above and beyond actual expenditures per day, previously estimated to be \$80 to \$90 per day.

Although the FAA report provides some estimate of GCNP's use value, the benefit transfer method, as applied, has certain shortcomings. Estimates provided in Table 3.42 likely do not fully reflect Grand Canyon's actual intrinsic use value mainly because values visitors place on visiting and recreating in other places will not be the same as the values visitors place on Grand Canyon. Economic values estimated for intrinsic use of other places cannot necessarily be transferred to Grand Canyon visitors, although there is some relevance since data used were derived from regional amenities with some similarity or other national park units.

Another factor affecting total estimation of intrinsic use value for GCNP includes the estimate of total visitor days. NPS park visitation reports in 1998 show a lower visitors number than used by FAA. Park visitation numbers, based on the most current information available at the time of analysis, were about 15% less than 1998 visitation figures. Using the smaller visitor number lowers total intrinsic use value. Conversely, any adjustments done to account for inflation would reflect higher use values than shown in Table 3.42.

## Non-use Values of Grand Canyon National Park

Estimation of non-use values rely mostly on the contingent valuation method, which asks survey respondents who are not visitors to a particular place to answer questions about the values they ascribe to that place. This method is relatively controversial due to the survey questions' hypothetical nature, and arguments have been made that values estimated from these surveys are inflated. Regardless, non-use values such as World Heritage designation and importance to native people, Americans, and global visitors clearly exist for Grand Canyon and are relevant in this EIS.

At least one non-use study relates to the Glen Canyon and Grand Canyon area. The survey's focus was the value respondents placed on improving environmental and cultural resources in this area. The sample group included people in the local area as well as a national sample group. Average non-use values for the Glen Canyon/Grand Canyon area were found to range about \$17 to \$26 per household and estimates of total non-use value of the area

1 were estimated in the range of about \$3 billion to \$4.3 billion when calculated at the national level (2004 dollars)  
2 (Welsh, et al. 1995).  
3

4 This information demonstrates there is a value the public ascribes to the presence or existence of Grand Canyon  
5 National Park in its current condition, regardless of whether they have visited or will ever visit the park. However,  
6 contingent valuation information applied in this instance presents several limitations when attempting to place a  
7 quantifiable dollar value on those perceptions. These figures are based on hypothetical questions of willingness to  
8 pay for an improvement to a resource that may have limited relevance to this particular case. Also, this particular  
9 study estimated the value of both Glen Canyon and Grand Canyon together and the estimated total non-use value  
10 may not reflect Grand Canyon by itself.  
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