

be infrequent, as visitation is not likely to increase greatly and as many roads and shorelines are not regularly visited.

The intensity of soundscape impacts is considered based on the decibel level of the sources involved. The sound level and thus the intensity of impact is greatest closest to the source (e.g., the OHV, street-legal ATV, or conventional motor vehicle) and decreases with increasing distance. Because of the low natural ambient level in much of Glen Canyon National Recreation Area, a pass-by of an OHV or street-legal ATV can be heard over long distances, reducing the listening area for humans and wildlife as explained in the methodology section. The intensity of soundscape impacts is also influenced by the operating characteristics of the vehicles—activities at higher speeds and with more frequent acceleration create a greater load on the vehicle engine and higher noise levels compared to cruise conditions. Thus, the most intense soundscape impacts at Glen Canyon are associated with the Lone Rock Beach Play Area. However, at the scale of the entire park and in consideration of the impacts in relation to the GMP management zones, the impacts are likely not significant.

## **VISITOR USE AND EXPERIENCE**

### **GUIDING REGULATIONS AND POLICIES**

Enjoyment of park resources and values by the people of the United States is fundamental to the purpose of all national parks. NPS is committed to providing appropriate, high-quality opportunities for the public to enjoy the parks. Because not all recreational activities are appropriate for each park, NPS will encourage activities that are appropriate to the purposes for which the park was established, are appropriate to the unique park environment, will promote enjoyment through direct association with park resources, and can be sustained without causing unacceptable impacts on park resources or values (NPS 2006a, Section 8.2).

The recreational use of motorized ORVs is subject to multiple regulations and policies. Most of these regulations are directed toward preventing impacts on park resources and values, as well as on visitor experience.

The Code of Federal Regulations (CFR) states that ORVs may be authorized for use only in national recreation areas, national seashores, national lakeshores, and national preserves (36 CFR 4.10). The majority of national park system units are off-limits to off-road use. For many park units, this prohibition extends to the use of ATVs and similar vehicles designed primarily for off-road driving, even when used on roads.

Overall, the management of visitor use and experience, like all management decisions affecting the resources of a national park, is subject to the Organic Act. It is this foundational law that requires NPS to “provide for the enjoyment” of the national parks while also leaving them “unimpaired for future generations.” Where there is conflict between the public enjoyment of a park area and the conservation of a park value or resource, then “conservation is to be predominant” (NPS 2006a, Section 1.4.3).

This same mandate is reflected in the Glen Canyon GMP (NPS 1979). Although the GMP identifies the primary objective for Glen Canyon as “to manage the recreation area so that it provides maximal recreational enjoyment to the American public and their guests,” the document similarly requires that Glen Canyon be managed “to preserve the scenic, scientific, and historic features contributing to the public enjoyment of the area.”

These purposes—one recreation and enjoyment, the other the preservation of resources and values—are reflected in the objectives of this plan/DEIS:

- Manage authorized vehicle uses to provide safe and healthful opportunities for visitor access and recreation.

- Manage authorized vehicle uses to protect the biological and physical environment, including natural processes and systems.
- Manage authorized vehicle uses to protect cultural resources.
- Establish clear policies to guide authorized vehicle uses.

The 1979 Glen Canyon GMP recognized motorized recreation as an acceptable activity in the Recreation and Resource Utilization Zone and the Development Zone (NPS 1979). The recreational description of these two zones includes scenic touring as an acceptable activity. The recreational use of motorized equipment is prohibited in the Natural Zone.

## **METHODOLOGY AND ASSUMPTIONS**

Quantitative information was used to assess the overall impact of ORV management on the supply of available recreation resources. This assessment considers the availability of ORV recreation opportunities, as well as the accessible areas, to assess the level of impacts for each action. The planning team incorporated the comments received during public scoping and the history of motor vehicle use, including off-road use, in Glen Canyon to help make a determination of the level of impact on visitor use and experience. Data used in this analysis, including visitor statistics, historic use patterns, visitor use observations obtained from NPS rangers, and data provided by other land management agencies, is presented in chapter 3. Acreages, miles, and percentages presented in the following analysis are estimates and are based on the best available GIS information the park has acquired to date. These numbers may change slightly as new GIS information becomes available allowing more refined analysis.

### **Context**

The geographic context for visitor use and experience considers both Glen Canyon and the larger Glen Canyon planning area, which extends to the surrounding BLM-administered lands. Incorporating the larger geographic planning area in this assessment provides for a more accurate description of the impacts within a larger landscape-planning context. The supply of ORV recreation opportunities is abundant on the federal holdings surrounding Glen Canyon.

## **ALTERNATIVE A: NO ACTION**

### **Lone Rock Beach**

In 2010, approximately 52,000 vehicles entered Lone Rock Beach and/or Lone Rock Beach Play Area, which represented almost 7% of all vehicle counts in Glen Canyon. Vehicle counts at Lone Rock have increased by a large amount in 2011, with a 35% increase to almost 77,000 vehicles (which does not include December counts), which represents 8% of 2011 vehicle counts (NPS 2012a). These vehicle counts also include those visitors accessing the Lone Rock Beach Play Area. Given that there would be no change in the existing management under alternative A, visitor use patterns would not be expected to change and approximately 250 acres would continue to be available for recreation at this location.

During public scoping, some commenters expressed that ORVs, including conventional motor vehicles, OHVs, and street-legal ATVs, produced too much noise and air emissions and that their visitor experience was negatively impacted by the presence of ORVs in Glen Canyon. For these visitors, the continuation of current management, especially at Lone Rock Beach where conventional motor vehicles, OHVs, and street-legal ATVs are allowed, would result in a continued adverse impact on their visitor experience.

## Lone Rock Beach Play Area

Lone Rock Beach Play Area is the only location in Glen Canyon where conventional motor vehicle, OHV, and street-legal ATV use is currently authorized and operation of motor vehicles in an unrestricted manner is permitted. The play area at Lone Rock Beach is a fence-enclosed, 180-acre area that is open to high-intensity motor vehicle use. Under alternative A, this unrestricted use would continue and visitor use would not be impacted. Visitors who expressed a diminished visitor experience from the noise and air emissions of these motor vehicles may continue to experience adverse impacts due to the proximity of the play area to Lone Rock Beach.

## Accessible Shorelines

The 13 existing accessible shoreline areas (approximately 5,900 acres) would continue to be authorized for use by conventional motor vehicles only based on the existing conditions and the water levels of Lake Powell. Accessible shorelines available for conventional motor vehicle use would continue to range from a backcountry, wilderness-like experience to more popular areas, such as Stanton Creek and Hite Boat Ramp. The Hite developed area, which includes the Hite Boat Ramp accessible shoreline, as well as primitive and recreational vehicle (RV) camping, a marina, and gas station, is also a popular area. Visitation to this entire developed area, not just the accessible shoreline, accounted for approximately 3% of total visitation to Glen Canyon in 2005 (NPS 2008e). In 2007, 3,953 vehicles were counted at Stanton Creek. Assuming 2.5 visitors per conventional motor vehicle, this equates to approximately 1% of total annual visitation to Glen Canyon. Given that Stanton Creek is one of the most popular accessible shoreline areas (while Bullfrog North and South, also very popular but have been closed in recent years due to low water levels), accessible shoreline use does not represent a major visitor attraction for Glen Canyon. Under the no-action alternative, all recreational opportunities, such as camping and fishing, would continue to occur at these locations with no measurable impact on visitor use numbers or patterns.

Paiute Farms and Nokai Canyon are currently being accessed by the public, primarily by residents of local communities, but are not officially open under the 1988 Accessible Shorelines EA/DCP or the 2006 DCP/EA. Both accessible shorelines have limited facilities and areas for camping. The no-action alternative would discontinue use of these two areas and management actions taken to prevent access. Eliminating all motor vehicle access to these two shoreline areas except by boat or walking would noticeably alter visitor use patterns of local residents that use these areas and their accessibility to the shorelines.

## Travel on GMP Roads in Glen Canyon

Under alternative A, conventional motor vehicles and street-legal ATVs would continue to be authorized to operate on all GMP roads in Glen Canyon, except only conventional motor vehicles would be allowed on GMP roads in the Orange Cliffs Unit. Approximately 75 miles of paved roads and 265 miles of unpaved GMP roads would be available to conventional vehicles and street-legal ATVs. An additional 100 miles of unpaved roads would be available to conventional vehicles in the Orange Cliffs Unit. All street-legal ATVs traveling on authorized GMP roads would be required to meet all state traffic and vehicle laws, including registration, titling, odometer statement, vehicle identification number, license plates, registration fees, and county motor vehicle emissions inspection and maintenance programs. Because there would be no change in use or accessibility, there would be no measurable impact on visitors using Glen Canyon roads. Visitors seeking a quiet, backcountry experience may be adversely impacted by the noise street-legal ATVs produce in the more remote areas of Glen Canyon.

## Ferry Swale

Ferry Swale is increasing in off-road use popularity, especially with residents from Page, Arizona, and allows direct access from Glen Canyon to BLM land to the west of Glen Canyon, providing a beneficial experience for local residents. According to a 2007 visitor use survey (University of Idaho 2008), Lees Ferry in Ferry Swale attracts approximately one-third of all Glen Canyon visitors. Lees Ferry provides day-hiking and camping opportunities in

addition to a boat launch. The hiking trails along the south end of Glen Canyon provide a quiet, backcountry experience for visitors; however, illegal off-road use is increasing in this area of Glen Canyon, intruding on the visual characteristics of the Ferry Swale area. Under alternative A, approximately 53 miles of ORV routes would be designated for use by conventional motor vehicles, OHVs, and street-legal ATVs, which would create an authorized off-road use from a previously illegal use. The continued presence of ORVs, along with the noise they produce, disrupts the backcountry experience by introducing the unnatural elements of engine noise and motorized vehicle into the otherwise scenic and natural landscape, adversely impacting the visitor experience. Under alternative A, visitors seeking a quiet, backcountry experience may continue to experience an adverse impact from the presence of ORVs in this location. OHVs and street-legal ATVs would be the main cause of this adverse impact, because the noise generated by OHVs and street-legal ATVs are generally louder and more disruptive than noise from conventional motor vehicles. With the introduction of designated ORV routes, however, visitors seeking a quiet, backcountry experience would be able to determine where authorized off-road use is located and avoid those locations to the extent possible, reducing the potential adverse impacts from noise.

### Cumulative Impacts

Other past, present, and planned future activities within Glen Canyon have the potential to affect visitors and the recreational opportunities. In recent years, the rising and falling water levels as a result of natural fluctuations and dam operations have exposed more or less of the accessible shoreline areas, impacting the areas available for recreation. Following these events, several popular accessible shoreline areas have been closed due to accessibility issues, resulting in an adverse impact on visitor use and experience.

Beneficial impacts on visitor experience have occurred, and would continue to occur into the future, from the implementation of the following plans or actions:

- 1979 Glen Canyon (GMP), which considers visitor needs in managing Glen Canyon resources.
- 1981 Lone Rock Beach EA/DCP, 1988 Accessible Shorelines EA/DCP, 1986 Paiute Farms/San Juan Marina DCP/EA, 2008 Uplake DCP/EA which provide guidance for development and use in various locations across Glen Canyon.
- Canyonlands National Park and Orange Cliffs Unit of Glen Canyon National Recreation Area Backcountry Management Plan which determines how the backcountry areas of Glen Canyon should be managed.
- Development of the Interim Management Plan for Lone Rock Beach Play Area, which determined the existing use of the play area by ORVs.
- Adverse impacts may also result from these management plans that restrict visitor use, including where OHVs and street-legal ATVs can be operated and which accessible shoreline areas are open to visitor use. For those visitors seeking a backcountry experience, when recreating in areas available to off-road use under these management plans, those visitors may experience adverse impacts from increased noise. In the interest of protecting resources, some of these management plans may restrict some visitor opportunities in certain locations, which may result in slight adverse impacts.

Additional actions include the development of BLM Arizona Strip Office Travel Management Plan and development and operation of the Amangiri Resort, which also results in beneficial impacts on visitor use and experience by providing an expanded choice of lodging locations in the vicinity of Glen Canyon. Unauthorized off-road use on adjacent BLM lands could continue, adversely impacting those visitors in Glen Canyon's adjacent backcountry locations due to the vehicle noise in a wilderness-like setting.

Current and future BLM projects include the update and implementation of resource management plans and travel management plans for the Monticello and Hanksville field offices, which provide beneficial impacts on visitors, similar to the existing management plans. Current and future projects within Glen Canyon include the development

and implementation of group use permits on Hole-in-the-Rock Road, which will provide beneficial impacts on visitor use at this location.

Actions, like the development and implementation of group use permits on Hole-in-the-Rock Road and Fee Station Improvements at Lone Rock Beach and improved interpretation along the Colorado River would likely provide long-term beneficial impacts on visitor use and experience because of the improved visitor amenities, programs, and use areas. The GMP and Experimental and Management Plan for Glen Canyon Dam (Bureau of Reclamation 2008) would most likely provide long-term beneficial impacts because these plans and activities would ensure that visitor opportunities continue within Glen Canyon.

The potentially adverse impacts from rising and falling water levels, in combination with the continuation of adverse impacts on those users disturbed by ORV activity under alternative A, would result in long-term adverse cumulative impacts on visitors in ORV areas of Glen Canyon. However, for ORV users, the beneficial impacts of Glen Canyon plans would continue to allow access throughout Glen Canyon and alternative A would not contribute adverse or beneficial impacts.

## **ALTERNATIVE B: NO OFF-ROAD USE**

### **Lone Rock Beach**

Under alternative B, Lone Rock Beach would be closed, and the area restored to natural conditions. Visitors would continue to be able to camp at Lone Rock Beach and would be able to park along Lone Rock Beach Road and walk to the shoreline, approximately 1/4 mile to 1 mile, depending on the lake elevation and desired location. Parking at this site is limited, however, and visitors would be expected to quickly fill the designated spaces. The restriction of off-road access to Lone Rock Beach would considerably alter use patterns and visitor accessibility to the shoreline. Those unable to walk the length of beach to the water would no longer be able to visit this location. Visitors seeking beach solitude, however, may experience beneficial impacts from the removal of off-road use at this location. Visitor use patterns at this location would be considerably altered, impacting all visitors that currently access this location. In 2010, approximately 6% of all visitors accessed the Lone Rock Beach area and these visitors would still be able to access the area without a boat, minimizing the potential impact on visitor use. Depending on parking availability, visitors would experience a moderate inconvenience of the beach being located farther from their vehicle and would have to carry all camping and fishing equipment to the beach from the parking area. This impact would be greater for elderly or disabled visitors, who may be unable to walk longer distances in the sand or carry all their equipment. The limited number of designated parking spaces may require some visitors to park along the road and walk a greater distance, and may create traffic congestion during the peak visitor season. Overall, there would be adverse impacts for visitors who cannot find parking, cannot walk longer distances, and those who cannot or do not wish to carry gear. The adverse impact would not be significant, however, because while visitors may be unable to continue their current use, they would still be able to access the site.

### **Lone Rock Beach Play Area**

Similar to Lone Rock Beach, under alternative B the Lone Rock Beach Play Area would be closed and the area restored to natural conditions. Users wishing to operate conventional motor vehicles, OHVs, or street-legal ATVs in an unrestricted manner would no longer be able to do so in Glen Canyon, resulting in a substantial change to visitor patterns and use for this location. With the closure of the play area, users would no longer be authorized to operate their motor vehicles in an unrestricted manner as the area is currently used in this unique way at Glen Canyon, resulting in a substantial adverse impact on those visitors seeking this type of experience in Glen Canyon. There are no other areas in the region of Glen Canyon, on adjacent BLM land or lands owned by other local, state, or federal agencies where this type of use could occur. Off-road use would continue to be allowed on neighboring BLM land. While full off-road use estimates are not available, there is 3,700 miles of designated ORV routes in the Richfield Office area (Wayne County) and 553 miles of designated routes that allow all ORV use at Grand Staircase

– Escalante National Monument (Downey 2012). There would be no easily accessible ORV area available in Page, Arizona, however, because all nearby off-road opportunities outside of Glen Canyon would be in Utah. Visitors at neighboring Lone Rock Beach, where off-road use would also be prohibited, may experience a beneficial impact on their visitor experience from the reduction in noise from ORVs at this location.

### **Accessible Shorelines**

Under alternative B, all motor vehicle use would be discontinued at 15 accessible shorelines—the 13 existing areas plus Paiute Farms and Nokai Canyon. Access to Lake Powell through off-road use would be restricted. All visitors seeking access to these 15 shoreline areas would need to use a boat or walk to reach them. Eliminating all access to these areas except by boat or walking would considerably alter visitor use patterns and accessibility to the shoreline. Camping would be permitted along any of the shorelines; however, the only access available would be by boat or walking. Hite Boat Ramp would be one of the only shoreline camping areas that could be accessed without walking a considerable distance. Visitors experiencing Glen Canyon by boat would not be adversely impacted.

Due to the remote nature of some of the accessible shoreline areas, it is unknown exactly how many visitors would be displaced under alternative B. Visitation at Stanton Creek, the most popular accessible shoreline, ranged from approximately 4,000 vehicles (2007) to 5,700 vehicles (2002), which may also be reflective of the changes in lake elevation. In 2002, nearly 10,000 vehicles were counted at Bullfrog North and South; however, the accessible shoreline has since been closed in recent years due to low water levels. At Hite developed area, visitors at the primitive and RV camping sites would continue to be able to access the Hite Boat Ramp accessible shoreline by walking. Approximately 59,000 visitors visited the entire Hite developed area in 2005, including the Hite Boat Ramp accessible shoreline (NPS 2008e). Visitors would continue to be able to launch boats at this location.

Overall, these visitation numbers indicate that between 2 and 4 % of all visitors to Glen Canyon would be impacted by the discontinuation of off-road use at the accessible shoreline areas and that these discontinuations would not noticeably impact the visitor use of the entire Glen Canyon. However, those without a boat who are seeking access to Lake Powell would be limited in their options. These visitors would only be able to see the lake from the marina areas, which can be crowded, or from the more remote Hite developed area. Because off-road access to the accessible shoreline areas would be discontinued, primitive camping opportunities at the managed shoreline areas would be eliminated for visitors without a boat outside of the Hite developed area.

Visitors seeking a remote, backcountry shoreline experience by vehicle would be unable to have that recreational opportunity at Glen Canyon and may therefore choose to no longer visit Glen Canyon; adverse impacts on visitor experience would be the greatest for this user group.

### **Travel on GMP Roads in Glen Canyon**

Impacts on visitor use and experience under alternative B would be the same as those described for alternative A, with no change to existing management and use. There would be no measurable change on visitors using conventional motor vehicles or street-legal ATVs on GMP roads. Visitors seeking a quiet, backcountry experience may be adversely impacted by the noise street-legal ATVs produce in the more remote areas of Glen Canyon.

### **Ferry Swale**

Off-road use would not be authorized in Ferry Swale, resulting in a reduction of historical connections to BLM lands and restricted off-road access between the two federally managed properties. Without off-road use, the hiking trails along the south end of Glen Canyon would provide a quiet, backcountry experience for visitors seeking such an experience.

## **Cumulative Impacts**

Under alternative B, the same past, present, and planned future activities within Glen Canyon that have the potential to affect visitor use and experience would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the noticeable adverse impacts on ORV users under alternative B, could likely result in noticeable long-term adverse cumulative impacts on ORV users because this use would no longer be available within Glen Canyon. However, the beneficial impacts of restricting off-road use, including closure of accessible shoreline areas, Lone Rock Beach, and Lone Rock Beach Play Area to off-road use under alternative B, would provide long-term cumulative benefits for visitors who desire an experience free of motorized vehicle presence, disturbance, lights, or noise.

## **ALTERNATIVE C: INCREASED MOTORIZED ACCESS**

### **Lone Rock Beach**

Impacts on visitor use and experience for ORV users at Lone Rock Beach would be the same as described for alternative A, with the additional requirement that all users obtain ORV permits. The permit requirement would not be expected to adversely impact visitor use at Lone Rock Beach, but may cause a small adverse impact on visitor experience due to the additional cost associated with visiting Glen Canyon and the time required to obtain the permit. Additionally, there would continue to be the potential for adverse impacts on visitor experience for some visitors disturbed by the noise of ORVs.

### **Lone Rock Beach Play Area**

Impacts on visitor use and experience for ORV users at Lone Rock Beach Play Area would be the same as described for alternative A. There would be no change to existing management, with the exception of the added ORV permit and safety requirement that all conventional motor vehicles, OHVs, and street-legal ATVs must attach a safety flag for increased visibility. This additional safety requirement would have a beneficial impact on the safety of all visitors in the play area due to the increased visibility and safety of all visitors.

### **Accessible Shorelines**

Impacts on visitor use and experience along accessible shorelines under alternative C would be similar to those described for alternative A, with the continuation of existing management of the 13 accessible shorelines, but two additional accessible shorelines would be authorized for off-road use. These two shorelines are currently accessed by visitors but are not managed under the 1988, 2006, or 2008 Uplake DCP/EAs. The addition of Paiute Farms and Nokai Canyon would increase the number of accessible shorelines to 15 (approximately 7,300 acres of accessible shoreline) for conventional motor vehicle use. The expansion of the number of accessible shoreline areas would benefit conventional motor vehicle users in Glen Canyon and would increase the area available for conventional motor vehicle users to drive directly to the shoreline. Under alternative C, OHVs and street-legal ATVs would also be authorized for use at the accessible shoreline area, which is currently restricted to these types of vehicles, increasing the area available for OHVs and street-legal ATV opportunities and providing a beneficial impact for these users.

With the expansion and authorization of OHV and street-legal ATV use at accessible shorelines, some visitors to Glen Canyon may perceive adverse impacts on their visitor experience due to the increase in noise and air emissions in new areas of Glen Canyon. Visitors seeking a quieter experience, especially along the less frequently used accessible shorelines, may experience negative impacts from increased OHV and street-legal ATV use in those locations. This impact would be more prominent in the less frequently used and more remote shoreline areas such as Red Canyon and Copper Canyon.

Under alternative C, permits would be required for all conventional motor vehicle, OHV, and street-legal ATV users to enter the accessible shoreline areas. Visitors would be able to obtain permits at designated issuing stations or by mail, and would need to pay a fee for each permit. The permit requirement could adversely impact conventional motor vehicle, OHV, and street-legal ATV operators, due to the additional cost associated with visiting Glen Canyon and the time required to obtain the permit.

### **Travel on GMP Roads in Glen Canyon**

Impacts on visitor use and experience on Glen Canyon roads under alternative C would be similar to those described for alternative A. Conventional motor vehicles would continue to be authorized to operate on all GMP roads. Unlike alternative A, OHVs and street-legal ATVs would also be authorized to operate on all GMP roads, including roads in the Orange Cliffs Unit. There would be a beneficial impact on visitors using OHVs and street-legal ATVs on GMP roads because the amount of roadways available for OHV and street-legal ATV use Glen Canyon-wide would increase by 100 miles to a total of 365 miles of unpaved road available. OHVs would also be authorized to use an additional 75 miles of paved GMP roads not currently authorized for use by these types of vehicles. Visitors seeking a quiet, backcountry experience may be adversely impacted by the noise OHVs and street-legal ATVs produce in the more remote areas of Glen Canyon. This adverse impact would be most noticeable in the Orange Cliffs Unit, where OHV and street-legal ATV use is currently restricted.

### **Ferry Swale**

Beneficial impacts on visitor use and experience for conventional motor vehicle, OHV, and street-legal ATV users within Ferry Swale under alternative C would increase. The designation of ORV routes within the Ferry Swale area would provide the beneficial impact of additional authorized ORV areas. Given that Ferry Swale is increasing in popularity for off-road use, especially for residents from Page, Arizona, the designated ORV routes would allow authorized direct access from Glen Canyon to BLM land to the west, providing a beneficial experience for local residents.

Currently, there is an estimated 70 miles of illegal user-created trails within the Ferry Swale management area. Under alternative C, NPS would formally designate 15 miles of these user-created trails into ORV routes. Although the miles of designated ORV routes is much less than the miles of user-created trails, the newly designated ORV routes would help meet the demands for off-road use in Ferry Swale. However, under alternative C, visitors seeking a backcountry experience and using the hiking trails along the south end of Glen Canyon near Lees Ferry would continue to experience an adverse impact from the presence of ORVs in this location.

### **Cumulative Impacts**

Under alternative C, the same past, present, and planned future activities within Glen Canyon that have the potential to affect visitor use and experience would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the localized, potentially noticeable adverse impacts on users seeking a remote experience under alternative C, would result in long-term adverse cumulative impacts on those visitors. However, ORV users Glen Canyon-wide would experience long-term beneficial cumulative impacts from the expansion of motor vehicle access, including authorized use off-road use by conventional motor vehicles at two new accessible shoreline areas, the use of OHVs and street-legal ATVs at 15 accessible shorelines and on GMP roads, including the Orange Cliffs Unit, and authorized off-road use on designated ORV routes in Ferry Swale under alternative C. Overall, the impacts on visitor use and experience from implementation of alternative C combined with impacts from cumulative projects would be noticeable.



## **ALTERNATIVE D: DECREASED MOTORIZED ACCESS**

### **Lone Rock Beach**

Under alternative D, Lone Rock Beach would remain open to conventional motor vehicles only; OHVs and street-legal ATVs would not be allowed. Conventional motor vehicle use would continue to be managed as described for alternative A, with the additional requirement that all users obtain ORV permits. Similar to alternative C, the permit requirement would not be expected to adversely impact visitor use at Lone Rock Beach, but may cause a small adverse impact on visitor experience due to the additional cost associated with visiting Glen Canyon and the time required to obtain the permit. Visitors would continue to be able to access Lone Rock Beach by conventional motor vehicles and overnight camping would still be authorized. Visitors wishing to enjoy a quieter beach experience may have an improved visitor experience due to the reduction in noise and air quality impacts from the removal of OHV and street-legal ATV use from the area. Those visitors wishing to access Lone Rock Beach by OHVs and street-legal ATVs would no longer be able to do so and could experience a considerable change in their use.

### **Lone Rock Beach Play Area**

Impacts on use and experience for conventional motor vehicle, OHV, and street-legal ATV users at Lone Rock Beach Play Area would be the same as described for alternative B. The Lone Rock Beach Play Area would be permanently closed and there would be no opportunities for unrestricted motor vehicle use in Glen Canyon, which would result in severe adverse effects on this user group.

### **Accessible Shorelines**

Under alternative D, 11 existing accessible shoreline areas, including Paiute Farms and Nokai Canyon, would not be authorized for off-road use. Without a boat, visitors would be unable to access these areas of Glen Canyon. Four accessible shoreline areas (approximately 1,100) acres would be authorized for use by conventional motor vehicles by permit only: Dirty Devil, Farley Canyon, Stanton Creek, and Hite Boat Ramp. Stanton Creek is one of the main accessible shoreline areas in Glen Canyon, increasing in popularity since the closure of the Bullfrog North and South site in 2002. Hite Boat Ramp, as part of the Hite developed area, is also popular, but visitation has dropped as lake levels have dropped (DCP 2008e). Farley Canyon is a popular fishing and camping location that receives a moderate amount of visitor use. The Dirty Devil shoreline area was previously popular, although it no longer provides access to Lake Powell due to the falling lake elevation and visitation has decreased in recent years. Visitors still camp at this location; however, it does not attract as many visitors as in the past and it does not allow for fishing.

While four accessible shoreline areas would remain available for use by conventional motor vehicles, depending on the level of use, visitors may experience a negative impact from increased crowding in the four authorized areas. However, generally, visitor experience at these shoreline areas would not be noticeably impacted and overall visitor use patterns would not likely change because two of the four accessible shorelines currently experience high visitation comparable to other accessible shorelines. Conversely, visitors seeking the more remote experience of using a less-visited accessible shoreline with access to Lake Powell may no longer be able to do so at Glen Canyon without a boat. There would be a potential for beneficial impacts on boaters accessing the shoreline areas closed to off-road use, due to the reduced visitation and noise at these locations. Similar to alternative C, visitors may experience an adverse impact from the additional cost of purchasing a permit to enter the accessible shorelines.

### **Travel on GMP Roads in Glen Canyon**

Under alternative D, only conventional motor vehicles would be authorized to operate on all GMP roads; OHVs or street-legal ATVs would be prohibited on all roads within Glen Canyon. Visitors wishing to tour Glen Canyon by

OHVs or street-legal ATVs would be unable to do so. Visitor use patterns would change substantially and access by OHVs or street-legal ATVs of any area of Glen Canyon would not be authorized.

### **Ferry Swale**

Under alternative D, all off-road use would not be authorized at Ferry Swale and impacts on visitor use and experience would be the same as described under alternative B. No motor vehicle users would be able to access BLM land by off-road methods, passing through the Ferry Swale area of Glen Canyon, limiting access points to BLM areas. There would be beneficial impacts for visitors not using motor vehicles in the Ferry Swale area due to the reduction of noise from the prohibition of off-road use in this area.

### **Cumulative Impacts**

Under alternative D, the same past, present, and planned future activities within Glen Canyon that have the potential to affect visitor use and experience would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the potential severe adverse impacts on OHV and street-legal ATV users under alternative D, could result in long-term severe adverse cumulative impacts on OHV and street-legal ATV users. Conventional motor vehicle users would experience long-term adverse cumulative impacts, but these impacts would not be noticeable. However, the beneficial impacts restrictions on motorized access, including closure of some accessible shoreline areas, Lone Rock Beach, and Lone Rock Beach Play Area to off-road use as well as the elimination of OHV and street-legal ATV use under alternative D would provide long-term cumulative benefits for visitors who desire an experience free of motorized vehicle presence, disturbance, lights, or noise.

## **ALTERNATIVE E: MIXED USE**

### **Lone Rock Beach**

Impacts on the visitor use and experience of motor vehicle users in Lone Rock Beach under alternative E would be the same as described for alternative C. Under alternative E, however, approximately 20 acres of the beach would be designated as a vehicle-free zone. This designation would provide an added beneficial experience for those visitors seeking a quieter beach experience away from motor vehicles.

### **Lone Rock Beach Play Area**

Impacts on the visitor use and experience of motor vehicle users in the Lone Rock Beach Play Area under alternative E would be the same as described for alternative C.

### **Accessible Shorelines**

Similar to alternative C, Paiute Farms and Nokai Canyon would be formally managed as accessible shoreline areas under alternative E. Off-road use at Warm Creek would be discontinued. Warm Creek provides a more primitive experience for visitors; however, it has been inaccessible since 2002 due to decreased lake elevations and received minimal visitor use when it was open. Warm Creek provides access to Warm Creek Bay; however, under alternative E visitors would still be able to access Warm Creek Bay by Crosby Canyon when lake elevations allow (currently, Crosby Canyon is inaccessible).

Conventional motor vehicle users would benefit from the formal management of off-road use at Paiute Farms and Nokai Canyon as accessible shorelines and would be authorized to access 14 accessible shoreline areas, providing approximately 6,000 acres of available area. Street-legal ATV users would also be authorized to use all accessible shoreline areas authorized for off-road use. This would also expand the areas available for street-legal ATV use

throughout Glen Canyon to approximately 6,000 acres, providing a beneficial impact for the visitor use and experience of street-legal ATV users.

Similar to alternative C, visitors to the accessible shoreline areas who are seeking a quiet experience may be adversely impacted by increased noise and air emissions from the addition of street-legal ATV use at these locations. This impact would be more noticeable in the more remote, less frequently visited accessible shoreline areas. Depending on each visitor's perception, this impact could be a small annoyance or great enough to discourage future visitation to the shoreline areas. Overall visitor use patterns would not be expected to change under this alternative, however, because street-legal ATV users make up a small percentage of Glen Canyon visitors and there are few registered street-legal ATVs in the surrounding counties.

### **Travel on GMP Roads in Glen Canyon**

Under alternative E, conventional motor vehicles would continue to be authorized on all GMP roads (75 miles paved and 365 miles unpaved). OHVs and street-legal ATVs would be authorized to operate on 265 miles of unpaved GMP roads; in addition, street-legal ATVs would be authorized to operate on 75 miles of paved GMP roads. OHVs and street-legal ATVs would continue to be unauthorized to operate in the Orange Cliffs Unit. Similar to alternative C, allowing OHVs and street-legal ATVs to operate on unpaved GMP roads may increase the amount of OHV and street-legal ATV use on roads. Likely, the impact on visitor use and experience from this increase in use would be small because OHV and street-legal ATV use is a small subset of ORV users within Glen Canyon. OHVs users would experience a beneficial impact from the addition of unpaved GMP road segments they are allowed to operate in within Glen Canyon. Similarly, street-legal ATV users would experience a beneficial impact from being authorized to use both paved and unpaved GMP roads throughout Glen Canyon, with the exception of the Orange Cliffs Unit. Visitors seeking a quiet, backcountry experience may be adversely impacted by the noise OHVs and street-legal ATVs produce in the more remote areas of Glen Canyon. Visitors to the Orange Cliffs Unit would likely not experience this adverse impact due the continuation of no authorized use of OHVs or street-legal ATVs in this location.

### **Ferry Swale**

Impacts on visitor use and experience for all motor vehicle users in Ferry Swale under alternative E would be the same as described for alternative C.

### **Cumulative Impacts**

Under alternative E, the same past, present, and planned future activities within Glen Canyon that have the potential to affect visitor use and experience would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the localized, notable adverse impacts on users seeking a remote experience under alternative E, would result in long-term adverse cumulative impacts on those visitors. However, motor vehicle users Glen Canyon-wide would experience long-term beneficial cumulative impacts from the expansion of varied motorized access, including two newly off-road authorized accessible shoreline areas, the use of street-legal ATVs at accessible shorelines, and the use of OHVs on unpaved GMP roads under alternative E. Overall, the impacts on visitor use and experience from implementation of alternative E combined with impacts from cumulative projects would noticeable and beneficial.

### **CONCLUSION**

Table 34 provides additional detail regarding the numbers of acres with authorized off-road use under each alternative. Table 35 shows numbers of miles of GMP roads with authorized off-road use, and table 36 shows miles of designated ORV routes at Ferry Swale.

**TABLE 34: NUMBER OF LOCATIONS AND ACRES OF AUTHORIZED OFF-ROAD USE, INCLUDING ACCESSIBLE SHORELINES, LONE ROCK BEACH, AND LONE ROCK BEACH PLAY AREA**

Vehicle Type	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Conventional Motor vehicles	15 (6,300 acres)	0 (0 acres)	17 (7,700 acres)	5 (1,350 acres)	16 (6,430 acres)
OHVs	2 (430 acres)	0 (0 acres)	17 (7,700 acres)	0	2 (430 acres)
Street-legal ATVs	2 (430 acres)	0 (0 acres)	17 (7,700 acres)	0	16 (6,430 acres)

**TABLE 35: MILES OF PAVED AND UNPAVED GMP ROADS WITH AUTHORIZED OFF-ROAD USE**

Vehicle Type	GMP Road Type	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Conventional Motor Vehicles	Paved GMP	75 miles	75 miles	75 miles	75 miles	75 miles
	Unpaved GMP	365 miles	365 miles	365 miles	365 miles	365 miles
OHVs	Paved GMP	0 miles	0 miles	75 miles	0 miles	0 miles
	Unpaved GMP	0 miles	0 miles	365 miles	0 miles	265 miles
Street-legal ATVs	Paved GMP	75 miles	75 miles	75 miles	0 miles	75 miles
	Unpaved GMP	265 miles	265 miles	365 miles	0 miles	265 miles

Note: All mileage is approximate and based on best available GIS data.

**TABLE 36: MILES OF DESIGNATED ORV ROUTES IN FERRY SWALE**

Miles of ORV Routes	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Conventional Motor Vehicles, OHVs and Street-Legal ATVs	53 miles	0 miles	15 miles	0 miles	15 miles

Alternative C would result in the widest variety of authorized visitor uses compared to alternatives A, B, and D, because alternative C would provide expanded OHV and street-legal ATV opportunities at accessible shoreline areas and on GMP roads, and the authorization of off-road use at two additional accessible shoreline areas. Both alternatives C and E would be fairly comparable in terms of visitor experience; both alternatives would allow OHV and street-legal ATV use within Glen Canyon, though alternative E would be comparable to a slightly lesser degree. Alternative C authorizes conventional motor vehicles, OHVs, and street-legal ATVs the use of 15 accessible shorelines and all GMP roads. Alternative E authorizes conventional vehicle and street-legal ATV use of 14 accessible shorelines and all GMP roads with the exception of the Orange Cliff Unit (however, OHVs would be authorized on unpaved GMP roads only, with the exception of the Orange Cliffs Unit), and alternative E creates a vehicle-free area at Lone Rock Beach. Visitors who do not enjoy the noise and air pollution produced by motor vehicles may prefer alternative E, which provides a vehicle-free experience at Lone Rock Beach. Alternative E could be expected to have slightly higher levels of visitation at Lone Rock Beach compared to alternatives A, B, C, and D, by providing vehicle-free area, which may attract visitors seeking this type of experience.

Under alternatives C and E, the continued access of conventional motor vehicles, OHVs, and street-legal ATVs to Lone Rock Beach and Lone Rock Beach Play Area; additional access for street-legal ATVs at the accessible shoreline areas; increased number of accessible shorelines; and designation of ORV routes in Ferry Swale would increase visitation by those wishing to enjoy off-road activities within Glen Canyon. Currently, OHV and street-legal ATV riding is not a prominent or primary activity at the recreation area (University of Idaho 2008); however, authorizing street-legal ATV use at 14 (alternative E) or 15 (alternative C) shoreline areas and authorizing OHVs on GMP roads under alternative C and unpaved GMP roads under alternative E could result in additional visitation in the recreation area. It is also possible that OHV and street-legal ATV users who would have visited Lone Rock Beach and the play area might instead choose to visit one of the newly accessible areas or drive on the GMP roads under alternatives C or E, shifting where the visitation would occur but not result in additional visitation.

Visitors seeking a quiet, backcountry experience may no longer be able to do so under alternatives C and E, due to the expansion of OHV and street-legal ATV use on accessible shorelines (though OHVs would not be authorized for use at accessible shorelines under alternative E) and the designation of ORV routes in Ferry Swale. The number of visitors seeking a quiet, backcountry experience may increase under alternatives B and D, where conventional vehicle, OHV, and street-legal ATV use would be discontinued at all accessible shorelines (alternative B) or OHV and street-legal ATV use would be eliminated from all of Glen Canyon (alternative D). This would be most noticeable on the accessible shorelines. No motor vehicle use, including use of conventional motor vehicles, would be authorized on any accessible shorelines under alternative B, but would be authorized on four accessible shorelines and Lone Rock Beach under alternative D. However, under alternative B and D, several of the accessible shorelines are remote and not easily accessible without a boat, potentially eliminating these shoreline areas with no off-road use from use by visitors relying on motor vehicles for access.

The management of ORVs under any of the alternatives would not likely significantly impact overall visitor use and experience at Glen Canyon. The continuation of the current visitor use patterns and experience under alternative A is not likely to result in significant impacts on the recreational opportunities or experiences associated with off-road use of conventional motor vehicles and street-legal ATVs in Glen Canyon. The 2007 Glen Canyon Visitor Study stated that most visitor groups, approximately 85%, rated the overall quality of services, facilities, and recreational opportunities at Glen Canyon as “very good” or “good” (University of Idaho 2008). Any visitors currently adversely impacted by the operation of ORVs in the recreation area, which may include the 3% of visitors who rated the quality of their visit as “very poor” or “poor,” would continue to experience negative impacts. These adverse impacts would be the greatest under alternatives A, C, and E, which would increase areas available for conventional motor vehicles, OHVs, and street-legal ATVs, most notably in the Ferry Swale and Orange Cliffs Unit. However, visitor studies indicate that overall, visitors are happy with the visitor experience at Glen Canyon (NPS 2007f). Additionally, the majority of Ferry Swale is designated as a Recreation and Resource Utilization Zone under the existing GMP; therefore, the multiple uses in this location would be consistent with current management and would reduce the potential for visitor conflicts, ensuring no likely significant impacts.

Use of GMP roads by conventional vehicles recreation area-wide would not change under any alternatives and would not impact visitor use or experience. Under alternative D, the use of street-legal ATVs and OHVs would be completely eliminated within Glen Canyon, including on GMP roads. This elimination would not likely be significant, however, because OHVs and street-legal ATV use represents a small fraction of the 2-4% of all Glen Canyon visitors that use ORVs. Use of GMP roads under all alternatives would be consistent with the existing management zones where the roads are located, which mainly include Recreation and Resource Utilization and Development Zones.

Alternative B would be the most restrictive for off-road use in Glen Canyon. Visitor use patterns and visitor experience for conventional vehicle and ATV users would be substantially impacted under alternative B because all off-road use would be eliminated from Lone Rock Beach, Lone Rock Beach Play Area, all accessible shoreline areas, and Ferry Swale. With the elimination of off-road use in the recreation area, alternative B would provide the most beneficial impact on visitors seeking a quiet recreation area experience with more solitude and backcountry

areas without the interruption of off-road use. However, impacts on visitor use and experience for conventional motor vehicle users currently using accessible shoreline areas; conventional motor vehicle, OHV, and street-legal ATV users at Lone Rock Beach and Lone Rock Beach Play Area would likely be locally significant because these areas would be closed, reducing the ORV areas available within Glen Canyon National Recreation Area. Visitors who prefer unrestricted off-road use would likely experience significant impacts with the closure of the Lone Rock Beach Play Area. This could result in a locally significant impact on their visitor experience because this unique use would no longer be available within the national recreation area and this user group may find this management action highly controversial. Additionally, eliminating off-road use at Lone Rock Beach and Lone Rock Beach Play Area would be inconsistent with the GMP, which manages the area as a Development Zone. Under the GMP, the Development Zone is designated to allow a wide range of recreational use. Although the specific percentage of visitors who would be impacted by these closures is unknown, the majority of visitors to Glen Canyon experience the recreation area by boat and less than 4% of visitors would be expected to be impacted by this alternative. The Development Zone equates to only 2% of the total acres available for recreation at Glen Canyon. Therefore, these adverse impacts would be limited to a specific user group and would be experienced in localized areas of the recreation area. Given that alternative B would not likely result in significant impacts, all other alternatives would not likely be significant because they would continue to allow some amount of off-road use within Glen Canyon.

## CULTURAL RESOURCES

### GUIDING REGULATIONS AND POLICIES

Federal actions that have the potential to affect cultural resources are subject to a variety of laws. The National Historic Preservation Act of 1966 (NHPA) (as amended) is the principal legislative authority for managing cultural resources associated with NPS projects. Generally, Section 106 of the act requires all federal agencies to consider the effects of their actions on cultural resources listed on or determined eligible for listing in the National Register. Such resources are termed historic properties. Agreement on how to mitigate effects on historic properties is reached through consultation with the State Historic Preservation Officer (SHPO); the Tribal Historic Preservation Officer (THPO), if applicable; and the Advisory Council on Historic Preservation, as necessary. In addition, federal agencies must minimize harm to historic properties that would be adversely affected by a federal undertaking. Section 110 of the act requires federal agencies to establish preservation programs for the identification, evaluation, and nomination of historic properties to the National Register.

The NHPA established the National Register, the official list of the nation's historic places worthy of preservation. Administered by NPS, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's cultural resources. The criteria applied to evaluate properties are contained in 36 CFR 60.4.

Cultural resources that are evaluated as significant to the nation's heritage are eligible for listing in the National Register. These resources must be taken into consideration during the planning of federal projects. When historically significant resources are found within the area of potential effect of an undertaking, the responsible agency official initiates an assessment of adverse effects (36 CFR 800.5). The assessment of adverse effects is a consultative process that includes SHPO associated American Indian tribes (and their THPO, if applicable) and/or traditionally associated groups other than American Indian tribes, and SHPO. At Glen Canyon, "Traditionally Associated Peoples" includes The Church of Jesus Christ of Latter-day Saints and descendants of contemporary ranching communities that attach cultural significance to the eligible resource. The consultation process can lead to avoidance or to minimization and mitigation of effects that are deemed adverse. By doing so, the NHPA and its implementing regulations offer some protection to significant historic properties.

Many of the identified archeological resources and ethnographic resources in the study areas have not been evaluated for the National Register. Until such time as these resources are formally evaluated, they should be treated as significant or National Register eligible by Glen Canyon. Ethnographic resources may be eligible for the

National Register if they are important to “the beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice” (Parker and King 1998). National Register-eligible ethnographic resources are known as traditional cultural properties (TCPs).

Other important laws or Executive Orders designed to protect cultural resources include, but are not limited to:

- American Indian Religious Freedom Act—to protect and preserve for American Indians access to sites, use and possession of sacred objects, and freedom to worship through ceremonials and traditional rites
- Archeological Resources Protection Act—to secure, for the present and future benefit of the American people, the protection of archeological resources and sites that are on public lands and Indian lands
- Native American Graves Protection and Repatriation Act
- Executive Order 11593 (Protection and Enhancement of the Cultural Environment)—to provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the United States
- Executive Order 13007 (Indian Sacred Sites)—to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites

Through the legislation and Executive Orders listed above, NPS is charged with the protection and management of cultural resources in its custody. This is further implemented through Director’s Order 28: Cultural Resource Management (NPS 1998c), NPS *Management Policies* 2006 (NPS 2006a), and the 2008 “Programmatic Agreement among NPS (U.S. Department of the Interior), the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers for Compliance with Section 106 of the National Historic Preservation Act” (NPS 2008f). These documents charge NPS managers with avoiding, or minimizing to the greatest degree practicable, adverse impacts on resources and values. Although NPS has the discretion to allow certain impacts in park units, that discretion is limited by the statutory requirement that resources and values remain unimpaired, unless a specific law directly provides otherwise.

## METHODOLOGY AND ASSUMPTIONS

The methodology for assessing impacts on archeological sites and ethnographic resources included a review of published literature, archeological site information from the Glen Canyon archeological site data base, discussions with the Glen Canyon staff archeologist, and the resource-specific knowledge of planning team members. In addition, it should be noted the accessible shoreline areas were sampled for the presence of archeological sites according to a previously published research design (Caldwell 2011; Vance and Downum 2012; Vance and Downum 2013). Those parts of the accessible shoreline study areas that fall outside the sampling design remain unsurveyed. The purpose of the sampling strategy was to generate data on types of historic properties present so that a level of survey effort could be established for these areas.

For the purposes of the impacts analysis, Lone Rock Beach, Lone Rock Beach Play Area, accessible shorelines, GMP roads, and proposed designated ORV routes in Ferry Swale were portioned into study areas. Additionally, Lone Rock Beach, Lone Rock Beach Play Area, and accessible shorelines included a buffer area of 0.5 mile. This is based on the nature and intensity of the impacts that may potentially occur in these areas. The study area represents the area where the highest level of use and greatest potential for impacts on archeological sites and ethnographic resources are anticipated. Direct impacts on these resources are anticipated in the study areas of each geographic area in the analysis. Indirect impacts are anticipated in the buffer areas which surround the study areas. For the accessible shorelines, the study area is the shoreline itself while the buffer extends for 0.5 mile outside the demarcated shoreline area. For the GMP roads, direct impacts occur within the footprint of the travel lanes

extending up to 33 feet (10 meters) from the road centerline. Indirect impacts may occur within the area outside of the travel lanes for a distance of between 33 and approximately 200 feet (60 meters) on either side of the centerline. Designated ORV routes in Ferry Swale are not roads and as a result their footprint is smaller than that of the GMP roads. Consequently, the zone of direct impacts measures approximately 24 feet in width (12 feet either side of the centerline). The zone of indirect impacts extends from between 12 and 200 feet on either side of the ORV route centerline. Acreages, miles, and percentages presented in the following analysis are estimates and are based on the best available GIS information the park has acquired to date. These numbers may change slightly as new GIS information becomes available allowing more refined analysis.

### Context

The geographic study area for archeological resources is contained within the areas of Glen Canyon that would be affected by management decisions under this plan/DEIS.

### ARCHEOLOGY

In the American southwest, archeological resources, some of which are ethnographic resources, are often found in surface contexts and are vulnerable to effects from off-road use (Schiffman 2005; Spangler 2006; Sampson 2009). Impacts from off-road use have been particularly severe on public lands (Ouren et al. 2007). Scientific literature has been generated to assist land managers tasked with maintaining the health of ecosystems and the integrity of archeological sites, cultural landscapes, and ethnographic resources (Ouren et al. 2007; Sowl and Poetter 2004). These scientific studies often include discussions of off-road use effects, off-road use effects mitigation, site-restoration techniques, and research needs (Ouren et al. 2007).

ORVs are known to impact many of the natural and cultural resources of this region. Prominent among them are soils, water quality, air quality, vegetative communities, wildlife, watersheds, archeological, and ethnographic resources. Soils are widely recognized in the scientific community as an important component of desert ecosystems (Dregne 1983; Lovich and Bainbridge 1999). ORV impacts on soils are particularly relevant to archeological resources that can include ethnographic resources because soils constitute the physical matrix in which artifacts, cultural features, and other cultural deposits reside.

Consequently a basic understanding of how off-road use impacts the physical characteristics of soils is germane to our discussion of effects on archeological and ethnographic resources. ORV disturbance of desert soils alters their physical characteristics resulting in compaction, reduced surface water infiltration, higher rates of surface water run-off and erosion, and destabilization of land forms resulting in accelerated rates of wind erosion (Webb 1982; Iverson et al. 1981; Tuttle and Griggs 1987; Gillette and Adams 1983; Belnap 2002). Soils compaction has been linked to increased run-off resulting in the formation of rills and gullies particularly on elevated terrain and hill side-slopes. Surface runoff mobilizes the sediments containing the archeological deposits destroying their contexts in the process.

Natural biotic communities are also susceptible to impacts from ORVs (Lathrop and Rowlands 1983). Damage to annual and perennial plants weakens the root systems that stabilize land surfaces. Once these communities are disturbed, soils become more susceptible to wind erosion. Wind erosion deflates archeological sites potentially combining different artifact assemblages from different time periods that become very difficult to interpret in terms of function, period of use, and ethnic affiliation (Grayson 2011).

Sampson (2009) and Sowl and Poetter (2004) summarize the scope of the threat to archeological sites and by extension ethnographic resources created by un-regulated off-road use on public lands in the West. Both direct and indirect impacts due to motor vehicles used off-road are described. The range of impacts includes:



- Breaking and displacement of surface artifacts degrading the ability of the site to yield important scientific information through artifact analysis and spatial interpretation;
- Damage to surface features, and cultural deposits caused by vehicle passage;
- Compaction and shearing of subsurface soils containing features and cultural deposits degrading their integrity and potential to contain preserved artifacts and eco-facts and;
- Indirect impacts are also documented in the literature where they are attributed to increased pedestrian access by ORVs to archeological sites and sensitive ethnographic resources. This category of impacts includes:
  - Looting of archeological sites by professional pot-hunters, as well as casual collecting by visitors to the recreation area,
  - Purposeful vandalism of petroglyph and pictograph sites often by “tagging” of these resources with spray paint;
  - Deflation of sediments containing archeological deposits caused by the passage of vehicles and foot-traffic and;
  - Inadvertent vandalism of archeological and ethnographic sites by camping activities such as trash disposal, hearth construction, and pit digging.

Lithic and ceramic surface scatters are by far the most commonly occurring site type in those portions of Glen Canyon covered by this plan/DEIS. All 182 sites currently identified in the accessible shoreline areas, along unpaved GMP roads and its buffers constitute surface sites of some kind. This total includes 47 sites determined or recommended eligible for the National Register including the Hole-in-the-Rock Trial and Hole-in-the-Rock. It is likely that additional archeological and ethnographic resources will be exposed below the 3,700-foot contour as Lake Powell recedes from the existing shoreline. Though the number of these sites is unknown, there are likely significantly fewer than the 518 identified in pre-inundation data (Bureau of Reclamation 2007). These sites will be vulnerable to the same impacts as those now exposed on the valley floor.

In summary, as more areas become accessible to the public for recreational use, both direct and indirect impacts on numbers of archeological sites, and by extension ethnographic resources, will potentially increase (Sampson 2009; Sowel and Poetter 2004). A correlation appears to exist between road proximity and vandalism of archeological sites some of which are ethnographic resources. The problem of vandalism and purposeful looting becomes more salient for land managers when ORV access opens up hard to monitor remote back country areas. Both direct and indirect impacts on archeological sites are likely to increase at Glen Canyon as the flood pool falls below the 3,700 foot contour exposing formally inundated archeological sites. Reservoir operations policy directly impacts the integrity of archeological sites, and by extension ethnographic resources by causing shoreline erosion and exposure by elevation fluctuations. Indirect impacts on vulnerable cultural remains include recreational activities and human intrusion from camping, boating, hiking, and ORV use. Although subject to direct and indirect impacts from many sources, many archeological sites, and by extension ethnographic resources, retain their integrity in shoreline environments.

The direct and indirect adverse impacts that may occur as a result of increased public and recreational use would be mitigated to some extent by implementation of NPS resource management practices and law enforcement policies. NPS would prosecute looters and vandals under the Archeological Resource Protection Act. In addition, under NPS stewardship policies for cultural resources, some sites in the Archeological Sites Management Information System inventory are periodically evaluated under the Archeological Sites Management Information System Site Condition Assessment program. Remedial actions are developed for sites are found to be threatened by natural or man-made causes.

## **Alternative A: No Action**

### **Lone Rock Beach**

No archeological sites or ethnographic resources have been identified in the Lone Rock Beach study area. Therefore, alternative A would not have direct impacts, beneficial or adverse, on archeological resources in Lone Rock Beach.

The Lone Rock Beach study area is surrounded by a 0.5-mile buffer. Three sites in the buffer have not been evaluated (see table 18). Long-term adverse indirect impacts on these sites may result from continued operation of conventional motor vehicles, OHVs, and street-legal ATVs in the area. Indirect impacts could include the increased risk of vandalism and looting, as well as long term soil loss or degradation by erosion, which could damage archeological resources. Potential illegal use of conventional motor vehicles, OHVs, and street-legal ATVs outside of authorized off-road areas may generate indirect adverse impacts on the three sites in the buffer area. NPS law enforcement and resource management policies would mitigate such adverse impacts.

### **Lone Rock Beach Play Area**

A total of three archeological sites, and by extension ethnographic resources, are located in the Lone Rock Beach Play Area study area (see table 18). A phased data recovery was completed at these sites to mitigate adverse impacts resulting in a finding of not eligible for the National Register (Liestman 1986). Because the adverse impacts on these three sites have been previously mitigated continued unrestricted off-road use at Lone Rock Beach Play Area would have no direct adverse impacts on these three sites.

The Lone Rock Beach Play Area study area is surrounded by a 0.5-mile buffer. One site in the Lone Rock Beach Play Area buffer has not been evaluated for the National Register. Long-term indirect adverse impacts may continue to occur under this alternative. Indirect adverse impacts could include the increased risk of vandalism and looting, as well as long-term soil loss/degradation by erosion, which could damage archeological resources. Potential illegal use of conventional motor vehicles, OHVs, and street-legal ATVs outside of authorized off-road areas may have both direct and indirect adverse impacts on the unevaluated site in the Lone Rock Beach Play Area buffer area. NPS law enforcement and resource management policies would mitigate such adverse impacts.

### **Accessible Shorelines**

Under alternative A, 13 accessible shorelines would remain open to conventional motor vehicle use only (Blue Notch, Bullfrog North and South, Copper Canyon, Crosby Canyon, Dirty Devil, Farley Canyon, Neskahi, Paiute Canyon, Red Canyon, Stanton Creek, Warm Creek, White Canyon, and Hite Boat Ramp). Three sites are eligible for the National Register; two of these unevaluated sites are located within the accessible shorelines study area (see table 18). Some of these sites are regarded as ethnographic resource of value to the descendent communities. Under alternative A, continued use of conventional motor vehicles may result long-term direct adverse impacts on these five sites.

The accessible shoreline study areas are surrounded by 0.5-mile buffers. The buffers contain 19 archeological sites that are eligible for the National Register and 25 sites that have not been evaluated. Long-term indirect adverse impacts on these sites may result from continued operation of motor vehicles in the area. Potential illegal use of conventional motor vehicles outside of authorized off-road areas may have both direct and indirect adverse impacts on the National Register-eligible and unevaluated sites in the accessible shoreline areas.

Under alternative A, only conventional motor vehicles would be permitted to depart roads and drive directly to the shoreline to park in designated areas, resulting in the continued disturbance of archeological sites in this area. Both direct and indirect impacts should be anticipated under these circumstances. Direct impacts would include artifact

breakage and displacement from original context, damage to surface cultural features and soil compaction. Indirect impacts would be increased risk of vandalism and looting, as well as long-term soil loss/degradation by erosion. Adverse impacts on National Register-eligible or unevaluated sites would require mitigation. NPS law enforcement or Archeological Resources Protection Act violations and resource management policies (Archeological Sites Management Information System Condition Assessments) would provide for mitigation of such adverse impacts.

In order to protect resources and promote public safety, Glen Canyon would retain the authority to administratively designate closures of these shoreline areas. Currently Warm Creek, Crosby Canyon, and Bullfrog North and South are temporarily closed due to low water conditions, but they would be reopened if future conditions allow and Glen Canyon staff deems it appropriate. The Paiute Farms and Nokai Canyon accessible shorelines are not officially open, although they are currently being accessed. Under alternative A, off-road use of these two areas would be discontinued and management action taken to prevent access. Archeological sites in these areas could continue to be damaged by pressure from vehicles, which would expose the sites to the forces of erosion. NPS maintains the administrative ability to enforce existing regulations and prevent unauthorized off-road use. The Park Service would implement a phased approach to the continued use of those accessible shorelines at which archeological surveys are not complete. For those shorelines areas not surveyed, and where none are planned, those areas would be closed until the resources can be identified and evaluated.

### **Travel on GMP Roads in Glen Canyon**

Under alternative A, conventional motor vehicles and street-legal ATVs would be authorized to operate on all GMP roads in Glen Canyon, except street-legal ATVs would not be allowed at the Orange Cliffs Unit. ATVs that do not meet the street-legal requirements under Utah and Arizona code and all OHVs are prohibited from operating on any road in Glen Canyon. Under this alternative, these current management practices would continue. A total of 39 National Register-eligible archeological sites, and by extension ethnographic resources, are present in 440 miles of GMP roads. An additional 23 sites have not been evaluated for the National Register (see table 18).

It is assumed that direct impacts on National Register-eligible and unevaluated archeological sites in the footprint of the roadways have already occurred. Because the integrity of the archeological deposits in the direct impact zone has been compromised, continued motor vehicle use of the GMP roads would have no direct adverse impact. Potential long-term indirect adverse impacts could occur in the buffer zone. Potential illegal off-road use of conventional motor vehicles and street-legal ATVs off of the GMP roads may have both direct and indirect adverse impacts on the National Register-eligible and unevaluated sites. NPS law enforcement and resource management policies would mitigate such adverse impacts.

The Hole-in-the-Rock Trail and Hole-in-the-Rock are National Register-listed properties accessible to the public by an unpaved GMP road. The landscape that encompasses these individually listed properties is regarded as potentially eligible for the National Register as a traditional cultural property (TCP) significant to The Church of Jesus Christ of Latter-day Saints. For the purposes of this plan/DEIS, the cultural landscape includes the Hole-in-the-Rock Trail and the unpaved GMP road, as vehicles cannot be driven down the Hole. Under alternative A, use of this unpaved GMP road would continue to be allowed for conventional motor vehicles and street-legal ATVs and therefore would not result in damage to the listed Hole-in-the-Rock Trail and to the potentially eligible TCP of the Hole-in-the-Rock landscape. The potential for adverse effects from potential illegal off-road use could continue under this alternative but would be mitigated by NPS law enforcement and resource management policies.

### **Ferry Swale**

Under alternative A, conventional motor vehicles, OHVs, and street-legal ATVs would be authorized for use on approximately 53 miles of designated ORV routes. A total of six National Register-eligible archeological sites, and by extension ethnographic resources, are within the study areas of these linear corridors (see table 18). An additional three sites have not been evaluated for the National Register.

Direct and indirect impacts on eligible and unevaluated archeological sites within the designated ORV routes would be similar to those for the GMP roads. It is assumed that direct impacts on National Register and unevaluated archeological sites in the footprint of the designated ORV routes have already occurred. Because the integrity of the archeological deposits in the direct impact zone has been compromised, continued motor vehicle use of the designated ORV routes would have no adverse impact. Long-term indirect impacts may occur in the buffer area. The potential indirect impacts include looting of archeological sites, purposeful vandalism of petroglyph and pictograph sites, deflation of sediments containing archeological deposits, and inadvertent vandalism of archeological and ethnographic sites. Potential illegal use of conventional motor vehicles, OHVs, and street-legal ATVs outside of the designated ORV routes may have both direct and indirect adverse impacts on the National Register-eligible and unevaluated sites in Ferry Swale. NPS law enforcement and resource management policies would mitigate such adverse impacts.

Short-term beneficial impacts on archeological sites, some of which are ethnographic resources, include designating ORV routes under NPS rules for the authorized operation of motorized vehicles within Glen Canyon. In addition, a long-term benefit to these resources would occur from the reduction and or elimination of ORV traffic in the dispersed areas of Ferry Swale. Under these conditions, natural vegetation in the area would be restored stabilizing local soils and by doing so reducing the potential for erosion. This would have a beneficial impact on archeological sites by preserving their physical integrity.

### **Cumulative Impacts**

Other past, present, and planned future activities within Glen Canyon have the potential to impact National Register-eligible and unevaluated sites. These cumulatively considerable actions are described in greater detail in chapter 1. Both adverse and beneficial impacts have occurred as a result of these. Adverse impacts have accrued to archeological resources, and by extension ethnographic resources, from authorized and unauthorized off-road use which has resulted in degradation of the resource base. Beneficial impacts on archeological sites have occurred, and would continue to occur into the future from the implementation of the following plans or actions:

- Resources Management Plan, Cultural Component, Glen Canyon National Recreation Area; which establishes cultural resource management zones;
- Glen Canyon National Recreation Area, Archeological Resources Protection Plan; which establishes protocols for protection of archeological sites;
- Ruins Protection Plan, Glen Canyon National Recreation Area, which establishes protocols for the preservation of this class of archeological resources.

Beneficial cumulative impacts may also result from the above-mentioned management plans where restrictions to off-road use are put in place. Overall, these actions contribute to cumulatively significant long-term adverse and beneficial impacts on National Register-eligible archeological sites, the National Register-listed Hole-in-the-Rock Trail, and the associated potentially eligible TCP landscape of Hole-in-the-Rock landscape.

### **Alternative B: No Off-road Use**

#### **Lone Rock Beach**

Under alternative B, Lone Rock Beach would be closed permanently to off-road use and restored to natural conditions. No archeological sites or ethnographic resources have been identified in the Lone Rock Beach study area. The Lone Rock Beach buffer area contains three archeological sites that have not been evaluated (see table 18). However, alternative B would not have any indirect impacts on these three unevaluated archeology sites, as off-road use would be prohibited. Restoration of natural vegetation in the area would stabilize local soils and by doing

so reduce the potential for erosion. This would have a beneficial long-term impact on these resources by preserving their physical integrity.

### **Lone Rock Beach Play Area**

Under alternative B, Lone Rock Beach Play Area would be closed permanently to off-road use and restored to natural conditions. A total of three archeological sites are located in the Lone Rock Beach Play Area study area (see table 18). Data recovery was completed at these sites to mitigate adverse impacts resulting in a finding of not eligible for the National Register (Liestman 1986). Because the adverse impacts on these three sites have been previously mitigated, closing the Lone Rock Beach Play Area would have no direct impact on these three sites. There is one site in the Lone Rock Beach Play Area buffer that has not been evaluated for the National Register. Restoration of natural vegetation in the area would stabilize local soils and by doing so reduce the potential for erosion. This would have a beneficial long-term impact on these resources by preserving their physical integrity.

### **Accessible Shorelines**

Alternative B would eliminate adverse direct and indirect impacts on the 66 archeological sites, and by extension ethnographic resources, that have either not been evaluated or have been determined eligible for the National Register at accessible shorelines in Glen Canyon (see table 18). In addition, restoration of natural vegetation in these areas would stabilize local soils and by doing so reduce the potential for erosion. This would have a long-term beneficial impact on archeological sites, and by extension ethnographic resources, eligible for the National Register, as well as those sites that have not been evaluated by preserving their physical integrity.

### **Travel on GMP Roads in Glen Canyon**

Under alternative B, impacts on 39 archeological sites, some of which are ethnographic resources determined eligible for the National Register, and 23 sites unevaluated would be the same as those under alternative A. The same may be said for the National Register-listed Hole-in-the-Rock Trail and the potentially eligible TCP of the Hole-in-the-Rock landscape. If Glen Canyon staff become aware of an eligible cultural resource on the roadway itself, the park would mitigate the effects on that resource. The mitigation techniques are described under alternative C, Lone Rock Beach.

### **Ferry Swale**

Under alternative B, no ORV routes would be designated. There would be no long- or short-term adverse direct or indirect impacts on the six National Register-eligible and three unevaluated sites recorded in the Ferry Swale study area. Cessation of off-road motor vehicle use would result in restoration of natural vegetation in this area. The potential for additional erosion from motor vehicle use would be eliminated, thereby stabilizing the sites. This would have a long-term beneficial impact on archeological sites, and by extension ethnographic resources, eligible for the National Register, as well as those sites that have not been evaluated by preserving their physical integrity.

### **Cumulative Impacts**

Under alternative B, the same past, present, and planned future activities within Glen Canyon that have the potential to impact archeological sites, and by extension ethnographic resources, the Hole-in-the-Rock Trail, and the potentially eligible TCP of the Hole-in the-Rock landscape under the no-action alternative would occur, however the impacts would be the less than those described under alternative A due to the elimination of off-road use in Glen Canyon. The impacts of these actions, in combination with the significant adverse impacts on National Register-eligible archeological sites under alternative B, would result in less severe long-term adverse cumulative impacts on these resources. However, the beneficial impacts on this class of historic properties accruing from greater protection of these resources provided under alternative B would provide long-term beneficial cumulative

impacts. The net result of the analysis indicates that the impacts on National Register-eligible and unevaluated sites under this alternative would be beneficial.

### **Alternative C: Increased Motorized Access**

#### **Lone Rock Beach**

Under alternative C, conventional motor vehicles, OHVs, and street-legal ATVs would continue to operate at Lone Rock Beach. However, off-road use of these motor vehicles would require an ORV permit. No archeological sites or ethnographic resources have been identified in the Lone Rock Beach study area. Therefore, alternative C would not have direct impacts on these resources in Lone Rock Beach.

There are three unevaluated sites in the buffer (see table 18). Long-term adverse indirect impacts on these sites may result from continued operation of motor vehicles in the area. Indirect impacts would be increased risk of vandalism and looting, as well as long-term soil loss/degradation by erosion, which may damage the archeological sites. Adverse impacts on National Register-eligible and unevaluated archeological sites, and by extension ethnographic resources, would be mitigated or eliminated by the following measures:

- Public education through media and resource interpretation by Glen Canyon personnel
- Increased law enforcement monitoring of culturally sensitive areas as provided for under the Accessible Shorelines 1988 Programmatic Agreement
- Reduction of use during time of the year when eligible or unevaluated archeological resources, and by extension ethnographic resources, are vulnerable due to surface conditions
- Use of Archeological Resources Protection Act signage and restrictive barriers where feasible
- Application of passive surveillance systems like video cameras and motion detectors
- Repairs and rehabilitation or other preservation treatments for damaged or threatened archeological deposits, foundations, and/or ruins
- Road relocation or redesign to avoid culturally sensitive archeological and ethnographic resources
- Re-vegetation and drainage control to stabilize threatened or damaged archeological deposits
- Data recovery of Criterion D National Register-eligible archeological sites in extreme cases when other protective measures have failed.

Although Lone Rock Beach has been surveyed, the potential exists for un-recorded sites to be impacted by motor vehicles operating off road in these areas. The potential for adverse impacts on un-recorded archeological sites, and by extension ethnographic resources, may be mitigated by monitoring of ORV impacts as stipulated in the Environmental Assessment and Management/Development Concept Plans for Lake Powell's Accessible Shorelines (NPS 1988).

#### **Lone Rock Beach Play Area**

Under alternative C, conventional motor vehicles, OHVs, and street-legal ATVs would continue to operate at Lone Rock Beach Play Area. However, off-road use of these motor vehicles would require an ORV permit and a safety flag.

A total of three archeological sites are located in the Lone Rock Beach Play Area. Data recovery was completed at these sites to mitigate adverse impacts resulting in a finding of not eligible for the National Register (Liestman

1986). Because the adverse impacts on these three sites have been mitigated, continued unrestricted off-road use at Lone Rock Beach Play Area would have no direct adverse impacts on these three sites.

There is one site in the Lone Rock Beach Play Area buffer that has not been evaluated for the National Register. Long-term adverse indirect impacts may continue under this alternative. Indirect impacts would be increased risk of vandalism and looting, as well as long-term soil loss/degradation by erosion that may damage the archeological site. Mitigation measures would be implemented at Lone Rock Beach Play Area, similar to the mitigation measures for Lone Rock Beach.

### **Accessible Shorelines**

Under alternative C, a total of 15 ORV-accessible shoreline areas (13 existing areas plus Paiute Farms and Nokai Canyon) would be open to conventional motor vehicles, OHVs, and street-legal ATVs by permit, subject to water-level closures.

A total of six sites eligible for the National Register and four evaluated sites are located within the accessible shorelines study area (see table 18). Some of these sites are regarded as ethnographic resource of value to the descendent communities. Under alternative C, increased off-road motor vehicle use may result long-term direct adverse impacts on these 10 sites. The buffers contain 19 archeological sites that are eligible for the National Register and 37 unevaluated sites. Long-term adverse indirect impacts on these sites may result from continued operation of motor vehicles in the area.

Continued off-road use by conventional motor vehicles combined with the additional use by OHVs and street-legal ATVs would lead to degradation of surface artifacts as well as subsurface cultural features and deposits. These impacts would likely occur as a result of the crushing and shearing of the archeological matrix, resulting in soil compaction and accelerated erosion.

Under this alternative, accessible shorelines would be marked and defined in a manner consistent with the control of off-road use for the protection of Glen Canyon resources, including soil and geological features. All motor vehicle users would be permitted to drive off-road only from the end of roads directly to the shoreline areas; soils along this path between roads and designated parking areas would continue to be impacted. Although a permitting system would result in better management of motorized access, the potential for future increased off-road use at accessible shorelines would result in the potential for more widespread and higher-intensity adverse impacts on archeological sites, some of which are also ethnographic resources. Mitigation measures would be implemented at accessible shorelines, similar to that for Lone Rock Beach and the play area. The mitigation techniques are described under alternative C, Lone Rock Beach.

### **Travel on GMP Roads in Glen Canyon**

Under alternative C, conventional motor vehicles, OHVs, and street-legal ATVs would be allowed to operate on all GMP roads, including the Orange Cliffs Unit. There could be a net increase in traffic under this alternative resulting in more long term direct and indirect effects on archeological resources, and by extension ethnographic resources, the Hole-in-the-Rock Trail, and the potentially eligible TCP of the Hole-in the-Rock landscape. Impacts on 39 National Register-eligible sites and 23 sites that have not been evaluated could increase in intensity under alternative C. Similar to alternatives A and B, it is assumed that short- and long-term direct adverse impacts on National Register sites and unevaluated archeological sites in the GMP roads have already occurred. Because the integrity of the archeological deposits in the direct impact zone has been compromised continued motor vehicle use of the GMP roads would have no short- or long-term adverse impact. The potential long-term indirect adverse impacts include looting of archeological sites, purposeful vandalism of petroglyph and pictograph sites, deflation of sediments containing archeological deposits, and inadvertent vandalism of archeological and ethnographic sites. If

Glen Canyon becomes aware of an eligible cultural resource on the roadway itself, the park would mitigate the effects on that resource. The mitigation techniques are described under alternative C, Lone Rock Beach.

### **Ferry Swale**

Under alternative C, conventional vehicles, OHVs, and street-legal ATVs would be authorized for use on approximately 15 miles of designated ORV routes. Other segments of user-created routes would be closed and restored to natural conditions.

Direct and indirect impacts on National Register-eligible and unevaluated archeological sites, and by extension ethnographic resources, within the designated ORV routes would be similar to those under alternative A. It is assumed that short- and long-term direct adverse impacts on National Register and unevaluated archeological sites in the ORV route have already occurred. Because the integrity of the archeological deposits in the direct impact zone has been compromised continued motor vehicle use of the ORV routes would have no short- or long-term adverse impact. The potential indirect impacts include looting of archeological sites, purposeful vandalism of petroglyph and pictograph sites, deflation of sediments containing archeological deposits, and inadvertent vandalism of archeological and ethnographic sites. Measures designed to mitigate these effects are similar to those presented for Lone Rock Beach and the accessible shorelines.

Short-term beneficial impacts on archeological sites, some of which are ethnographic resources, would result from closing 38 miles of user-created routes. In addition, a long-term benefit to these resources would occur from the reduction and or elimination of ORV traffic in the dispersed areas of Ferry Swale and concentrating the traffic to only 15 miles of designated routes. Under these conditions, natural vegetation in the area of closed routes would be restored stabilizing local soils and by doing so reducing the potential for erosion. This would have a beneficial impact on archeological sites by preserving their physical integrity.

### **Cumulative Impacts**

Under alternative C, the same past, present, and planned future activities within Glen Canyon that have the potential to impact National Register-eligible sites under the no-action alternative would occur, and impacts would be the same as described under alternative A. The impacts of these actions, in combination with the increased motorized access proposed under alternative C could generate significant adverse impacts on these resources and could result in long-term adverse cumulative impacts on these archeological sites, and by extension ethnographic resources, the Hole-in-the-Rock Trail, and the potentially eligible TCP of the Hole-in-the-Rock landscape. However, the beneficial impacts on these historic properties accruing from greater protection of these resources by NPS using its administrative ability as stated above would provide long-term beneficial cumulative impacts under this alternative. The net result of the analysis indicates that the impacts on National Register and unevaluated sites under this alternative would be adverse.

## **Alternative D: Decreased Motorized Access**

### **Lone Rock Beach**

Under alternative D, conventional motor vehicles would be authorized for use at Lone Rock Beach, only by permit. No OHVs or street-legal ATVs would be allowed; however, off-road use of conventional motor vehicles would require an ORV permit.

No archeological sites or ethnographic resources have been identified in the Lone Rock Beach study area. Therefore, alternative D would not have a direct impact, beneficial or adverse, on archeological resources in Lone Rock Beach.



There are three unevaluated sites in the buffer (see table 18). Long-term adverse indirect impacts on these sites may result from continued operation of motor vehicles in the area. Indirect impacts would be increased risk of vandalism and looting, as well as long-term soil loss/degradation by erosion that may damage the archeological sites. These impacts are similar to those found under alternative A. Mitigation measures would be the same as those listed for Lone Rock Beach under alternative C.

### **Lone Rock Beach Play Area**

Under alternative D, the Lone Rock Beach Play Area would be closed permanently and restored to natural conditions. Impacts on archeological resources, and by extension ethnographic resources, would be the same as under alternative B.

### **Accessible Shorelines**

Under alternative D, a total of 11 accessible shoreline areas would be closed permanently, whereas four (Dirty Devil, Farley Canyon, Stanton Creek, and Hite Boat Ramp) would be authorized for off-road use by conventional motor vehicles only, by permit, subject to water-level closures.

No archeological sites, and by extension ethnographic resources, either eligible for the National Register or unevaluated are located within the four authorized accessible shorelines study areas (see table 18). Therefore, no impacts on archeological resources would be expected.

The buffer areas of the four open accessible shorelines contain eight archeological sites that are eligible for the National Register and five unevaluated sites. Long-term adverse indirect impacts on these sites may result from continued operation of conventional motor vehicles in the buffer areas. Adverse impacts on National Register-eligible and unevaluated archeological sites would be mitigated or eliminated by the following measures outlined under alternative C. Although these accessible shorelines have been surveyed, the potential exists for un-recorded sites to be impacted by conventional motor vehicles operating off-road in these areas. The potential for adverse impacts on un-recorded archeological sites may be mitigated by monitoring of ORV impacts as stipulated in the Environmental Assessment and Management/Development Concept Plans for Lake Powell's Accessible Shorelines (NPS 1988).

Under this alternative, the archeological sites, and by extension ethnographic resources, found within the 11 closed areas would benefit. The restoration of natural vegetation in these areas would reduce potential soil erosion thereby preserving the physical integrity of these resources.

### **Travel on GMP Roads in Glen Canyon**

Under alternative D, there would be no direct impacts on archaeological resources on GMP roads because OHVs and street-legal ATVs would not be permitted. Impacts on archaeological resources from conventional motor vehicles are assessed as a cumulative impact because conventional motor vehicles are not part of the scope of this plan.

### **Ferry Swale**

Under alternative D, off-road use would not be authorized in Ferry Swale and existing user-created ORV routes closed and restored to natural conditions. Impacts on archeological resources, and by extension ethnographic resources, within Ferry Swale would be the same as for alternative B.

## **Cumulative Impacts**

Under alternative D, the same past, present, and planned future activities within Glen Canyon that have the potential to impact National Register eligible sites under the no-action alternative would occur. As a result of discontinuation and non-designation of ORV routes, the impacts of decreased motorized access, under alternative D, would result in reduced long-term adverse cumulative impacts on these historic properties, compared to alternative A. However, the beneficial impacts on archeological sites, the Hole-in-the-Rock Trail, and the potentially eligible Hole-in the-Rock landscape accruing from greater protection of these resources provided under alternative D would provide long-term beneficial cumulative impacts. The net result of the analysis indicates that the impacts on National Register eligible and unevaluated sites under this alternative would be beneficial.

## **Alternative E: Mixed Use**

### **Lone Rock Beach**

Under alternative E, conventional motor vehicles, OHVs, and street-legal ATVs would continue to operate at Lone Rock Beach. However, off-road use of these motor vehicles would require an ORV permit. In addition, a 20-acre area would be designated as a vehicle-free zone (no motor vehicles of any kind would be allowed in this area).

No archeological sites or ethnographic resources have been identified in the Lone Rock Beach study area. Therefore, alternative E would not have a direct impact, beneficial or adverse, on archeological resources in Lone Rock Beach. There are three unevaluated sites in the buffer (see table 18). Long-term adverse indirect impacts on these sites may result from continued operation of motor vehicles in the area. Indirect impacts would be increased risk of vandalism and looting, as well as long-term soil loss/degradation by erosion. These adverse impacts would be similar to those under alternative C and would be mitigation similar to alternative C.

### **Lone Rock Beach Play Area**

Under alternative E, conventional motor vehicles, OHVs, and street-legal ATVs would continue to operate at Lone Rock Beach Play Area. However, off-road use of all motor vehicles would require an ORV permit and a safety flag. Impacts on archeological resources, and by extension ethnographic resources, would be the same as for alternative C.

### **Accessible Shorelines**

Under alternative E, a total of 14 accessible shoreline areas (12 existing areas plus Paiute Farms and Nokai Canyon) would be open to conventional motor vehicles and street-legal ATVs by permit, subject to water-level closures. Off-road use at Warm Creek would be discontinued.

A total of six sites eligible for the National Register and two unevaluated sites are located within the 14 accessible shorelines study areas (see table 18). Some of these sites are regarded as ethnographic resource of value to the descendent communities. Continued use of off-road motor vehicle use may result in long-term direct adverse impacts on these eight sites.

The buffers of the accessible shorelines contain 19 archeological sites that are eligible for the National Register and 37 unevaluated sites. Long-term adverse indirect impacts on these sites may result from continued operation of motor vehicles in the area. Adverse impacts would be mitigated similar to alternatives C and D. Although these accessible shorelines have been surveyed, the potential exists for un-recorded sites to be impacted by motor vehicles operating off-road in these areas. The potential for adverse impacts on un-recorded archeological sites may be mitigated by monitoring of ORV impacts as stipulated in the Environmental Assessment and Management/Development Concept Plans for Lake Powell's Accessible Shorelines (NPS 1988).

By discontinuing off-road use at Warm Creek, fewer not evaluated sites could be impacted under this alternative. In addition, OHVs would not be allowed to operate in the 14 ORV accessible shoreline areas further reducing potential impacts. Under alternative E, the archeological sites, and by extension ethnographic resources, found within Warm Creek would benefit. The restoration of natural vegetation in at this shoreline would reduce potential soil erosion thereby preserving the physical integrity of these resources. The loss of one shoreline access area is not anticipated to result in substantial impacts on archeological resources at the other 14 areas as a result of increased demand for access and visitation to those sites, because the remaining areas is expected absorb the increased demand without additional disturbance of resources.

### **Travel on Unpaved and Paved GMP Roads in Glen Canyon**

Under alternative E, conventional motor vehicles and street-legal ATVs would be authorized on all GMP roads, with the exception of the Orange Cliffs Unit where street-legal ATVs would not be allowed. Additionally, OHVs would be limited to unpaved GMP roads, with the exception of the Orange Cliffs Unit.

Long-term indirect adverse effects on the 39 National Register and 23 unevaluated archeological sites, and by extension ethnographic resources, located within the boundaries of these linear road corridors would continue to occur under this alternative. Archeological sites, the Hole-in-the-Rock Trail, and the potentially eligible TCP of the Hole-in-the-Rock landscape in these areas would continue to be impacted by ongoing use. The effects of erosion as a result of runoff from compacted areas, as discussed for other alternatives, would continue to impact areas immediately adjacent to roads, particularly near culverts and in areas of steeper terrain. Similar to alternatives A, B, C, and D, short and long-term direct adverse impacts on National Register and unevaluated archeological sites within the roadway of the GMP roads have already occurred. Because the integrity of the archeological deposits in the direct impact zone has been compromised, continued, and increased in some instances, motor vehicle use of the GMP roads would have no adverse impact. The potential indirect impacts include looting of archeological sites, purposeful vandalism of petroglyph and pictograph sites, deflation of sediments containing archeological deposits, and inadvertent vandalism of archeological and ethnographic sites. If Glen Canyon staff become aware of an eligible cultural resource on the roadway itself, the park would mitigate the effects on that resource. Mitigation techniques are described under alternative C, Lone Rock Beach.

### **Ferry Swale**

Under alternative C, conventional vehicles, OHVs, and street-legal ATVs would be authorized for use on approximately 15 miles of designated ORV routes by permit. Other user-created routes would be closed and restored to natural conditions. Direct and indirect impacts would be the same as alternative C.

### **Cumulative Impacts**

Under alternative E, the same past, present, and planned future activities within Glen Canyon that have the potential to impact National Register eligible archeological sites, and by extension ethnographic resources, under the no-action alternative would occur, and impacts would be the same as described under alternative A. The impacts of these actions, in combination mixed use, would result in long-term adverse cumulative impacts on this class of historic properties. However, the beneficial impacts on archeological sites, the Hole-in-the-Rock Trail, and the potentially eligible Hole-in-the-Rock TCP landscape accruing from greater protection of these resources provided under alternative E would provide long-term beneficial cumulative impacts. The net result of the analysis indicates that the impacts on National Register eligible and unevaluated sites under this alternative will be beneficial.

## **CONCLUSION**

Table 37 is a comparison of impacts on archeological resources.

**TABLE 37: COMPARISON OF IMPACTS ON ARCHEOLOGICAL RESOURCES ACROSS ALTERNATIVES**

Location	Contributing Elements/ Affected Resources (# of sites)	Eligible and Unevaluated Sites Impacted				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
<b>Lone Rock Beach</b>	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 3	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 3	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 0	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 3	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 3	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 3
<b>Lone Rock Beach Play Area</b>	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 3 mitigated sites Buffer: 1	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 3 mitigated sites Buffer: 1	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 0	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 3 mitigated sites Buffer: 1	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 0	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 3 mitigated sites Buffer: 1
<b>Accessible Shoreline Areas</b>	<b>Eligible</b> Study Area: 6 Buffer: 19 <b>Unevaluated</b> Study Area: 4 Buffer: 37	<b>Eligible</b> Study Area: 3 Buffer: 19 <b>Unevaluated</b> Study Area: 2 Buffer: 25	<b>Eligible</b> Study Area: 0 Buffer: 0 <b>Unevaluated</b> Study Area: 0 Buffer: 0	<b>Eligible</b> Study Area: 6 Buffer: 19 <b>Unevaluated</b> Study Area: 4 Buffer: 37	<b>Eligible</b> Study Area: 0 Buffer: 8 <b>Unevaluated</b> Study Area: 0 Buffer: 5	<b>Eligible</b> Study Area: 6 Buffer: 19 <b>Unevaluated</b> Study Area: 2 Buffer: 37
<b>GMP Roads</b>	<b>Eligible</b> Study Area: 39 <b>Unevaluated</b> Study Area: 23	<b>Eligible</b> Study Area: 17 <b>Unevaluated</b> Study Area: 6	<b>Eligible</b> Same as alternative A <b>Unevaluated</b> Same as alternative A	<b>Eligible</b> Study Area: 39 <b>Unevaluated</b> Study Area: 23	<b>Eligible</b> Study Area: 0 <b>Unevaluated</b> Study Area: 0	<b>Eligible</b> Same as alternative A <b>Unevaluated</b> Same as alternative A
<b>Ferry Swale</b>	<b>Eligible</b> Study Area: 6 <b>Unevaluated</b> Study Area: 3	<b>Eligible</b> Study Area: 6 <b>Unevaluated</b> Study Area: 3	<b>Eligible</b> Study Area: 0 <b>Unevaluated</b> Study Area: 0	<b>Eligible</b> Study Area: 6 <b>Unevaluated</b> Study Area: 3	<b>Eligible</b> Study Area: 0 <b>Unevaluated</b> Study Area: 0	<b>Eligible</b> Study Area: 6 <b>Unevaluated</b> Study Area: 3

Compared to all the other alternatives including alternative A, alternative B is the most protective of cultural resources because it eliminates most direct and indirect adverse impacts on archeological sites, some of which are ethnographic resources. Alternative B also conveys a long-term benefit through stabilization of areas with archeological sites by restoration of natural vegetation. In terms of protecting these resources alternative B is followed by alternative D which will decrease motorized traffic by prohibiting OHV and street-legal ATV use within Glen Canyon and also discontinuing off-road use at 11 accessible shorelines and at Ferry Swale, resulting in both short and long-term benefits to archeological sites through protection and stabilization. Alternative E falls between alternatives B and D in terms of impacts on archeological sites. Under this alternative off-road use would be allowed at 14 accessible shorelines as well as 15 miles of designated ORV routes in Ferry Swale. Compared to all the other alternatives, alternative C would generate the most direct and indirect adverse impacts by increasing

motorized access from 13 to 15 accessible shorelines, increasing the types of motor vehicles allowed on GMP roads, including the Orange Cliffs Unit, as well as designating 15 miles of ORV routes in Ferry Swale.

Although adverse impacts on archeological sites, some of which are ethnographic resources, could occur under all alternatives, they may not meet the contextual significance criteria defined in NEPA regulations. However, these impacts, particularly under alternatives C and E, will be sufficient to trigger Section 106 of the NHPA, as amended. Section 106 makes no distinction between direct and indirect impacts as any action that negatively affects the integrity of a historic property is regarded as an adverse effect.

Section 106 provides for the identification and resolution of adverse effects (impacts) to National Register listed or eligible archeological sites. In general, resolution of adverse effects is achieved by consultation among federal agency, in this case NPS, relevant SHPOs, appropriate THPOs, and other interested parties like the ranching community. Once the consulting parties have agreed on a set of measures to mitigate the adverse effect on the historic property, the measures are incorporated into a programmatic agreement. The programmatic agreement stipulates the legal authority under which the measures are being undertaken, the responsible parties, and the character and intensity of the measures themselves. Because adverse effects are likely to result from all but alternative B, NPS is currently undertaking Section 106 consultation regarding the management of off-road use and on-road use of OHVs and street-legal ATVs. Documents demonstrating compliance with Section 106 of the NHPA, as amended are presented in the appendix A of this plan/DEIS.

## ETHNOGRAPHIC RESOURCES

NPS defines “ethnographic resources” as “objects and places, including sites, structures, landscapes, and natural resources, with traditional cultural meaning and value to associated peoples” (NPS 2006a). These resources are the cultural and natural features of a park that are closely linked with their own sense of purpose, existence as a community, and development as ethnically distinctive peoples. These places may support ceremonial activities, migration routes, or harvesting or collecting places. Continued access and use of ethnographic resources is often essential to the survival of family, community, or regional cultural systems, including patterns of belief and sociocultural and religious life (NPS 2006a).

Some ethnographic resources or places are eligible for inclusion in the National Register of Historic Places as Traditional Cultural Properties (TCP) because of their association with the cultural practices or beliefs of a living community that are (1) rooted in that community’s history, and (2) important in maintaining the continuing cultural identity of the community (NPS 2006a; Parker 1993; and Parker and King 1998).

Further, NPS is directed to allow traditionally associated people access to and use of ethnographic resources that are essential for their cultural survival with the caveat that such use can be sustained without causing unacceptable impacts (NPS 2006a). Additionally, NPS is directed to pursue opportunities to improve management of its resources by pursuing cooperative conservation with traditionally associated peoples (Executive Order 13352, Facilitation in Cooperative Conservation).

The potentially National Register-eligible TCP of the Hole-in-the-Rock landscape, inclusive of the unpaved GMP road, would be the only historic property of this type to be carried through the analysis. This decision was made following consultation with the five contemporary Native American tribes most closely associated with Glen Canyon, The Church of Jesus Christ of Latter-day Saints, and other consulting parties.

The Hole-in-the-Rock site is a part of the historic Hole-in-the-Rock wagon trail directly associated with the colonization of the region by Latter-day Saints pioneers in the late nineteenth-century. It represents an engineered passage traversing a 1000-foot gorge over-looking the Colorado River. This cultural resource is managed by Glen Canyon as part of its unpaved GMP road system. In recent years, members of The Church of Jesus Christ of Latter-day Saints have been permitted to conduct re-enactments of the events leading to the passage of the Colorado River

through the Hole-in-the-Rock. These re-enactments include camping along the historic trail in both Glen Canyon and Grand Staircase – Escalante National Monument.

The Hole-in-the-Rock landscape inclusive of the road corridor seems to meet the criteria for a TCP because it is significant to members of The Church of Jesus Christ of Latter-day Saints as a location associated with their pioneer history, and it continues to be important in the maintenance of their ongoing communal identity and in their development as an ethnically distinctive group (Sucec 2012). The significance of the corridor is documented in the 2011 Programmatic Environmental Assessment for Organized group Activities along Hole-in-the-Rock Road. Nevertheless, impacts can be considered to be for the reasons cited above. Further, in consulting on the Hole-in-the-Rock EA, The Church of Jesus Christ of Latter-day Saints community was a proponent for increased use by organized groups; they do not view pedestrian and vehicular use as having more than impacts.

### **ALTERNATIVE A: NO ACTION**

The Hole-in-the-Rock is managed as an unpaved GMP road. Consequently, under alternative A, conventional motor vehicles and street-legal ATVs would continue to be authorized to operate inside the boundaries of this potential TCP landscape. This could leave the site vulnerable to the long term indirect adverse impact of purposeful and inadvertent vandalism. Maintenance of current management practices would have a beneficial long term impact because it would allow continued access to the site by members of The Church of Jesus Christ of Latter-day Saints for permitted activities such as re-enactments and over-night camping.

#### **Cumulative Impacts**

Under alternative A, the Programmatic Environmental Assessment for Organized Group Activities along Hole-in-the-Rock Road may affect the potential Hole-in-the-Rock TCP; the no-action alternative would have cumulative effects due to the potential for vandalism offered by the continuance of existing management policies. This adverse impact is somewhat off-set by the use of the potential TCP landscape for heritage commemoration by The Church of Jesus Christ of Latter-day Saints community.

### **ALTERNATIVE B: NO OFF-ROAD USE**

Under alternative B, conventional motor vehicles and street-legal ATVs would continue to operate on the unpaved GMP road. This would result in the same indirect impacts as those described for alternative A.

#### **Cumulative Impacts**

Under alternative B, the same past, present, and planned future activities within the Glen Canyon that have the potential to affect the Hole-in-the-Rock and potential TCP of the Hole-in-the-Rock under no-action alternative would occur, and cumulative impacts would be the same as described under alternative A.

### **ALTERNATIVE C: INCREASED MOTORIZED ACCESS**

Under alternative C, the indirect impacts would be similar to those from the no-action alternative. Conventional motor vehicles and street-legal ATVs would continue to be allowed on unpaved GMP roads, however, under this alternative, OHVs would also be authorized to operate on unpaved GMP roads. Increase motor vehicle access would have a beneficial long term impact because it would allow continued and expanded access to the site by members of The Church of Jesus Christ of Latter-day Saints for permitted activities such as re-enactments and over-night camping. With the addition of OHVs on unpaved GMP roads, however, there is the potential for increased vandalism.

## **Cumulative Impacts**

Under alternative C, the same past, present, and planned future activities within Glen Canyon that have the potential to affect the Hole-in-the-Rock under the no-action alternative would occur, and impacts would be the same as described under alternative A. The impacts of these actions, in combination with the adverse impacts on the potential TCP landscape under alternative C, would result in long-term adverse cumulative impacts on this historic property.

## **ALTERNATIVE D: DECREASED MOTORIZED ACCESS**

Under alternative D, only conventional motor vehicles would be authorized to operate on all unpaved GMP roads in Glen Canyon, including the Hole-in-the-Rock landscape. This alternative could decrease public access by prohibiting the use of unpaved GMP roads by OHVs and street-legal ATVs. This has the potential to constrain access by members of The Church of Jesus Christ of Latter-day Saints for the purpose of heritage commemoration and would constitute a negative impact on that community. A mitigation strategy could be implemented to allow use of the Hole-in-the-Rock road during permitted group activities. Beneficial effects would flow from this alternative in the form of reduced potential for purposeful and inadvertent vandalism as a result of decreased motorized access.

## **Cumulative Impacts**

Under alternative D, the same past, present, and planned future activities would occur within Glen Canyon that have the potential to impact the Hole-in-the-Rock and the potential TCP Hole-in-the-Rock landscape under the no-action alternative and impacts would be the same as described under alternative A. The impacts of these actions, in combination with the adverse impacts on the potential TCP under alternative D, would result in long-term adverse cumulative impacts on the historic property. However, the beneficial impacts on the Hole-in-the-Rock accruing from greater protection of this resource provided under alternative D would provide long-term beneficial cumulative impacts.

## **ALTERNATIVE E: MIXED USE**

Impacts under alternative E would be the same as alternative C, as the Hole-in-the-Rock would be accessed by conventional motor vehicles, OHVs, and street-legal ATVs.

## **Cumulative Impacts**

Under alternative E, the same past, present, and planned future activities would occur within Glen Canyon that have the potential to affect the Hole-in-the-Rock TCP under the no-action alternative and impacts would be the same as described under alternative A. The impacts of these actions, in combination with the adverse impacts on the potential TCP under alternative E, would result in long-term adverse cumulative impacts on this historic property. However, the beneficial impacts on the Hole-in-the-Rock TCP eligible landscape accruing from greater protection of this resource provided under alternative E would provide long-term beneficial cumulative impacts.

## **CONCLUSION**

Compared to all the other alternatives including alternative A, alternative D is the most protective of cultural resources because it reduces the potential for indirect adverse impacts on the Hole-in-the-Rock and potentially National Register eligible Hole-in-the-Rock landscape TCP as a result of decreased motorized access (no OHVs or street-legal ATVs allowed on unpaved GMP roads, as well as the rest of Glen Canyon). However, this alternative could have long-term adverse impact on The Church of Jesus Christ of Latter-day Saints community by limiting

access of unpaved GMP roads to conventional motor vehicles only. Alternative C and E are the least protective as both alternatives add OHVs to conventional motor vehicles and street-legal ATVs as motor vehicles allowed to operate on unpaved GMP roads. Impacts of alternative B would be similar to alternative A as it allows conventional motor vehicles and street-legal ATVs to operate on unpaved GMP roads.

As stated in the preceding archeological resources section, adverse impacts on National Register listed or eligible properties trigger Section 106 of the NHPA, as amended. In this case, the Hole-in-the-Rock landscape TCP is regarded as potentially eligible. As such it would be afforded the same consideration as the listed Hole-in-the-Rock property until such time as its eligibility for the National Register is evaluated.

All alternatives would have adverse impacts on the Hole-in-the-Rock landscape TCP. Measures to mitigate the adverse effect on the historic property will be incorporated into a programmatic agreement. Because adverse effects are likely to result from all alternatives NPS is currently undertaking Section 106 consultation regarding the management decision that could affect this unpaved GMP road. Documents demonstrating compliance with Section 106 of the NHPA, as amended are presented in the appendix A of this plan/DEIS.

## **SOCIOECONOMICS**

### **GUIDING REGULATIONS AND POLICIES**

Although economic or social effects do not by themselves require the preparation of an EIS, when an EIS is prepared and economic or social and natural or physical environmental effects are interrelated, then the EIS must discuss all these effects on the human environment (40 CFR 1508.14). CEQ also requires NPS to consider the effects of actions on the quality, growth, expansion, and use of outlying and gateway communities (40 CFR 1502.16).

NEPA requires the analysis of social and economic impacts resulting from proposed major federal actions in an EIS. From these requirements, NPS has identified conditions that it wants to achieve in association with its management of national parks. These conditions are described in the *NPS Management Policies 2006* (NPS 2006a). Furthermore, Section 2.3.1.4 of *NPS Management Policies 2006* (NPS 2006a) requires that decisions documented in planning products such as environmental analyses be based on the current scientific understanding of park ecosystems, the cultural context, and the socioeconomic environment.

### **METHODOLOGY AND ASSUMPTIONS**

The methodology for determining the level of potential socioeconomic impact was based on several factors, including economic data, historic visitor use data, and economic studies related to ORV recreation trip expenditures and economic impacts. A mostly qualitative analysis based on the professional expertise and judgment of planning team members and outside experts was sufficient to compare the impacts of the alternatives for decision-making purposes. However, where possible the planning team incorporated quantitative measures into the analysis. The “Socioeconomics” section in chapter 3 provides a thorough discussion on the socioeconomic environment and the economic impacts of motor vehicle recreation.

This socioeconomic impact analysis considers direct and indirect impacts on the local and regional economies. Direct impacts are defined as those that occur when individuals make expenditures to support their recreational activity, including the purchase of vehicles and related equipment and the costs of maintaining and operating them. Indirect impacts occur when individuals take recreation trips and spend money on restaurants and groceries, lodging (including camping fees), souvenirs, and other trip-related expenditures.

The economic effects of the ORV management alternatives are based on estimated ORV visitation to Glen Canyon, associated visitor spending, and the economic impacts (i.e., jobs, labor income, gross regional product) generated



by this spending. Glen Canyon attracts a large number of visitors, almost all of whom are from outside Glen Canyon. These visitors consume from local businesses, such as restaurants, hotels, and retail outlets, in communities surrounding and in Glen Canyon during their visits, contributing to local economies. The economic contribution of the visitor spending is a function of how many visitors arrive, and how much money they spend while visiting.

Visitor spending benefits for Glen Canyon have been estimated by the MGM2 model (Stynes 2011). Glen Canyon had a total of 2,270,817 recreation visitors in 2011, with 1,311,741 overnight stays (Cui et al. 2013). Total spending associated with Glen Canyon visitation in 2011 was estimated to be \$233,895,000, all of which was spent by nonlocal visitors (Cui et al. 2013). The total labor income generated by this spending was over \$88,152,000, and the gross regional product was \$138,044,000. This economic activity supported 2,755 jobs in the local economy, as further described below (Cui et al. 2011). The economic impacts are typically felt in communities within 60 miles of Glen Canyon. However, because Glen Canyon is located in a remote and isolated area, visitor spending could also occur in communities farther away from Glen Canyon, perhaps even as far as St. George and Flagstaff, Arizona, as campers, boaters, or other recreationists gather supplies for their vacation at Glen Canyon.

The number of jobs (employment) supported by visitor spending to Glen Canyon is estimated to be 2,755, which includes direct jobs in accommodations, food and beverage establishments, grocery stores, other retail sales, and service industries. This employment also includes jobs that are supported by the direct industry workers spending their money in the local economies, supporting indirect jobs and income in other sectors, such as health care, retail sales, and construction.

The socioeconomic analysis uses the vehicle counts, visitation, visitor spending, and economic impact ratios from the MGM2 model (described previously) to estimate, and in some cases quantify, the economic effects of potential reductions in ORV visitation on local economies. Vehicle counts were accessed from NPS Public Use Statistics website or were provided from counts at Glen Canyon. It is assumed that all visitors are nonlocal visitors (unless stated otherwise), coming from more than 60 miles from Glen Canyon, based on Glen Canyon being a remote and isolated global attraction drawing visitors from around the United States and around the world. Additionally, the MGM2 model assumes that the visitor spending associated with Glen Canyon is all generated by nonlocal visitors. Local visitors do not inject new money and spending into the region associated with visiting Glen Canyon; their jobs and income contribute to the local economies, but their spending cannot be attributed to the visitation of Glen Canyon.

On average, each visitor spent approximately \$103 per visit in 2011 (Cui et al. 2013). For every \$85,000 annually spent by visitors, one job, \$32,035 in labor income, and \$50,167 in gross regional product is supported in the local economies (Cui et al. 2013); generally, this is considered to be counties within 60 miles of Glen Canyon. Where needed, it is assumed that there are approximately 2.5 people per ORV (NPS Public Use Statistics Office 2012) and 1.5 people per ATV.

It is also assumed that there are other factors also known to affect visitation aside from management decisions, including the price of gas; national and regional economic conditions, which can affect the amount and availability of disposable income; lake levels; the availability and quality of substitute sites; trends in vacation and recreational activities; local celebrations that briefly increase the general population base; and information provided by public and private sources. These factors can be very important in influencing visitation levels.

## Context

The geographic area assessed includes counties in the Glen Canyon vicinity, including Garfield, Kane, San Juan, and Wayne Counties in Utah. Additionally, Coconino County is included in the study area; it lies in the Arizona portion of Glen Canyon and is a geographically large county including the city of Flagstaff, Arizona. It is possible that communities in the Utah counties of Washington, Iron, and Sevier would also be affected by visitor spending

associated with Glen Canyon because their labor force is closely associated with the Glen Canyon counties, so these counties are also included as needed in the context.

### **ALTERNATIVE A: NO ACTION**

#### **Lone Rock Beach**

Under the no-action alternative, current management practices would continue at Lone Rock Beach. Lone Rock Beach is currently open to conventional motor vehicles, OHVs, and street-legal ATVs. Motor vehicles may be operated from the operator's camping location to the Lone Rock Beach Play Area. In 2010, approximately 52,000 vehicles entered Lone Rock Beach and/or Lone Rock Beach Play Area, which represented almost 7% of all vehicle counts in Glen Canyon (NPS 2012a). Vehicle counts at Lone Rock have increased by a large amount in 2011, with a 35% increase to almost 77,000 vehicles (not including December counts), which represents 8% of 2011 vehicle counts.

Assuming 2.5 visitors per vehicle, 2010 and 2011 Lone Rock Beach visitation represent 7% and 9%, respectively, of 2010 visitation figures and 6% and 8% of 2011 visitation figures. These visitors to Lone Rock Beach are estimated to spend approximately \$13.4 to \$19.8 million in local economies in and surrounding Glen Canyon. This visitor spending is estimated to annually contribute from 156 to 233 jobs, \$5.0 to \$7.8 million in labor income, and \$7.5 to \$11.7 million in gross regional product. Under this alternative, these visitors would continue to beneficially contribute to the local economies through their visitor spending, having a small but important impact on local communities. Proximate communities are the primary beneficiaries associated with the ORV visitor spending contributions, including jobs, income, and taxes.

An estimated 498 ATVs/OHVs visited Lone Rock Beach and/or Lone Rock Beach Play Area in 2007, with an estimated visitation of 747 ATV/OHV riders. In 2011, 1,681 OHVs and street-legal ATVs were reported in Lone Rock Beach; data included captures vehicles that were trailered in and recorded by the entrance station. However, this figure does not capture off-road use, or the number of ORVs that entered the area when the entrance station was closed, either seasonally or after hours (NPS 2012a). In 2011, these ORVs, with an associated 2,522 visitors to Lone Rock Beach and Lone Rock Beach Play Area represent approximately 0.1% of visitors to Glen Canyon and spend an estimated \$234,000 annually, making a limited contribution to jobs and income in the region. Therefore, the bulk of the Lone Rock Beach visitation is likely conventional motor vehicles accessing the beach.

#### **Lone Rock Beach Play Area**

The play area is a fenced, 180-acre area that is open to high-intensity motor vehicle use. Under the no-action alternative, the play area would continue to be open to conventional motor vehicle, OHV, and street-legal ATV operators to develop riding skills, operate at high speeds, and perform jumps and hill climbs. An estimated 1,681 OHVs and street-legal ATVs may have visited the Lone Rock Beach Play Area in 2011. The economic benefits associated with the accessibility of Lone Rock Beach Play Area are included in the Lone Rock Beach assessment due to limited data for the play area.

#### **Accessible Shorelines**

The 13 accessible shoreline areas, which are intended to provide public conventional motor vehicle access to the shoreline for the purposes of primitive recreation use, would continue to be authorized or would have the potential to be reopened, if the accessible shoreline is currently closed. The most popular accessible shoreline areas have been Bullfrog North and South, Stanton Creek, and Hite Boat Ramp, although Bullfrog North and South have been closed since 2002 due to low water levels. Currently Warm Creek, Crosby Canyon, and Bullfrog North and South are temporarily closed due to low lake elevation, but they would be reopened if future conditions allow and Glen Canyon staff deems it appropriate. The Paiute Farms and Nokai Canyon accessible shorelines are not officially

open, although they are currently being accessed. Under alternative A, off-road use of these two areas would be discontinued and management action taken to prevent access.

There were 5,716 vehicles at Stanton Creek in 2002, whereas 9,680 vehicles visited Bullfrog North and South in 2002. Stanton Creek had fewer vehicle visits in 2007, with 3,953 vehicles recorded. In 2009 and 2011, Stanton Creek off-road visitation also was less than visitation in 2002, 590 to 1,680 vehicles respectively, as higher lake elevations provided a smaller area for off-road use. The Stanton Creek vehicle counts represented less than 1% (0.7% in 2002 and 0.6% in 2007) of all vehicles accessing Glen Canyon. This portion of visitors accounts for approximately \$1.5 million in visitor spending in 2011, supporting 18 jobs, \$573,000 in labor income, and \$897,000 in gross regional product.

Bullfrog visitation in 2002 represented 1.3% of total in Glen Canyon in 2002; this portion of 2011 Glen Canyon visitation supported approximately \$3.0 million in visitor spending, 36 jobs, \$1.1 million in labor income, and \$1.8 million in gross regional product.

The Hite developed area is also a popular area. It includes the Hite Boat Ramp accessible shoreline, primitive and RV camping, a marina, and a gas station. Visitation to this entire developed area, not just the accessible shoreline, accounted for approximately 3% of total visitation to Glen Canyon in 2005 (NPS 2008e). The Hite developed area visitation has varied; lower visitation is associated with lower lake levels. Since 1999, Hite developed area visitation has decreased annually, with the lowest use in 2005 of 59,405 visitors (NPS 2008e). These 59,000 visitors in 2005 represented not only visitors to the accessible shoreline at Hite Boat Ramp, but also those launching boats, visiting the ranger station, driving through the northern part of Glen Canyon, and camping. If it is assumed that one-tenth of the visitors to the Hite developed area have the primary purpose of visiting the accessible shoreline at Hite Boat Ramp, which is likely a conservative figure, then approximately 6,000 people visited Hite Boat Ramp accessible area in 2005, representing 0.3% of visitation in 2005. The Hite Boat Ramp accessible shoreline visitation portion of Glen Canyon visitation is estimated to support approximately \$702,000 in visitor spending, 8 jobs, \$274,000 in labor income, and \$414,000 in gross regional product in 2011.

Visitation to the other accessible shorelines has been limited, and fluctuations in Lake Powell's levels over the last decade have been a contributing factor to the small amount of visitation at these areas. Visitation to Stanton Creek and other accessible shoreline areas would continue under alternative A, with direct beneficial effects on local economies as described above. However, if Stanton Creek visitation represents the bulk of the visitation to the accessible shoreline areas, the beneficial impacts on local economies from this visitation would continue to be limited.

## **Travel on GMP Roads in Glen Canyon**

Under the no-action alternative, conventional motor vehicles and street-legal ATVs would continue to be allowed to operate on all GMP roads in Glen Canyon, except street-legal ATVs would not be allowed at the Orange Cliffs Unit. ATVs that do not meet the street-legal requirements under Utah and Arizona code are prohibited from operating on any road in Glen Canyon.

The prevalence of street-legal ATVs (as well as OHVs because they are generally categorized together) on Glen Canyon roads is not known at this time, although the Glen Canyon Visitor Use Study (University of Idaho 2008) and the NPS suggest that ATV/OHV riding is not a prominent or primary activity at Glen Canyon (NPS 2012c) despite street-legal ATVs being authorized on Utah roads since 2008 under Senate Bill 181, and subsequently authorized for operation on Glen Canyon GMP roads. It is likely that street-legal ATV (and OHV) riders come to Glen Canyon not only to ride their vehicles but also to participate in other activities, such as boating, fishing, swimming, or camping.

There are an estimated 4,210 registered OHVs in the four Utah counties, while 35% of households in Coconino County, Arizona are OHV users (Utah State Parks and Recreation 2012; Arizona State Parks 2003). Wayne County, Utah estimated that there were three street-legal ATVs in the county, while Kane and San Juan counties indicated that there were several street-legal ATVs in their counties. Data on street-legal ATVs in Coconino County, Arizona and Garfield County, Utah were not available but it is likely that only a very small proportion of ATVs are street-legal. Since there are so few street-legal ATVs in these counties in close proximity to Glen Canyon, it is likely that there is not considerable street-legal ATV use of GMP roads. The current level of visitation is expected to continue under this alternative. The ability to continue to ride conventional motor vehicles and street-legal ATVs on Glen Canyon roads is likely to have a minimal impact on socioeconomic resources.

### Ferry Swale

Off-road use, though currently illegal, occurs throughout the Ferry Swale area before crossing onto federal lands administered by the BLM, including the Vermilion Cliffs National Monument, an area of sensitive geologic formations. Because of its proximity to Page, Arizona, this area is popular with local ORV users. This illegal use has contributed to the creation of user-created routes (not formally designated routes) in the Ferry Swale area. Under alternative A, approximately 53 miles of ORV routes would be designated for off-road use by conventional vehicles, OHVs, and street-legal ATVs and the remaining user-created routes closed. Due to the increasing popularity of off-road use of Ferry Swale, alternative A could have some beneficial impacts on socioeconomic resources as this previously illegal use would be authorized. However, since a large portion of the visitors already reside in proximate communities, the impacts on socioeconomic resources associated with designating ORV routes in this area would be limited.

### Cumulative Impacts

Other past, present, and planned future activities within Glen Canyon have the potential to affect visitation, visitor spending, with potential impacts on local economies. In recent years, the rising and falling water levels as a result of natural fluctuations and dam operations have exposed more or less of the accessible shoreline areas, impacting the areas available for recreation. Following these events, several popular accessible shoreline areas have been closed due to accessibility issues, resulting in an adverse impact on visitation, visitor spending, and economic contributions to local economies. Additionally, Glen Canyon visitation can also be affected by other factors such as the health of the economy, trends in vacation and recreational activities, the price of gasoline, the character and condition of the recreation and access areas, local celebrations that briefly increase the general population base, and information provided by public and private sources.

Beneficial impacts on visitation and visitor spending have occurred, and would continue to occur into the future, from the implementation of the following actions:

- Buildout of Antelope Point Marina.
- Construction and Operations of Town of Escalante Hole-in-the-Rock Cultural Center.
- Development and Operations of the Amangiri Resort adjacent to Ferry Swale.

Additionally, existing plans and actions that determine the existing uses of Glen Canyon for ORVs would continue to guide and affect visitation and visitor spending in local economies. Adverse impacts may result from these management plans that restrict visitor use, including where OHVs and street-legal ATVs can be operated and which accessible shoreline areas are open to visitor use. In the interest of protecting resources, some of these management plans may restrict some visitor opportunities in certain locations, which may result in slight adverse impacts on visitor spending and local economies.

Additional actions include the development and operation of the Amangiri Resort, which would draw additional visitors to the area, beneficially impacting visitor spending in local economies. The buildout of Antelope Point Marina which includes a floating marina village and boat docks, dry storage for boats, campground and RV park, a resort hotel and cultural center, and supporting infrastructure, is likely to draw additional visitors to Glen Canyon, beneficially impacting visitor spending in local economies. Visitors to the Town of Escalante Cultural Center could also be drawn to visit Glen Canyon Recreation Area, slightly benefiting local economies. Construction activities associated with these actions also bring jobs and income to the local communities surrounding Glen Canyon.

The potentially adverse impacts of rising and falling water levels, higher gasoline prices, and current management plans that restrict access, may adversely affect visitation and visitors spending levels; however, since Glen Canyon is an internationally-renowned destination area and current visitation levels are beneficially supporting local economies, these cumulative impacts are likely to be relatively low in context of the total demand, use and visitation to Glen Canyon. With current and future infrastructure, marina, cultural facility, and adjacent resort development and improvements expected to beneficially affect visitation and visitor spending, the cumulative impacts on local economies in combination with the no-action alternative would be beneficial, although these impacts are not expected to noticeably affect the socioeconomic environment. Long term cumulative impacts associated with alternative A to visitor spending, jobs, and income are expected to beneficially effect local communities, making a small economic contribution to the region; however, these beneficial effects are likely not to be noticeable in the larger regional economic context of the study area socioeconomic resources.

## **ALTERNATIVE B: NO OFF-ROAD USE**

### **Lone Rock Beach**

Lone Rock Beach would be closed permanently to all off-road use and restored to natural conditions. Visitation to Glen Canyon would likely decrease without the opportunity to access Lone Rock Beach by a motor vehicle. Without the ability to access Lone Rock Beach, with its unique beach experience, ORV users may seek out other recreation opportunities outside the region, which would have an adverse effect on the local economy. There are other off-road opportunities on lands adjacent to Glen Canyon, managed by the BLM, including the Arizona Strip Field Office, Richfield Field Office, Monticello Field Office, and Grand Staircase – Escalante National Monument. There are an estimated 3,700 miles of designated ORV routes in Richfield Field Office, and 908 miles of ORV routes in Grand Staircase – Escalante National Monument, 553 miles of which are open to OHVs (Downey 2012). To the extent that Glen Canyon visitors would choose to visit nearby substitute ORV areas, the adverse effects on local economies could be partially offset.

It is possible that ORV visitors would still visit Glen Canyon to experience the other attractions, perhaps accessing Lone Rock Beach by boat or parking along Lone Rock Beach Road and walking to the beach area. It is also likely that visitors who value a more natural experience would visit this area on foot. However, the preclusion of off-road use under alternative B is not expected to increase use at the beach.

In 2010 and 2011, Lone Rock Beach vehicle counts and visitation represented 7% and 9%, respectively, of the total 2010 visitation and 6% and 8% of 2011 visitation to Glen Canyon (NPS 2012a). These visitors were primarily ORVs accessing Lone Rock Beach and/or Lone Rock Beach Play Area. If it is assumed that none of the previous Lone Rock Beach users would visit Glen Canyon given the restrictions under alternative B, Glen Canyon visitation could decrease by up to 9% associated with the closure of these areas. It is possible that up to \$21.1 million in visitor spending would be lost to the local economies if visitation were to decrease by 9%. The local and regional economies would be directly and adversely affected by these closures, which would result in the loss of up to 248 jobs, \$7.9 million in labor income, and \$12.4 million in gross regional product in the five-county study area. It is likely that not all Lone Rock Beach users would cease to visit Glen Canyon; therefore, these impacts would be expected to be less than those stated here. There would be adverse effects associated with decreased visitor

spending associated with alternative B; however, within the five-county study area, the loss of 248 jobs represents a very small portion of economic activity, less than 0.3% of employment in the region.

### **Lone Rock Beach Play Area**

Lone Rock Beach Play Area would be closed permanently to all motor vehicles and restored to natural conditions. The play area represents a unique experience in the area, where conventional motor vehicles, OHVs, and street-legal ATVs are authorized for use. Although visitation data does not exist for the play area itself, it is likely that some of the users who visit Lone Rock Beach come for the play area experience. There are no other off-road play area opportunities within the Page, Arizona area. The economic impacts associated with the closure of the Lone Rock Beach Play Area are included in the Lone Rock Beach assessment due to limited data for the play area. As a result of the Lone Rock Beach and Lone Rock Beach Play Area closure, the local economies would be directly and adversely impacted, as described in the Lone Rock Beach section.

### **Accessible Shoreline Areas**

Under alternative B, off-road use at the 13 accessible shorelines, plus Paiute Farms and Nokai Canyon, would be discontinued, and accessible shorelines would be restored to natural conditions. The most popular accessible shorelines include Hite Boat Ramp, Bullfrog North and South and Stanton Creek, although Bullfrog North and South have been closed since 2002 due to low water levels.

Stanton Creek is a popular accessible shoreline area. Hite Boat Ramp also has a fair amount of visitation, likely due to the accessible shoreline, boat launch, ranger station, and camping amenities in the Hite Marina area. The other accessible shoreline areas are not a strong attraction to Glen Canyon and have minimal visitation throughout the year due to their remoteness and isolation. Approximately 1.3% of visitors are estimated to access Stanton Creek and Hite Boat Ramp (Bullfrog North and South are currently closed), which accounts for approximately \$3.0 million in visitor spending, supporting 36 jobs, \$1.1 million in labor income, and \$1.8 million in gross regional product in 2011.

With use of Stanton Creek, Hite Boat Ramp, and the other accessible shoreline areas discontinued, it is possible that visitation related to accessible shorelines could decrease by approximately 1.3%, adversely affecting visitor spending and local economies. Because Glen Canyon provides a unique setting with the ability to drive and recreate on the beaches, it is possible that visitors would no longer choose to visit Glen Canyon because off-road use would be discontinued at accessible shorelines. The impact of the discontinued use would be limited because the contribution of these visitors to the local economies is relatively small. For example, in 2009, 36 jobs represented 0.2% of the four-county region in Utah, and 0.04% of the five-county study area. Additionally, there are other off-road opportunities on lands adjacent to the Glen Canyon, managed by the BLM Arizona Strip Field Office, Richfield Field Office, and Monticello Field Office. To the extent that Glen Canyon visitors would choose to visit these nearby substitute sites, the adverse effects on local economies could be partially offset.

Additionally, it is likely that visitors, such as boaters or hikers, who enjoy and value a more natural, remote, and quiet experience would have an enhanced experience with the closure of these areas to off-road use. It is possible that the increased quality of the experience could increase visitation, although this would be an indirect and minor effect.

Because Bullfrog North and South is currently closed to off-road use, the loss in visitation, spending, and economic impacts from the planned permanent closure under alternative B is already embedded in current visitation levels.

## **Travel on GMP Roads in Glen Canyon**

The impacts on socioeconomic resources associated with conventional motor vehicles and street-legal ATVs on Glen Canyon roads are expected to be the same as those described for alternative A. Since there are so few street-legal ATVs, alternative B is not likely to considerably affect visitation and visitor spending in Glen Canyon, and would have limited impacts on local social and economic resources.

## **Ferry Swale**

Under alternative B, no ORV routes would be designated and existing user-created routes would be closed and restored to natural conditions. Implementation of alternative B could reduce visitation to this region. Since a large portion of the visitors already reside in proximate communities, the impacts on socioeconomic resources associated with the discontinued use of this area would be limited.

## **Cumulative Impacts**

Under alternative B, the same past, present, and planned future activities within Glen Canyon that have the potential to affect visitor use and experience would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the adverse impacts on visitation and visitor spending under alternative B, would result in long-term adverse cumulative impacts on visitation and visitor spending contributions to local economies. These impacts are likely to be experienced primarily in proximate communities and could be adverse in the larger regional context.

## **ALTERNATIVE C: INCREASED MOTORIZED ACCESS**

### **Lone Rock Beach**

The impacts on socioeconomic resources associated with off-road use at Lone Rock Beach would be expected to be similar to those of alternative A. Under this alternative, conventional motor vehicles, OHVs, and street-legal ATVs would continue to access Lone Rock Beach, although all motor vehicles would be required to obtain a permit. A permit system would be established to recover the costs of managing these areas, curb illegal activity, and fund education programs. Although the permit system may discourage a small amount of visitation to these sites, visitation is expected to be similar to alternative A, with beneficial implications for visitor spending and local economies.

Lone Rock Beach visitation represents up to 9% of recreation area visitation. These visitors are estimated to spend approximately up to \$21.1 million in local economies, contributing up to 248 jobs, \$7.9 million in labor income, and \$12.4 million in gross regional product to local economies. Under this alternative, these visitors would continue to beneficially contribute to the local economies through their visitor spending.

### **Lone Rock Beach Play Area**

The impacts on socioeconomic resources associated with Lone Rock Beach Play Area would be expected to be similar to those of alternative A. The difference in management of this area under alternative C is that ORV users would be required to obtain a permit to access the area and to possess and use safety flags in the play area. Although the cost to purchase a permit may discourage a small amount of visitation to these sites, visitation is expected to be similar to alternative A, with beneficial implications for visitor spending and local economies. The safety flags requirement would not be expected to affect visitation. The economic impacts associated with the continuation of Lone Rock Beach Play Area visitation are included in the Lone Rock Beach assessment due to

limited data for the play area. Continued off-road use of Lone Rock Beach and Lone Rock Beach Play Area would beneficially affect local economies through visitor spending.

### **Accessible Shoreline Areas**

Under alternative C, 15 accessible shoreline areas (13 existing areas plus Paiute Farms and Nokai Canyon) would be open to conventional motor vehicles, OHVs, and street-legal ATVs by permit, subject to water-level closures. This alternative would allow OHVs and street-legal ATVs to access these shoreline areas, where they have not currently been allowed. A permit system would be established to recover the costs of managing these areas, to curb illegal activity, and to fund education programs.

Increased opportunities for OHV and street-legal ATV use at the 13 existing areas and the authorization of off-road use at two additional shorelines (Paiute Farms and Nokai Canyon) could increase visitation to Glen Canyon. The cost of a permit may discourage visitation to these sites, although the intent of the permit system is not to limit visitation but to fund management activities. The opportunity to operate OHVs and street-legal ATVs in the 15 shoreline areas is likely to enhance the off-road experience and draw additional visitors. It is possible that Lone Rock Beach visitors would choose to visit these sites, dispersing the off-road use from Lone Rock Beach to other areas. However, the remote experience at the shoreline areas would not allow for ORV “playing” as available at Lone Rock Beach Play Area, but would likely attract visitors who would enjoy fishing, hiking, picnicking, and camping in these relatively more remote and isolated locations. However, off-road use has been rapidly increasing in Utah and Arizona (McVay and Racki 2008; Burr et al. 2008; Keith et al. 2008), and with additional areas open to OHV and street-legal ATV use, it is likely that visitation to these areas would increase.

Data provided from Stanton Creek and Bullfrog North and South indicate that these areas during amenable lake elevation conditions each accounted for approximately 1% of Glen Canyon visitation. It is estimated that Hite Boat Ramp accessible area visitation accounts for 0.3% of visitation and possibly more at amenable lake levels. Stanton Creek and Bullfrog areas are located close to the busy and relatively accessible Bullfrog marina, allowing for easier access and relatively more visitation than the other accessible shoreline areas. Remote shoreline areas currently experience very little off-road use. Paiute Farms and Nokai Canyon are currently experiencing some off-road use, although the areas are not currently authorized. Paiute Farms and Nokai Canyon are located on the remote southern shoreline adjacent to the Navajo Indian Reservation, with limited access; therefore, considerable additional visitation associated with these sites is not likely to occur.

The off-road use of these accessible shorelines is likely to increase compared to current levels, primarily associated with increases in visitation associated with the 15 shoreline areas being authorized for use by OHVs and street-legal ATVs. Because street-legal ATV/OHV use is not a prominent or primary draw for visitors to Glen Canyon (University of Idaho 2008), it is expected that beneficial effects on local economies would be limited.

### **Travel on GMP Roads in Glen Canyon**

Under alternative C, conventional motor vehicles, OHVs, and street-legal ATVs would be allowed to travel on all GMP roads, including GMP roads in the Orange Cliffs Unit. As described in alternative A, there are currently very few street-legal ATVs in the Utah counties surrounding the recreation area, although there are a considerable number of registered OHVs. There over 4,000 registered OHVs in the Utah 4-county region and almost 200,000 in the state of Utah, many of which are likely ATVs. In Coconino County, Arizona, 35% of households are OHV users, and ATVs were used in 30% of the most recent OHV trip (Arizona 2003). It is likely that opening GMP roads to OHVs will expand visitation to Glen Canyon. Use of OHVs on roads may allow visitors to access multiple locations by OHVs instead of conventional motor vehicle or street-legal ATVs, drawing more visitors to Glen Canyon. To the extent that these visitors already reside in the local communities, the beneficial impact of increased visitation on local economies would be minimal. However, if this new policy were to draw new visitors from outside of the study area, the stimulus of new visitor spending will beneficially affect local economies with additional jobs and income.



However, because OHV and street-legal ATV use is not a prominent or primary reason for people to visit Glen Canyon (University of Idaho 2008), it is expected that beneficial effects on local economies would be limited.

### **Ferry Swale**

Under alternative C, conventional motor vehicles, OHVs, and street-legal ATVs would be authorized to operate on approximately 15 miles of designated ORV routes. The designated ORV routes in this area may induce additional visitation and visitor spending in the area because this use and visitation (that is currently unauthorized) would become authorized. However, most of the visitation is expected to be current residents within the local region, and therefore, there would be limited beneficial impacts on socioeconomic resources.

### **Cumulative Impacts**

Under alternative C, the same past, present, and planned future activities within Glen Canyon that have the potential to affect visitor use and experience would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the beneficial impacts on visitation and visitor spending under alternative C, would result in long-term beneficial cumulative impacts on visitation and visitor spending contributions to local and regional economies, with proximate communities experiencing most of these effects.

## **ALTERNATIVE D: DECREASED MOTORIZED ACCESS**

### **Lone Rock Beach**

Under alternative D, Lone Rock Beach would remain open to conventional motor vehicles only. Lone Rock Beach and/or Lone Rock Beach Play Area account for approximately 7% to 9% of visitation to Glen Canyon. The vehicle counts at Lone Rock are assumed to include conventional motor vehicles, OHVs, and street-legal ATVs. An estimated 498 ATVs visited Lone Rock Beach and/or the play area in 2007, while in 2011, three times as many ATVs were recorded visiting this area, with 1,681 visitors (NPS 2012b). ATVs represented 1% of vehicle counts in Lone Rock Beach in 2007, and 2% of vehicle counts in 2011.

A portion of the off-road users come to Lone Rock Beach and Lone Rock Beach Play Area with the sole purpose of using OHVs or street-legal ATVs. Visitation would likely decrease due to prohibition of OHV and street-legal ATV use at Lone Rock Beach and the Lone Rock Beach Play Area. Estimates of OHV use at Lone Rock Beach and the play area indicate that approximately 2% of Lone Rock Beach visitors use OHVs. The NPS Visitor Use Study (NPS 2007f) also suggests that ATV riding is not a prominent or primary activity at Glen Canyon. Conventional motor vehicle users who access Lone Rock Beach and desire a quieter, perhaps more remote beach, camping, and picnicking experience may benefit from the prohibition of OHVs and street-legal ATVs on the beach, which could increase conventional motor vehicle use at Lone Rock Beach. Additionally, there are other off-road use opportunities on lands adjacent to Glen Canyon, managed by the BLM, including the Arizona Strip Field Office, Richfield Field Office, Monticello Field Office, and Grand Staircase – Escalante National Monument. There are an estimated 3,700 miles of designated ORV routes in Richfield Field Office, and 908 miles of ORV routes in Grand Staircase – Escalante National Monument, 553 miles of which are open to OHVs and street-legal ATVs (Downey 2012). To the extent that the OHV and street-legal ATV users would choose to visit these nearby substitute sites, the adverse effects on local economies could be partially offset.

Currently, visitors to Lone Rock Beach are estimated to spend approximately \$13.4 to \$19.8 million in local economies in and surrounding Glen Canyon. This visitor spending is estimated to annually contribute from 156 to 233 jobs, \$5.0 to \$7.8 million in labor income, and \$7.5 to \$11.7 million in gross regional product. Under this alternative, conventional motor vehicle user visitation would continue similar to current conditions, beneficially contributing to the local economies through continued visitor spending. Decreased OHV and street-legal ATV

visitation would result from the prohibition of these types of vehicles at Lone Rock Beach and Lone Rock Beach Play Area, although this portion of visitation is very small. Visitation overall would be expected to slightly decrease, with slight adverse effects on local economies.

### **Lone Rock Beach Play Area**

The impacts under alternative D would be the same as those described under alternative B.

### **Accessible Shoreline Areas**

Under alternative D, off-road use at 11 accessible shoreline areas would be discontinued. Visitors would still be able to access these areas either by boat or on foot. Four accessible shoreline areas would remain open to conventional motor vehicles by permit only: Dirty Devil, Farley Canyon, Stanton Creek, and Hite Boat Ramp. Since Bullfrog North and South closed in 2002, Stanton Creek has become the most visited accessible shoreline area, partly due to its proximity to the busy Bullfrog marina. Stanton Creek and Hite Boat Ramp are estimated to account for 1.3% of Glen Canyon visitation, contributing \$3.0 million in visitor spending, 36 jobs, \$1.1 million in labor income, and \$1.8 million in gross regional product.

Farley Canyon is a popular fishing and camping location that receives a small amount of visitor use. The Dirty Devil shoreline area was previously popular, but it no longer provides access to Lake Powell due to lower water levels. Visitors still camp at this location but it is not as popular as it was when the lake levels were higher.

Although four of the more popular accessible shoreline areas would remain open, off-road use at 11 areas would be discontinued. These areas of discontinued off-road use would be expected to only slightly decrease overall ORV visitation, because the most popular and heavily visited areas would remain open for use. However, visitors seeking a more natural, remote, and quiet experience may have an enhanced experience in these areas, which could be reached either by boat or on foot; this enhanced experience could have implications for slight and indirect increases in visitation.

If the loss of visitation at the 11 closed areas were assumed to equal the total visitation at Stanton Creek (approximately 14,000 annual visitors), local economies would be adversely affected by the loss of \$2.3 million in visitor spending and 28 jobs. These economic impacts would account for a very small portion of the employment and economic activity in the study area and would be expected to be lower than these estimates.

### **Travel on GMP Roads in Glen Canyon**

Under alternative D, only conventional motor vehicles would be able to access GMP roads in Glen Canyon; street-legal ATV travel, currently allowed, would not be authorized. The impacts on socioeconomic resources associated with prohibiting street-legal ATVs on Glen Canyon roads would be expected to be limited because ATV riding has not been identified as a prominent or primary activity in Glen Canyon (NPS 2007f) and there are very few registered street-legal ATVs in adjacent counties (Downey pers. comm. 2012). Prohibiting street-legal ATVs on Glen Canyon roads would not be likely to considerably affect visitation and visitor spending in Glen Canyon, resulting in limited to no impact on local economies and socioeconomic resources.

### **Ferry Swale**

The impacts on socioeconomic resources associated with Ferry Swale would be expected to be the same as impacts under alternative B.

## Cumulative Impacts

Under alternative D, the same past, present, and planned future activities within Glen Canyon that have the potential to affect visitor use and experience would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the slightly adverse impacts on visitation and visitor spending under alternative D, could result in long-term adverse cumulative impacts on visitation and visitor spending contributions to local economies.

## ALTERNATIVE E: MIXED USE

### Lone Rock Beach

Lone Rock Beach would remain open to conventional motor vehicles, street-legal ATVs, and OHVs under alternative E, similar to alternative A. Additionally, a portion (approximately 20 acres) of Lone Rock Beach would be designated as a vehicle-free area to provide a unique experience for tent and car campers. Alternative E would continue OHV and street-legal ATV use of Lone Rock Beach, while also providing an area where non-vehicle beach users can have a quieter experience away from motor vehicles. In addition, a permit would be required to access Lone Rock Beach. Under alternative E, impacts are expected to be similar as those described under alternative C.

### Lone Rock Beach Play Area

Impacts on socioeconomic resources associated with alternative E would be the same as those described for alternative C. Visitation and visitor spending associated with users at the play area would continue to support local economies.

### Accessible Shoreline Areas

Similar to alternative C, alternative E would formally manage Paiute Farms and Nokai Canyon as accessible shoreline areas. Off-road use at Warm Creek would be discontinued, whereas 14 accessible shoreline areas (including Paiute Farms and Nokai Canyon) would be open to conventional motor vehicles and street-legal ATVs only by permit.

Although Warm Creek provides a more primitive experience for visitors when open, it has been closed since 2003 due to lower lake elevations and it received minimal visitor use while open. Warm Creek provides visitors with access to Warm Creek Bay; however, under alternative E visitors would still be able to access Warm Creek Bay by Crosby Canyon when lake elevations allow (currently, Crosby Canyon is closed). Discontinuation of off-road use in this area would therefore have a minimal adverse impact on local economies.

Conventional motor vehicle users would benefit from the formal management of Paiute Farms and Nokai Canyon, and in total 14 accessible shoreline areas would be available for conventional motor vehicle use. Similar to alternative C, street-legal ATVs would be authorized for use at the 14 accessible shoreline areas, which would expand the availability of street-legal ATV recreation throughout Glen Canyon. Since conventional motor vehicles already use these areas, the additional authorization of street-legal ATVs is likely not to expand visitation considerably since most ATVs are not street-legal in the region. Use of the accessible shorelines would be by permit, and the fees are expected to contribute to the costs of managing the areas. The permit system would possibly limit use levels to protect resources (although the intent of permits is not to specify use levels).

With existing conventional motor vehicle and additional street-legal ATV visitation to these shoreline areas, Glen Canyon could possibly have a minimal increase in visitation compared to current levels. Because ATV riding is not a prominent or primary attraction for visitors to Glen Canyon (University of Idaho 2008) and street-legal ATVs

represent a very small proportion of all OHVs, it is expected that these beneficial effects on local communities would be negligible.

### **Travel on GMP Roads in Glen Canyon**

Alternative E would authorize street-legal ATVs for use on paved roads, while OHVs and street-legal ATVs would be authorized on unpaved GMP roads. No OHVs or street-legal ATVs would be authorized on GMP roads in the Orange Cliffs Unit. Conventional motor vehicles would continue to be authorized on all GMP roads, including those in the Orange Cliffs Unit. The impacts would be very similar to those of alternative C; the exception is that OHVs would not be authorized on paved GMP roads under alternative E and would be authorized under alternative C. Similar to alternative C, there could be a slight increase in visitation associated with beneficial impacts on local and regional economies. Because OHV and street-legal ATV use is not a prominent or primary reason for people to visit Glen Canyon (University of Idaho 2008), it is expected that beneficial effects on local economies would be limited.

### **Ferry Swale**

Similar to alternative C, conventional motor vehicles, OHVs, and street-legal ATVs would also be authorized to operate on approximately 15 miles of designated ORV routes. The impacts on socioeconomic resources would be expected to be the same as those described for alternative C.

### **Cumulative Impacts**

Under alternative E, the same past, present, and planned future activities within Glen Canyon that have the potential to affect visitor use and experience would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the minor beneficial impacts on visitation and visitor spending under alternative E, would result in long-term beneficial cumulative impacts on visitation and visitor spending contributions to local economies, with proximate communities experiencing a good portion of these effects.

## **CONCLUSION**

Alternative C would result in higher levels of visitation compared to alternatives A, B, and D, because under alternative C there would be expanded OHV and street-legal ATV opportunities at existing shoreline areas, the authorization of off-road use at two additional accessible shoreline areas. It is unclear whether alternative C or alternative E would allow for the greatest amount of visitation to the recreation area. Alternative C authorizes OHVs, street-legal ATVs, and conventional vehicle use of 15 accessible shorelines and all GMP roads while alternative E authorizes conventional motor vehicle and street-legal ATV use of 14 accessible shorelines (12 existing accessible shoreline areas plus Paiute Farms and Nokai Canyon) and all GMP roads (OHVs would be authorized on unpaved GMP roads only), and it also creates a vehicle-free area at Lone Rock Beach. Alternative E may attract visitors seeking a vehicle-free experience at Lone Rock Beach. Alternative E would be expected to have higher levels of visitation and visitor spending compared to alternatives A, B, and D, due to the creation of a vehicle-free area at Lone Rock Beach, which may entice visitors seeking this type of experience.

Under alternatives C and E, increases in visitor spending from increased visitation could bring additional jobs, income, tax receipts, indirectly benefiting public services, road maintenance, and other community services. The continued access to Lone Rock Beach, Lone Rock Beach Play Area, and the accessible shoreline areas; the expanded street-legal OHV and ATV opportunities; and the opening of additional accessible shoreline areas would have direct and indirect, beneficial impacts on local economies through increased visitation and visitor spending. Alternative C would allow OHVs on all GMP roads, including Orange Cliffs Unit, and accessible shorelines, while alternative E would create a vehicle-free zone at Lone Rock Beach and no OHV or street-legal ATV use in the

Orange Cliffs Unit. Increases in visitation and visitor spending associated with alternatives C and E would be limited due to the remote location of the new areas (which already experience some visitation) and as a result of the limited existing OHV and street-legal ATV use at the recreation area. Currently, OHV and street-legal ATV riding is not a prominent or primary activity at the recreation area (University of Idaho 2008); however, opening accessible shoreline areas to street-legal ATVs and authorizing OHVs on unpaved GMP roads under alternative E could induce additional visitation in the recreation area. Under alternatives C and E, it is also possible that OHV or street-legal ATV users who would have visited Lone Rock Beach and the play area might choose to visit one of the newly accessible areas or drive on the GMP roads instead, shifting where the visitation would occur but not increasing visitation.

Glen Canyon visitation in 2011 supported approximately 2,755 jobs in local communities. Visitation to Lone Rock Beach, Stanton Creek, and Hite Boat Ramp supports up to an estimated 284 jobs in local economies, or 10.3% of Glen Canyon visitation. Alternatives C and E are expected to result in increased visitation and visitor spending relative to alternative A, although the increases would likely be slight with benefits relative to alternative A.

Alternatives B and D would likely decrease off-road visitation and associated visitor spending to Glen Canyon relative to alternative A. Alternative B could result in up to an estimated 10.3% decrease in Glen Canyon visitation associated with closure of Lone Rock Beach to all off-road use and the discontinuation of off-road use of the accessible shorelines. This discontinuation of use could result in adverse impacts, including the loss of up to \$24.1 million in visitor spending, 284 jobs, \$9.0 million in labor income, and \$14.2 million in gross regional product. Alternative D is expected to have only slightly less visitation compared to alternative A, due to Lone Rock Beach remaining open to conventional motorized vehicles and four of the most-visited accessible shoreline remaining open to conventional motorized use. The adverse effects of alternative D on socioeconomic resources are therefore expected to be relatively small.

Current socioeconomic resource impacts associated with off-road use and on-road motor vehicle use at Glen Canyon would continue, benefiting local economies. Alternatives C and E are expected increase visitation and visitor spending associated with expanded off-road and on-road use at Glen Canyon relative to alternative A. Alternatives B would result in decreased visitor spending, adversely affecting local and regional economies relative to alternative A. Direct and indirect impacts on socioeconomic resources associated with closures at the Lone Rock Beach and the play area associated with alternative B may be locally significant because fewer visitors would be able to visit this part of the recreation area (Lone Rock Beach accounts for approximately 10% of visitation) with adverse effects on the community of Page, Arizona. However, within the five-county regional economy, the employment supported by this reduction in visitor spending represents 0.3% of employment within the five-county study area. Therefore, in the overall context of the five-county regional economy, this impact is likely not significant. Alternative D likely would not have significant adverse effects on the local or regional economy since Lone Rock Beach and four of the most-visited accessible shoreline areas would remain open to conventional motorized use with limited decreases in visitation and visitor spending relative to alternative A.

Alternatives C and E would provide increased opportunities for OHV and street-legal ATV use and would be likely to draw additional visitors to the recreation area at accessible shorelines and on GMP roads. However, the number of visitors and associated visitor spending would likely be relatively small due to limited numbers of street-legal ATVs in the region and OHV and street-legal ATV riding not being a prominent or primary activity at the recreation area. Additionally, the visitation would be dispersed across the accessible shorelines and the GMP roads across the recreation area. Therefore, direct and indirect impacts are likely not to be locally or regionally significant.

## HEALTH AND SAFETY

### GUIDING REGULATIONS AND POLICIES

CEQ regulations (40 CFR 1508.27) require NPS to consider the effects of proposed actions on visitor health and safety. NPS recognizes that the recreation area resources that attract visitors and some of the specific recreational activities in which visitors participate can present sources of potential hazards. Although NPS strives to provide a safe and healthful environment for visitors, visitors must be aware of risks and assume a substantial degree of responsibility for their own safety when visiting and recreating in the national recreation area. *NPS Management Policies 2006* does not impose park-specific visitor safety prescriptions. Rather, the means by which public safety concerns might be addressed are left to the discretion of the area manager (NPS 2006a, Section 8.2.5.1).

Because motor vehicle use presents a visitor health and safety concern, some alternatives include new requirements for OHVs and street-legal ATVs. Since 2000, there have been 17 incident reports involving personal injury at Glen Canyon due to unsafe operations. ATVs in particular have been the subject of actions by the Consumer Product Safety Commission.

### METHODOLOGY AND ASSUMPTIONS

Analysis methods are based on a review of existing data from incident reports and the best professional judgment of Glen Canyon law enforcement staff.

#### Context

The geographic context for health and safety encompasses the boundary of Glen Canyon National Recreation Area, formally managed by NPS with adjacent land administered by the BLM.

### ALTERNATIVE A: NO ACTION

Risk and danger are often associated with ATV or OHV use. Glen Canyon has had 17 incidents involving personal injury due to unsafe operations since 2000 (Carey pers. comm. 2013a). Between 2000 and 2011, more than 7,720 estimated deaths were attributed to ATVs throughout the United States (CPSC 2013). An estimated 1,544,400 people were treated in an emergency room for injuries sustained while riding an ATV during 2001-2011 (CPSC 2013).

Of particular concern is the operation of ATVs by children. Under the Consumer Product Safety Commission ATV Safety recommendations, children and young people under the age of 16 should not be allowed to ride or operate adult-size ATVs. According to Rachel Weintraub, Director of Product Safety and Senior Counsel for the Consumer Federation of America, this is because ATVs are inherently difficult to operate for adults and beyond the development capability of children to control. While children do ride and operate adult size ATVs, many injuries and deaths are attributed to these vehicles that are too large, too fast, and too powerful (ATV Safety, 2007). In 2011, an estimated 29,000 injuries were attributed to people under the age of 16. This accounts for 27% of all injuries reported in 2011 (CPSC 2013). The CFA has recommended the following guidelines for children riding on federal lands (ATV Safety 2007):

- Prohibit children from riding adult size ATVs
- Require the use of helmets
- Ban passengers

- Ban riding on paved roads
- Ban riding at night

Glen Canyon assimilates Utah and Arizona state laws, which encourage the safe operation of ATVs and OHVs for operators under the age of 18 (see chapter 2 for specific state rules regarding OHV and street-legal ATV use). Glen Canyon has only had 17 incidents involving ATV operation to personal injury since 2000.

## **Lone Rock Beach**

Currently, Lone Rock Beach allows off-road use by conventional motor vehicles, OHVs, and street-legal ATVs, and would remain so under the no-action alternative. To help prevent incidents from occurring after dark, Glen Canyon administers quiet hours at Lone Rock Beach from 10:00 p.m. to 6:00 a.m. The use of quiet hours would not completely prevent accidents, however it could substantially decrease use which could lead to a decreased potential for accidents.

Lone Rock Beach and Lone Rock Beach Play Area (described below) are the only locations in Glen Canyon where all types of motor vehicles are authorized for use in Glen Canyon. Utah's OHV program (currently described in Utah Code Annotated 41-22-1 et seq.) and Utah ATV registration processes and requirements are followed at Lone Rock Beach and the play area. By following Utah state regulations and obtaining the required safety inspections, vehicle users would likely drive their vehicles under safe speeds and actions which would be beneficial to other off-road users and non-users. If rules and regulations are disregarded by motor vehicle users, this could result in unsafe operating behavior, such as speeding and riding in unauthorized areas, creating danger to other motor vehicle users and pedestrians. Unsafe operator behavior and/or unsafe operating conditions can create accidents leading to personal injury.

Under Utah state law, no one under the age of 8 is allowed to operate any OHV on public lands, roads, or trails. Operators ages 8 through 15 may drive an OHV provided that they possess an education certificate issued by Utah State Parks and Recreation or the equivalent from their home state. Resident operators aged 16 years or older may operate an OHV if they possess either a valid driver's license or an approved OHV education certificate. Education certificates are issued to anyone aged 8 years or older who completes the Utah State Parks and Recreation "Know Before You GO!" OHV education course. All operators under the age of 18 are required to wear helmets. Operators under the age of 16 may have difficulty operating a full sized OHV or street-legal ATVs as these vehicles were designed for adult riders. The Consumer Product Safety Commission also encourages safety gear such as boots and gloves while operating an ATV. As mentioned above, while a young person may have no problem operating a vehicle in an ideal atmosphere, in case of unforeseen factors (weather, hazards, additional ORVs operating in the area), it is a possibility that their inexperience of operating a vehicle may cause direct adverse impacts on themselves and other off-road users and non-users. Users over the age of 16 would likely have experience in handling vehicles in these types of factors not only on OHVs or street-legal ATVs but with commercial motor vehicle use as well.

## **Lone Rock Beach Play Area**

The Lone Rock Beach Play Area is the only location in Glen Canyon where all vehicles are allowed to operate in an unrestricted manner. The use of all types of motor vehicles at unrestricted speeds may lead to accidents or user conflicts. Since 1998, one incident has occurred between a motor vehicle and an ATV (Carey pers. comm. 2013b). Operators driving conventional motor vehicles may not notice OHVs and street-legal ATVs as they may be smaller than and not as noticeable as conventional motor vehicles. Since all types of vehicles would be allowed at the play area, all motor vehicle operators would need to be aware of the presence of all types of vehicles to help avoid accidents and possible conflict. Since 2000, vehicle accidents have occurred within the play area, however no

specific number is known as Glen Canyon does not differentiate within incident reports between Lone Rock Beach and Lone Rock Beach Play Area (Carey pers. comm. 2013a).

The play area is intended as a location where motor vehicle operators can challenge themselves, including developing riding skills, operating at high speeds, and performing jumps and hill climbs. Operators would continue to need to be aware that while operating their vehicles at high speeds and performing jumps, they need to keep their vehicle under control. Losing control may result in injury to themselves or injury of other users and spectators. Medical attention from the Wahweap Ranger Station, located approximately 8 miles away, might not be quickly available if an accident occurred. All vehicle operators in the play area would have to conform to the same requirements as those for Lone Rock Beach. This would include the prohibition of operating any ORV while under the influence of drugs or alcohol. Adhering to these requirements would be beneficial to operators because they would likely have better control of their vehicles.

### **Accessible Shorelines**

The operation of any OHV or street-legal ATV would not be authorized in 13 accessible shoreline areas (Blue Notch, Bullfrog North and South, Copper Canyon, Crosby Canyon, Dirty Devil, Farley Canyon, Neskahi, Paiute Canyon, Red Canyon, Stanton Creek, Warm Creek, White Canyon, and Hite Boat Ramp), and would be open only to conventional motor vehicles. The Paiute Farms and Nokai Canyon accessible shorelines are not officially open, although they are currently being accessed by. Under alternative A, off-road use of these two areas would be discontinued and management action taken to prevent access. Speed limits are set to keep conventional motor vehicles at 15 mph for the surrounding environment and circumstances. The operation of conventional motor vehicles at the posted speed limit would likely decrease the potential for accidents. Motor vehicle operators must conform to all applicable state licensing, registration, and insurance requirements.

In order to reach the accessible shorelines, visitors are allowed to depart the road, drive directly to the shoreline, and park in designated ORV areas. The ORV areas are not intended to be play areas: climbing hills in vehicles, driving at high speeds, and similar behavior is strictly prohibited to help decrease the potential for accidents or injury. These safeguards would likely continue to result in direct beneficial impacts on the health and safety of visitors.

The remoteness of and difficulty of access to Blue Notch, Red Canyon, and Wilson Mesa, make these sites difficult for Glen Canyon staff to reach quickly by vehicle in case of an accident. Currently, public health and safety facility areas are located at Wahweap, Bullfrog, Halls Crossing, and Hite. The closest hospital/services to Wilson Mesa include Blanding, Utah (90 miles), and Page, Arizona (122 miles).

### **Travel on GMP Roads in Glen Canyon**

Under current conditions, conventional motor vehicles and street-legal ATVs are authorized to operate on all GMP roads in Glen Canyon, with the exception of the Orange Cliffs Unit where street-legal ATVs are prohibited. ATVs that do not meet the street-legal requirements under Utah code are prohibited from operating on any road in Glen Canyon. Requirements for street-legal ATVs are described in chapter 2. These requirements for lights, reflectors, horns and other safety equipment would help street-legal ATVs be more easily noticed while driving alongside conventional motor vehicles. Street-legal ATV users would continue to follow Utah and Arizona OHV regulations. There would be no change from current management actions for visitors. Because street-legal ATV use would not be allowed at the Orange Cliffs Unit, there would be no potential for conflicts or accidents between conventional motor vehicles and street-legal ATVs in Orange Cliffs.

Because both conventional motor vehicles and street-legal ATVs would continue to operate on GMP roads, this could lead to accidents even with motor vehicle users following state regulations. This could occur when conventional motor vehicle users are not aware of street-legal ATVs or users are not aware of the 20 mph speed



limit difference between paved and unpaved GMP roads. Current speed limits on unpaved GMP roads are set at 45 mph unless otherwise posted, while speed limits on paved GMP roads is 45 mph on State Routes but varies between 35 and 65 mph on U.S. highways. However, users following the posted speed limit and adhering to state regulations would likely be able to avoid or minimize possible accidents or incidents. Since street-legal ATVs have been allowed to drive simultaneously with conventional motor vehicles, there has been one reported incident between a motor vehicle and ATV (Carey pers. comm. 2013b). Because no management changes would be made under this alternative, currently stated health and safety practices would continue to be followed.

Street-legal ATVs complying with Arizona or Utah law may legally operate on Highway 89. Within Arizona, street-legal ATVs may operate on the highway as long as they have the proper rated tires, while in Utah, they must adhere to the 45 mph speed limit (or as posted). In Arizona and Utah, street-legal ATV operators must wear protective headgear if under the age of 18. In addition, in Utah ATV operators under the age of 18 must be under the direct supervision of a person who is at least 18 years of age if operating on a public highway that is open to motor vehicle use. The majority of unpaved GMP roads in Glen Canyon are located within Utah.

According to the Wisconsin Department of Transportation, currently, eight states (Arizona, Idaho, Indiana, Kansas, Minnesota, Montana, North Dakota, and South Dakota) permit the use of on-road operation of street-legal ATVs and five additional states (Alaska, Missouri, Nevada, Oklahoma, and West Virginia) provide detailed exceptions to crossing-only provisions. These states have strict rules and regulations under which ATVs may operate with other vehicles. This includes the requirement of headlights and brakes and operating under posted speed limits (Wisconsin Department of Transportation, 2009). The state of Wisconsin allows street-legal ATVs to operate with conventional motor vehicles. Riders must obey all posted speed limits and regulatory signs, such as stop or yield signs. The requirement of these rules enables street-legal ATVs and conventional motor vehicles to operate in a safe fashion while driving on the same roads (Wisconsin Department of Natural Resources 2011).

## **Ferry Swale**

Under the no-action alternative, approximately 53 miles of ORV routes would be designated and authorized for use by conventional motor vehicles, OHVs, and street-legal ATVs. Use of these ORV routes would result in long-term and negligible effects for health and safety because speed limits would be 25 mph or as posted. Illegal use could continue at Ferry Swale, which could include motorized users traveling outside of the designated ORV routes. This could lead to accidents or incidents between motorized and non-motorized users at Ferry Swale. Non-motorized users would include pedestrians, bicyclists, etc. From 1991-2009, 12 incidents were recorded between non-motorized and motorized users throughout Glen Canyon (Carey pers. comm. 2013b). Eleven of these were accidents between motor vehicles and pedestrians and one involved a trailer hitting a pedestrian.

## **Cumulative Impacts**

Other past, present, and planned future activities within Glen Canyon have the potential to affect the health and safety of visitors. The use of ORVs presents the possibility of potential hazards and injury to both ORV operators and non-vehicular users. Since 2000, 17 incident reports involving personal injury have been filed. These incidents were due to unsafe operations, which result in adverse impact on health and safety.

Unauthorized off-road use on adjacent lands could continue. Because these areas are not authorized for off-road use and may not be heavily traveled, poor condition and remoteness of the roads could lead to an extended wait time for emergency response in case of an accident. This would result in adverse impacts on health and safety.

Beneficial impacts on health and safety have occurred, and would continue to occur into the future, due to the short distance between Ferry Swale to the City of Page. The City of Page would continue to provide long-term emergency response provided by Page to motor vehicle users and non-vehicular users within Glen Canyon.

Continued long-term beneficial impacts would occur as Glen Canyon acquired vehicles and a fireboat. This results in a better response to incidents in remote or rugged areas and fires located along accessible shorelines.

Current and future actions include the Memorandums of Agreement with emergency service provided throughout Glen Canyon, adjacent BLM lands, and mutual air agreements. This will provide long-term beneficial impacts on the health and safety of visitors because more emergency services would be offered to visitors in case of an incident. Additionally, air ambulance services would continue to be offered for backcountry rescues.

The improvements to the Repeater Tower at Navajo Mountain would provide long-term beneficial impacts on law enforcement and rescue teams at Glen Canyon because the improvements would lead to better radio communication capabilities. The improvements may lead to short-term adverse impacts if the radio towers would be “offline” while the improvements were constructed.

The potential adverse impacts resulting from off-road use, in combination with the beneficial health and safety at Glen Canyon, would result in long-term beneficial cumulative impacts on ORV users and non-users within Glen Canyon. The beneficial impacts of Glen Canyon’s past, present, and future activities would continue to pursue the health and safety of visitors throughout Glen Canyon and alternative A would not contribute either adverse or beneficial impacts.

### **ALTERNATIVE B: NO OFF-ROAD USE**

#### **Lone Rock Beach**

Under alternative B, Lone Rock Beach would be closed permanently and restored to natural conditions. Beneficial effects on health and safety would occur because visitors would no longer be allowed to drive or ride vehicles in this area, thus eliminating potential accidents between conventional motor vehicles, OHVs, and street-legal ATVs. This would result in an improvement to the health and safety of visitors, with beneficial impacts on a Glen Canyon-wide basis.

#### **Lone Rock Beach Play Area**

Under alternative B, Lone Rock Beach Play Area would be closed permanently and restored to natural conditions. Beneficial effects would be the same as described above under Lone Rock Beach.

#### **Accessible Shorelines**

Under alternative B, off-road use at all 15 accessible shoreline areas would be discontinued permanently to all vehicles. Visitors would still be able to access these areas, but only by boat or foot. Because off-road use would be prohibited at the accessible shorelines, potential accidents between motor vehicles would be eliminated. This would result in an improvement to the health and safety of visitors.

#### **Travel on GMP Roads in Glen Canyon**

Under alternative B, conventional motor vehicles and street-legal ATVs would be allowed to operate on GMP roads throughout Glen Canyon; no street-legal ATVs would be allowed in the Orange Cliffs Unit. Impacts would be the same as alternative A.

#### **Ferry Swale**

Under alternative B, off-road use would not be authorized and the area restored to natural conditions. Health and safety concerns, including vehicle accidents, caused by off-road use would be eliminated.

## **Cumulative Impacts**

Under alternative B, the same past, present, and planned future activities within Glen Canyon that have the potential to affect health and safety would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the beneficial impacts on motor vehicle users and non-vehicular users under alternative B, would result in long-term beneficial cumulative impacts.

## **ALTERNATIVE C: INCREASED MOTORIZED ACCESS**

As described under alternative A, there is risk and danger associated with the operation of a conventional motor vehicle with other vehicles, such as OHVs and street-legal ATVs. When street-legal ATVs, OHVs, and conventional motor vehicles operate in the same area, on the same roads or designated routes, even more risk is taken. However, the implementation of state rules and regulations and all traffic laws would help mitigate these possible occurrences.

### **Lone Rock Beach**

Impacts would be similar to alternative A. However, under alternative C, an ORV permit system would be implemented, which would be required for all off-road users at Lone Rock Beach. The implementation of the permit system would allow funds collected to be used for education programs, monitoring, place better signs, partnerships, as well as the administrative costs associated with administering the permits. Additionally, users violating the applicable regulations or terms and conditions of the permit could be revoked and not allowed to use their vehicle in the areas mentioned above. These permits could help minimize issues that otherwise may not be addressed without education to motor vehicle operators about rules and regulations, safety, and resource protection within Glen Canyon. The implementation of permits would be long term and beneficial for Glen Canyon.

### **Lone Rock Beach Play Area**

Under alternative C, conventional motor vehicles, OHVs, and street-legal ATVs would be allowed to operate in an unrestricted manner. Impacts would be similar to alternative A. Additionally, all motor vehicle users would be required to install a safety flag to their vehicle and wear protective headgear, consistent with Utah regulations for designated sand dune areas (ATV Utah 2012). The flag would be beneficial for all motor vehicle users as it would allow for greater visibility, which would likely reduce the risk of accidents.

Under alternative C, mitigation measures implemented at the play area would be similar to Lone Rock Beach, to include an ORV permit system. The implementation of the permit system would allow funds collected to be used for education programs, monitoring, signs, partnerships, as well as the administrative costs associated with administering the permits. Additionally, users violating the applicable regulations or terms and conditions of the permit could be revoked and not allowed to use their vehicle in the areas mentioned above. These permits could help minimize issues that otherwise may not be addressed without education to motor vehicle operators about rules and regulations, safety, and resource protection within Glen Canyon. The implementation of permits would be long term and beneficial for Glen Canyon.

### **Accessible Shorelines**

Under alternative C, a total of 15 accessible shoreline areas (13 existing areas plus Paiute Farms and Nokai Canyon) would be open to off-road use by conventional motor vehicles, OHVs, and street-legal ATVs, by permit, subject to water-level closures.

Since the accessible shorelines would be open to conventional motor vehicles, OHVs, and street-legal ATVs, this could lead to incidents and issues between the different types of motor vehicles. To help drivers avoid an accident to losing control of their vehicle, the speed limit would be set at 15 mph, unless otherwise posted, throughout all accessible shoreline areas. As stated in the On-Road Operation of ATVs Technical Synthesis Report, speed limits are set at a reasonable limit that regard for existing conditions (Wisconsin Department of Transportation, 2009). These speed limits would help mitigate against accidents in which excessive speed is likely to play a role.

Under alternative C, mitigation measures would be implemented similar to the measures discussed above for Lone Rock Beach and the play area. The implementation of permits would be long term and beneficial for Glen Canyon.

### **Travel on GMP Roads in Glen Canyon**

All GMP roads under alternative C would be open to both conventional motor vehicles, OHVs, and street-legal ATVs, including roads in the Orange Cliffs Unit. The use of conventional motor vehicles, OHVs, and street-legal ATVs in combination on the same roads could lead to incidents and issues between these types of vehicles. This would include the use of street-legal ATVs on paved GMP roads. Since 1998, one incident has occurred between a motor vehicle and an ATV (Carey pers. comm. 2013b). Operators driving conventional motor vehicles may not notice OHVs and street-legal ATVs, which may be smaller than and not as noticeable as conventional motor vehicles. If vehicle drivers are aware of the road and current driving conditions, there should be none to minimal conflicts between OHV and street-legal ATV operators and conventional motor vehicle operators. To help drivers avoid an accident to losing control of their vehicle, the speed limit on unpaved GMP roads would be set at 25 mph unless otherwise posted. Reducing the current 45 mph limit would help to mitigate accidents in which excessive speed would likely play a role. Safety rules governing OHV use would continue to be based on the Utah or Arizona state OHV regulations as described in chapter 2. The use of a helmet would also aid in the protection of operators under the age of 18 in case of an accident. The youth supervision requirement in Utah would also contribute to the safe operation of OHVs. As stated under alternative A, street-legal ATVs complying with Arizona or Utah law may legally operate on Highway 89. Within Arizona, street-legal ATVs may operate on the highway as long as they have the proper rated tires. In Utah, street-legal ATV users must adhere to the 45 mile-per-hour speed limit (or as posted). OHV riders would legally be allowed to operate on Highway 89 while following management requirements as stated in chapter 2. The addition of these regulations could help minimize possible accidents or incidents that could occur to OHV, street-legal ATV users, and conventional vehicle users.

### **Ferry Swale**

Under alternative C, conventional motor vehicles, OHVs, and street-legal ATVs, would have authorized access to approximately 15 miles of designated ORV routes at Ferry Swale. Under current conditions, approximately 70 miles user-created routes present at Ferry Swales. The reduction of 38 miles would contain all vehicle users to a much smaller area, which could lead to adverse operating conditions as motor vehicle users would be in a much more concentrated area.

These designated routes would have a posted speed limit of 25 mph (or as otherwise posted), to help users stay at a speed at which they can control their vehicles on an unpaved surface and potentially reduce conflict between types of motor vehicles. This would be beneficial to the health and safety of off-road motor vehicle operators at Ferry Swale.

Under alternative C, mitigation measures would be implemented at Ferry Swale similar to the measures discussed above for Lone Rock Beach, the play area, and accessible shorelines. The implementation of permits would be long term and beneficial for Glen Canyon.

## **Cumulative Impacts**

Under alternative C, the same past, present, and planned future activities within Glen Canyon that have the potential to affect the health and safety of visitors would occur, and impacts would be the same as described for alternative A. More traffic may be present at accessible shorelines thus creating a possibility for more accidents to occur which could create long-term adverse impacts. The reduction of ORV routes designated for off-road use could create a concentration of conventional motor vehicles, OHVs, and street-legal ATVs, which could lead to long-term adverse impacts. However, the impacts of these actions, in combination with the beneficial impacts on motor vehicle users and non-users throughout Glen Canyon under alternative C, would result in long-term beneficial cumulative impacts.

## **ALTERNATIVE D: DECREASED MOTORIZED ACCESS**

### **Lone Rock Beach**

Under alternative D, Lone Rock Beach would remain open to conventional motor vehicles only, as OHVs or street-legal ATVs would not be authorized for use in Glen Canyon. The elimination of OHV and street-legal ATV use would be beneficial to health and safety because this would eliminate the possibility of conflicts between conventional motor vehicles and OHVs or street-legal ATVs. Health and safety impacts would be beneficial at Lone Rock Beach due to the absence of OHVs and street-legal ATVs.

Under alternative D, mitigation measures would be implemented to include an ORV permit system for all ORV users at Lone Rock Beach. The implementation of mitigation measures would have similar impacts on the safety at Lone Rock Beach as under alternative C.

### **Lone Rock Beach Play Area**

Lone Rock Beach Play Area would be closed permanently and the area restored to natural conditions. Impacts on health and safety would be the same as under alternative B.

### **Accessible Shorelines**

Under alternative D, off-road use at 11 accessible shoreline areas would be discontinued permanently, whereas four (Dirty Devil, Farley Canyon, Stanton Creek, and Hite Boat Ramp) would remain open only to conventional motor vehicles by permit, subject to water-level closures. Discontinuation of off-road use at the 11 accessible shoreline areas would result in a decrease in accidents because no vehicles would be authorized to operate at these shoreline areas. However, there is also the possibility that more incidents could occur at the remaining four authorized accessible shoreline lines because conventional motor vehicles could be forced into fewer ORV areas, thus causing more conflicts or issues with one another. Motor vehicle users would still be expected to follow state regulations and to use discretion and caution while operating their vehicles. Impacts on accessible shorelines would likely be beneficial due to the reduction of the number of authorized ORV areas; however, there could be crowding of conventional motor vehicles in these four areas due to the closures of the other areas which could lead to user conflict or the increase chance of accidents.

Under alternative D, mitigation measures would be implemented to include an ORV permit system for all ORV users at accessible shorelines. The implementation of mitigation measures would have similar impacts on the safety at accessible shorelines as under alternative C.

## **Travel on GMP Roads in Glen Canyon**

Only conventional motor vehicles would be authorized to operate on all GMP roads within Glen Canyon. The absence of OHVs or street-legal ATVs operating side by side with conventional motor vehicles would be beneficial as conventional motor vehicle users would not be sharing the road with other generally smaller, vehicles. This would lead to fewer vehicles on the road, which could decrease the possibility of accidents or incidents occurring. Reducing the current 45 mph limit on unpaved GMP roads would help to mitigate accidents in which excessive speed would likely play a role.

## **Ferry Swale**

Under alternative D, no ORV routes would be designated and existing user-created routes would be closed and the areas restored to natural conditions. Impacts would be the same as alternative B.

## **Cumulative Impacts**

Under alternative D, the same past, present, and planned future activities within Glen Canyon that have the potential to affect health and safety would occur, and impacts would be the same as described for alternative A. The closing of 11 accessible shorelines may present more traffic at the four permit-only accessible shorelines thus creating a possibility for more incidents to occur which could create long-term adverse impacts. However, the impacts of these actions, in combination with the beneficial impacts on motor vehicle users and non-vehicular users under alternative D, would result in long-term beneficial cumulative impacts.

## **ALTERNATIVE E: MIXED USE**

### **Lone Rock Beach**

Under alternative E, a 20-acre section of the beach would be designated as a vehicle-free zone. The vehicle free zone would lead to beneficial impacts on pedestrians as they would not need to worry about the possibility of an incident occurring with vehicles. Outside of the vehicle-free area, both user groups would need to be aware of each other to keep incidents at a low number. OHV users would be required to follow Utah rules and regulations regarding OHV use, which would include the use of helmets for those under the age of 18 years. Impacts for health and safety at Lone Rock Beach would be beneficial as the non-vehicle area of the beach would be clearly marked as off limits to motor vehicles. Both conventional motor vehicle users, OHV and street-legal ATV users would need to be aware of each other and operate their vehicles carefully to keep the possibility of incidents low. Similar to alternative C, the implementation of a permit system would educate operators about the rules and regulations of operating an OHV or street-legal ATV, safety issues, and resource protection. If users violate the permit terms, their permit could be revoked, removing a potentially dangerous OHV or street-legal ATV user.

### **Lone Rock Beach Play Area**

Lone Rock Beach Play Area would remain open to conventional motor vehicles, OHVs, and street-legal ATVs. Impacts would be the same as under alternative C.

### **Accessible Shorelines**

Under alternative E, off-road use at Warm Creek would be discontinued. This permanent closure would create a beneficial health and safety effect as no vehicles would be allowed to drive in this shoreline area thus eliminating user conflicts. Also under this alternative, the remaining 14 accessible shoreline areas (12 managed accessible shorelines plus Paiute Farms and Nokai Canyon) would remain open to conventional motor vehicles and street-

legal ATVs only, by permit, subject to water-level closures. As both conventional motor vehicle and street-legal ATV traffic would be allowed at these shorelines, a speed limit of 15 mph would be enforced. This speed limit would help drivers at safe speeds and reduce the potential for accidents between motor vehicles and motor vehicle and pedestrians.

Under alternative E, mitigation measures would be implemented to include an ORV permit system for all ORV users at accessible shorelines. The implementation of mitigation measures would have similar impacts on the safety at accessible shorelines as under alternative C and D.

## **Travel on GMP Roads in Glen Canyon**

Conventional motor vehicles, OHVs, and street-legal ATVs would be authorized to operate on unpaved GMP roads, with the exception of the Orange Cliffs Unit, whereas only conventional motor vehicles and street-legal ATVs would be allowed to operate on paved GMP roads in Glen Canyon. The use of conventional motor vehicles and street-legal ATVs on paved GMP roads could lead to accidents or incidents, however the person operating the vehicle at prescribed speeds and with caution could reduce the risk of accidents or incidents. The use of OHVs on unpaved GMP roads added to the existing use by conventional motor vehicles and street-legal ATVs could potentially lead to an unsafe environment, as described in alternative C. However, if vehicle operators are aware of the road and conditions, conflicts should not arise. All motor vehicle operators would need to be aware of their speed, making sure they do not drive over the posted 25 mph speed limit (unless otherwise posted). OHV users would follow state regulations (described in chapter 2) while operating their OHV. Drivers under the age of 18 would be required to wear a helmet which would be beneficial in case of an accident.

All GMP roads in the Orange Cliffs Unit would remain open to conventional motor vehicles but OHVs or street-legal ATVs would not be allowed. Drivers of conventional motor vehicles would not have to worry about OHVs or street-legal ATVs driving on the road along with conventional motor vehicles. This would create beneficial long-term impacts on the health and safety of conventional motor vehicle drivers.

## **Ferry Swale**

Under alternative E, conventional motor vehicles, OHVs, and street-legal ATVs would have access to approximately 15 miles of designated ORV routes at Ferry Swale. Impacts would be the same as alternative C.

## **Cumulative Impacts**

Under alternative E, the same past, present, and planned future activities within Glen Canyon that have the potential to affect health and safety would occur, and impacts would be the same as described for alternative A. More traffic may be present at the Warm Creek accessible shoreline, thus creating a possibility for more accidents to occur which could create long-term adverse impacts. The reduction of ORV routes designated for off-road use could create a concentration of conventional motor vehicles, OHVs, and street-legal ATVs, which could lead to long-term adverse impacts. However, the impacts of these actions, in combination with the beneficial impacts on ORV users and non-users throughout Glen Canyon under alternative E, would result in long-term beneficial cumulative impacts.

## **CONCLUSION**

Compared to alternatives A, B, and D, alternatives C and E could lead to increased adverse impacts for health and safety as conventional motor vehicles, OHVs, and street-legal ATVs would be allowed at all accessible shorelines (under alternative C) while only conventional motor vehicles and street-legal ATVs would be allowed at accessible shorelines (under alternative E). Additionally, all types of motor vehicles would be authorized to operate at Lone Rock Beach, Lone Rock Beach Play Area, designated ORV routes at Ferry Swale, and many segments of GMP roads.

However, under alternatives C and E, the ORV permit system could increase health and safety in ORV areas as funds collected from permits would lead to education programs, signs, monitoring, and partnerships. Additionally, users violating the applicable regulations or terms and conditions of the permit could be revoked and not allowed to use their vehicle in the areas mentioned above.

Alternative B would likely have the most beneficial impacts on health and safety of conventional vehicle users, OHV, and street-legal ATVs, as off-road use would be eliminated from Glen Canyon. Alternative D would provide the most beneficial impacts on conventional motor vehicle users compared to alternative A, B, C, or E, because only conventional motor vehicles would be allowed with Glen Canyon. As such, there would be no conflict with OHV and street-legal ATV users.

Adverse impacts on health and safety would not be expected to be significant under any alternative because all motor vehicle users would be subject to state safety regulations within Glen Canyon. As stated above, since 2000, there have been 17 incidents at Glen Canyon (Carey pers. comm. 2013a). Street-legal ATV users on GMP roads would continue to follow Utah and Arizona OHV regulations as described above under alternatives A, B, C, and E. All motor vehicles, including OHVs, would be expected to follow the set speed limits and practice safe driving methods, which in turn could reduce the possibility of an incident. Alternative C, the alternative allowing the most use could pose increase risk exposure as a result of the potential for increase motor vehicle conflict. However, reducing the speed limits on GMP roads and having a set speed of 25 mph on designated ORV routes could reduce conflict and incidents between types of motor vehicles. The use of whip flags would further allow users to better see and identify different motor vehicles operating at Lone Rock Beach Play Area. Additionally, under alternative C, D and E, the implementation of the permit system would allow money collected to fund additional signage, education programs, monitoring, and partnerships which would be beneficial to the health and safety of users within Glen Canyon. The permits would be required for all off-road use, including accessible shoreline areas, Lone Rock Beach, and Lone Rock Beach Play Area, and for designated ORV routes in Ferry Swale. With mitigation measures such as improved signage and additional law enforcement adding beneficial impacts on health and safety, any adverse impacts would not likely be significance.

## PALEONTOLOGICAL RESOURCES

### GUIDING REGULATIONS AND POLICIES

NPS *Management Policies 2006* recognizes paleontological resources (fossils) as “resources such as fossilized plants, animals, or their traces, including both organic and mineralized remains in body or trace form” (NPS 2006a, Section 4.8.2.1). Paleontological resources are studied and managed in their paleoecological context (that is, the geologic data associated with the fossil that provides information about the ancient environment and their placement in time). Fossils are nonrenewable resources and are managed for their scientific and educational values. The stated purpose of Glen Canyon is “to provide for public outdoor recreation use and enjoyment of Lake Powell and adjacent lands, and to preserve and protect the scenic, scientific, and historic features contributing to public enjoyment of the area” (NPS 1979). NPS is required to take appropriate action to prevent damage to and unauthorized collection of fossils and to protect paleontological resources from harm, theft, or destruction. NPS *Management Policies 2006* further states that “scientifically significant resources will be protected by collection or by on-site protection and stabilization” (NPS 2006a).

### METHODOLOGY AND ASSUMPTIONS

The following discussion of impacts on paleontological resources assesses the potential for such resource damage to occur (both erosion and intentional collecting and vandalism) as a result of ORV access under each of the proposed alternatives. The methodology for assessing impacts on paleontological resources included the review of a paleontological resources assessment conducted by Clites (2011), which describes the sensitivity of several



accessible shorelines in Glen Canyon, as well as consultation with NPS resource specialists and the analysis of geospatial data on paleontological sites in Glen Canyon and their proximity to current and proposed ORV access areas. As described in chapter 3, “Paleontological Resources” section, geologic formations at the recreation area have varying degrees of trace paleontological resources. For example, the Moenkopi formation contains the earliest record of Triassic flora and fauna of the southern Colorado Plateau, and this formation is exposed around the Hite Boat Ramp, on the eastern shores of Lake Powell in the San Juan Arm, and in the Escalante canyons of the northwestern part of Glen Canyon. Other resource sensitive formations present at the recreation area include the Chinle formation, which contains fossiliferous lacustrine deposits; the Tropic Shale formation, which contains primarily marine specimens; the Carmel formation, which contains vertebrate tracks; and the Organ Rock Formation, which contains root casts in petrified soil horizons, ferns, pteridosperms, and conifer, fish, amphibian and reptile fossils. The potential for impacts on sensitive paleontological resources contained within these and other formations located within Glen Canyon is described in further detail below. Acreages, miles, and percentages presented in the following analysis are estimates and are based on the best available GIS information the park has acquired to date. These numbers may change slightly as new GIS information becomes available allowing more refined analysis.

## Context

The geographic study area for paleontological resources is contained within the areas of Glen Canyon that would be affected by management decisions under this plan/DEIS.

## ALTERNATIVE A: NO ACTION

Glen Canyon contains a very extensive fossil record of Pennsylvanian- to Quaternary-aged resources. Particularly vulnerable to damage are the many dinosaur track ways that are managed in situ. The effects on desert soils from off-road use, such as accelerated surface water runoff and erosion, as documented in “Soils and Geology,” also pertain to paleontological resources, which occur in local concentrations in lithologic units (Shipman 1981). Depending on the level of intensity of such activities, prolonged ORV-related damage to soils can result in exposed soil substrate, causing the exposure of paleontological resources and leading to weathering and erosion, as discussed below. Schiffman (2005) and others have described the potential of off-road use to impact resources on public lands by enabling collectors to reach remote areas, which facilitates greater resource damage from intentional collection and vandalism.

Fossil resources are finite and nonrenewable. Santucci et al. (2009) describe weathering and erosion as the primary natural processes that affect the stability of in situ fossils like those found at Glen Canyon. Human disturbances, such as those from off-road use, can accelerate local rates of weathering and erosion through soil damage and the removal of vegetation cover. Other, more direct, impacts on paleontological resources include the outright removal of resources themselves, also referred to as fossil “poaching.” Management plans should include basic considerations regarding the type and locations of visitor activities in areas with access to paleontological resources and assess the proximity of developed areas to areas with fossiliferous strata (Santucci et al. 2009).

## Lone Rock Beach

Under the no-action alternative, impacts on paleontological resources stemming from erosion resulting from motor vehicle use would continue to occur on approximately 250 acres with ongoing off-road use by conventional motor vehicles, OHVs, and street-legal ATVs. While most paleontological resources at the recreation area are buried deep within the geologic layers underlying Glen Canyon, the geologic strata containing these resources is exposed at various locations. Paleontological resources known to exist at Glen Canyon include fossils of the Quaternary, Triassic, Cretaceous and Jurassic periods. Many of these are found in exposed or seasonally-exposed locations, such as at gravel bars and along the shoreline of Lake Powell. A paleontological resources assessment (Clites et al. 2011) found that Lone Rock Beach contains no known paleontological sites, although fossils of plant material,

mammal bones, and animal dung of many different types (including mammoth, shrub ox, mountain lion, and bison) have the potential to occur. The bedrock of this area consists mostly of eolian and alluvial deposits of Holocene to Pleistocene Age. Overall, these types of deposits occur over approximately 188,000 acres within Glen Canyon. Years of off-road use have resulted in the potential for impacts such as damage through erosion of topsoil and potential impacts on the underlying geologic material and the resources contained therein. These would continue and potentially increase in severity of impact under the no-action alternative.

### **Lone Rock Beach Play Area**

Impacts for Lone Rock Beach Play Area would be similar to those described for Lone Rock Beach. The Lone Rock Beach Play Area is a fence-enclosed, 180-acre area that is open to high-intensity motor vehicle use. The play area is the only location in Glen Canyon where all motor vehicles (conventional motor vehicles, OHVs, and street-legal ATVs) are authorized to operate in an unrestricted manner. The paleontological resources assessment found that the play area contains no known paleontological sites, although fossils of plant material, mammal bones, and animal dung of many different types (including mammoth, shrub ox, mountain lion, and bison) have the potential to occur. With ongoing unrestricted off-road use by conventional motor vehicles, OHVs, and street-legal ATVs at the Lone Rock Beach Play Area under the no-action alternative, the potential for impacts on paleontological resources would continue.

### **Accessible Shorelines**

Paleontological resources are associated with the geology present at several of the accessible shoreline areas. For instance, abundant and widespread significant fossils are present in the Neskahi and Paiute Canyon areas, which overlie portions of the Chinle Formation. The Chinle Formation, the geologic substrate that characterizes Copper Canyon and Nokai Canyon, contains extensive fossiliferous lacustrine deposits, abundant petrified logs, and a variety of invertebrate, leaf, and trace fossils (Clites 2001). Under alternative A, approximately 107.1 acres of ground surface overlying the Chinle Formation could be potentially affected by vehicle disturbances at accessible shorelines (see table 38). By comparison, the recreation area contains approximately 103,808 acres of ground surface overlying the Chinle Formation.

Stanton Creek, which overlies the Carmel formation, has the potential to contain fossils such as vertebrate track sites because the formation is known to preserve such fossils elsewhere. Glen Canyon contains approximately 93,436 acres of ground surface overlying the Carmel Formation. Under alternative A, approximately 18 acres of ground surface overlying the Carmel Formation could be potentially affected by vehicle disturbances at accessible shorelines (see table 38).

Sensitive paleontological resources, including swim tracks and trace fossils, have also been recorded in the vicinity of the Farley Canyon and White Canyon shoreline areas, which overlie portions of the Organ Rock formation. Paiute Farms is also located within the Organ Rock Formation, which contains root casts in petrified soil horizons, ferns, pteridosperms, and conifer, fish, amphibian and reptile fossils (Santucci et al. 2009). Under alternative A, approximately 367 acres of ground surface overlying the Organ Rock Formation would be potentially affected by vehicle disturbances at accessible shorelines (see table 38). Overall, the recreation area contains approximately 27,494 acres of ground surface overlying the Organ Rock Formation.

Particularly prominent in the Bullfrog area and to the south along the western shore of Lake Powell is the Entrada Sandstone, which is known to contain notable track sites. A particularly notable fossil reported from Glen Canyon is the handprint of a small sauropod dinosaur found near Bullfrog, the first sauropod track with skin impressions (Santucci et al. 2009). Under alternative A, approximately 308 acres of ground surface overlying the Entrada Sandstone Formation would be potentially affected by vehicle disturbances at accessible shorelines (see table 38). By comparison, the recreation area contains approximately 74,252 acres of ground surface overlying the Entrada Sandstone Formation.

Under alternative A, Glen Canyon would retain the authority to administratively designate closures of shoreline areas and would do so if off-road use resulted in impacts on paleontological resources. Currently, Warm Creek, Crosby Canyon, and Bullfrog North and South are temporarily closed due to low water conditions; however, they would be reopened if future conditions allow and Glen Canyon staff deems it appropriate. The Paiute Farms and Nokai Canyon accessible shorelines are not officially open, although they are currently being accessed. Under alternative A, off-road use at Paiute Farms and Nokai Canyon would be discontinued and management action taken to prevent access.

As described in the “Geology and Soils” section, a higher susceptibility to erosion exists for soils at Bullfrog North and South. Continued off-road use would lead to impacts on paleontological resources due to continued crushing and shearing of the soil substrate, resulting in accelerated rates of erosion. With increased erosion of the soil, the existing paleontological resources could be exposed and become vulnerable to erosion, as well as to intentional collection and vandalism. As a result, impacts to paleontological resources located in areas on and near the accessible shorelines could occur.

### **Travel on GMP Roads in Glen Canyon**

Under alternative A, GMP roads would remain open to conventional motor vehicle and street-legal ATV use. Street-legal ATVs are prohibited, however, from use on GMP road segments in the Orange Cliffs Unit. Paved and unpaved GMP roads traverse areas of Glen Canyon which are characterized by geologic units classified as sensitive due to their propensity to contain paleontological resources. These resources may include locally important invertebrate and vertebrate sites, tracks and traces. While some roads pass through formations with known paleontological sites (e.g., Warm Creek Road [Tropic Shale] and Moody Canyon Road [Moenkopi Formation]), other roads pass through areas with only the potential for discovery of fossils. No impacts on paleontological resources would result from vehicle use occurring on paved GMP roads because it is assumed that vehicles would travel along the paved portions of the roadways. Paleontological resources are located within geologic strata underlying road locations and would not be impacted by vehicles travelling along paved roadways.

On unpaved GMP roads, direct impacts (areas within 33 feet [10 meters] on either side of the road centerline) currently occur on approximately 153.7 surface acres overlying the Organ Rock formation, which contains notable Permian-era reptiles and reptile-related fossils. Indirect impacts (areas between 33 feet [10 meters] and 200 feet [60 meters] on either side of the road centerline) currently occur on approximately 751.9 acres of the Organ Rock formation. Because the majority of the unpaved GMP roads have compacted dirt surfaces, impacts on paleontological resources on designated unpaved GMP roads would likely be contained to the edges of already disturbed areas. These roadways are previously disturbed through blading, compaction, and other earthmoving activities required for road construction; routine maintenance; and use. As a result, the continued use of conventional motor vehicles and street-legal ATVs would not result in notable harm to paleontological resources.

### **Ferry Swale**

Under the no-action alternative, off-road use would continue on approximately 53 miles of designated ORV routes at Ferry Swale. Ferry Swale is located in an area of Glen Canyon that contains various paleontological resources, including: abundant tracks and scattered skeletal remains; abundant logs, together with a variety of invertebrate, invertebrate, leaf, and trace fossils; extensive fossiliferous lacustrine deposits in the lower Chinle Formation in and near the east side of Glen Canyon; and diverse marine invertebrates and locally important microvertebrate sites. Impacts on paleontological resources would continue but would likely be contained to the edges of already disturbed areas. These designated ORV routes, which were previously user-created routes, have been disturbed through use by conventional motor vehicles, OHVs, and street-legal ATVs. As a result, the continued use of vehicles on these routes would not result in notable harm to paleontological resources.

## **Cumulative Impacts**

Other past, present, and planned future activities within Glen Canyon have the potential to affect paleontological resources. These cumulatively considerable actions are presented at the beginning of this chapter and described in greater detail in chapter 1. Both adverse and beneficial impacts have occurred as a result of these activities. Adverse impacts include damage to paleontological resources in paleontologically sensitive geologic formations due to past illegal off-road use. Lithologies most vulnerable to indirect and cumulative impacts from off-road use include the Wingate, Kayenta, Navajo, Page, Entrada, Dakota and Straight Cliffs formations. While the potential exists for significant fossil discovery in these units, their vulnerability to cumulative impacts from off-road use varies greatly throughout Glen Canyon. Beneficial impacts on paleontological resources have occurred, and would continue to occur into the future from the implementation of the following plans or actions:

- 1979 Glen Canyon GMP, which considers paleontological resources in managing Glen Canyon resources.
- Implementation of the 1999 Grazing Management Plan, which allows for vehicle use associated with the management of grazing animals.
- Canyonlands National Park and Orange Cliffs Unit of Glen Canyon National Recreation Area Backcountry Management Plan which determines how the backcountry areas of Glen Canyon should be managed.
- Road and ORV route improvements at Ferry Swale.

Additional actions include the development of BLM Arizona Strip Office Travel Management Plan which also results in beneficial impacts on paleontological resources. Beneficial cumulative impacts may also result from the above-mentioned management plans where restrictions to where ATVs can be operated are established. Overall, these actions contribute to cumulatively considerable long-term adverse and beneficial impacts on paleontological resources at Glen Canyon.

## **ALTERNATIVE B: NO OFF-ROAD USE**

### **Lone Rock Beach**

Under alternative B, off-road use would be discontinued permanently and the area restored to natural conditions. As described under alternative A, the paleontological resources assessment found that Lone Rock Beach contains no known paleontological sites, although fossils have the potential to occur. Eliminating off-road access to Lone Rock Beach would reduce the risk of resource loss and damage caused by the unauthorized collection of materials. Further, by prohibiting off-road use in this area, alternative B would reduce the exposure of underlying geologic material, and the resources contained therein, to damage from off-road use. These beneficial impacts would be localized and long term.

### **Lone Rock Beach Play Area**

Impacts for Lone Rock Beach Play Area are the same as described for Lone Rock Beach.

### **Accessible Shorelines**

By discontinuing off-road use at 15 accessible shorelines in Glen Canyon (13 existing areas in addition to Paiute Farms and Nokai Canyon), alternative B would eliminate off-road access to these areas of Glen Canyon and prevent damage to or loss of paleontological resources from continued off-road access. Under alternative B, ground surface disturbances would not continue at shoreline areas overlying the paleontologically sensitive geologic formations of the Chinle formation, the Carmel formation, the Organ Rock formation, and the Entrada Sandstone formation. Beneficial impacts resulting from the cessation of off-road use would be most apparent at shoreline areas with

particularly sensitive paleontological resources, such as the Bullfrog North and South shoreline areas, near which a particularly notable fossil was reported, as described under alternative A. These beneficial impacts would be Glen Canyon-wide and long term.

### **Travel on GMP Roads in Glen Canyon**

Under alternative B, GMP roads would remain open to conventional motor vehicle and street-legal ATV use, with the exception of the Orange Cliffs Unit where street-legal ATVs would not be authorized. Impacts on paleontological resources would be the same as under alternative A.

### **Ferry Swale**

Under alternative B, no off-road use would be allowed in Ferry Swale. At locations within Ferry Swale where the geologic strata containing sensitive paleontological resources is exposed, these resources would benefit from the cessation of off-road activities. The geology of Ferry Swale reveals bedrock exposures of the Navajo Sandstone and Tropic Shale within which significant fossils are present, although sporadic in occurrence. Under alternative B, approximately 136.3 acres of direct ground disturbances to surfaces overlying Tropic Shale and 18.9 acres of direct ground disturbances to surfaces overlying Navajo Sandstone would be eliminated (see table 38), resulting in a reduced potential for damage to paleontological resources present in underlying lithologies. Thus, beneficial impacts would accrue to paleontological resources present at Ferry Swale under the implementation of alternative B.

### **Cumulative Impacts**

Under alternative B, the same past, present, and planned future activities within Glen Canyon that have the potential to affect paleontological resources under the no-action alternative would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the adverse impacts on paleontological resources under alternative B, would result in long-term adverse cumulative impacts on paleontological resources. However, the beneficial impacts on paleontological resources accruing from greater protection of these resources provided under alternative B would provide long-term beneficial cumulative impacts.

## **ALTERNATIVE C: INCREASED MOTORIZED ACCESS**

### **Lone Rock Beach**

Impacts on paleontological resources at Lone Rock Beach under alternative C would be similar to the impacts described for these areas under alternative A. However, mitigation measures would be implemented under this alternative, including the requirement of ORV permits, improved signs and education with partners and users, physical barriers, enhanced NPS presence, and closures. Requiring all operators desiring to travel off-road in Glen Canyon to obtain a permit will provide a means to monitor use as well as educate operators about rules and regulations and protect resources. NPS also maintains the administrative ability to enforce existing regulations and prevent unauthorized off-road use. These measures likely would reduce impacts on undiscovered paleontological resources to some degree by limiting driving outside of the designated ORV area, thereby limiting erosion and compaction outside of the authorized area.

### **Lone Rock Beach Play Area**

Impacts on paleontological resources at the Lone Rock Beach play area under alternative C would be essentially identical to the impacts described for these areas under alternative A. Mitigation measures noted for Lone Rock

Beach would also be implemented for the play area, thus reducing the potential for impacts on undiscovered paleontological resources within the authorized ORV area.

### Accessible Shorelines

Under alternative C, a total of 15 accessible shoreline areas (13 existing areas plus Paiute Farms and Nokai Canyon) would be open to conventional motor vehicles, OHVs, and street-legal ATVs by permit, subject to water-level closures. Impacts under this alternative would result in the same potential for localized impacts on paleontological resources as described for alternative A, with the addition of mitigation measures to minimize adverse impacts. Additionally, abundant and widespread significant fossils present in the Neskahi and Paiute Canyon area, such as petrified logs in the Neskahi Wash, would be affected by increased motorized access. Paiute Farms is located in the Organ Rock Formation, which contains root casts in petrified soil horizons, ferns, pteridosperms, and conifer, fish, amphibian and reptile fossils that would be affected by increased visitation and increases in ORV traffic, resulting in disturbances to underlying geologic material and the resources contained therein. Approximately 434.4 acres of geologic substrate on the Organ Rock formation would be directly disturbed at shoreline areas under this alternative (see table 38). Similarly, increased access to Copper Canyon and Nokai Canyon would affect the extensive fossiliferous lacustrine deposits, abundant petrified logs, and invertebrate, leaf, and trace fossils found in the Chinle Formation. In other shoreline areas, where the Organ Rock Formation is known to contain plant fossils and vertebrates, such resources would also be affected by increased motorized access. Mitigation measures under this alternative, including improved signs and physical barriers, enhanced NPS presence, and closures, likely would reduce impacts on paleontological resources to some degree by limiting driving outside of designated ORV areas, thereby limiting erosion and compaction outside of the authorized areas.

### Travel on GMP Roads in Glen Canyon

Under alternative C, conventional motor vehicles, OHVs, and street-legal ATVs would be allowed on all GMP roads, including all roads in the Orange Cliffs Unit. Impacts would be similar to alternative A and B. No impacts on paleontological resources would result from vehicle use occurring on paved GMP roads because it is assumed that vehicles would travel along the paved portions of the roadways. However, impacts under C could be greater along unpaved GMP roads because of the addition of OHVs and, similarly, the addition of OHVs and street-legal ATVs on roads in Orange Cliffs.

As the majority of Glen Canyon's unpaved GMP roads have compacted dirt surfaces, impacts on paleontological resources on designated unpaved GMP roads would likely be contained to the edges of already disturbed areas. Soils along these roads are previously disturbed through blading, compaction, and other earthmoving activities required for road construction, routine maintenance and motorized use. As a result, the continued use of conventional motor vehicles and street-legal ATVs would not result in notable harm to paleontological resources.

### Ferry Swale

Under alternative C, paleontological resources at Ferry Swale would continue to be affected by motor vehicle use, though there would be some beneficial impacts from the restriction of ORV use to approximately 15 miles of designated ORV routes. Direct disturbances occurring within 12 feet of either side of the centerline of the designated ORV routes in Ferry Swale would occur over approximately 11.2 acres of Navajo Sandstone formation, while indirect disturbances (i.e., those disturbances over an area from 12 feet to approximately 200 feet (60 meters) from the centerline of the ORV route) would equate to approximately 160.9 acres under this alternative (see table 38). Mitigation measures under this alternative, such as improved signs, physical barriers, enhanced NPS presence, and closures, would reduce impacts on paleontological resources to some degree by limiting driving outside of designated ORV routes, thereby limiting erosion and compaction outside of the authorized areas.

## **Cumulative Impacts**

Under alternative C, the same past, present, and planned future activities within Glen Canyon that have the potential to affect paleontological resources under the no-action alternative would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the potential significant adverse impacts on paleontological resources under alternative C, would result in long-term adverse cumulative impacts on paleontological resources. However, the beneficial impacts on paleontological resources accruing from greater protection of these resources provided under alternative C would provide long-term beneficial cumulative impacts.

## **ALTERNATIVE D: DECREASED MOTORIZED ACCESS**

### **Lone Rock Beach**

Under alternative D, Lone Rock Beach would be open only to conventional motor vehicles, and only by permit. As a result, paleontological resources at Lone Rock Beach would benefit from the reduction of motor vehicle activity. The paleontological resources assessment found that Lone Rock Beach contains no known paleontological sites, although fossils have the potential to occur. Limiting access to this area to conventional motor vehicles only could reduce the risk of resource loss and damage caused by the unauthorized collection of materials. By prohibiting off-road use of OHVs and street-legal ATVs, alternative D could reduce the exposure of underlying geologic material, and the resources contained therein, to damage from OHV and street-legal ATV use.

Similar to alternative C, mitigation measures would be implemented under this alternative, to include an ORV permit, improved signs and communication/education with partners and users, physical barriers, enhanced NPS presence, and closures. Requiring all operators desiring to travel off-road in Glen Canyon to obtain a permit will provide a means to monitor use as well as educate operators about rules and regulations. NPS also maintains the administrative ability to enforce existing regulations and prevent unauthorized off-road use. These measures likely would reduce impacts on undiscovered paleontological resources to some degree by limiting driving outside of the designated ORV area, thereby limiting erosion and compaction outside of the authorized area.

### **Lone Rock Beach Play Area**

Impacts for Lone Rock Beach Play Area are the same as described for Lone Rock Beach.

### **Accessible Shorelines**

Under this alternative, the discontinuation of off-road motor vehicle access at 11 accessible shoreline areas would prevent damage to or loss of paleontological resources from off-road use at these areas. Beneficial effects would be readily apparent at shoreline areas with particularly sensitive paleontological resources, such as Bullfrog North and South. However, beneficial effects would not be apparent at the four shoreline areas that would remain open, and the impact in these areas would be the same as described for alternative C.

### **Travel on GMP Roads in Glen Canyon**

Under alternative D, there would be no direct impacts on paleontological resources on GMP roads because OHVs and street-legal ATVs would not be permitted. Impacts on paleontological resources from conventional motor vehicles are assessed as a cumulative impact because conventional motor vehicles are not part of the scope of this plan.

## **Ferry Swale**

Under alternative D, impacts on paleontological resources at Ferry Swale would be the same as those described for alternative B. Because no off-road use would be allowed in Ferry Swale, resources present at locations where geologic strata is exposed would benefit from the cessation of off-road activities.

## **Cumulative Impacts**

Under alternative D, the same past, present, and planned future activities within Glen Canyon that have the potential to affect paleontological resources under the no-action alternative would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the beneficial impacts on paleontological resources accruing from greater protection of these resources provided under alternative D, would result in long-term beneficial cumulative impacts on paleontological resources.

## **ALTERNATIVE E: MIXED USE**

### **Lone Rock Beach**

Impacts on paleontological resources at Lone Rock Beach under alternative E would be similar to the impacts described for this area under alternative C. Established a 20-acre vehicle-free zone on the beach could slightly lessen impacts on paleontological resources, but no substantial beneficial impacts would accrue over time from this restriction.

Similar to alternatives C and D, mitigation measures would be implemented and would include the requirement of ORV permits, improved signage and communication with partners and users, physical barriers, enhanced NPS presence, and closures. Requiring all operators desiring to travel off-road in Glen Canyon to obtain a permit would provide a means to monitor use and educate operators about rules and regulations. NPS also maintains the administrative ability to enforce existing regulations and prevent unauthorized off-road use. These measures likely would reduce impacts on undiscovered paleontological resources to some degree by limiting driving outside of the designated ORV area, thereby limiting erosion and compaction outside of the authorized area.

### **Lone Rock Beach Play Area**

Impacts on paleontological resources at Lone Rock Beach Play Area under alternative E would be the same as described for these areas under alternative C.

## **Accessible Shorelines**

Under alternative E, off-road use at Warm Creek would be discontinued permanently. Fourteen areas (12 existing areas plus Paiute Farms and Nokai Canyon) would remain open to conventional motor vehicles and street-legal ATVs (approximately 6,000 acres), only by permit, subject to water-level closures. Under this alternative, impacts on accessible shoreline areas would be similar to those under alternative C but to a lesser degree. The prohibition of vehicle entry into Warm Creek would prevent damage to or loss of paleontological resources at this site from continued off-road access. Paleontological resources in the Warm Creek site vicinity include abundant marine vertebrates and invertebrates. These resources would be afforded greater protection under this alternative. The loss of Warm Creek as a shoreline access area would not be anticipated to result in substantial impacts on paleontological resources at the other accessible shoreline areas as a result of increased demand for access and visitation to that site. The incorporation of additional mitigation measures, as described above under alternative C and D, would result in additional protection for paleontological resources from impacts stemming from off-road driving.



## Travel on GMP Roads in Glen Canyon

Under alternative E, paved GMP roads would be open to conventional motor vehicles and street-legal ATVs while unpaved GMP roads would be open to conventional motor vehicles, OHVs, and street-legal ATVs, with the exception of roads in Orange Cliffs where no OHVs or street-legal ATVs would be authorized. Impacts on paleontological resources on paved GMP roads would be the same as described under alternative A and B.

Unpaved GMP roads traverse areas of Glen Canyon that are characterized by geologic units classified as sensitive due to their propensity to contain paleontological resources. These resources may include locally important invertebrate and vertebrate sites, tracks and traces. While some roads pass through formations with known paleontological sites (e.g., Warm Creek Road [Tropic Shale] and Moody Canyon Road [Moenkopi Formation]), other roads pass through areas with only the potential for discovery of fossils. Because the majority of Glen Canyon's unpaved GMP roads have compacted dirt surfaces, impacts on paleontological resources on designated unpaved GMP roads would likely be contained to the edges of already disturbed areas. Soils along these roads are previously disturbed through blading, compaction, and other earthmoving activities required for road construction and routine maintenance and through use. As a result, the expanded use of OHVs, and street-legal ATVs on unpaved GMP roads, but not within Orange Cliffs, would not result in notable harm to paleontological resources.

## Ferry Swale

Impacts on paleontological resources at Ferry Swale under alternative E would be the same as those described under alternative C.

## Cumulative Impacts

Under alternative E, the same past, present, and planned future activities within Glen Canyon that have the potential to affect paleontological resources under the no-action alternative would occur, and impacts would be the same as described for alternative A. The impacts of these actions, in combination with the potential significant adverse impacts on paleontological resources under alternative E, would result in long-term adverse cumulative impacts on paleontological resources. However, the beneficial impacts on paleontological resources accruing from greater protection of these resources at Ferry Swale provided under alternative E would provide long-term beneficial cumulative impacts.

## CONCLUSION

Table 38 provides additional detail regarding the amounts of disturbance to various Paleontological Resources, as estimated by their associated lithologies, across each alternative considered in this analysis.

**TABLE 38: COMPARISON OF IMPACTS ON PALEONTOLOGICAL ACROSS ALTERNATIVES**

Geologic Formation	Associated Paleontological Features	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
<b>Lone Rock Beach and Play Area (acres impacted)</b>						
Holocene to Pleistocene Age eolian and alluvial deposits	Fossils of plant material, mammal bones, and animal dung	250 (Lone Rock Beach) 180 (play area)	0	250 (Lone Rock Beach) 180 (play area)	250 (Lone Rock Beach) 180 (play area)	230 (Lone Rock Beach) 180 (play area)
<b>Accessible Shorelines (acres impacted)</b>						
Entrada Sandstone	Notable track sites	308.8	0.0	309.7	5.4	247.2
Organ Rock	Permian reptiles or reptile-related fossils	367.0	0.0	434.4	206.9	Same as alternative C
Moenkopi Formation	Locally common tracks and traces	256.5		258.3	0.0	Same as alternative C
Chinle Formation	Petrified wood, carbonaceous debris, gastropods, crayfish burrows, bones, coprolites, and dinosaur tracks	107.1		131.2	0.0	Same as alternative C
Carmel Formation	Vertebrate tracks	18.0		Same as alternative A	Same as alternative A	2.6
TOTAL		1,057.4	0	1,151.6	230.3	1,073.7
<b>Unpaved GMP Roads</b>						
Tropic Shale	Primarily marine specimens	Direct: 169.3 Indirect: 865.8	Same as alternative A	Same as alternative A	No Impact	Same as alternative A
Organ Rock	Permian reptiles or reptile-related fossils	Direct: 153.7 Indirect: 751.9	Same as alternative A	Direct: 178.7 Indirect: 776.9	No Impact	Same as alternative A
Moenkopi	Locally common tracks and traces	Direct: 223.5 Indirect: 1,117.6	Same as alternative A	Same as alternative A	No Impact	Same as alternative A
Chinle	Petrified wood, carbonaceous debris, gastropods, crayfish burrows, bones, coprolites, and dinosaur tracks	Direct: 192.5 Indirect: 909.6	Same as alternative A	Same as alternative A	No Impact	Same as alternative A

Geologic Formation	Associated Paleontological Features	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Kayenta	Dinosaur tracks, trace fossils including coprolites and tracks of small (Grallator) and large (Eubrontes) theropods	Direct: 157.1 Indirect: 764.5	Same as alternative A	Direct: 182.1 Indirect: 789.5	No Impact	Same as alternative A
Navajo Sandstone	Eubrontes prosauropods, small theropods, large bipeds, both small and large tridactyl tracks, ornithopod tracks, and mammal-like reptile tracks	Direct: 200.8 Indirect: 1,000.5	Same as alternative A	Same as alternative A	No Impact	Same as alternative A
TOTAL (direct)		1,096.9	Same as alternative A	1,146.9	0	Same as alternative A
TOTAL (indirect)		5,409.9	Same as alternative A	5,459.9	0	Same as alternative A
<b>Ferry Swale (acres impacted)</b>						
Tropic Shale	Primarily marine specimens	Direct: 136.3 Indirect: 668.9	0	Direct: 0 Indirect: 0	0	Same as alternative C
Organ Rock	Permian reptiles or reptile-related fossils.	Direct: 0.0 Indirect: 0.0	0	Direct: 0.0 Indirect: 0.0	0	Same as alternative C
Moenkopi	Locally common tracks and traces	Direct: 0.0 Indirect: 0.0	0	Direct: 0.0 Indirect: 0.0	0	Same as alternative C
Chinle	Petrified wood, carbonaceous debris, gastropods, crayfish burrows, bones, coprolites, and dinosaur tracks	Direct: 0.0 Indirect: 0.0	0	Direct: 0.0 Indirect: 0.0	0	Same as alternative C

Geologic Formation	Associated Paleontological Features	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Navajo Sandstone	Eubrontes prosauropods, small theropods, large bipeds, both small and large tridactyl tracks, ornithopod tracks, and mammal-like reptile tracks	Direct: 18.9 Indirect: 295.5	0	Direct: 11.2 Indirect: 160.9	0	Same as alternative C
TOTAL (direct)		155.2	0	11.2	0	Same as alternative C
TOTAL (indirect)		964.4	0	160.9	0	Same as alternative C

Note: Direct impacts apply to geology and associated paleontological features contained within 12 feet (3.65 meters) on either side of designated ORV route centerlines at Ferry Swale and within 33 feet (10.05 meters) on either side of road centerlines on GMP roads. Indirect impacts apply to geology and associated paleontological features contained within an area between 12 feet (3.65 meters) and 196.85 feet (60 meters) on either side of designated ORV route centerlines at Ferry Swale and between 33 feet (10.05 meters) and 200 feet (60 meters) on either side of road centerlines on GMP roads.

Compared to the no-action alternative, alternative B would provide the greatest protection to paleontological resources through elimination of off-road use and an accompanying decreased area of disturbance where underlying geologic strata and formations bear notable fossil resources. Alternatives C and E would result in an increased potential for impacts on paleontological resources because both alternatives would result in increased off-road use by adding additional types of motor vehicles authorized for off-road use at accessible shorelines (OHVs and street-legal ATVs under alternative C; street-legal ATVs under alternative E), formalizing off-road use at Paiute Farms and Nokai, and designating ORV routes in Ferry Swale.

While off-road use has the potential to cause impacts on geologic features containing sensitive paleontological resources, it should be noted that most paleontological resources are buried deep within the geologic layers underlying Glen Canyon. The geologic strata containing these resources is exposed at various locations at Glen Canyon, and years of off-road use have resulted in the potential for damage through erosion of topsoil and resulting impacts on the underlying geologic material and the resources contained therein. As a result, where adverse impacts are likely to occur, they would be highly localized.

Direct impacts on paleontological resources at Lone Rock Beach and the play area would not be significant under any of the alternatives considered in this plan/DEIS. While fossils have been known to occur in the eolian and alluvial deposits present in the bedrock material found at Lone Rock Beach and the play area, this area does not contain any known paleontological sites. The NPS has intentionally confined the type of off-road use that results in concentrated and prolonged disturbance to the play area in order to ensure that this high level of repeated impact does not occur throughout the recreation area. Off-road use at the play area severely impacts roughly 120 acres of the ground surface material present there. However, 188,000 acres of this type of eolian and alluvial lithology are found throughout the recreation area. Therefore, in the overall context of the full extent of potentially fossil containing eolian and alluvial deposits throughout the park, this impact likely would not be significant.

Paleontological resources at accessible shoreline areas under alternatives C and E, where off-road use would be the most intense, would be impacted only to a relatively limited extent by off-road use in comparison to the entire

approximately 2,000 miles of Lake Powell shoreline available at Glen Canyon. Adverse impacts may be locally severe where exposed lithologies of the recreation area contain sensitive paleontological resources. Locally intense and prolonged off-road use would occur under alternatives C and E, and such use likely would be anticipated to result in significant impacts on paleontological resources through the exposure of underlying geologic material and the fossil resources contained therein. Different lithologies occur throughout Glen Canyon. Lithologies most vulnerable to direct impacts from off-road use and which are found near accessible shoreline areas include the Entrada Sandstone, Organ Rock, Moenkopi and Chinle formations. These formations contain notable track sites, reptile fossils and other sensitive paleontological resources. The resulting potential for loss of these resources could likely be significant. Impacts would rise to the level of significance if the adverse effect represented direct, localized impacts on the landscape of which the possible effects on the human environment are highly uncertain and which may establish a precedent for future actions with significant effects. Direct impacts occurring under alternatives C and E, where off-road use would be the most intense compared to alternatives B and D and the no-action alternative, would be locally significant but would not rise to the level of significance at the broader scale.

Paleontological resource-containing lithologies present at the most highly visited accessible shorelines—Bullfrog North and South (though currently closed) and Stanton Creek—may experience localized severe impacts associated with off-road use within the authorized areas. However, impacts are concentrated to certain portions within authorized accessible shorelines and generally do not extend beyond authorized areas. If paleontological resources present within these shorelines were affected, the resulting impacts would be highly noticeable, apparent, and severe at the specific accessible shorelines; however, in the context of the entire Lake Powell shoreline, impacts would be barely discernible. As a result, impacts on paleontological resources are not likely to be significant because the proportion of impacts is small in the wider context of Glen Canyon National Recreation Area.

Under alternative C, where motor vehicle use would be the most intense, impacts on paleontological resources from conventional motor vehicles, OHVs, and street-legal ATVs on GMP roads would not likely be significant because the roads are designated for motor vehicle use and are constructed and maintained for such use. The soft geologic materials of the Kayenta formation, which is found along GMPs roads, are vulnerable to damage caused by off-road use. This formation is known to contain dinosaur tracks and trace fossils including tracks of small and large theropods. However, roadways are previously disturbed through blading, compaction, and other earthmoving activities required for road construction; routine maintenance; and use. As a result, the continued use of conventional motor vehicles and street-legal ATVs would not result in notable new harm to paleontological resources. Taken together, direct impacts would occur on approximately 1,097 acres of the sensitive lithologies of Tropic Shale, Organ Rock, Moenkopi, Chinle, Kayenta, and Navajo Sandstone found along unpaved GMP roadways. Within the greater context of Glen Canyon National Recreation Area, which contains nearly 1,000,000 acres of surface area overlying these geologic formations, this represents less than 1% of the total extent of those sensitive lithologies within the entire park unit. Overall, the total footprint of surface disturbances from off-road use estimated under alternative C (from direct and indirect impacts along unpaved GMP and ORV routes in Ferry Swale as well as at accessible shorelines) is 19,970 acres. This represents less than 2% of the total 1,249,934 acres of the recreation area. Impacts from the addition of OHVs and street-legal are thus not likely to be significant.