

Volume 1
Final
General Management Plan
Environmental Impact Statement

**ROCK CREEK PARK
AND THE
ROCK CREEK AND
POTOMAC PARKWAY**

Washington, D.C.

ENVIRONMENTAL CONSEQUENCES

For each impact topic, this section identifies the applicable regulations and policy, describes the methods used to determine environmental effects, presents the results of the analysis, identifies cumulative impacts, and presents a conclusion.

ENVIRONMENTAL IMPACTS OF ALTERNATIVE A: IMPROVED MANAGEMENT OF ESTABLISHED PARK USES

IMPACTS ON AIR QUALITY

Regulations and Policy

The regulations and policies that guide NPS actions with respect to air quality are presented in the “Servicewide Mandates and Policies” section of this document.

Methodology

Within Rock Creek Park, vehicle tailpipe emissions are the only substantial source of air pollutants. Occasionally, dust emissions from exposed soils and smoke particulates from small wildfires contribute particulate pollutants. However, dust and smoke particulate emissions occur only sporadically, for short periods, and in such small quantities that their contributions to overall park air quality are very small. Consequently, dust and smoke emissions are not considered further in this analysis.

Tailpipe emissions from automobiles and other internal combustion engines contain particulates, hydrocarbons, and oxides of carbon, nitrogen, and sulfur. As described in the “Affected Environment” section, the Washington, D.C. region most recently achieved compliance with the National Ambient Air Quality Standard (NAAQS) for carbon monoxide (in 1988) and now implements a maintenance plan to prevent violations. Therefore, this impact evaluation focuses on changes in emissions of carbon monoxide that result from each alternative. It is assumed that if carbon monoxide concentrations are within the standard, other tailpipe emissions, which have not historically been a problem in the region, also will not exceed air quality standards.

Air quality has been improving in the region. No exceedences of carbon monoxide have occurred since 1988 and data indicate that the long-term trend for carbon monoxide is downward. This trend has been attributed to the increasing use of oxygenated fuels and the gradual replacement of older, more polluting motor vehicles with newer models (Day 2004).

It is believed that improvements will continue into the future (Day 2004). However, there is no basis for quantifying these improvements. Therefore, this evaluation assumed that emissions per vehicle in the year 2020 would be identical to those produced per vehicle in 2001 and 2002.

Most tailpipe emissions in the Washington, D.C. area come from automobile traffic. Regardless of any actions taken by the National Park Service at Rock Creek Park, local and regional traffic levels are expected to increase from those defined in the “Affected Environment” section. The magnitude of these increases is presented in the “Impacts on Regional and Local Transportation” section.

Because traffic will increase, the evaluation of impacts on air quality for each action alternative was determined through comparisons to the conditions that are modeled for the year 2020 without any change in park management (Alternative B).

Carbon monoxide concentrations in the year 2020 were estimated by assuming that increases in carbon monoxide between now and 2020 would be proportional to increases in automobile traffic volumes between now and 2020. Average daily traffic counts were used to express automobile volumes.

The most recent average traffic counts available for city streets were obtained from the District of Columbia, Department of Transportation map entitled *2001 Traffic Volumes* (District of Columbia 2001a and 2001b). For locations inside Rock Creek Park, average daily traffic counts were measured in June 2004 (Parsons 2004). These counts are shown on the Average Weekday Traffic Volumes map in the “Affected Environment” section.

Average daily traffic counts for 2020 were obtained from modeling conducted by Robert Peccia and Associates (1997). For details on the model, see the section “Impacts on Regional and Local Transportation” for Alternative A and the information in appendixes G and H. The resulting Alternative A and B Year 2020 Average Weekday Traffic Volumes map is shown on the following page. Maps applicable to other alternatives are included in subsequent sections.

The highest 1-hour carbon monoxide concentration detected during 2001 and 2002, a reading of 7.6 parts per million on October 16, 2002, was used as the baseline representation of the reasonable worst-case condition within the District and in the park and parkway area.

The traffic modeling for the year 2020 did not identify any changes in regional traffic because of management actions at Rock Creek Park. Instead, the alternatives would redistribute the same traffic volume onto different roadways. Based on the traffic modeling, this air quality analysis assumed that regional air quality also would not change among alternatives. Therefore, this analysis focused on changes among alternatives that would occur at individual intersections.

The geographic area that was included in the air quality analysis is the area shown on the Alternative A and B Year 2020 Average Weekday Traffic Volumes map. Within this area, the following locations were evaluated to determine effects on air quality.

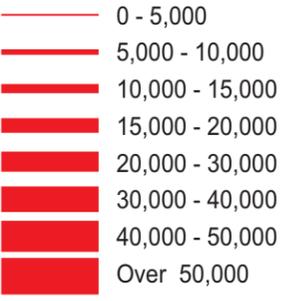
The Rock Creek and Potomac Parkway/M Street/Pennsylvania Avenue intersection, because this is the busiest intersection on the map.

The intersections of Beach Drive/Wise Road, Beach Drive/Military Road, and Beach Drive/Broad Branch Road/Blagden Avenue, because the management prescriptions vary among alternatives at these intersections.

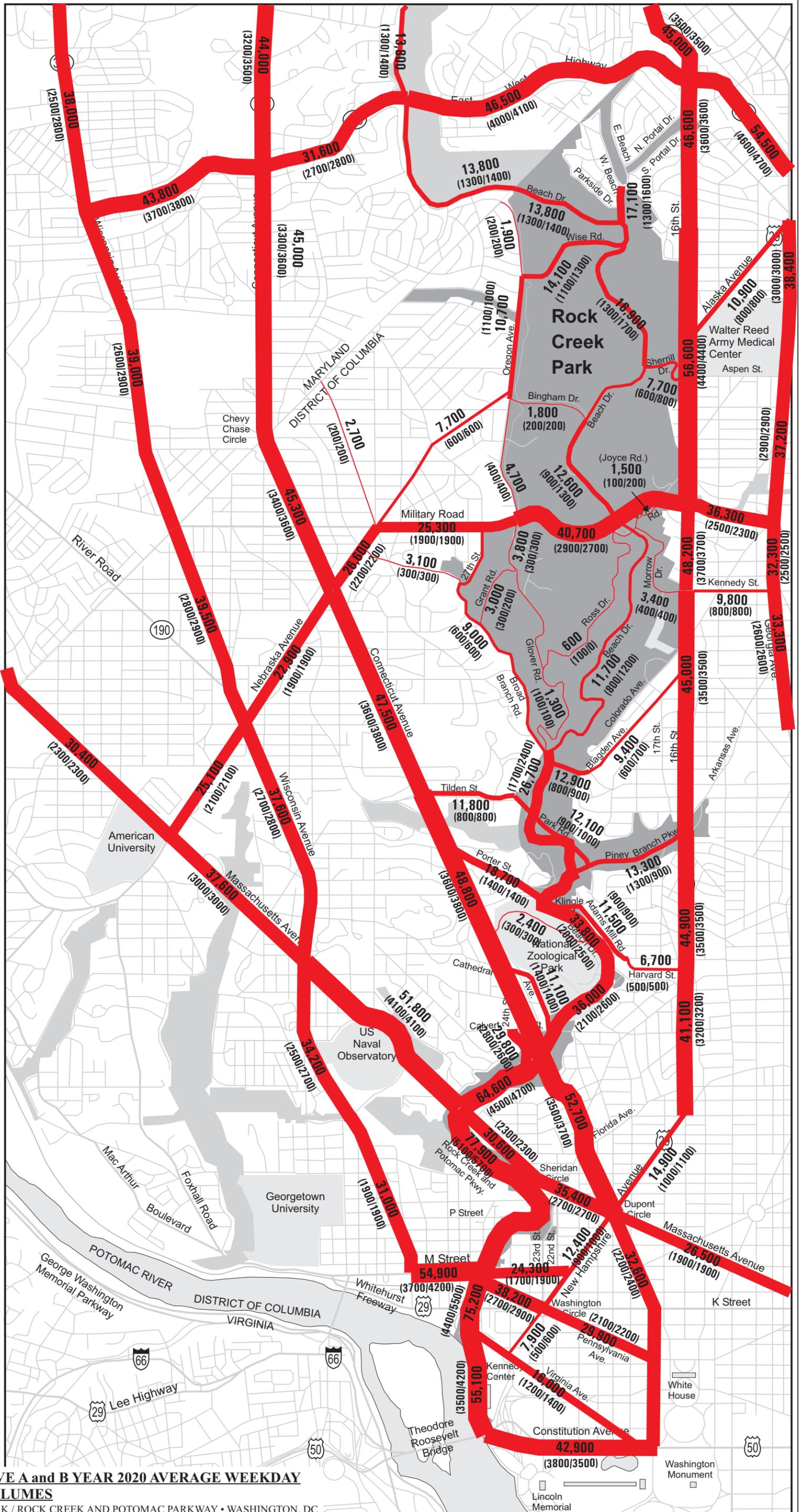


Map Scale: 1" = 0.5 Miles

Rock Creek Park



900 = ADT
 (100/100) =
 (AM Peak Hour/PM Peak Hour)



ALTERNATIVE A and B YEAR 2020 AVERAGE WEEKDAY TRAFFIC VOLUMES

ROCK CREEK PARK / ROCK CREEK AND POTOMAC PARKWAY • WASHINGTON, DC
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The intersections of Wisconsin Avenue and Nebraska Avenue, Connecticut Avenue and Nebraska Avenue, and 16th Street and Military Road, because these are the locations that would receive the greatest increases in traffic if traffic management procedures were implemented in the park and along the parkway.

Each car both enters and exits an intersection. To avoid double-counting of cars, all of the average daily traffic counts around an intersection were summed, and the total was divided by two. For example, using values from the Alternative A and B Year 2020 Average Weekday Traffic Volumes map at the intersection of 16th Street and Military Road, the average daily traffic volumes were summed (total equals 181,800) and divided by two to determine that 90,900 vehicles would pass through the intersection during a normal workday.

Changes in air quality could be either beneficial (reducing carbon monoxide concentrations relative to Alternative B) or adverse (increasing carbon monoxide concentrations relative to Alternative B).

A short-term air quality impact could last over a period of several weeks or months, but would not be expected to recur after a defined period. For example, dust and construction-vehicle emissions associated with rehabilitation and expansion of the Rock Creek Nature Center and Planetarium would cause a short-term air quality impact but would end with the completion of construction. A long-term air quality impact may last for only a few hours each day, but would recur regularly, creating a pattern of changes in carbon monoxide concentrations relative to Alternative B. Changes in tailpipe emissions at an intersection because of changes in traffic management would be an example of a long-term air quality impact.

A negligible impact on air quality was defined as a change resulting from an alternative that would cause the maximum 1-hour average concentration of carbon monoxide at any intersection to change by less than 2 parts per million relative to Alternative B.

A minor impact on air quality was defined as a change resulting from an alternative that would cause the maximum 1-hour average concentration of carbon monoxide at any intersection to change by 2 to 5 parts per million relative to Alternative B.

A moderate impact on air quality was defined as a change resulting from an alternative that would cause the maximum 1-hour average concentration of carbon monoxide at any intersection to change by 5 to 8 parts per million relative to Alternative B.

A major impact on air quality was defined as a change resulting from an alternative that would cause the maximum 1-hour average concentration of carbon monoxide at any intersection to change by more than 8 parts per million relative to Alternative B. In addition, any change resulting from an alternative that would cause a change in carbon monoxide National Ambient Air Quality Standard attainment at any intersection relative to Alternative B was identified as a major impact.

Impairment of air quality would occur if there was a major adverse impact on air quality resources or values whose conservation was (1) necessary to fulfill specific purposes identified in the establishing legislation of the park or parkway, (2) key to the natural or cultural integrity of the park and parkway or opportunities for enjoyment of these units, or (3) identified as a goal in this general management plan or other NPS planning documents.

As described in the “Affected Environment” section, the Washington, D.C. metropolitan area is not yet classified as an attainment area for the ground-level ozone National Ambient Air Quality Standard. However, as discussed in that section, ozone is not a tailpipe emission but is a secondary pollutant that results from region-wide interactions of air pollutants with sunlight. Ozone would not be affected by the redistribution of traffic that would occur from the Rock Creek Park management alternatives and, therefore, was not considered in this impact evaluation.

Analysis

Regardless of the actions associated with Alternative A, the air quality of Rock Creek Park and the Rock Creek and Potomac Parkway would be affected more by emissions throughout the regional airshed than by tailpipe emissions from vehicles using the park and parkway.

Table 20 summarizes the effects of Alternative A on air quality in the year 2020 compared to Alternative B. The focus of Alternative A is on reducing traffic speeds throughout the park and parkway rather than changing traffic volumes. Some of the traffic that would have used Beach Drive under Alternative B may voluntarily divert under Alternative A to Ross Drive between Military Road and the Broad Branch Road/Ross Drive/Beach Drive intersection, but would reestablish the Alternative B traffic pattern outside of this area. As a result, the differences in traffic volumes between the two alternatives would be negligible, as would differences in carbon monoxide concentrations at intersections in and around the park and parkway.

Table 20 also shows the estimated concentrations of carbon monoxide at intersections in and around the park and parkway in the year 2020 with the implementation of Alternative A. As shown in the table, the worst 1-hour carbon monoxide concentration that would be associated with Alternative A (12.6 parts per million at the intersection of Beach Drive, Broad Branch Road, and Bladgen Avenue) would be well below the 1-hour National Ambient Air Quality Standard of 35 parts per million that is protective of human health and the environment.

Alternative A would include some construction in the park that would not occur with Alternative B. This would include preserving historic structures, expanding the Rock Creek Nature Center and Planetarium, and possibly constructing new buildings at the maintenance yard or the H-3 area. Best management practices and prompt revegetation would be applied in association with all construction to ensure that dust and construction-vehicle emissions associated with these activities would not be substantially greater than those that would occur with Alternative B.

Cumulative Impacts

No changes would occur in air emissions from vehicles in the region because of Alternative A management actions at Rock Creek Park and the Rock Creek and Potomac Parkway. Although Alternative A would slow traffic speeds along the park and parkway, there would be little difference in motor vehicle use or distribution compared to Alternative B. As a result, Alternative A would have negligible effects on the regional air quality.

**TABLE 20: AIR QUALITY IMPACT EVALUATION BASED ON ESTIMATED
MAXIMUM-HOUR CARBON MONOXIDE (CO) CONCENTRATIONS IN 2020**

Location	Alternative A	Alternative B	Alternative C	Alternative D
Rock Creek and Potomac Parkway/M Street/Pennsylvania Avenue				
Average daily traffic count (vehicles)	135,250	135,250	130,050	130,050 to 135,250
Max 1-hour carbon monoxide concentration	9.9	9.9	9.6	9.6 to 9.9
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible
Beach Drive/Wise Road				
Average daily traffic count (vehicles)	24,050	24,050	13,250	13,250 to 24,050
Max 1-hour carbon monoxide concentration	11.4	11.4	6.3	6.3 to 11.4
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	moderate	negligible to minor
Beach Drive/Military Road				
Average daily traffic count (vehicles)	51,700	51,700	39,800	39,88 to 51,700
Max 1-hour carbon monoxide concentration	9.6	9.6	7.4	7.4 to 9.6
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	minor	negligible to minor
Beach Drive/Broad Branch Road/Blagden Avenue				
Average daily traffic count (vehicles)	30,800	30,800	22,050	22,050 to 30,800
Max 1-hour carbon monoxide concentration	12.6	12.6	9.1	9,1 to 12.6
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	minor	negligible to minor
Wisconsin Avenue north of Nebraska Avenue				
Average daily traffic count (vehicles)	62,550	62,550	65,000	62,550 to 65,000
Max 1-hour carbon monoxide concentration	8.7	8.7	9.1	8.7
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible
Connecticut Avenue north of Nebraska Avenue				
Average daily traffic count (vehicles)	71,150	71,150	72,350	71,150 to 72,350
Max 1-hour carbon monoxide concentration	9.2	9.2	9.3	9.2
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible
16th Street/Military Road intersection				
Average daily traffic count (vehicles)	90,900	90,900	95,250	90,900 to 95,250
Max 1-hour carbon monoxide concentration	10.2	10.2	10.7	10.2
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible

Provisions of Alternative A to reduce traffic speeds in the park and on the parkway may encourage some travelers to use bicycles rather than automobiles. This change in transportation mode would result in a beneficial but negligible effect on the regional air quality.

Conclusions

Alternative A would result in negligible effects on air quality compared to Alternative B. It would not result in the exceedence of the 1-hour National Ambient Air Quality Standard for carbon monoxide. It would not cause any impairment of resources or values associated with air quality.

IMPACTS ON ROCK CREEK AND ITS TRIBUTARIES

Regulations and Policy

The regulations and policies that guide NPS actions with respect to water quality and hydrology in Rock Creek and its tributaries are presented in the “Servicewide Mandates and Policies” section of this document.

Methodology

The area addressed in the water quality and hydrology analysis of Rock Creek and its tributaries is described in the “Geographic Area Covered by the General Management Plan” section. This includes

- the 1,754 acres administered by the National Park Service in the Rock Creek valley from the Maryland state line south to the National Zoo

- the Rock Creek and Potomac Parkway from the National Zoo to Virginia Avenue

- selected tributaries to Rock Creek and associated roadways

All of the alternatives include implementing best management practices to improve the hydrology and quality of surface waters in the park. Therefore, the analysis for each alternative included an evaluation of the effects of the best management practices compared to current conditions. In addition, conditions that would occur under Alternatives A, C, and D were compared to conditions that would occur under Alternative B to determine differences that would result compared to continuing with current management practices at the park.

Historical and current water quality within the park was determined from existing water quality data. The effects of Alternatives A, C, and D were estimated by adding the incremental effect of the alternatives to the estimated water quality conditions with continuation of existing management practices (Alternative B).

Changes to Rock Creek and its tributaries could be either beneficial (reducing pollutant loadings or the intensity of storm water flows) or adverse (increasing pollutant loadings or the intensity of storm water flows).

A negligible effect would be a change that probably would not be detected by water quality or quantity monitoring.

A measurable effect on Rock Creek and its tributaries was defined as a change that probably would be detected by water quality or quantity monitoring, but that would not be major.

A major effect on the water quality of Rock Creek and its tributaries was defined as a change caused by an alternative that would alter the ability of the waterway to meet a water quality standard. For example,

a change that would enable Rock Creek to consistently meet fecal coliform standards, which it frequently fails, would be a major beneficial change

a change that caused Rock Creek to repeatedly exceed the standard for lead, which it has historically met (NPS 1994), would be a major adverse change

A major effect on the hydrology of Rock Creek and its tributaries would result in visually obvious changes in channel configuration, such as areas of scour or deposition.

Impairment of Rock Creek or its tributaries would occur if there was a major adverse impact on water resources or values whose conservation was (1) necessary to fulfill specific purposes identified in the establishing legislation of the park or parkway, (2) key to the natural or cultural integrity of the park and parkway or opportunities for enjoyment of these units, or (3) identified as a goal in this general management plan or other NPS planning documents.

Short-term effects would be temporary changes. Increased sediment loading from construction runoff would be a short-term effect, even though the construction-related increase might last for more than a year. Long-term effects would occur for many years, such as increased runoff from the installation of a large area of impervious surface, such as a new parking lot. For storm water flows, a long-term effect would refer to a change in the hydrologic pattern, rather than changes associated with any particular storm event.

Analysis

No new point-source discharges in the park are anticipated as a result of Alternative A. The contribution of pollutants from existing point source discharges would be expected to decline as the park increased its implementation of best management practices and corrective measures to reduce or eliminate discharges. The result of these activities would produce beneficial, long-term, negligible to measurable effects on water quality.

Continued cooperation of NPS staff with local, district, state, and federal environmental and sanitation agencies for monitoring and completing timely repair of sanitary and combined sanitary/storm sewers would reduce contamination of Rock Creek and its tributaries. Continued progress toward eliminating combined sanitary/storm sewers would also improve water quality. This would produce beneficial, long-term, measurable to major effects on water quality.

The application of best management practices at the three park stables, the maintenance yard and storage area, the golf course, and other existing park facilities would reduce contaminated runoff.

Specific sources of potential contamination in the park and recommendations for best management practices to minimize pollution are presented in the *Best Management Practices for Water Quality – Rock Creek Park* (URS Greiner Woodward Clyde 1999). Implementation of best management practices at these sites has begun; continuation would produce beneficial, long-term, measurable effects on water quality.

Alternative A would include preservation of historic features, expansion of the Rock Creek Nature Center and Planetarium, and relocation of the park administrative offices and the District 3 U.S. Park Police substation. The relocations preferably would be to commercial space outside of the park, but could involve construction of a new administrative facility at the maintenance yard and/or construction of a new park police substation at the H-3 area. During construction activities and throughout long-term operations, the National Park Service would employ conventional soil erosion and runoff prevention best management practices that have proved effective in minimizing both the volume and sediment loading of runoff. Anticipated effects during construction would be adverse, but would be short-term and would not last more than 2 to 3 months after construction was completed.

Without best management practices, construction activities could cause temporary increases in sedimentation and turbidity in surface water as a result of soil disturbance. However, the representative sites that are being evaluated in this general management plan are already disturbed, are well removed from streams (at least 1,200 feet), and are buffered by surrounding natural vegetation cover. When combined with best management practices, these factors should result in negligible adverse, short-term effects from construction on water quality and hydrology compared to conditions under Alternative B.

If administrative and U.S. Park Police functions were relocated within the park, such as at the maintenance yard or H-3 stable area, the National Park Service has committed to not increasing the impervious area at the site compared to existing facilities (buildings and parking lots). This might be accomplished by removing existing single-story buildings and replacing them with multi-story structures or by removing part of the parking area and developing a shuttle service to nearby Metro stations. Moreover, the National Park Service would use low-impact development, such as the installation of green roofs, creation of rain gardens, or use of vegetated swales, to minimize areas of impervious surfaces. As a result, the impervious area at these sites would remain the same or decrease slightly. These long-term, beneficial effects would be highly localized and would be of negligible intensity.

Alternative A may cause some automobile traffic to divert to other routes, particularly Ross Drive. However, all of the alternate routes, both in and outside the park, are within the Rock Creek drainage. Therefore, any changes in traffic patterns related to Alternative A would have a negligible effect on pollutant loadings in Rock Creek that result from storm water runoff from roadways in the drainage.

Trail improvement activities associated with Alternative A could involve

- upgrading almost 10 miles of trails along Oregon Avenue, Beach Drive, the Rock Creek and Potomac Parkway, and Bingham Drive

- constructing up to 1.75 miles of new trails along Piney Branch Parkway and other park roads

rerouting up to 2 miles of poorly designed trail segments, such as areas with severe drainage, stability, or soil erosion problems

Best management practices would be employed during construction to minimize soil mobilization and transport into the water system. However, because of the proximity of some trail segments to Rock Creek or its tributaries, an measurable increase in sediment loading could occur. Disturbed areas would be rapidly revegetated with native species. Therefore, this adverse effect would be short-term.

An estimated 3.6 acres of new, impervious surface, configured as a long, narrow corridor, would be created by the construction of new trails. The trail shoulders would be revegetated with native species, with an emphasis on dense vegetation, such as grasses, that slow the speed of runoff and allow the water to soak into the ground. As a result, little if any additional runoff would reach the stream channels and the intensity of the long-term, adverse effect on hydrology would be negligible.

Replacement of poorly designed trail segments would substantially reduce their current erosion problems that cause sediment loading of Rock Creek. This would be a long-term, beneficial effect that probably would be measurable but would not change the ability of the creek to meet any water quality standards.

Adaptive management is an important feature of Alternative A that can be applied to improving the water quality and hydrology of Rock Creek and its tributaries. As described under “Connected, Cumulative, and Similar Actions,” a component of this alternative will be the updating of the existing natural resources management plan. This plan would include water quality improvements focused on outcomes. Implementing actions could include planting trees and shrubs to enhance riparian zone functions and reduced mowing along roadways to maximize the soil-stabilizing effects of vegetation while preventing vegetation succession. The long-term, beneficial effect of these actions on Rock Creek and its tributaries would be measurable.

Cumulative Impacts

Water quality and flows in Rock Creek and its tributaries would continue to be more heavily influenced by urban development in the upstream watershed than by activities in the park. However, the incremental effects of reducing pollutant loading inside the park through the application of best management practices, replacement of poorly designed trail sections, and other Alternative A features would measurably benefit stream water quality.

NPS programs to encourage public awareness of water quality problems could improve citizen stewardship of water resources in the region. Improvements could result from the cumulative effects of small measures taken by better-informed individual citizens on their properties. In addition, park water quality improvements could result from the increased action of citizen groups in upstream communities. Implementation and enforcement of water pollution control regulations in Maryland, especially storm water controls, would improve water quality and storm water flows in the park.

Use of best management practices in the park to reduce runoff from impervious surfaces would have a small beneficial effect in offsetting general watershed trends of increased storm water runoff. The higher runoff flows from the upstream watershed appear responsible for scouring the

streambed in some areas of the park and depositing sediment in others. Coordination with upstream jurisdictions to implement best management practices in the upstream watershed as well as in the park would result in beneficial, long-term, measurable to major reductions in streambed alterations such as scour and sedimentation.

The installation of a fish bypass at the dam at Peirce Mill and the removal of other impediments to fish migration in Rock Creek as part of the Woodrow Wilson Bridge mitigation were described in the “Connected, Cumulative, and Similar Actions” section. The Woodrow Wilson Bridge fish bypass mitigation project was initiated in 2004 and several components have been completed. This project is having short-term, measurable, adverse effects by slightly increasing sediment loading in Rock Creek, but the long-term effects on water quality and hydrology will be negligible.

Continued cooperation with local, district, state, and federal environmental and sanitation agencies for monitoring and completing timely repairs of sanitary and combined sanitary/storm sewers would reduce contamination of Rock Creek and its tributaries. Continued progress toward eliminating combined sanitary/storm sewers would also improve water quality. This would produce beneficial, long-term, major effects on water quality.

As described in the “Affected Environment” section, the District of Columbia Water and Sewer Authority has proposed a storm water management program that includes installing a 5-million-gallon-capacity tunnel along Rock Creek to provide temporary storage of combined storm runoff and sewage. This would eliminate most of the 60 to 70 overflow events that currently occur each year. The remaining 5 to 10 overflow events that would occur annually would be associated with major storms. Elimination of most combined sewer overflow events would produce major, beneficial, long-term effects on water quality of Rock Creek and its tributaries. An alignment for placing such a tunnel “along Rock Creek” has not yet been proposed, and would require extensive coordination to ensure that park resources and values were not adversely affected.

The National Park Service would continue to provide support of, and participation in, other regional programs to improve water quality and watershed management. These include the Chesapeake Bay Program described in “Servicewide Mandates and Policies.” Collectively, these actions already have had major, beneficial, long-term effects on water quality of Rock Creek and its tributaries and continued improvements are expected.

Conclusions

Compared to future conditions occurring under the alternative of no action/continue current management (Alternative B), Alternative A would produce short-term, negligible to measurable, adverse effects on water quality. These primarily would be caused by increased sedimentation associated with trail construction near streams. Short-term, adverse effects from other construction would be negligible.

Long-term effects of Alternative A on Rock Creek and its tributaries would be measurable and beneficial. Contributing factors would include increased implementation of best management practices, reduced sedimentation by replacing poorly designed trail segments that have erosion problems, and improved park-wide management of soils, vegetation, and water under an updated natural resources management plan.

Cumulatively, continued interagency measures, such as reducing point and non-point discharges, and maintaining and improving sanitary and combined sewer systems would continue to produce beneficial, long-term, major effects on water quality. Coordination would also produce beneficial, long-term, major reductions in streambed alterations such as scour and sedimentation.

The management actions of Alternative A would not result in impairment of resources or values associated with Rock Creek and its tributaries.

IMPACTS ON WETLANDS AND FLOODPLAINS

Regulations and Policy

The regulations and policies that guide NPS actions with respect to wetlands and floodplains are presented in the “Servicewide Mandates and Policies” section of this document.

Methodology

The area addressed in the analysis of wetlands and floodplains is described in the “Geographic Area Covered by the General Management Plan” section.

Protection of wetlands and floodplains has been a standard practice at Rock Creek Park for many years. Protection of these resources will continue in conformance with NPS guidance documents such as

Procedural Manual #77-1: Wetland Protection (NPS 1998e)

Director’s Order 77-1, Wetland Protection (NPS 2002a)

Director’s Order 77-2, Floodplain Management (NPS 2003a)

Procedural Manual #77-2: Floodplain Management (NPS 2002b)

Management Policies 2001 (NPS 2000a)

The protection of freshwater spring-fed wetlands and seeps and the biota found in and around them, including rare amphipods, would be an important management objective. None of the alternatives would allow any actions that potentially would cause adverse effects on these sites. Therefore, effects on these specific wetland resources were not considered further in this impact analysis.

Potential effects were assessed based on the potential for locating new construction in floodplains or near known seep locations; conducting ground disturbing activities or depositing fill material in wetlands, seeps, or floodplain zones; or changing the existing hydrologic regime of one of these locations through facility construction or operation. Indirect effects from construction, management activities, or visitor use upgradient from floodplain and wetland areas were also considered.

The analysis consisted of identifying the locations and types of wetlands, seeps, and floodplain areas from existing park maps. The locations of the proposed facilities associated with the

alternative were superimposed on the wetland and floodplain locations to determine which facilities (if any) would be located in or across one or more of these features. The potential consequences of the facility or activities anticipated at each location were then estimated.

Short-term effects were defined as temporary changes, such as the temporary placement of fill in a wetland or floodplain in association with construction that would last less than one growing season, followed by site restoration. Long-term effects would occur for many growing seasons.

Intensities of effects on wetlands were defined as follows.

A minor adverse effect on a wetland would include a change that would not require a Section 404 nationwide dredge-and-fill permit.

A major adverse effect on a wetland would include any of the following:

a change that needed an individual Section 404 dredge-and-fill permit

a change that resulted in the loss of one or more wetland functions

the permanent loss of a wetland, regardless of whether or not it was included in the National Wetland Inventory or was classified as jurisdictional by the U.S. Army Corps of Engineers

A major adverse effect on a floodplain would be an action that reduced the hydraulic capacity of the floodplain or caused the floodplain boundaries to shift outside its current 100-year boundary.

Impairment of wetlands or floodplains would occur if there was a major adverse impact on wetlands or floodplain resources or values whose conservation was (1) necessary to fulfill specific purposes identified in the establishing legislation of the park or parkway, (2) key to the natural or cultural integrity of the park and parkway or opportunities for enjoyment of these units, or (3) identified as a goal in this general management plan or other NPS planning documents.

Analysis

None of the proposed actions in Alternative A would have long-term, adverse effects on wetlands.

Rehabilitation of the Peirce Mill complex would occur within the 100-year floodplain. This historic structure is allowed within the 100-year floodplain according to *Procedural Manual #77-2: Floodplain Management* because location is integral to the historic structures' significance (NPS 2002b). Prior to rehabilitation, the National Park Service would perform a floodplain analysis and would include appropriate mitigation to prevent adverse, long-term impacts on the floodplain capacity or boundaries. Short-term adverse effects on the 100-year floodplain capacity could occur during construction.

Alternative A would include improving and possibly rerouting of the recreation trails along Rock Creek, portions of which are in the 100-year floodplain. Trail construction in a floodplain is acceptable under *Procedural Manual #77-2: Floodplain Management* because trails do not affect a floodplain's capacity for flood management (NPS 2002b). Short-term adverse effects on the

100-year floodplain capacity could occur during construction. All trail modifications and route alignments would be designed to avoid wetland areas.

This alternative's better education of the public on the need to control storm water runoff upstream from the park could produce a beneficial effect on the park's wetlands and floodplains relative to Alternative B. However, the size of this effect probably would be negligible.

Cumulative Impacts

Alternative A would not produce any adverse, long-term impacts on wetlands, seeps, or floodplains. Therefore, it would not contribute to any cumulative adverse impacts on wetlands or floodplains in the park or in the region.

Floodplains and wetlands throughout the park would continue to be protected from direct disturbance from development. Application of best management practices would help reduce risk to floodplain and wetland resources from polluted runoff, erosion, filling activities, water diversions, and sedimentation from sources within the park. Wetlands located in the Rock Creek floodplain would continue to be threatened by sediments transported during high storm water discharges originating upstream from the park.

The removal of impediments to fish migration, including construction of a fish bypass at Peirce Mill dam, represents a new construction action in the 100-year floodplain. Some of the construction has already occurred and completion of the project is expected in 2005. These actions are being implemented as part of the mitigation program for the Woodrow Wilson Bridge. Construction activity would represent a short-term adverse effect on the 100-year floodplain capacity. However, because federal floodplain management strategies require no net loss of 100-year floodplain hydraulic capacity, the bypass structure and barrier removals will be designed so there is no long-term loss of floodplain hydraulic capacity.

Construction would temporarily increase downstream water turbidity while construction was in progress. Use of best management practices to control downstream siltation would ensure that the deposition of silt in wetlands did not occur and that silt deposition did not reduce floodplain capacity.

Conclusions

Alternative A would not produce any adverse, long-term effects on wetlands or floodplains. Short-term reductions in floodplain capacities could occur during construction activities at the Peirce Mill complex and along trails. There would be no impairment of resources or values associated with wetlands and floodplains.

IMPACTS ON DECIDUOUS FORESTS

Regulations and Policy

The regulations and policies that guide NPS actions with respect to deciduous forests are presented in the "Servicewide Mandates and Policies" section of this document.

Methodology

The area addressed in the analysis of deciduous forests is described in the “Geographic Area Covered by the General Management Plan” section. Particular emphasis is placed on lands within each alternative’s designated Forest Zone management prescription.

Protection of the deciduous forest has been a long-term management goal at Rock Creek Park. Protection has included such actions as minimizing or avoiding clearing of trees, suppressing wildfires, and controlling the presence and distribution of invasive species. Protecting the forest resource from disturbance factors will continue in conformance with NPS *Management Policies 2001* (NPS 2000a). Therefore, these types of management actions will not be considered further in this impact analysis.

The deciduous forest impact evaluation consisted of comparing conditions that would occur under Alternatives A, C, and D to those under Alternative B, which would strive to maintain current park conditions. It involved comparing the proposed locations of new and upgraded structural facilities to current forest distribution and to the susceptibility of forest areas to disturbances. Anticipated changes in the operational characteristics of future park activities were reviewed to determine whether such activities could lead to the substantial loss of portions of the forest, conversion of one plant assemblage to another type of plant composition, or reduced productivity. The assessment also examined whether facilities were proposed for forested sites that were steep or would be difficult to revegetate.

Because deciduous forests require a long time to reach maturity, the concepts of short-term versus long-term effects were defined based on plant associations rather than maturity.

Short-term effects were defined as the removal of forest vegetation, followed by restoration with native woody species representative of the various successional stages of the eastern hardwood forest. It is recognized that areas of short-term effects may not have the appearance of the mature deciduous forest for 50 to 80 years.

Long-term effects involve the removal of forest vegetation, followed by a change in vegetation. This could include conversion to another use such as a paved trail or a building site, implementation of management techniques such as mowing to maintain herbaceous vegetation, selected clearing to preserve historic views, or revegetation with exotic species.

A negligible effect would not be measurable.

A minor effect on the deciduous forest would be measurable, but would involve changes smaller than those described in the next paragraph as major.

A major effect would include any of the following. All of these effects would include the aggregate loss or gain from the same action in different locations. For example, all forest alterations associated with trail improvements and construction of new paved trails under an alternative would be considered together.

A permanent loss or gain of the upland deciduous forest resource in an area totaling 12 acres or more. This area represents approximately 0.5 percent of the forested area in the park.

A permanent loss or gain of the riparian deciduous forest resource in an area totaling 1 acre or more. This criterion recognizes the ecological importance of riparian areas and their relative scarcity.

Conversion of similar-sized upland or riparian areas to or from a vegetation type dominated by invasive or non-native species.

Any loss or creation of a rare plant community within the deciduous forest.

Any disturbance or rehabilitation of the deciduous forest on slopes greater than 30 percent.

Impairment of the deciduous forest would occur if there was a major adverse impact on deciduous forest resources or values whose conservation was (1) necessary to fulfill specific purposes identified in the establishing legislation of the park or parkway, (2) key to the natural or cultural integrity of the park and parkway or opportunities for enjoyment of these units, or (3) identified as a goal in this general management plan or other NPS planning documents.

Adverse effects on the deciduous forest would involve loss of existing forest, or conversion of a native species plant assemblage to predominantly exotic or invasive plant species. Beneficial effects would include such actions as restoring unvegetated areas to deciduous woodlands, amending poor or impaired soil conditions to accommodate restoration of deciduous tree species, realigning trails away from steeply sloping areas and revegetating the former alignments, and discontinuing the artificial suppression of tree regeneration through periodic cutting or mowing.

Analysis

Rock Creek Park is the only large area of deciduous forests in the Washington, D.C. metropolitan area, and the deciduous forest is a major factor in defining park character. As such, changes in the area or character of the deciduous forest are an important management factor.

The primary action under Alternative A compared to Alternative B that would affect the abundance and presence of deciduous forest would be associated with trail system improvements. A summary of these activities was included in the Alternative A description and would include

- preparing a trail plan that would determine optimal trail alignments to minimize impacts of trails and avoid conflicts among visitors; outline the trail design and construction standards to be used; include maps and costs for trail alternatives; and provide National Environmental Policy Act documentation with opportunities for agency and public review and comment

- upgrading almost 10 miles of trails along Oregon Avenue, Beach Drive, the Rock Creek and Potomac Parkway, and Bingham Drive

- constructing up to 1.75 miles of new trails along Piney Branch Parkway and other park roads

- rerouting up to 2 miles of poorly designed trail segments, such as areas with severe drainage, stability, or soil erosion problems

The upgrading of trails along park roadways would have a negligible effect on the deciduous forests of Rock Creek Park. These trails occur in previously disturbed areas where there would be little need to remove trees or otherwise alter the vegetation or character of the deciduous forest.

Similarly, constructing new trails along Piney Branch Parkway and other park roads would have a negligible effect on the park's deciduous forests. Some of the lands on which new trails would be aligned currently are maintained as grasslands within the road right-of-way, and there would be no effects on deciduous forests in these areas. The wooded areas where trail construction would occur would be on the forest margins, and careful trail design could avoid most tree removal and other activities that would alter the forest.

In areas where current trail alignments are moderately to severely eroded, in areas of rare or unusual plant or animal assemblages, or in areas where trails cross slopes of 30 percent or more, up to 2 miles of trail may be relocated to more appropriate areas. Assuming a construction corridor 24 feet wide, which would include the permanent trail alignment (typically ranging from 6 to 9 feet), tree removal and other disturbances would occur on up to 5.8 acres of the park's deciduous forest.

Following completion of trail work, the construction zone outside the permanent trail alignment (about 3.6 acres) would promptly be planted with native grasses to stabilize the soil, and would then be allowed to revegetate naturally with native woody species. Based on the impact thresholds presented above, construction activities would result in a short-term, minor, adverse effect on the park's upland deciduous forest resource.

The former alignments of the poorly designed trail segments would be revegetated in the manner described above for the construction zone. The restoration of the old trail segments would directly offset the long-term commitment of about 2.2 acres of the deciduous forest to the new trail alignments, and the net effect on the acreage of the deciduous forest committed to trails would be negligible. However, realigning the poorly designed trail segments would produce a major, long-term, beneficial effect on the deciduous forest by protecting forest resources and by helping to maintain soil productivity and prevent erosion on steep slopes.

Prior to any trail construction, the National Park Service would perform research and detailed field investigations to support final trail designs. Improvements would be designed to maximize safety and the quality of the visitor recreational experience, and to accommodate historic alignments of old roads and trails without compromising the long-term composition and reproductive capability of the surrounding forest. This would include routing trails around rare plant and animal communities and areas with slopes greater than 30 percent to avoid adverse effects on these areas.

Effects on riparian deciduous forest zones could include the following. The effect would be beneficial in the long term, but the impact intensity would depend on the aggregate acreages of all of these actions.

Within riparian zones, vegetation restoration would be implemented to correct problem areas. This would supplement the regenerating capabilities in this zone.

Existing trails in riparian zones may be relocated outside the riparian zone. After stabilization with native grasses, riparian vegetation would be reestablished along the former

alignment either naturally or with the assistance of plantings. This would be a beneficial, long-term effect.

The improved education and interpretation elements of Alternative A may increase the public's appreciation for deciduous forests. However, the impact of this beneficial, long-term effect probably would be negligible in the park because, as demonstrated by scoping, the public already recognizes the value of the deciduous forest to Rock Creek Park. The beneficial impact would increase if this appreciation were translated into action to protect other remnant woodlands in the region.

The traffic management changes in Alternative A would not affect the forest resources of Rock Creek Park and the Rock Creek and Potomac Parkway. If park administration offices and a new District 3 substation for the U.S. Park Police were constructed in the park, they would not be located in wooded and would not affect the deciduous forest.

Cumulative Impacts

Ongoing urbanization of the Rock Creek watershed and other forested areas of Maryland and Virginia near Washington, D.C. will continue to eliminate deciduous forests. Park management practices associated with Alternative A would have little effect on regional, development-related decreases in deciduous forests. However, as discussed above, the improved education and interpretation elements of Alternative A could provide beneficial, long-term effects if the public's appreciation for deciduous forests obtained at Rock Creek Park were translated into action to protect other remnant forests in the region.

Conclusions

Compared to Alternative B, trail construction activities would result in a short-term, minor, adverse effect on up to 5.8 acres of the park's upland deciduous forest resource. Following revegetation, long-term effects in these areas would be negligible. Major, long-term, beneficial effects may occur in both upland and riparian deciduous forest areas through rehabilitation and/or restoration of problem areas of trails. There would be no impairment of resources or values associated with deciduous forests.

IMPACTS ON PROTECTED AND RARE SPECIES

Regulations and Policy

The regulations and policies that guide NPS actions with respect to protected and rare species are presented in the "Servicewide Mandates and Policies" and "Affected Environment" sections of this document. The National Park Service is required under the Endangered Species Act to ensure that federally listed species and their designated critical habitats are protected on lands within the agency's jurisdiction. Although the National Park Service is not under any legal obligation to protect rare plants or animals identified by the adjoining states of Maryland and Virginia, NPS policy and management actions include maintaining these uncommon native species (NPS 2000a).

Methodology

This analysis evaluated impacts on protected and rare species in the area described in the section entitled “Geographic Area Covered by the General Management Plan.” Species of interest were identified from the current federal list of endangered or threatened fish, wildlife, and plants and from the lists of special-interest species that are maintained by the states of Virginia and Maryland.

The analysis consisted of comparing known species location information and typically occupied habitat conditions in the park to the proposed locations of facilities associated with each alternative. Areas of potential overlap were considered indications of potential adverse effects on the special-concern species. Conditions that would occur under Alternative A, C, and D were compared to those under Alternative B, which would strive to maintain current park conditions.

Moderate effects on protected or rare plant or animal species would include any of the following:

- short-term degradation of critical habitat, followed by effective restoration

- restoration of a previously degraded habitat

- the loss of one or more individuals of a plant or animal listed as being of interest by the states of Virginia and Maryland

Any of the following would be a major adverse effect:

- the removal or long-term degradation of critical habitat for a protected or rare plant or animal species

- the loss of a rare plant community

- the loss of one or more individuals of a federally listed or candidate plant or animal

Impairment of protected or rare plant or animal resources would occur if there was a major adverse impact on protected or rare species resources or values whose conservation was (1) necessary to fulfill specific purposes identified in the establishing legislation of the park or parkway, (2) key to the natural or cultural integrity of the park and parkway or opportunities for enjoyment of these units, or (3) identified as a goal in this general management plan or other NPS planning documents.

Analysis

The groundwater amphipods that were described in the “Affected Environment” section, including the federally endangered Hays spring amphipod, inhabit seeps and springs in several park locations. The National Park Service is aware of these sites and may implement additional measures to protect these important habitats under Alternative A. Compared to Alternative B, long-term protection of the endangered Hays spring amphipod could be enhanced by implementing more active protection of the springs and their upgradient drainages.

Alternative A could include construction at several park locations. All of these sites have previously been disturbed and do not support any protected or rare species. Therefore, these activities would not have any effects on protected or rare species.

As described in the section on deciduous forests, prior to any trail construction, the National Park Service would perform detailed field investigations to ensure that new or upgraded trail segments would not affect any rare plant and animal communities. As a result, the effect of trails on rare or protected species would be negligible.

None of the activities that would affect the waterways within the park, including Rock Creek, would adversely affect protected or rare aquatic species because no species of concern are known to occur in the park's drainages.

The improved education and interpretation elements of Alternative A may increase the public's appreciation for protected and rare species. This could include assisting the public in gaining a better understanding of the importance of rare plants and animals, the need to prevent species extinction, and the importance of habitat in the maintenance of protected and rare species. The resulting beneficial, long-term effect probably would be negligible in the park because the National Park Service already protects rare species within park boundaries. The beneficial effect would increase if this appreciation were translated into action by members of the public to protect rare species in other locations throughout the region.

Cumulative Impacts

Under Alternative A, the park's assemblage of national and regionally rare plants and animals would continue to benefit from the protection that the park affords.

Ongoing urbanization of the Rock Creek watershed and other areas of Maryland and Virginia near Washington, D.C. will continue to eliminate individuals and habitats of protected and rare species. Park management practices associated with Alternative A would have little effect on regional, development-related impacts on these species. However, as discussed above, the improved education and interpretation elements of Alternative A could provide beneficial, long-term effects if the public's appreciation for rare species obtained at Rock Creek Park were translated into action to protect these species outside the park.

Conclusions

Compared to Alternative B, long-term protection of the endangered Hays spring amphipod could be enhanced by implementing more active protection of springs and their upgradient drainages. Opportunities for the public to learn about protected and rare species would be improved. There would be no impairment of resources or values associated with protected and rare species.

IMPACTS ON OTHER NATIVE WILDLIFE

Regulations and Policy

The regulations and policies that guide NPS actions with respect to native wildlife are presented in the "Servicewide Mandates and Policies" section of this document.

Methodology

The effects analysis was conducted by identifying the general wildlife habitats of representative native species that would be affected by the alternative. Once identified, an evaluation was made whether the physical environmental changes associated with each alternative were likely to displace some or all members of a species present in the park, or result in the substantial loss or creation of habitat conditions needed for the continued survival and welfare of the species. The potential for attracting and supporting new wildlife species also was considered by the analysis.

This analysis evaluated effects on native wildlife species associated with the area described in the “Geographic Area Covered by the General Management Plan” section.

Long-term effects on native wildlife were considered to encompass a period of one year or more. Effects of less than this duration would be short-term.

Beneficial effects would result from the maintenance or restoration of native wildlife populations, including their habitat. Adverse effects would involve the loss of native species diversity, supporting habitat, or population numbers.

Intensity was defined as follows.

Negligible effects could cause changes (including death) to individual animals, but would not affect the viability of a wildlife population or assemblage, either locally or park-wide.

A moderate effect would result in the displacement, loss, or restoration of a wildlife population or wildlife assemblage within a localized area of the park.

A major effect would result in the displacement, loss, or restoration of a wildlife population or wildlife assemblage throughout the entire park.

Impairment of the native wildlife resource would occur if there was a major adverse impact on wildlife resources or values whose conservation was (1) necessary to fulfill specific purposes identified in the establishing legislation of the park or parkway, (2) key to the natural or cultural integrity of the park and parkway or opportunities for enjoyment of these units, or (3) identified as a goal in this general management plan or other NPS planning documents.

Throughout the park, little change in the overall management approach for native wildlife would occur under any of the alternatives. The native wildlife evaluation consists of comparing conditions that would occur under Alternatives A, C, and D to those under Alternative B, which would strive to maintain current park conditions.

Analysis

Native species that require deciduous forest habitats in relatively large, contiguous tracts would continue to benefit from the protection of most of the park’s land area as relatively undisturbed woodland.

Alternative A includes a commitment to identify areas with high-quality habitat for birds, including areas such as the maintenance yard where other management activities have inadvertently

created attractive vegetation assemblages. In the natural resources management plan that will tier from this general management plan, the National Park Service would develop measures to protect and enhance these areas. Although the long-term effects of this commitment would be beneficial, differences from the conditions that would occur under Alternative B would be negligible.

Trail realignments and proposed construction activities associated with Alternative A may cause the localized, short-term displacement of individuals. Minor, temporary effects on species from trail realignments would be controlled by using best management practices. There would be no removal of substantial blocks of forest, which might eliminate or substantially alter habitat conditions for species affiliated with the park.

Compared to Alternative B, actions to reduce traffic speeds in the park and on the parkway would reduce the number of wildlife individuals killed or injured by motor vehicles. Additional mitigating efforts to reduce roadkill, such as increasing public awareness, strategic traffic calming, and providing underpasses, could further reduce the frequency of wildlife mortality. This would produce long-term, beneficial effects on the park's native wildlife. For most park species, the change would be negligible, because their populations are stable or expanding. Expected effects on species that have been identified by park staff as potentially declining would be as follows.

Effects on opossums would be negligible. This prey species has a high reproductive rate to compensate for the high mortality it typically experiences from predation. Reducing deaths by the average recorded roadkill of 10 individuals per year would have little effect on populations of this species in the park.

Effects on black rat snakes would be negligible. Recorded roadkill within the park averages less than one individual per year, which would have little effect on the population, either locally or in the park as a whole.

Effects on box turtles would be moderate, long-term, and beneficial. The survival of an additional two to three box turtles per year could help ensure the long-term success of localized populations of this species, which has long-lived individuals with low reproductive potential.

Effects on gray foxes would be major, long-term, and beneficial. As described in the "Affected Environment" section, the gray fox population in the park is small and experiences multiple stress factors. Under these conditions, even infrequent roadkills could contribute to an overall reduction of the resident population or even local extirpation. Actions that reduced roadkill of gray foxes could help ensure the continued existence of this species in the park.

Alternative A would better provide the public with information that removing box turtles from the park is illegal and would provide better education on the adverse effects on box turtles of removing them from the park or even moving them within the park. Because anecdotal evidence suggests that a substantial number of box turtles are removed from the park each year for use as pets, this would provide a moderate, long-term, beneficial effect on box turtles.

For the following reasons, other actions associated with Alternative A would be unlikely to substantially affect native wildlife population abundance, diversity, or habitat abundance compared to Alternative B.

Areas along roadways already experience a high level of human presence and disturbance that degrades habitat conditions for species that are intolerant of human presence. Changes in traffic management associated with Alternative A without substantial decreases in nonmotorized use of park roads and trails would be unlikely to alter wildlife conditions sufficiently to encourage new species presence or increases in abundance.

If suitable commercial space cannot be located outside the park, new administrative or U.S. Park Police facilities could be constructed within the park, such as at the park maintenance yard and/or H-3 stable areas. Any new construction would occur within the footprint of the existing developed sections of these areas to avoid impacts on the native wildlife.

The restoration of some historic clearings could produce beneficial effects by restoring edge areas that are preferred habitat for many native wildlife species. However, these areas would be limited in size and would have negligible effects when considered on a park-wide basis.

Cumulative Impacts

Both terrestrial and aquatic native wildlife species within the District of Columbia and the region would continue to benefit from habitat protection provided by natural areas in Rock Creek Park. Benefits could be enhanced through cooperative efforts with the District of Columbia Water and Sewer Authority and other agencies to reduce or eliminate pollutant discharges from currently developed areas of the drainage.

As described in the section entitled “Connected, Cumulative, and Similar Actions,” mitigation for the Woodrow Wilson Bridge is currently being constructed in Rock Creek Park, with completion expected in 2005. This will include removing or mitigating man-made obstructions to fish migration in Rock Creek, including the Peirce Mill dam, fords, and sewerline crossings. This action is expected to have a major beneficial effect for at least three native species.

The blueback herring and alewife return from saltwater to spawn in freshwater. The Woodrow Wilson Bridge mitigation actions would provide access to historical Rock Creek spawning grounds for these species.

The American eel lives primarily in freshwater but migrates to saltwater to spawn. The fish migration improvements would help restore access to its historical habitat throughout the Rock Creek drainage.

The pollution control measures described previously for Rock Creek and its tributaries also would enhance the restoration of these species upstream from the Peirce Mill dam and throughout the drainage.

Protection of wildlife habitat in the park is important. However, despite the actions taken under Alternative A, terrestrial and semi-aquatic wildlife habitat on privately owned land throughout the region would continue to be lost and fragmented because of continued high-density urban development and in-filling. This would result in declines in both numbers and diversity of native wildlife, and would be a major, long-term, adverse effect.

Species with relatively small home ranges, high reproduction rates, generalized habitat requirements, and/or a high tolerance of human activities, such as squirrels, opossums, raccoons, white-tailed deer, coyotes, and many birds, would likely persist in the region.

Wildlife species with limited mobility, low reproduction rates, specialized habitat requirements, or large home ranges, such as many amphibians and reptiles, some birds, and many predatory mammals, would continue to decline and could be locally extirpated.

Watershed development outside the park also would alter aquatic life habitat within the park and throughout the drainage. Effects on aquatic life could be either beneficial or adverse.

Development would alter the hydrology of the basin. Adverse effects on aquatic life could occur as increases in impervious areas increased the intensity of flood flows and the scouring of stream channels and banks. Conversely, runoff to storm sewers from lawn irrigation would increase creek flows during dry periods and could produce beneficial effects on aquatic life.

Short-term increases in sediment, which can suffocate aquatic life, could result from construction sites where best management practices were not employed. However, long-term sediment loadings could decrease as agricultural fields were converted to turf and impervious surfaces.

Modern sewage collection and treatment systems installed in new developments would prevent the introduction of massive nutrient loadings into Rock Creek. At the same time, non-point pollutant loadings would change. Runoff from animal wastes, agricultural pesticides, and agricultural fertilizers would decrease. Loadings of heavy metals, and oil and grease from roadways would increase, as would runoff from lawn fertilizers. Effects on aquatic life could be either beneficial or adverse, and would result both from changes in direct toxicity of pollutant loadings and indirectly from algal blooms associated with nutrient inputs.

Conclusions

Alternative A would not produce substantial changes in the overall abundance, diversity, or habitat availability for native wildlife. However, long-term, beneficial effects could result within the park to box turtles (moderate) and gray foxes (major) from reductions in roadkill associated with Alternative A's traffic management provisions and from better education of visitors on the importance of not disturbing or removing box turtles. Alternative A would not result in any impairment of resources or values associated with native wildlife.

Cumulative impacts from actions outside the park would have much larger effects than those actions associated with Alternative A. Woodrow Wilson Bridge mitigation, which will restore upper watershed access for at least three species of migratory fish in Rock Creek, will produce a major, long-term, beneficial effect within the park and the entire creek system. Adverse effects on terrestrial and semi-aquatic native wildlife would occur from the loss of habitat associated with development in the watershed. Development-related effects on native aquatic life within the park could be either adverse or beneficial, based on changes in pollutant loadings and basin hydrology from development occurring upstream from the park.

IMPACTS ON ARCHEOLOGICAL RESOURCES

Regulations and Policy

The regulations and policies that guide NPS actions with respect to archeological resources are presented in the “Servicewide Mandates and Policies” section of this document.

Methodology

This analysis evaluates effects on archeological resources within the area described in the “Geographic Area Covered by the General Management Plan” section. The archeological resource evaluation consists of comparing conditions that would occur under Alternatives A, C, and D to those under Alternative B, which would strive to maintain current park conditions.

The Advisory Council on Historic Preservation’s “Regulations for the Protection of Historic Properties” (36 *Code of Federal Regulations* 800) provide guidance for determining whether an archeological or historic property is eligible for inclusion in the National Register of Historic Places and provides a procedure for nominating such properties to the National Register. The regulations also define what constitutes an impact or effect on an archeological or historic property listed in or eligible for listing in the National Register of Historic Places. These definitions, described below, were used in this environmental impact statement.

An activity has an effect on a prehistoric or historic property when that activity may alter characteristics of the property that may qualify the property for inclusion in the National Register of Historic Places. Alteration to a property’s location, setting, or use may be relevant in determining effect, depending on the property’s characteristics.

An action is considered to have a significant adverse impact when the effect on the prehistoric or historic property may diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association.

Impairment of archeological resources would occur if there was a major adverse impact on archeological resources or values whose conservation was (1) necessary to fulfill specific purposes identified in the establishing legislation of the park or parkway, (2) key to the natural or cultural integrity of the park and parkway or opportunities for enjoyment of these units, or (3) identified as a goal in this general management plan or other NPS planning documents.

Determination of effect is made jointly by the National Park Service, District of Columbia State Historic Preservation Officer, and Advisory Council on Historic Places. Properties that have been evaluated and are deemed ineligible for listing in the National Register of Historic Places following consultation may be altered without further consultation among the three parties. Properties that are listed in the National Register of Historic Places or have been determined eligible for listing require consultation among the parties to ensure that the actions proposed do not “adversely affect” (in the language of the National Historic Preservation Act) the resource.

Analysis

As discussed in the “Affected Environment” section, there is a high probability that there are unknown prehistoric and historic archeological resources within the boundaries of the park and

parkway. Any ground-disturbing activities associated with Alternative A would have the potential to affect such sites.

Until a National Register of Historic Places evaluation for any site was completed, it would be assumed that the site is eligible for listing in the National Register of Historic Places. Therefore, until proven otherwise, disturbance to any archeological site that was discovered during an archeological survey of the proposed site prior to design or construction of any facilities under Alternative A would be considered a significant adverse effect. Because Alternative A includes construction that would not occur under Alternative B, Alternative A has a higher potential for adverse construction-related effects on archeological resources than does Alternative B.

As described in the section entitled “Servicewide Mandates and Policies,” the National Park Service is required to protect archeological resources within the park and parkway. Therefore, prior to undertaking any construction activities under Alternative A, the National Park Service would

conduct cultural resources surveys of areas to be disturbed, including trail alignments

identify all archeological resources that are discovered during the surveys

systematically evaluate each site to determine and document its significance to support its evaluation for National Register of Historic Places eligibility

determination eligibility in concert with the District of Columbia State Historic Preservation Officer and Advisory Council on Historic Places

avoid locating any proposed facilities in areas that would disturb sites that were eligible for listing in the National Register of Historic Places, or mitigate the adverse effect by conducting scientific evaluation in advance of construction

The collection of data to support the eligibility evaluation, and the determination of eligibility can be time consuming. Therefore, as a time-saving approach, the National Park Service would assume that any archeological site that is discovered is eligible for listing, and would relocate the facility to be constructed to avoid that site. This approach would substantially reduce the potential for construction-related significant adverse effects on archeological resources.

Under Alternative B, the integrity of some sites would be degraded by natural processes such as wind and water erosion, or by vandalism or inadvertent damage by visitors. Alternative A would include actions to reduce these effects, such as increased ranger monitoring and visitor education programs. These actions would reduce the potential for non-construction-related significant adverse effects compared to Alternative B.

Where sites were disturbed, data recovery and preservation efforts would partly mitigate impacts. However, the disturbance could result in some irretrievable and irreversible loss of archeological resources.

Cumulative Impacts

Archeological resources in most of the Washington, D.C. area have been lost because of construction activity during the historic period. Therefore, it is important that the archeological re-

sources remaining in the park and parkway be protected as examples of the types of resources that formerly existed throughout the region.

A systematic program to identify and inventory the archeological resources in the park and parkway began in 2004 and is expected to be completed in 4 years (NPS, Cox 2004a). This program will offer an opportunity to add to the knowledge of the prehistory and history of the park and the entire vicinity. This survey is not part of any of the general management plan alternatives.

Conclusions

Because it includes ground-disturbing activities, Alternative A would have a higher potential for construction-related significant adverse effects on archeological resources than Alternative B. However, the survey, identification, and avoidance measures that would be implemented prior to construction would avoid most or all of the significant adverse effects. There would be no impairment of resources or values associated with archeological resources.

IMPACTS ON HISTORIC STRUCTURES AND CULTURAL LANDSCAPES

Regulations and Policy

The regulations and policies that guide NPS actions with respect to historic structures and cultural landscapes are presented in the “Servicewide Mandates and Policies” section of this document.

Methodology

The historic structures and cultural landscapes analysis used the same effects criteria and definitions as the archeological resources analysis. Please refer to the previous section for a description of the procedures that were applied.

Analysis

Most historic structures in the park and parkway, such as Boulder Bridge, the Godey Lime Kilns, and the Jules J. Jusserand Memorial, would not be changed relative to Alternative B. However, under Alternative A, a significant beneficial impact would occur on

the Peirce-Klinge Mansion and Lodge House, which would be rehabilitated to preserve their architecturally significant features and be used in accordance with park resource values

historic trails in the park and parkway, where improvements or rehabilitation would enhance their integrity and preservation

Rehabilitation of the significant cultural landscape features and attributes of the Linnaean Hill and Peirce Mill areas would enhance park preservation and visitor understanding of the historic settings in the park. This would be a beneficial effect compared to Alternative B. Historic-designed roads would be preserved and maintained.

Where sites were disturbed, data recovery and preservation efforts would partly mitigate impacts. However, the disturbance could result in some irretrievable and irreversible loss of historic resources.

Cumulative Impacts

Rock Creek Park and the Rock Creek and Potomac Parkway contain a variety of cultural resources that are significant to the historic development of the Rock Creek valley and Washington, D.C. area. Some of these resources are among the last remaining examples of their construction types in the region. Protection and rehabilitation of these resources by Alternative A would have a significant beneficial effect in preserving them for the future.

Conclusions

Under Alternative A, the historic structures and cultural landscapes in Rock Creek Park would be afforded enhanced protection and preservation treatment. Rehabilitation of historic structures and cultural landscapes would occur. Several significant historic structures would be rehabilitated and adaptively reused in accordance with park resource values. There would be no impairment of resources or values associated with historic structures and cultural landscapes.

IMPACTS ON TRADITIONAL PARK CHARACTER AND VISITOR EXPERIENCE

Regulations and Policy

The regulations and policies that guide NPS actions with respect to park character and visitor experience are presented in the “Servicewide Mandates and Policies” section of this document.

Methodology

This analysis evaluates effects on traditional park character and visitor experiences associated with the area described in the “Geographic Area Covered by the General Management Plan” section.

Public comments submitted during scoping initially were used to identify public concerns regarding park character and visitor experience. Comments from the public commonly addressed the traditional character of Rock Creek Park, including the historic appearance of facilities and landscapes, and the availability of traditional ways of enjoying the park and parkway. Access for visitors with impaired mobility was a commonly expressed concern in the comments on the draft general management plan and was added to this final general management plan analysis.

Commenters often disagreed on their perception of what constituted “traditional” use of the park. Some interpreted this as retaining established use patterns, including through traffic. Others felt that reductions in automobile traffic in the park would return it to lower use levels, which they consider more traditional.

The analysis of impacts on traditional park character and visitor experience involved comparisons of the action alternatives to Alternative B, which would strive to maintain current park conditions. Because this impact topic is based primarily on perceptions, rather than the regulatory standards

that provide a framework for most other impact topic analyses, impacts often were expressed as advantages relative to Alternative B. The action alternatives were evaluated based on three components of traditional character and visitor experience, described below.

Continuation and Quality of Traditional Park Uses. Comments on the draft general management plan reinforced the observation that visitors like, and would not want to change, most aspects of Rock Creek Park. They most often cited its pleasing appearance and the range of activities. Less commonly mentioned were the services that support an enjoyable experience, such as adequate directional signage and adequate administration resources. This evaluation considered all of these factors that contribute to the traditional character of the park and visitor enjoyment.

A negligible effect would not measurably change traditional park uses or the quality of the experience for most users, or the effect would not be noticeable or measurable outside normal variability.

A minor effect would be measurable, and might be noticed by some park users, but would not substantially affect visitor use or enjoyment of the park.

A moderate effect would be readily apparent and would result in a noticeable change in traditional park uses or the quality of the experience for many users.

A major effect would be recognized by most visitors as being markedly different from the existing character and experience and would substantially alter a traditional park use or the quality of the experience for most users. Major effects would include the elimination of a traditional visitor experience. The addition of a visitor experience would not be a major effect, since through the years the park has accommodated many new experiences, including the recent growth of in-line skating.

Recreational Opportunities. Protection of the park's and parkway's cultural and natural resources is mandated by law and would be managed much the same under all of the action alternatives. Therefore, providing for public use and enjoyment of park resources was identified as the most important factor in identifying advantages among the alternatives.

Visitor recreational opportunities associated with each alternative have been evaluated for four attributes, including

quality, which is based on the purpose of the park, as stated in the establishing legislation (appendix A) and park mission and mission goals presented in the "Planning Direction or Guidance" section of this general management plan

quantity, or the total number of people using the park

spectrum, which relates to diversity in the types of recreational opportunities

interpretive and education opportunities

The advantages associated with each alternative were identified as lowest, middle, or highest relative to the other alternatives. Alternative B: Continue Current Management/No Action was then used as a baseline for expressing the relative advantages of the action alternatives for the four attributes.

A negligible effect on traditional park character and visitor experience would not have any net difference in number of advantages relative to Alternative B.

A minor effect on traditional park character and visitor experience would have a net difference of one advantage relative to Alternative B.

A moderate effect on traditional park character and visitor experience would have a net difference of two advantages relative to Alternative B.

A major effect on traditional park character and visitor experience would have a net difference of three advantages relative to Alternative B.

Net difference in numbers of advantages could be either beneficial or adverse.

The analysis of visitor recreational opportunities did not consider short-term effects, because the concept of “traditional” character and experience implies a long-term result.

Access for Visitors with Impaired Mobility. Impact threshold definitions for this category were defined as follows.

A negligible effect would not measurably affect accessibility for individuals with disabilities.

A minor effect would be noticeable, but would affect only a small portion of the individuals with mobility-related disabilities who use the park.

A moderate effect would be readily apparent to many of the individuals with mobility-related disabilities who use the park.

A major effect would be readily apparent to most of the individuals with mobility-related disabilities who use the park and would substantially change their ability to access multiple features throughout the park.

Impairment to traditional park character and visitor experience would occur if there was a major adverse impact on resources or values whose conservation was (1) necessary to fulfill specific purposes identified in the establishing legislation of the park or parkway, (2) key to the natural or cultural integrity of the park and parkway or opportunities for enjoyment of these units, or (3) identified as a goal in this general management plan or other NPS planning documents.

Analysis of Effects on Continuation and Quality of Traditional Park Uses

The overall character of the park would not change under Alternative A. Recognition of cultural landscape values and management for those values would help maintain the traditional appearance of the park. Development of design standards for park facilities and signs would also enhance the traditional ambiance.

The traditional appearance of Beach Drive, the Rock Creek and Potomac Parkway, and other park roads would be largely maintained. Some new traffic-calming structures such as speed humps, speed tables, and signs would be necessary to implement controls on automobile speeds under Alternative A. Visual intrusion of such facilities could be offset by removal of some existing traffic

structures such as right-turn lanes and signs. The net effect on the traditional character of the park probably would be negligible.

As described under the heading “Impacts on Regional and Local Transportation,” Alternative A would have a negligible effect on traffic volumes and speeds during the rush hours. Outside the rush hours, Alternative A is expected to cause a noticeable reduction in traffic volumes and speeds on Beach Drive. This may result in a small but measurable increase in nonmotorized recreation along Beach Drive, particularly among bicyclists who could now maintain a speed similar to that of the automobiles on the road. Changes in use by other visitor groups probably would not occur. The long-term effect along Beach Drive during non-rush-hour periods would be beneficial, but the intensity would be negligible to minor.

Noise levels in the Rock Creek valley would follow the existing pattern. However, because of this alternative’s traffic-calming measures, noise levels throughout the park and parkway, and particularly on Beach Drive, may be somewhat lower than with Alternative B. Even so, noise levels close to major roadways would probably continue to exceed Federal Highway Administration noise abatement criteria during both peak and off-peak traffic periods. During weekdays, traffic noise would remain the dominant background sound at picnic groves and along Rock Creek, and the beneficial effect relative to Alternative B would be negligible to minor.

Weekend road closures would continue current opportunities for nonmotorized recreation in the park. Alternative A would have similar weekend use levels and experiences as Alternative B, because weekend traffic management would be similar for both alternatives.

Compared to Alternative B, upgraded recreation trails, bridle trails, and foot trails throughout the park would increase visitor safety and provide a more pleasant recreational experience for most trail users. Rehabilitated trails and better directional and information signs would enhance visitor access, safety, and orientation to park areas and facilities. This would be a moderate, beneficial, long-term effect on traditional park character and visitor experience.

Rehabilitation of the cultural landscape at the Peirce Mill complex would provide visitors with a better understanding of the land-use history of the Rock Creek valley and its contribution to the development of the nation’s capital. A visitor contact station at the Lodge House would improve the park experience for recreational visitors. They would have greater opportunities to learn about and experience the park’s natural and cultural resources and to take advantage of the programs and exhibits at the park’s other interpretive centers. This would be a moderate, beneficial, long-term effect on traditional park character and visitor experience.

Improvements to the Rock Creek Nature Center and Planetarium would result in better opportunities for the public to learn about and understand the park’s natural resources and their relationship to the urban environment. The addition of six full-time staff positions for interpretation and outreach would allow the park to improve both the quality and quantity of programming. It would also greatly improve services to school and youth groups. As a result, more visitors, especially young people, would have opportunities to participate in quality, resource-based environmental education programs. This would be a moderate, beneficial, long-term effect on traditional park character and visitor experience.

The more efficient and cohesive working environment that Alternative A would provide for park staff, and the dispersed park police presence would result in better service to park visitors. Increased visitor services and activities in the park may give some visitors a perception of improved

security. Improved working conditions would result in a moderate beneficial effect on park operations, but the intensity of the beneficial impact perceived by the public probably would be minor.

Analysis of Effects on Visitor Recreational Opportunities

Table 21 summarizes the advantages of Alternative A relative to Alternative B for recreational opportunity quality, quantity, spectrum, and interpretation and education. Alternative A would have a moderate, beneficial effect on recreational opportunities relative to Alternative B. It would be more advantageous than the alternative to continue current management in two attributes and would not be less advantageous in any attributes, as follows:

The quality of the visitor experience for people participating in nonmotorized recreation activities along Beach Drive would be somewhat improved compared to Alternative B, based primarily on reduced automobile speeds. Along the Rock Creek and Potomac Parkway, the quality of the experience would be enhanced for all visitors by slower speeds resulting from improved traffic enforcement. Upgraded recreation trails would improve the quality of the experience along the parkway for visitors participating in nonmotorized recreation activities.

Alternative A would match Alternative B in continuing to accommodate the greatest number of visitors. These include the many visitors who drive through the park without stopping and view their use of the park as secondary to their travel. However, traffic studies demonstrate that some travel through the park on Beach Drive is time-inefficient (Parsons 2004), suggesting that these visitors may choose this route at least partly for the quality of the aesthetic experience.

Alternative A would be similar to Alternative B with regard to the spectrum of opportunities. Management actions associated with this alternative would not limit any of the traditional recreational uses in the park. In practice, however, nonmotorized recreation on Beach Drive during rush hours would continue to be limited by the heavy automobile traffic. Better speed control during other daylight hours may encourage some nonmotorized recreational use of Beach Drive relative to Alternative B, but the change probably would not change the relative rankings of the alternatives.

Interpretation and education opportunities would experience substantial advantages under Alternative A. Increased opportunities to learn about and experience the park's natural and cultural resources would result from upgraded interpretation and education facilities in the park. Six additional staff positions for interpretation and education would substantially improve opportunities for visitor contact, programming, and outreach.

**TABLE 21: RELATIVE ADVANTAGES OF THE ALTERNATIVES
WITH REGARD TO VISITOR RECREATIONAL OPPORTUNITIES ON WEEKDAYS**

Attribute	Alternative B = Baseline	Alternative A	Alternative C	Alternative D
Quality: based on purpose of the park and parkway	<p>Lowest</p> <p>Rock Creek Park: quality would be reduced on and along roadways, particularly Beach Drive, during the week because of heavy traffic volumes and associated noise and congestion.</p> <p>Rock Creek and Potomac Parkway: same effect as along roads within Rock Creek Park.</p>	<p>Middle</p> <p>Rock Creek Park: use of traffic calming measures and improved enforcement would enhance the quality of the experience by reducing traffic speeds with associated noise.</p> <p>Rock Creek and Potomac Parkway: improved traffic enforcement and upgraded recreation trails would enhance the quality of the parkway experience.</p>	<p>Highest</p> <p>Rock Creek Park: permanent closure of three segments of Beach Drive would provide an unhurried experience with the ability to enjoy natural sounds and smells and view park resources in a manner consistent with the intent of its establishing legislation.</p> <p>Rock Creek and Potomac Parkway: HOV during rush hours and an end to lane reversal would provide a more pleasurable driving experience with the ability to enjoy a scenic drive into the monumental core of the city.</p>	<p>Highest</p> <p>Rock Creek Park: Same as Alternative A during rush hours, same as Alternative C during mid-day period.</p> <p>Rock Creek and Potomac Parkway: same as Alternative A.</p>
Quantity: total number of people using the park	<p>Highest</p> <p>Highest number of visitors using the park; primarily would include motorists who travel through the park without stopping.</p>	<p>Highest</p> <p>Visitor numbers would be similar to Alternative B and primarily would include motorists who travel through the park without stopping.</p>	<p>Lowest</p> <p>Permanent road closures would result in the lowest number of people using the park, but recreation would be the primary focus of all visitors.</p>	<p>Middle</p> <p>Same as Alternative B during rush hours, same as Alternative C during mid-day period.</p>
Spectrum: diversity of recreational types	<p>Middle</p> <p>Less diversity of recreational opportunities would occur along Beach Drive because recreational users would avoid roadway area during heavy traffic periods.</p>	<p>Middle</p> <p>Similar to Alternative B, although better speed control may somewhat improve opportunities for nonmotorized recreation.</p>	<p>Lowest</p> <p>Lowest variety of recreational opportunities would be available because of limits on recreational driving the length of Beach Drive.</p>	<p>Highest</p> <p>Would provide the greatest variety of recreational opportunities. Would allow driving the length of the Beach Drive 18 hours daily; nonmotorized recreation would be emphasized on Beach Drive between rush hours.</p>
Interpretation and education opportunities	<p>Lowest</p> <p>Some exhibits would continue to be inaccurate, worn, and dated; most visitors would have little contact with interpretive and education personnel or programs.</p>	<p>Highest</p> <p>Upgraded facilities and six additional staff positions to improve visitor contact, education, and interpretation would increase opportunities to learn about and experience the park's natural and cultural resources.</p>	<p>Highest</p> <p>Same as A.</p>	<p>Highest</p> <p>Same as A.</p>

Analysis of Effects on Access for Visitors with Impaired Mobility

Alternative A would have a long-term, moderate, beneficial effect by providing improved access to many facilities throughout the park to individuals with impaired mobility.

All construction involving non-historic buildings, including remodeling and new construction, would provide compliance with the Americans with Disabilities Act. For historic buildings, improvements would be made to the extent that they did not alter the historic features or character. Rehabilitation of the historic scenes at the Peirce Mill complex and the Linnaean Hill complex also would include access improvements that would not intrude on the historic character.

The trail upgrades that are included in Alternative A would include improvements that would increase accessibility to people with impaired mobility. In some areas, physical features such as topography may limit the ability to comply with width or slope parameters. However, the improvements should be readily apparent to individuals with impaired mobility and would enhance their ability to enjoy the park and parkway.

Cumulative Impacts

The Maryland Office of Planning (1993) predicted that demand for bicycling, hiking, and picnicking facilities in the state would increase by 6 to 14 percent between the years 2000 and 2010. Rock Creek Park and the parkway would continue to contribute to the regional mix of recreational opportunities and would be compatible with regional recreational plans.

Despite the actions associated with Alternative A that would improve access for individuals with impaired mobility, these people would continue to be challenged on a daily basis in Washington, D.C. by street curbing, buildings that are accessible only by stairs, and doorways and restrooms that do not accommodate people in wheelchairs. Compared to the impediments that occur on a daily basis, the improvements that would result from Alternative A would have a negligible effect on access for mobility-impaired people in the city. However, Alternative A would provide substantial improvements in the ability of these people to experience the unique cultural and natural resources of Rock Creek Park and would represent an important action in allowing them to lead enjoyable, productive lives.

Conclusions

Alternative A would maintain the traditional character and visitor experiences of Rock Creek Park and the Rock Creek and Potomac Parkway. Moderate, beneficial, long-term effects would be associated with upgraded trails throughout the park; improvements to visitor contact, interpretation, and education facilities and services; and improved access for visitors with impaired mobility. Improved working conditions for park administrative staff and personnel in the U.S. Park Police District 3 substation would result in a moderate beneficial effect on park operations, but the intensity of the beneficial impact perceived by the public probably would be minor. Compared to Alternative B, this alternative would have a moderate, beneficial effect on the park's recreational opportunities.

IMPACTS ON PUBLIC HEALTH AND SAFETY

Regulations and Policy

The regulations and policies that guide NPS actions with respect to public health and safety are included in the “Visitor Experience and Park Use Requirements” presented in the “Servicewide Mandates and Policies” section of this document.

Methodology

The area addressed in the public health and safety analysis is described in the “Geographic Area Covered by the General Management Plan” section. Conditions that would occur under Alternatives A, C, and D were compared to conditions that would occur under Alternative B to determine differences that would result each action alternative compared to continuing with current management practices at the park and along the parkway. Thresholds that were used to determine impacts on public health and safety were defined as follows.

A negligible effect would not change the safety or health of park visitors, or the effects would not be measurable. Indicators such as traffic accident rates would be within historical norms.

A minor effect would be detectable and would include variations from historical norms for such factors as minor traffic accident rates. However, they would not produce an appreciable change in public health or safety.

A moderate effect would be locally apparent, and could be expressed in such factors as numbers of serious traffic accidents or crimes against persons compared to historical norms.

A major effect would be sufficiently large to be apparent in District-wide statistics for such factors as serious traffic accidents rates that result in injury or fatality or crimes against persons.

Public health and safety issues identified during scoping and addressed in the impact analysis included traffic safety, crimes against persons in the park, and emergency evacuations of the Washington, D.C. metropolitan area.

Analysis of Effects on Safety along Roadways

Traffic management measures associated with Alternative A that could affect public health and safety would include

- enhanced enforcement

- use of traffic-calming measures, such as speed humps and speed tables, all-way stops, rumble strips, or raised intersections

- reconfiguration of the intersection of the parkway with Beach Drive near Connecticut Avenue to improve safety

continuation of one-way traffic on the Rock Creek and Potomac Parkway during peak periods

Most vehicles travel at or above the posted speed limit through the park. Spot speed checks showed that the average speed was 15 miles per hour above the speed limit (Robert Peccia & Associates 1997). This finding is consistent with traffic management problems occurring throughout the nation and around the world. Studies in the United States, Canada, and Europe that were reviewed by the Federal Highway Administration (1998) consistently found that about 70 percent of the vehicles on low- and moderate-speed roads exceed the posted speed limits.

Multiple studies reviewed by the Federal Highway Administration (1998) show that the incidence of crashes depends not so much on speed as on the difference in speed between an individual vehicle and the mean speed of traffic. Large differences in speed commonly occur in the park, where nonrecreational visitors using park roads to get to a destination encounter slow-traveling cyclists, pedestrians, and recreational visitors driving for pleasure. Therefore, a key traffic management component of Alternative A would be to reduce the mean speed of traffic along Beach Drive and the Rock Creek and Potomac Parkway. This would reduce the difference in speed among park users.

Enhanced Enforcement. The effectiveness of the improved speed enforcement measures associated with Alternative A would depend on the types of actions and how frequently and consistently they were applied. Studies reviewed by the Federal Highway Administration (1998) found the following:

The duration of speed-reducing effects of using mobile patrols could end almost immediately after the patrol activities ceased (Benekohal *et al.* 1992) or could last as long as eight weeks following intensive enforcement (Vaa 1997).

Parking a marked patrol car in a problem area was an effective method of reducing speeds (Armour 1986; Stuster 1995) and crashes (Stuster 1995). However, speeds returned to their pre-enforcement level within three days after a single episode of stationary enforcement (Hauer *et al.* 1982). Exposure of traffic to a stationary patrol vehicle over a 5-day period had the greatest effect in suppressing speeds after the enforcement period (Hauer *et al.* 1982).

Speed feedback indicators that are intended to increase awareness of excessive speeds and encourage drivers to slow down sometimes reduce speeds in the vicinity of the placement site. However, they have no effect on traffic speeds after they are removed unless they were combined with enforcement activities (Dart and Hunter 1976; Casey and Lund 1990, Perrillo 1997).

The Federal Highway Administration (1998) observed that a large proportion of the reviewed studies mentioned a public information or education program. None of them attributed a significant reduction in speed, speeding, crashes, or crash severity to any such campaign that was not closely tied to an enforcement or engineering action. However, a combined program of enforcement with public information or education can effectively reduce injury crashes (Sali 1983) and result in successful speed enforcement using such methods as speed indicators and photo radar (Hamalainen and Hassel 1990; Cameron *et al.* 1992).

The enhanced enforcement elements of Alternative A would have a minor to moderate beneficial effect on public health and safety. However, if traffic enforcement levels were reduced because of budget cuts or the need to assign U.S. Park Police staff to other duties, the beneficial effects would not be expected to continue for very long.

Traffic-Calming Devices. As described by the Federal Highway Administration (1998), traffic-calming techniques are street design or regulatory features that cause motorists to be more attentive to their surroundings and to drive more slowly. The National Highway Traffic Safety Administration (1999) in its *Literature Review on Vehicle Travel Speeds and Pedestrian Injuries* identifies the following advantages for traffic-calming devices.

Once implemented, they are effective without constant attention (such as enforcement).

They can be placed in areas where regular enforcement would be unaffordable.

They require little maintenance, so engineering changes can be implemented as funding is available without placing burdens on future budgets.

Fildes and Lee (1993) pointed out that traffic-calming techniques have the common objective of transferring the costs associated with excessive speed from unprotected road users (that is, death and injury of pedestrians and cyclists) to speeding drivers through such mechanisms as increased inconvenience, wear to vehicles, and longer travel time. In many roadway situations, this transfer conflicts with the goal of moving traffic more efficiently. However, there is no such dilemma in the park, which has mandates for resource preservation and public enjoyment (see the Park Mission section) but no requirement to accommodate nonrecreational traffic.

Other features identified by the National Highway Traffic Safety Administration (1999) make traffic-calming devices especially suitable for uses in the park and parkway.

These measures are most practical on moderate- and low-speed roadways. Posted speed limits on Beach Drive and the parkway are 25 miles per hour and 35 miles per hour, respectively.

Because they cause alterations to the driving environment, their success requires the public's understanding, involvement in planning, and approval. The public involvement capabilities of Rock Creek Park, such as those described in the "Consultation and Coordination" section, could be used to ensure the success of these measures.

The Federal Highway Administration (1998) reported that the most effective traffic-calming measures involve vertical shifts in the roadway, such as speed humps and speed tables. Greater reductions in vehicle speeds and crashes were achieved when combinations of measures were implemented and when traffic calming was implemented systematically over a wide area. Reductions in the incidence and severity of crashes of 50 percent or more were frequently reported. However, the Federal Highway Administration review pointed out that most traffic-calming projects also resulted in reductions in traffic volume, and that the traffic and associated crashes could be migrating to other roads.

Data reviewed by the National Highway Traffic Safety Administration (1999) included analyses of the safety and cost benefits of traffic-calming devices in Europe, Australia, the United States, and Canada (Geddes *et al.* 1996; Zein *et al.* 1997). For 85 case studies reviewed, the median

crash reduction was about 80 percent. In the 15 cases with expected numbers of crashes of five or more, the median reduction was about 70 percent. Looking at case studies where it was possible to isolate the effectiveness of individual types of traffic-calming measures, Geddes *et al.* (1996) found the following levels of crash reduction

traffic circles and chicanes:	82 percent
speed humps:	75 percent
narrowings:	74 percent
stop signs:	70 percent
multiple measures:	65 percent
pedestrian refuges:	57 percent
speed limit reductions:	30 percent

Cost-benefit analyses were performed on the Canadian projects (Geddes *et al.* 1996). On average, costs of the modifications were paid back in approximately 6 months in crash-reduction savings.

The use of traffic-calming devices in Alternative A would have a major beneficial effect on visitor safety in the park and parkway compared to Alternative B. If these measures were successful in reducing the frequency and severity of crashes by the levels indicated above, they would be highly apparent in the statistics maintained for the park and parkway with regard to the number of accidents and the ratio of injury to non-injury accidents. The changes probably would be sufficiently large to be detected in District-wide statistics. As long as the traffic-calming devices were maintained, these would be long-term effects.

Effects on Vehicle Occupants. As described in the “Affected Environment” section, more than 97 percent of the traffic accidents in the park and parkway in the 1993-1995 period and 99 percent of the traffic accidents during the 2001-2003 period did not involve cyclists or pedestrians (see table 13). For these types of accidents, the risk of injury to vehicle occupants depends on the change in speed upon impact. Bowie and Waltz (1994) found that the risk of moderate or greater injury was about 10 percent when the change in speed on impact was 20 miles per hour or less, was more than 50 percent at changes in speed up to 40 miles per hour, and was almost 70 percent for changes in speed greater than 50 miles per hour.

It is probable that geometric deficiencies are contributing to the accident history at the intersection of Beach Drive and the parkway near Connecticut Avenue. Based on results typically associated with the redesign of major intersections, improvements have the potential to reduce accidents related to the deficiency by 40 to 60 percent.

Two accidents where vehicle occupants died occurred during the 1993-1995 period, and three such accidents occurred in the 2001-2003 period (Robert Peccia & Associates 1997; NPS, Pettiford 2004c). Because of these low numbers compared to the 9 million vehicle trips on Beach Drive each year and 20 million annual trips on the parkway, the effect of Alternative A on the number of fatal accidents cannot be accurately calculated. However, if the Alternative A actions reduced accidents by 50 percent or more (reasonable reduction estimates, based on studies reviewed by the Federal Highway Administration (1998) and National Highway Traffic Safety Administration (1999)), a similar reduction in fatalities among vehicle occupants would be expected.

The 1993-1995 and 2001-2003 periods each resulted in more than 200 injury accidents to vehicle occupants on the park and parkway. The periods had similar injury-accident rates of about 23 percent. Based on studies reviewed by the Federal Highway Administration (1998) and National Highway Traffic Safety Administration (1999), the traffic management actions of Alternative A would reduce the number of injury accidents by 50 percent or more. Even greater reductions would be expected on Beach Drive, where lower speed limits combined with traffic calming measures would result in speeds for most vehicles of 20 miles per hour or less. In this area, the risk of moderate or greater injury would be reduced to the 10 percent level found by Bowie and Waltz (1994).

Alternative A would have a long-term, major, beneficial effect in reducing the number and severity of motor-vehicle-only accidents in the park and along the parkway. The reduced speeds produced by enhanced enforcement and traffic-calming measures would reduce both the number of accidents and the number and severity of injuries to vehicle occupants. This would reduce the ratio of accidents to number of visitors, the ratio of injury to non-injury accidents, and the frequency of fatal accidents. These changes would be highly apparent in the statistics maintained for the park and parkway and probably could be perceived in District-wide statistics.

Effects on Pedestrians and Bicyclists. The National Highway Traffic Safety Administration (1999) summarized information in three United States databases containing the outcome of hundreds of thousands of crashes involving pedestrians. Information in all three databases demonstrated that the pedestrian had a 98.8 percent or better chance of surviving if the pre-crash speed of the vehicle was less than 20 miles per hour. Fatalities were about 5 percent when the pre-crash speed of the vehicle was below 35 miles per hour. Speeds up to 45 miles per hour doubled or tripled the fatality rate for the pedestrian. Crashes at speeds greater than 45 mps killed more than 20 percent of the pedestrians and caused incapacitating injuries to at least 25 percent more.

As shown in table 13, 28 of the 1,175 accidents recorded in the park and along the parkway in the 1993-1995 period involved pedestrians or bicyclists. Among these, seven bicyclists or pedestrians were injured and two pedestrians were killed. During the 2001-2003 period, only six of the 943 accidents, and no fatalities, involved bicyclists or pedestrians.

By slowing traffic speeds, the traffic management measures of Alternative A would have a long-term, beneficial effect in reducing the number and severity of collisions between automobiles and pedestrians or cyclists in the park and along the parkway. However, because of the low number of this type of accidents (average of two per year) compared to the 2 million annual pedestrian and cyclist visits to the park and parkway, some year-to-year fluctuation in the number of pedestrian and cyclist accidents would be expected.

Analysis of Effects on Personal Safety

Alternative A would not alter the patterns of use along park roads or the parkway compared to Alternative B. As a result, the effects of this alternative on crimes against persons would be negligible.

Analysis of Effects on Emergency Evacuations

For Alternative A, there would be no change compared to Alternative B regarding management of roads during emergencies. Rock Creek Park roads could be used during emergencies for evacuation; however, segments of Beach Drive would be closed on the weekends.

Cumulative Impacts

Rock Creek Park is located in large metropolitan area with a traffic accident rate that is almost double that of the national rate (see table 15 in the “Affected Environment” section). The Metropolitan Washington Council of Governments, District Department of Transportation, District of Columbia Metropolitan Police, and other local transportation agencies and organizations are continuously planning and implementing measures to improve local and regional traffic safety. The National Park Service is working cooperatively with these agencies. The 20 percent reductions in accident rates, including property-only, injury, and fatal accidents, in the park and parkway between the 1993-1995 period and 2001-2003 period (see table 13) provide evidence that these types of actions are having cumulative beneficial effects.

Conclusions

By reducing the number and severity of traffic accidents in Rock Creek Park and along the Rock Creek and Potomac Parkway, the traffic calming measures of Alternative A would have a long-term, major, beneficial effect on public health and safety. This alternative would have negligible effects on crimes against persons or the effectiveness of emergency evacuations.

IMPACTS ON REGIONAL AND LOCAL TRANSPORTATION

Regulations And Policy

All roads proposed for management changes under Alternative A are within NPS ownership and jurisdiction. Chapter 9 of the NPS’ *Management Policies 2001* (2000a) provides guidance for management of park access and circulation systems. While there are no legal restrictions to the traffic management actions associated with any of the alternatives, their implementation in the park would require coordination with local, regional, and federal transportation agencies.

All park roads are designated as contributing resources to the Rock Creek Park Historic District listed on the National Register of Historic Places. The Rock Creek and Potomac Parkway has been determined to be eligible for nomination to the National Register of Historic Places. Any changes in the physical layout of the roads or their setting may require consultation with the District of Columbia State Historic Preservation Officer and the Advisory Council on Historic Preservation under Section 106 of the National Historic Preservation Act (see “Impacts on Archeological Resources”).

Methodology

The area addressed in the regional and local transportation analysis is the area shown on the map entitled Average Weekday Traffic Volumes. The evaluation of effects on regional and local transportation consisted of comparing conditions that would occur in the year 2020 under Alter-

natives A, C, and D to those in the year 2020 under Alternative B, which would strive to maintain current park conditions.

The National Park Service wanted to be certain that the alternatives and the evaluation of effects incorporated the concerns of major transportation agencies in the vicinity. Therefore, early in the planning process, the National Park Service consulted with representatives of the

District of Columbia Department of Public Works

District of Columbia Department of Transportation

Federal Highway Administration

Maryland Department of Transportation

Maryland National Park and Planning Commission

National Zoological Park.

Washington Area Transit Authority

Washington Metropolitan Council of Governments (MWCOG) Transportation Planning Board

Potential impacts of the action alternatives were estimated using a refined traffic projection model based on the official regional model developed by the Metropolitan Washington Council of Governments. A summary of the traffic modeling technique is presented in appendix H. Information on the validation of the traffic model also is provided in this appendix.

The modeling assumed that the current widespread use of private automobiles would continue, and did not anticipate major shifts toward mass transit or other transportation modes. Regional plans that support increased intermodal travel and the use of “intelligent transportation systems” to better manage traffic flows and reduce congestion have been developed by the State of Maryland, Montgomery County, and the Washington Metropolitan Council of Governments. If these programs are successful, the results of the transportation model may be somewhat higher than actual year 2020 traffic levels. Conversely, traffic in the past two decades has grown more quickly than anticipated, and may continue to do so. Based on these both positive and negative uncertainties, the model results are considered reasonable estimates.

The modeling results for the alternatives in the year 2020 are provided in appendix G. The Alternative A and B Year 2020 Average Weekday Traffic Volumes map shows the modeling results used for the Alternative A evaluation. As appropriate, the maps for the other alternatives are provided with their respective analyses.

Where management actions associated with an alternative would result in changes in traffic volumes relative to Alternative B (the “Continue Current Management/No Action” alternative), results of the model are also presented as potential “levels of service” (LOS) along road segments. The levels of service scale was defined by the American Association of State Highway and Transportation Officials (AASHTO) (1990) and is widely used to describe traffic and driving characteristics at various intensities of traffic flow and congestion. These characteristics are described in table 22.

TABLE 22: LEVEL-OF-SERVICE CHARACTERISTICS OF URBAN AND SUBURBAN ARTERIALS^{a/}

Level of Service	Descriptor	Characteristics
A	Light traffic	Average travel speed is about 90 percent of free flow speed. Stopped delay at signalized intersections is minimal.
B	Moderate traffic	Average travel speeds drop because of intersection delay and inter-vehicle conflicts, but remain at 70 percent of free flow speed. Delay is not unreasonable.
C	Substantial traffic	Stable operations. Longer queues at signals result in average travel speeds of about 50 percent of free flow speeds. Motorists experience appreciable tension.
D	Heavy traffic	Approaching unstable flow. Average travel speeds are down to 40 percent of free flow speed. Delays at intersections may become extensive.
E	Very heavy traffic	Unstable flow. Average travel speeds are 33 percent of free flow speed. Continuous backups occur on approaches to intersections.
F	Extremely heavy traffic	Forced flow; near gridlock conditions. Average travel speed is between 25 and 33 percent of free flow speed. Vehicular backups and long delays occur, particularly at signalized intersections.

a/ Source: American Association of State Highway and Transportation Officials 1990

An level of service analysis was conducted for the major routes within the study area. The analysis was developed as an interpretive tool to help define existing and future traffic conditions. The analysis compared the projected peak-hour traffic volumes for each alternative to the estimated traffic capacity of each corridor. Both the morning and afternoon peak-hour conditions were evaluated.

The capacity of each corridor was estimated based on the number of travel lanes, the number of stop or signal-controlled intersections, the presence of buses and heavy trucks in the traffic mix, and other roadside friction factors such as on-street parking and the number of access points. The following volume/capacity relationships were used to define the levels of service:

Level of service A: volume/capacity = 0 to 28 percent

Level of service B: volume/capacity = 29 to 47 percent

Level of service C: volume/capacity = 48 to 66 percent

Level of service D: volume/capacity = 67 to 79 percent

Level of service E: volume/capacity = 80 to 100 percent

Level of service F: volume/capacity = 100+ percent

The level of service categories are designed for urban and suburban driving conditions. In contrast, public expectations for recreational driving conditions on park roads are often at a very high level of service. For instance, many people would describe existing evening rush-hour traffic through the gorge section of Beach Drive between Joyce Road and Broad Branch Road as heavy

because the stream of traffic is constant, fast flowing, and demands constant attention of the driver. However, it is classified as level of service B, moderate traffic, because the flow is steady with few traffic-related delays.

The level of service analysis is only an approximation of the traffic on various segments of the road network and does not reflect the operation of specific intersections. In many cases, intersections within the study area operate at a different level of service than the adjacent corridors. Within the park, three intersections currently operate poorly. These include the intersections at Beach Drive and Park Road/Tilden Street, Beach Drive and the parkway, and Virginia Avenue and the parkway. All of these intersections are currently providing level of service E/F during the morning and evening peak-hours. These poor level of service conditions would not be correctable without expanding the intersection corridors to include additional traffic lanes, and the National Park Service does not propose to take such action in this general management plan.

Traffic impacts of the action alternatives are defined as the differences between future traffic conditions predicted without changing existing management (represented by Alternative B) and future traffic conditions if the traffic management measures included in the action alternative are implemented.

A change of one level of service (for example, level of service D to C) is characterized in this analysis as a noticeable effect.

A change of two levels of service (for example, level of service B to D) is characterized as a considerable effect.

A change of three levels of service or more (for example, level of service B to E) is characterized as a major effect.

Analysis

Traffic-calming measures applied to Beach Drive between the Maryland state line and the Rock Creek and Potomac Parkway would reduce vehicle speeds through the park. The speed limit on Beach Drive could also be modified (after experimentation to determine the optimal speed limit) to reduce traffic speeds. Currently, the speed limit on Beach Drive is 25 miles per hour, but it could be reduced to 20 or 15 miles per hour under Alternative A.

During rush hours, neither the traffic-calming measures nor the adjustment of the speed limit on Beach Drive are anticipated to cause vehicles to reroute. Because congestion on Beach Drive during the rush hours often forces vehicles to travel below the speed limit, the traffic calming measures would not cause the level of inconvenience that would influence drivers to choose alternate routes. Therefore, during rush hours, traffic volumes for Alternative A would be essentially the same as those in Alternative B.

Outside the rush hours, Alternative A would reduce traffic volumes and speeds on Beach Drive. The inconvenience of the traffic calming measures probably would influence some drivers who were not planning to stop in the park and enjoy its other recreational opportunities to select other routes, including Ross Drive or non-park roads. The engineered measures also would force all drivers to control their speeds. While the reductions in traffic volumes and speeds probably would be noticeable, they would not result in a change in level of service within the park. They also

would not result in level-of-service changes outside the park, where roads during the off-peak periods have plenty of capacity available.

Proposed safety modifications to the intersection of Beach Drive and the parkway would reduce vehicle conflicts and help minimize traffic congestion and delays. The result of these combined measures would be a safer and more somewhat pleasant environment for recreationists and other visitors using either motorized or nonmotorized travel.

Average Daily Traffic. Alternative A average daily traffic projections for the year 2020 are shown in table G.1 in appendix G and the Alternative A and B Year 2020 Average Weekday Traffic Volumes map. Alternative A would not change rush-hour traffic volumes, so the increases in traffic volumes between current conditions and those in 2020 would not be attributable to Rock Creek Park's management strategies. Modeling shows that by the year 2020, traffic volumes would increase on all of the roads within the park and throughout the area. Traffic also would increase during the morning and evening peak-hours, and the peak periods would begin earlier and last longer than what currently occurs.

Daily traffic volumes on Beach Drive north of Sherrill Drive are projected to more than double by the year 2020. Traffic on other sections of Beach Drive would increase between 30 and 48 percent. All of the intersections along Beach Drive south of Joyce Road would operate at or near capacity during the morning and evening peak periods.

By the year 2020, traffic delays would create long lines both on Beach Drive and the side roads. The flow of traffic along Beach Drive would be quite congested. Bumper-to-bumper traffic conditions would be common on Beach Drive between the parkway and Joyce Road during all hours of the day.

Traffic congestion would be substantial at several intersections with Beach Drive. These include the intersections with the parkway, Porter Street, Piney Branch, Tilden Street/Park Road, Blagden Avenue, Broad Branch Road, and Wise Road. In some instances, the vehicle backups at one or more of these intersections would be long enough to interfere with the operation of adjacent intersections on the park road network and/or the city street grid.

Daily traffic on side roads in the park would also increase, compared to the most recent traffic counts available. Traffic on Wise Road and West Beach Drive would increase by 38 percent (to 14,100 vehicles per day) and 49 percent (to 17,100 vehicles per day) respectively by the year 2020. Piney Branch Parkway traffic would increase by 32 percent, to 13,300 vehicles per day. There would be proportionately very large increases on lightly used side roads. For instance, daily volumes on Sherrill Drive and the Ross Drive-Glover Road connection would almost triple. Volumes on other side roads would increase from 40 to 100 percent. Despite such increases, service would be at level of service C or better on most side roads.

Traffic on the Rock Creek and Potomac Parkway also would increase by the year 2020. Traffic congestion on the parkway, created by the increased volumes, would be greatest at the north end near the intersection with Beach Drive and at the south end near Virginia Avenue. Traffic congestion would also occur on several of the ramps connecting with the parkway, including the on-ramp at P Street and the off-ramp at Waterside Drive.

Morning Rush-Hour Traffic. Table G.3 in appendix G shows year 1990 levels of service and the levels of service that would occur with implementation of Alternative A. During the morning

peak hour, 57 percent of the modeled roadways would have very heavy (level of service D) to extremely heavy (level of service F) traffic. In contrast, fewer than 44 percent of these roadways were level of service D or worse in 1990.

During the morning rush hour, the level of service would noticeably decline on four of seven segments of Beach Drive. There would be a considerable deterioration in level of service on the northern-most stretch of Beach Drive above West Beach Drive. Traffic conditions on Beach Drive south of Blagden would be heavy to very heavy in the mornings.

On the Rock Creek and Potomac Parkway, morning traffic would range from substantial (level of service C) to very heavy (level of service E). On three of the four segments modeled, this would be a noticeable decrease in level of service.

No change in level of service would be anticipated for Ross Drive, Glover Road, Grant Road, Bingham Drive, Morrow Drive, or Joyce Road in the mornings. Traffic levels of service on all other park roads would decline noticeably by 2020. Morning traffic would increase considerably on West Beach Drive to very heavy levels.

Evening Rush-Hour Traffic. There pattern of declining level of service and increasing traffic on Beach Drive and the Parkway during the evening would be similar to the morning rush hour. Levels of service on Beach Drive would be noticeably reduced compared to year 1990 conditions. The worst traffic problems on Beach Drive would occur between Blagden Avenue and the parkway, reaching extremely heavy traffic conditions (level of service F).

Except on the south end where traffic would be substantial, the parkway would see heavy (level of service D) and very heavy (level of service E) conditions in the evenings. This would represent a noticeable reduction in service from year 1990 conditions.

With a few exceptions, side roads in the park would see less of a change in traffic levels. West Beach Drive would decline in level of service during the evenings from the year 1990 to a very heavy level (level of service E) or extremely heavy level of traffic (level of service F) by 2020. Traffic on Wise and Blagden would noticeably increase, and traffic on Sherrill Drive would considerably increase from light to substantial levels.

Neighborhood Traffic. During rush hours, traffic volumes would not change relative to Alternative B and all park roads would remain open. Therefore, there would not be any changes during these periods in the volumes of traffic that turned off Beach Drive and into the neighborhoods adjacent to Rock Creek Park compared to volumes that would occur with Alternative B.

During other periods, all park roads would remain open, and most drivers who elected to use other routes because of the traffic calming measures would make that decision before they approached the park. Therefore, there would be a negligible change compared to Alternative B in neighborhood traffic because of changes in traffic volumes on Beach Drive.

Nonmotorized Travel. Weekday nonmotorized travel for recreation and personal transport would increase in the park with Alternative A, primarily because this alternative would provide improved conditions for cyclists, pedestrians, in-line skaters, and others. Improvements would include rehabilitation of recreation trails in the park and improved enforcement to ensure that automobile traffic traveled at or below the speed limit (currently 25 miles per hour, but it could be reduced) on Beach Drive. The current weekend closures of sections of Beach Drive and all of

Bingham and Sherrill Drives for recreational use would continue to support weekend nonmotorized recreation.

Actions in Alternative A such as traffic calming measures and reduced speed limits would cause some drivers to use non-park roads or Ross Drive instead of Beach Drive. This would cause a measurable reduction in traffic on Beach Drive. The reductions in traffic speeds and volumes through the park could be sufficient to cause some increase in nonmotorized travel on Beach Drive on weekdays, particularly bicycle travel. However, visitors using nonmotorized transportation modes would still have to use park roads with extreme caution because of continued automobile traffic throughout the length of Beach Drive.

Cumulative Impacts

Regional growth in the counties around the District of Columbia, especially to the north in Montgomery County, Maryland, is the primary reason for the projected increases in traffic volumes around the park. No matter which action is taken in Rock Creek Park or on the parkway, traffic in the region is expected to increase by at least 70 percent above 1990 levels by the year 2020 (Metropolitan Washington Council of Governments 1998b). The transportation model used by Metropolitan Washington Council of Governments incorporates expected increases in mass transportation and nonmotorized transportation. Growth-induced increases in traffic would have a detrimental impact on traffic on all of the roads in the area with or without Alternative A.

Major commuter routes in the city would be unaffected by Alternative A. Maryland Department of Transportation does not anticipate any impacts to state roads (Simpson 2003).

A project to improve Broad Branch Road is currently being designed by the District of Columbia Department of Transportation (see “Connected, Cumulative, and Similar Actions”). Once completed, an improved Broad Branch Road may attract drivers as an alternative to Beach Drive.

Alternative A would have little influence on nonmotorized travel outside the park. An individual’s decision to walk or ride a bicycle would not likely be influenced by the traffic control measures associated with Alternative A.

Conclusions

During rush-hour periods, effects of Alternative A on regional and local transportation would be negligible compared to Alternative B.

During non-rush-hour periods, Alternative A would reduce traffic speeds and volumes along Beach Drive while allowing weekday vehicle access to all existing road segments and preserving the existing visitor experience of automobile travel through the park. The decreased weekday non-rush-hour traffic speeds and volumes on Beach Drive would reduce conflicts between automobile use and nonmotorized travel in the Rock Creek valley.

Because Beach Drive would remain open to mid-day traffic, changes in traffic in neighborhoods around the park would not be expected. Any shift in automobile traffic from park roads to other routes outside the park would have very little effect on city traffic conditions.

Throughout the day, the improvements to recreation trails would enhance nonmotorized transportation in the park. During non-rush-hour periods, reduced automobile traffic speeds and volumes may increase nonmotorized travel on Beach Drive, particularly bicycle travel.

IMPACTS ON COMMUNITY CHARACTER

Regulations and Policy

There are no applicable regulations or policies to guide NPS actions with respect to community character because the entire area of concern is outside the jurisdiction of the National Park Service.

Methodology

This analysis evaluated impacts on community character in the nine Washington, D.C. and three Maryland zip code tabulation areas that were characterized in the “Affected Environment” section.

Changes in community character were assumed to be related to changes in traffic management because traffic changes are the primary element of the alternatives that would have recurring, detectable effects outside the park. As a result, traffic changes associated with each action alternative were analyzed in relation to the neighborhoods, delineated as U.S. Census Bureau zip code tabulation areas, that the changes would potentially affect. Changes were measured against the projected traffic volumes for Alternative B, the continue current management/no action alternative, for the year 2020.

In addition, the projected changes were evaluated from an environmental justice perspective. This evaluation examined whether noticeable or greater increases in traffic would disproportionately occur in neighborhoods characterized as disadvantaged or minority, based on U.S. Census Bureau zip code tabulation area data.

Traffic changes and the associated, qualitative changes in community character were described as noticeable, considerable, and major. This evaluation used the same criteria that were used to determine the effects of traffic changes on traditional park character and visitor experience. Effects were defined in terms of a change in level of service as follows:

A change of one level of service would be considered a noticeable change.

A change of two level of service would be considered a considerable change.

A change of three or more level of service would be considered a major change.

See the “Impacts on Regional and Local Transportation” section for definitions of level of service and the data related to the projected level of service changes.

The environmental justice evaluation was conducted by examining current neighborhood demographic information to determine whether patterns were present that would suggest that noticeable or greater traffic increases would occur disproportionately in economically disadvantaged or

ethnic neighborhoods. The zip code tabulation areas were superimposed on the forecast traffic volume increases for the traffic corridors that were analyzed.

Analysis

As described in “Impacts on Regional and Local Transportation,” the traffic management components of Alternative A would affect traffic volumes only during non-rush-hour periods. Because of the relatively low traffic volumes during these times, the small proportion of drivers that may voluntarily choose other routes to avoid the inconvenience of the traffic calming measures on Beach Drive, and the large number of alternate routes available to these drivers, Alternative A would not result in changes to traffic volumes that were outside the range of normal variability on roads outside the park, compared to Alternative B.

Alternative A would have negligible effects, relative to Alternative B, on community character and the quality of life of area residents or the economic health of businesses. Although traffic and noise levels would continue to increase both in the park and surrounding neighborhoods, the cause would be regional population growth and not any actions by the National Park Service. Recreational opportunities and access to the park would continue to be compromised by traffic congestion in the area. No changes would occur to recreational or educational opportunities outside the park because of implementation of Alternative A.

Regional and local economic patterns would not be affected by Alternative A. Although this alternative includes almost \$15 million in capital improvements, these funds would be spent throughout the life of this general management plan and may average about \$1 million per year. This would represent a negligible contribution to the economies of the neighborhoods surrounding the park. Alternative A’s \$880,000 increase in annual park operating costs compared to Alternative B also would be undetectable in the local economy and would have a negligible effect. The eight new jobs associated with this alternative could not be discerned economically in comparison with employment opportunities available in the neighborhoods and city and would have a negligible effect on the character of the community.

Cumulative Impacts

Traffic levels are anticipated to grow substantially by 2020 and increase congestion in the park and surrounding neighborhoods (Metropolitan Washington Council of Governments 1998b). For example, traffic projections indicate residents of the Brightwood neighborhood can expect a 57 percent increase in traffic on 16th Street over 30 years. Mount Pleasant residents would experience a 48 percent increase in traffic on 16th Street during the same period. Similar increases would occur on the western side of the park. Cleveland Park residents can expect a 32 percent increase in traffic on Connecticut Avenue and Barnaby Woods residents would see a 26 percent increase in traffic along Oregon Avenue north of Bingham Drive.

A project to improve Broad Branch Road is currently being designed by the District of Columbia Department of Transportation (see “Connected, Cumulative, and Similar Actions”). An improved Broad Branch Road may attract drivers as an alternative to Beach Drive. Such projects are continually occurring in the vicinity of the park and throughout the city as transportation departments strive to improve travel conditions for citizens. After each project is completed, area-wide traffic patterns will adjust to take advantage of the changes. Cumulatively, these projects

will have a greater influence on the character of the community outside the park than will the actions associated with Alternative A.

Conclusions

Alternative A would have negligible effects, compared to Alternative B, on the quality of life of area residents. Traffic is expected to become more congested, but park actions would not introduce additional traffic onto the roadways surrounding the park. Opportunities for recreation and education outside the park would continue to be available. Alternative A would have negligible economic effects on the neighborhoods around the park and would not be detectable in the city's economy.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

The Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Actions associated with Alternative A would be consistent with a long-term management strategy for ensuring the protection of natural, archeological, and historic resources and improving park visitor experiences.

Some motorists who use park roads as a nonrecreational travel route would be inconvenienced by traffic-calming measures, and by increased travel times. However, this inconvenience would be offset by an improved weekday recreational visitor experience that would be more compatible with the park character.

The development of new administrative and interpretive facilities would support the 'PS' mission while having no adverse cumulative impacts on ecosystems or resources. Removing NPS administrative facilities from historic sites would allow for improved educational and interpretive uses at the sites and would better protect these cultural resources.

Short-term degradation of local water quality during construction projects would largely be prevented by best management practices. Any unmitigated short-term degradation would be overwhelmingly offset by long-term improvements resulting from reduced storm water contaminant discharges into Rock Creek and reduced non-point runoff from developed areas.

Short-term localized soil erosion (largely prevented by best management practices) and removal of plant communities along trail construction corridors would be offset by long-term reductions in soil erosion resulting from the repair or realignment of poorly designed or damaged trails.

Any Irreversible or Irrecoverable Commitments of Resources that Would Be Involved Should the Alternative Be Implemented

There would be a potential for irreversible or irretrievable commitments of archeological and historic resources under Alternative A.

None of the natural resource changes associated with Alternative A would be considered irreversible or irretrievable commitments. However, the effort required to reverse some resource

commitments and decisions, once implemented, may require substantial planning and implementation efforts.

The construction of new administrative space and the renovation of historic structures would employ methods encouraging energy conservation and recycling when possible. The energy expended during any construction project would be an irretrievable resource commitment.

Financially, Alternative A would require funding to accomplish its goals. In the long-term, some costs may be reduced as a result of more efficient use of administrative space and lowered maintenance costs.

Any Adverse Impacts that Cannot Be Avoided Should the Action Be Implemented

None of the effects identified in this assessment of Alternative A would be considered major adverse effects. Alternative A would not result in impairment of any resources that would affect the basic purposes of Rock Creek Park and the Rock Creek and Potomac Parkway.

ENVIRONMENTAL IMPACTS OF ALTERNATIVE B: CONTINUE CURRENT MANAGEMENT/NO ACTION

The regulations and policy that apply to Alternative B, and the methods used to conduct the analysis are identical to those describe for Alternative A, unless otherwise noted.

IMPACTS ON AIR QUALITY

Analysis

Under Alternative B, the area of Rock Creek Park and the Rock Creek and Potomac Parkway would be affected more by emissions throughout the regional airshed than by tailpipe emissions from vehicles using the park and parkway. Table 20 summarizes the effects of Alternative B on air quality in the year 2020 based on modeling described in the "Methodology" section under Alternative A. The analysis showed the following would occur in the vicinity of Rock Creek Park if the National Park Service maintains its current management practices.

Peak-hour traffic would have increased substantially since the 2001 and 2004 traffic counts shown on the Average Weekday Traffic Volumes map in the "Affected Environment" section. At most intersections shown in Table 20, the increases between the current counts and the modeled values for 2020 are between 20 and 35 percent. However, the projected increase in average daily traffic counts is 50 percent at the intersection of Beach Drive and Wise Road at the northern end of the park and 72 percent at the intersection of Beach Drive, Broad Branch Road, and Bladgen Avenue. Despite traffic increases, the worst 1-hour carbon monoxide concentration that would be associated with Alternative B (12.6 parts per million at the intersection of Beach Drive, Broad Branch Road, and Bladgen Avenue) would be well below the 1-hour National Ambient Air Quality Standard of 35 parts per million that is protective of human health and the environment.

Cumulative Impacts

No changes would occur in emissions from vehicles in the region because of management actions at Rock Creek Park.

Conclusions

Alternative B would not result in the exceedence of the 1-hour National Ambient Air Quality Standard for carbon monoxide at any of the intersections in the vicinity of Rock Creek Park. In addition, it would not cause any impairment of resources or values associated with air quality.

IMPACTS ON ROCK CREEK AND ITS TRIBUTARIES

Analysis

No new point-source discharges in the park are anticipated as a result of Alternative B. The application of best management practices at the three park stables, the maintenance yard and storage area, the golf course, and other existing park facilities would reduce contaminated runoff from non-point sources. Specific sources of potential contamination in the park and recommendations for best management practices to minimize pollution are presented in the *Best Management Practices for Water Quality – Rock Creek Park* (URS Greiner Woodward Clyde 1999). Implementation of best management practices at these sites would produce beneficial, long-term measurable effects on water quality.

Up to 2 miles of park trails are poorly designed or are located on slopes greater than 30 percent. Erosion and sedimentation from these trail segments are having a measurable, adverse effect on water quality in Rock Creek. This long-term effect would continue under Alternative B.

Cumulative Impacts

Cumulative impacts of Alternative B would be like those described in Alternative A. Water quality and flows in Rock Creek and its tributaries would continue to be more heavily influenced by urban development in the upstream watershed than by activities in the park. Continued interagency measures, such as reducing point and non-point discharges, and maintaining and improving sanitary and combined sewer systems would continue to produce beneficial, long-term, major effects on water quality. Coordination would also produce beneficial, long-term, major reductions in streambed alterations such as scour and sedimentation.

Conclusions

Compared to current conditions, the implementation of best management practices under Alternative B would produce long-term, measurable improvements in water quality. Erosion from poorly designed trail segments or trails on steep slopes would continue to have long-term, measurable, adverse water quality effects. Regional coordination would continue to result in major beneficial effects on water quality and hydrology throughout the watershed.

The management actions of Alternative B would not result in impairment of resources or values associated with Rock Creek and its tributaries.

IMPACTS ON WETLANDS AND FLOODPLAINS

Analysis

None of the actions included in Alternative B would have beneficial or adverse effects on wetlands. Protection of these resources would continue in conformance with NPS guidance documents such as those listed in the “Methodology” section under Alternative A.

Cumulative Impacts

Alternative B would not produce any adverse, long-term impacts on wetlands, seeps, or floodplains. Therefore, it would not contribute to any cumulative adverse impacts on wetlands or floodplains in the park or in the region.

Floodplains and wetlands throughout the park would be continue to be protected from direct disturbance from development. Application of best management practices would help reduce risk to floodplain and wetland resources from polluted runoff, erosion, filling activities, water diversions, and sedimentation from sources within the park. Wetlands located in the Rock Creek floodplain would continue to be threatened by sediments transported during high storm water discharges originating outside the park.

The removal of impediments to fish migration, including construction of a fish bypass at Peirce Mill dam, represents a new construction action in the 100-year floodplain. The effects under Alternative B would be similar to those described for Alternative A and would not result in a long-term loss of floodplain hydraulic capacity.

Conclusions

Alternative B would have negligible, long-term effects on wetlands or floodplains. There would be no impairment of resources or values associated with wetlands and floodplains.

IMPACTS ON DECIDUOUS FORESTS

Analysis

Alternative B would have little effect of the deciduous forests of Rock Creek Park. Protection of the deciduous forest has been a long-term goal at Rock Creek Park. The continuation of current management practices such as avoiding clearing of trees, suppressing wildfires, and controlling the presence and distribution of or invasive species, would maintain the deciduous forest in a condition much like that currently seen in the park.

As described in the “Affected Environment” section, accelerated erosion currently is occurring along heavily used or improperly designed trails. Under Alternative B, this problem would continue and probably worsen.

Cumulative Impacts

Ongoing urbanization of the Rock Creek watershed and other forested areas of Maryland and Virginia near Washington, D.C. will continue to eliminate deciduous forests. Park management practices associated with Alternative B would have little effect on regional, development-related decreases in deciduous forests.

Conclusions

Alternative B would have little effect on most of the deciduous forest areas of Rock Creek Park. At selected sites along heavily used or improperly designed trails where accelerated erosion is

occurring, problems would continue and probably worsen. However, there would be no impairment of resources or values associated with the deciduous forest.

IMPACTS ON PROTECTED AND RARE SPECIES

Analysis

The groundwater amphipods that were described in the “Affected Environment” section, including the federally endangered Hays spring amphipod, inhabit several seeps and springs in the park. The National Park Service is aware of these locations and would continue measures to protect these sites in the long term from general park use.

Cumulative Impacts

Under Alternative B, the park’s assemblage of national and regionally rare plants and animals would continue to benefit from the protection that the park affords. Ongoing urbanization of the Rock Creek watershed and other areas of Maryland and Virginia near Washington, D.C. will continue to eliminate individuals and habitats of protected and rare species. Park management practices associated with Alternative B would have little effect on regional, development-related effects on these species.

Conclusions

Alternative B would continue to maintain protected or rare species populations currently present in the park. There would be no impairment of resources or values associated with protected and rare species.

IMPACTS ON OTHER NATIVE WILDLIFE

Analysis

Native species that require deciduous forest habitats in relatively large, contiguous tracts would continue to benefit from the protection of most of the park’s land area as relatively undisturbed woodland.

Compared to current conditions, the number of wildlife animals killed or injured by motor vehicles in the park would increase under Alternative B as traffic volumes through the park continued to increase. Higher traffic volumes during daylight rush hours on park roads and adjacent streets would increase the risk to box turtles and black rat snakes, both of which are believed to be declining within the park.

Increased evening, nighttime, and early morning traffic, when many mammals are active, would probably result in increased gray fox deaths. The effect of this mortality on the gray fox population is unknown. However, the gray fox population in the park is small and experiences multiple stress factors. Under these conditions, even infrequent roadkills could contribute to an overall reduction of the resident population (a moderate, adverse, long-term effect) or even local extirpation (a major, adverse, long-term effect).

For native species that are not currently declining, continuing current traffic management patterns in Alternative B would be unlikely to affect on their population abundance, diversity, or habitat availability compared to present conditions. The park already experiences a high level of human presence and disturbance, and additional traffic would have little additive effect.

Cumulative Impacts

Cumulative effects on native wildlife under Alternative B would be similar to those described for Alternative A. They would include:

- continued benefits from habitat protection provided by natural areas in Rock Creek Park

- improved habitat conditions from cooperative efforts with other agencies to reduce or eliminate pollutant discharges in currently developed areas of the drainage

- restoration of access to the watershed upstream from Peirce Mill dam by removing or mitigating man-made obstructions to fish migration

- continued loss and fragmentation of wildlife habitat on privately owned land throughout the region because of continued urban development and in-filling

- continued changes in hydrology and water quality because of watershed development outside the park

Conclusions

Alternative B would not produce any major changes in native wildlife species abundance, diversity, or habitat availability. Increased roadkill from higher levels of traffic could produce long-term, adverse effects on species that are believed to already be declining. However, this would not result in any impairment of resources or values associated with native wildlife. As with Alternative A, cumulative impacts from actions outside the park would have much larger effects on native wildlife than those actions associated with Alternative B.

IMPACTS ON ARCHEOLOGICAL RESOURCES

Analysis

Information about the location, characteristics, and significance of the majority of the archeological resources of Rock Creek Park and the Rock Creek and Potomac Parkway currently is lacking. However, following completion of the 4-year archeological inventory and analysis of the park and parkway that began in 2004, park managers will have sufficient information to carry out their responsibilities for protection and interpretation in an effective and efficient manner.

Under Alternative B, the integrity of some sites would be degraded by natural processes such as wind and water erosion, or by vandalism or inadvertent damage by visitors. These processes could result in non-construction-related significant adverse effects on archeological resources.

Cumulative Impacts

Cumulative impacts of Alternative B would be the same as those described for Alternative A.

Conclusions

Following completion of the 4-year, park-wide archeological inventory and evaluation that currently is underway, resource managers will have the necessary information to provide effective protection of the park's and parkway's archeological resources. There would be no impairment of resources or values associated with archeological resources as a result of Alternative B.

IMPACTS ON HISTORIC STRUCTURES AND CULTURAL LANDSCAPES

Analysis

Under Alternative B, Rock Creek Park would continue to inventory historic resources. Measures for the preservation of significant resources would be undertaken in accordance with NPS policies and guidelines. Historic designed roads and trails would be preserved and maintained as part of the cultural landscape, as would structures such as Peirce Mill, the Godey Lime Kilns, and Fort DeRussy.

Cumulative Impacts

Cumulative impacts of Alternative B would be the same as those described for Alternative A.

Conclusions

Under Alternative B, cultural resource management activities would protect, preserve, and interpret the park and parkway cultural resources in a manner consistent with *Management Policies 2001* (NPS 2000a). Cultural resources would continue to be maintained as at present. There would be no impairment of resources or values associated with historic structures and cultural landscapes.

IMPACTS ON TRADITIONAL PARK CHARACTER AND VISITOR EXPERIENCE

Analysis of Effects on Continuation and Quality of Traditional Park Uses

The traditional character of the park would not change under Alternative B. Visitors would continue to have access to the wide variety of established recreational activities described in the "Affected Environment" section. The appearance of park historic structures and grounds would be mostly preserved (see "Impacts on Historic Structures and Cultural Landscapes"), maintaining the traditional ambiance of the park setting.

Continuing current management under Alternative B would result in park visitors being affected by increased nonrecreational traffic along park roads and the parkway. Projections for traffic volumes on Beach Drive (table G.1 in appendix G) indicate that by the year 2020, average daily traffic on Beach Drive may increase by 30 percent.

Increases in traffic, particularly during weekday rush hours, would cause increased noise, and for several hours each weekday views along park roads would be dominated by long lines of slowly moving or stopped vehicles. When traffic volume allowed, such as during the mid-day period, speeding would continue to be a problem in the park. Visitors attempting to use park roads for recreation during weekdays could feel distracted and intimidated by the large volume of traffic and congestion on park roads.

Noise levels in Rock Creek valley would continue to follow the existing pattern. Noise levels within 60 feet Beach Drive and within 125 feet of the Rock Creek and Potomac Parkway would exceed the Federal Highway Administration's noise abatement criteria during high traffic periods. Traffic noise would remain the dominant background sound at picnic groves and along Rock Creek during weekdays. On weekends when road closures were implemented, traffic noise would be eliminated or greatly reduced in the valley north of Broad Branch Road.

Weekend road closures would continue current opportunities for nonmotorized recreation in the valley. As the number of visitors participating in nonmotorized recreation increased, weekend use could grow considerably above current levels occurring on the closed segments of Beach Drive on weekends.

Without realignment of segments of the park horse and foot trails, trail erosion would be a continuing and growing problem in some areas. This would lead to unsightly and potentially unsafe conditions at some trail sites.

At the Rock Creek Nature Center and Planetarium, visitors would continue to have opportunities to learn about the park, although the exhibits and furnishings would be worn and dated. School children and their teachers would continue to participate in environmental education programs at the center within the existing facility. Visitor contacts would continue to be limited by an insufficient number of NPS personnel to provide education, interpretation, and outreach services.

Park maintenance, patrol, and resource management activities would have continuous difficulties in staying abreast of deteriorating infrastructure, inadequate administration and operations support, and increasing resource threats. This situation would have a deleterious effect on visitors' aesthetic experience and, potentially, on their safety.

Analysis of Effects on Visitor Recreational Opportunities

Table 21 summarizes the advantages of Alternative B relative to the action alternatives for recreational opportunity quality, quantity, spectrum, and interpretation and education.

Alternative B is in the lowest rank with regard to the quality of the visitor experience. Throughout workdays, heavy traffic volumes and associated noise and congestion would continue to have adverse effects on nonmotorized recreation. Particularly on Beach Drive, the heavy traffic would continue to interfere with the recreational purposes of the park that were identified in its establishing legislation.

Alternative B would continue to accommodate the greatest number of visitors and was ranked highest for this attribute. These include the many visitors who drive through the park without stopping and view their use of the park as secondary to their travel. However, traffic studies demonstrate that some travel through the park on Beach

Drive is time-inefficient (Parsons 2004), suggesting that these visitors may choose this route at least partly for the quality of the aesthetic experience.

Alternative B is in the middle rank with regard to the spectrum of opportunities. Management actions associated with this alternative would not limit any of the traditional recreational uses in the park. In practice, however, nonmotorized recreation on Beach Drive during rush hours is limited by the heavy automobile traffic. During other daylight hours, the excessive speed of individual automobiles causes many people on foot or bicycle to avoid this area or not participate in nonmotorized recreation.

Alternative B is in the lowest rank for interpretation and education opportunities. Existing inadequacies led to identification of this among the three decision points that guided the development of the alternatives, and the action alternatives would result in major improvements in visitor facilities and staffing for education, interpretation, and outreach.

Analysis of Effects on Access for Visitors with Impaired Mobility

No changes in access for individuals for impaired mobility would occur. Within the park they would continue to be challenged by stairs, narrow doorways, and inadequate restroom facilities in public buildings. They also would continue to have difficulty using some segments of the paved trails that are in disrepair.

Cumulative Impacts

The Maryland Office of Planning (1993) predicted that demand for bicycling, hiking, and picnicking facilities in the state would increase by 6 to 14 percent between the years 2000 and 2010. Rock Creek Park and the Rock Creek and Potomac Parkway would continue to contribute to the regional mix of recreational opportunities and would be compatible with regional recreational plans.

For individuals with impaired mobility, the inability to access many of Rock Creek Park's facilities, including the public buildings, would be a continuing impediment to their ability to experience simple activities that others take for granted and that contribute to a sense of well-being.

Conclusions

The traditional character and recreational enjoyment of the park would decline over time under Alternative B. Already high traffic volumes would continue to increase through the park and would cause threats to safety and a reduced quality of visitor experience. Trail erosion would be a continuing and growing problem that would lead to unsightly and potentially unsafe conditions at some trail sites. Education, interpretation, and outreach would continue to be limited by inadequate staffing levels and worn and outdated facilities. Inadequate administration and operations support could result in declines in the quality of visitors' aesthetic experience and, potentially, their safety.

IMPACTS ON PUBLIC HEALTH AND SAFETY

Analysis of Effects on Safety along Roadways

Alternative B would not substantially change how traffic was managed in the park and on the parkway. As a result, as discussed in “Impacts on Regional and Local Transportation,” traffic volumes would increase on park roads and the parkway. By year 2020, traffic flows and levels of service throughout the park would deteriorate to a poor condition. Speeds would likely be highly variable, which would increase accident rates along Beach Drive and the Rock Creek and Potomac Parkway.

Because Alternative B would not mitigate existing safety problems, vehicle accident numbers and rates would either continue at present levels or increase. However, the slow speeds of the overly congested traffic may reduce the *severity* of accidents that occur during peak periods.

Under Alternative B, pedestrians and bicyclists would be sharing the road with increased numbers of cars. Therefore, automobile accidents involving pedestrians or cyclists would be expected to increase.

Analysis of Effects on Personal Safety

Alternative B would not alter current patterns of use along park roads or the parkway. As a result, the effects of this alternative on crimes against persons would be negligible.

Analysis of Effects on Emergency Evacuations

For Alternative B, there would be no changes in management from current conditions. Rock Creek Park roads could be used during emergencies for evacuation; however, segments of Beach Drive would be closed on the weekends.

Cumulative Impacts

Cumulative effects of Alternative B on public health and safety would be the same as those described for Alternative A.

Conclusions

Visitors’ safety would decline over time under Alternative B. Already high traffic volumes that would continue to increase throughout the park and on the parkway would represent the greatest threat to safety.

IMPACTS ON REGIONAL AND LOCAL TRANSPORTATION

The evaluation of effects on regional and local transportation for Alternative B involved comparing the conditions that would occur in the year 2020 under Alternative B to current conditions. The intent of this analysis is to provide an understanding of traffic conditions in the year 2020 if current park management practices are maintained.

Analysis

The effects of Alternative B on traffic volumes would be identical to those in Alternative A. However, because Alternative B does not include Alternative A's actions to reduce speed on Beach Drive through additional enforcement or traffic-calming measures, speeds would be expected to be substantially higher under Alternative B. For a detailed analysis of traffic projections for 2020, see the Analysis section of "Impacts on Regional and Local Transportation" for Alternative A.

Cumulative Impacts

The Washington Metropolitan Area Council of Governments predicts that if current patterns of growth and motor vehicle use continue, traffic in the region would increase by 70 percent between 1990 and the year 2020 (Metropolitan Washington Council of Governments 1998b). The transportation model used by Metropolitan Washington Council of Governments incorporates expected increases in mass transportation and nonmotorized transportation. The Transportation Planning Board for the council of governments has targeted increased intermodal transportation, reduced single occupancy vehicle use, and improved management of the traffic grid to avoid further problems with flows in the region.

If past trends continue and there are no major changes in transportation management, future daily traffic would increase on all arterials in northwest Washington. Most major streets in the vicinity of the park would see a 20 to 30 percent increase in volume by 2020. This would include Connecticut Avenue, Massachusetts Avenue, Wisconsin Avenue, Military Road, and Pennsylvania Avenue. The greatest relative increases are predicted east of the park on 16th Street (28 to 62 percent), Georgia Avenue (32 to 56 percent), and New Hampshire Avenue (22 to 49 percent).

Already crowded commuter routes would become even more congested by the year 2020 during rush hours. Levels of service on segments of many major arterials would noticeably decline and most would range from heavy (level of service D) to extremely heavy (level of service F) during peak traffic hours. Rush-hour levels of service would be noticeably reduced on several smaller streets around the park including Tilden, Harvard, and Kennedy Street.

The Maryland Department of Transportation does not anticipate any impacts on state roads from the implementation of Alternative B or any other management alternative for Rock Creek Park (Simpson 2003).

As described in Alternative A, transportation departments in the area will continually be implementing projects on roads near the park and throughout the city to improve travel conditions for citizens. After each project is completed, area-wide traffic patterns will adjust to take advantage of the changes.

The Rock Creek Trail, including the segment through the park and parkway, is a designated regional bikeway in the Washington metropolitan area. Maintaining existing facilities for bicyclist and pedestrians in the park and on the parkway would not change their contribution to regional efforts to promote nonmotorized transportation. Increasing automobile traffic on park roads could, to an unknown extent, discourage weekday nonmotorized travel.

Conclusions

Alternative B would result in increased traffic volumes in 2020 on park roads with deteriorating levels of service on Beach Drive and the Rock Creek and Potomac Parkway. Traffic on Beach Drive south of Porter Street would reach near-gridlock levels during evening rush hours by the year 2020. Conflicts and safety problems among visitors participating in nonmotorized recreation and automobile users would likely increase on park roads.

Alternative B would continue to support existing traffic patterns through and around the park but at greater volumes.

IMPACTS ON COMMUNITY CHARACTER

Analysis

Continuing current management practices with Alternative B would not affect community character and the quality of life of area residents or businesses. Although traffic and noise levels would continue to increase in both the park and surrounding neighborhoods, the cause would be regional population growth and not any actions by the National Park Service. Recreational opportunities and access to the park would continue to be compromised by traffic congestion in the area.

Alternative B would not include any additional spending in the area for capital improvements, jobs, or annual operations. The economic effects of this alternative would be negligible on a local and city-wide basis.

Cumulative Impacts

Cumulative impacts would be the same as those described for Alternative A. Other social and economic factors in neighborhoods near the park and throughout the Washington, D.C. metropolitan area would have a greater influence on the character of the community outside the park than would the actions associated with implementing Alternative B.

Conclusions

The impacts of Alternative B on community character would be identical to those described for Alternative A.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

The Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Existing traffic problems, which will worsen with time, and the space constraints faced by NPS administrators are not likely to be sustainable as demand for recreation in the park grows. These conditions could jeopardize the long-term enjoyment of park resources.

Any Irreversible or Irrecoverable Commitments of Resources that Would Be Involved Should the Alternative Be Implemented

There would be a potential for irreversible or irretrievable commitments of archeological and historic resources under Alternative B. These losses could occur because of the continuing inability to place mitigative actions within an appropriate research context, to synthesize data, and to implement a comprehensive program for historic resource preservation.

Any Adverse Impacts that Cannot Be Avoided Should the Action Be Implemented

None of the effects identified in this assessment of Alternative B would be considered major adverse effects. Alternative B would not result in impairment of any resources that would affect the basic purposes of Rock Creek Park and the Rock Creek and Potomac Parkway.

ENVIRONMENTAL IMPACTS OF ALTERNATIVE C: NONMOTORIZED RECREATION EMPHASIS

IMPACTS ON AIR QUALITY

Analysis

The area of Rock Creek Park and the Rock Creek and Potomac Parkway would be affected more by emissions throughout the regional airshed than by tailpipe emissions from vehicles using the park and parkway. Table 20 summarizes the effects of Alternative C on air quality in the year 2020 compared to Alternative B. The analysis showed the following.

At three intersections in the park, Alternative C would result in minor to moderate beneficial effects on the air quality, as represented by carbon monoxide concentrations, during the representative worst-case conditions.

At intersections outside the park, the differences in carbon monoxide concentrations between Alternative C and Alternative B would be negligible, and would differ by only a few tenths of a part per million.

The worst 1-hour carbon monoxide concentration that would be associated with Alternative C (10.7 parts per million at the intersection of 16th Street and Military Road) would be well below the 1-hour National Ambient Air Quality Standard of 35 parts per million that is protective of human health and the environment.

Alternative C would include some construction that would not occur with Alternative B. This would include preserving historic structures, expanding the Rock Creek Nature Center and Planetarium, and possibly constructing new buildings at the maintenance yard and H-3 stables. Best management practices and prompt revegetation would be applied with all construction to ensure that dust and construction-vehicle emissions would not be substantially greater than those that would occur with Alternative B.

Cumulative Impacts

No changes would occur in air emissions from vehicles in the region because of Alternative C's management actions at Rock Creek Park and the Rock Creek and Potomac Parkway. Instead, Alternative C would redistribute the same traffic volume onto different roadways, compared to Alternative B. This redirection of the same volume of traffic would have negligible effects on the regional air quality.

Provisions of Alternative C to eliminate traffic on segments of Beach Drive and to create a transportation corridor separated from motorized vehicles may encourage some travelers to use bicycles rather than automobiles. This change in transportation mode would result in a beneficial but negligible effect on the regional air quality.

Conclusions

Alternative C would result in negligible effects on air quality at intersections outside the park compared to Alternative B. At intersections within the park under assumed worst-case conditions, it would have a minor to moderate beneficial effect on air quality, as represented by carbon monoxide concentrations. It would not result in the exceedence of the 1-hour National Ambient Air Quality Standard for carbon monoxide. In addition, it would not cause any impairment of resources or values associated with air quality.

IMPACTS ON ROCK CREEK AND ITS TRIBUTARIES

As described in the section “Impacts on Local and Regional Transportation,” automobile traffic on Beach Drive north of Broad Branch Road would be eliminated on the closed sections and would decrease by 97 percent relative to Alternative B on the segments that remained open to support east-west traffic. South of Broad Branch Road, Beach Drive traffic would decrease by 15 percent to 25 percent. Traffic decreases greater than 5 percent would occur along most of the Rock Creek and Potomac Parkway.

These decreases in park and parkway traffic would result in lower pollutant loadings (sediments, oils and grease, and metals from the road surface) draining into Rock Creek from park roads. However, all of the alternate routes, both in and outside the park, are within the Rock Creek drainage. Therefore, changes in traffic patterns related to Alternative C would redistribute rather than reduce pollutant loadings in the Rock Creek watershed. The effect on water quality in the Rock Creek drainage would be negligible.

Aside from roadway runoff, Alternative C would have the same effects as Alternative A on Rock Creek and its tributaries. This includes identical cumulative impacts and conclusions. There would be no impairment of resources or values associated with Rock Creek and its tributaries.

IMPACTS ON WETLANDS AND FLOODPLAINS

Alternative C would have the same effects as Alternative A on wetlands and floodplains. This would include identical cumulative impacts and conclusions.

IMPACTS ON DECIDUOUS FORESTS

Alternative C would have the same effects as Alternative A on deciduous forests. This would include identical cumulative impacts and conclusions.

IMPACTS ON PROTECTED AND RARE SPECIES

Alternative C would have the same effects as Alternative A on protected and rare species. This would include identical cumulative impacts and conclusions.

IMPACTS ON OTHER NATIVE WILDLIFE

Except as noted below, Alternative C would have the same effects as Alternative A on native wildlife. This would include identical cumulative impacts and conclusions. There would be no impairment of resources or values associated with native wildlife.

Permanent closure of segments of Beach Drive and other actions to reduce traffic speeds and volumes on park roads and the parkway would reduce the number of wildlife killed or injured by motor vehicles. Compared to Alternative B, this would produce long-term, beneficial effects on the park's native wildlife.

For most park species, the reductions in mortality from closing the road would be negligible. As shown in table 10, nine animals were killed in the year 2000 on sections of Beach Drive that would be permanently closed under Alternative C (the same sections that currently are closed to traffic on weekends and holidays). This value represents less than 8 percent of the average road-kill recorded in the park each year (122 animals per year, calculated from table 9). Measures to reduce traffic volumes and speeds would further reduce roadkills compared to Alternative B, but would have little effect on the populations of most park species because their populations are stable or expanding. As with Alternative A, the effects on box turtles would be moderate, long-term, and beneficial. Effects on gray foxes would be major, long-term, and beneficial.

IMPACTS ON ARCHEOLOGICAL RESOURCES

Alternative C would have the same effects as Alternative A to archeological resources. This would include identical cumulative impacts and conclusions.

IMPACTS ON HISTORIC STRUCTURES AND CULTURAL LANDSCAPES

Analysis

Impacts on historic structures and cultural landscapes would be the same as those described for Alternative A with the following exceptions. Conversion of portions of Beach Drive to a paved recreation trail could have an effect on its historically significant design features if the paved surfaces were reduced over time. Its historic use would also change with the removal of vehicles, because the roadway was constructed for scenic driving.

Cumulative Impacts

Cumulative impacts under this alternative would be the same as described for Alternative A.

Conclusions

The impacts of this alternative would be similar to those described for Alternative A except that the design features of the roads converted to trails could be modestly affected and vehicles would be removed from the roadways. In addition, there would be a change in the use of Beach Drive from the historic use of scenic driving to other uses. Because the roadbed would not be greatly altered, the historic use could be returned at some future date if management goals changed. Con-

sequently, there would be no impairment of resources or values associated with historic structures and cultural landscapes.

IMPACTS ON TRADITIONAL PARK CHARACTER AND VISITOR EXPERIENCE

Analysis of Effects on Continuation and Quality of Traditional Park Uses

Except in the areas where Beach Drive was permanently closed, the overall character of the park would not change under Alternative C. Recognition of cultural landscape values and management for those values would help maintain the traditional appearance of the park. Development of design standards for park facilities and signs would also enhance the traditional ambiance.

The traditional appearance of the Rock Creek and Potomac Parkway, the segments of Beach Drive that remained open to motorized vehicles, and other park roads would be largely unchanged. Some new traffic-calming structures such as speed humps and speed tables, four-way-stop intersections, and signs would be necessary to implement controls on automobile speeds and volumes under Alternative C. Visual intrusion of such facilities could be offset by removal of some existing traffic structures such as right-turn lanes and signs. The net effect on the traditional character of the park probably would be negligible.

Along closed sections of Beach Drive, existing traffic control signs would be removed and in some cases replaced by control signs related to pedestrian and bicycle use. Beach Drive would remain paved in these sections, although the width of pavement could be reduced over time if warranted by recreational use.

Permanent closure of sections of Beach Drive north of Broad Branch Road would eliminate the existing visitor experience of automobile travel along the length of the park, including the gorge area. With the exception of cross-park access using the Wise Road-West Beach Drive and Bingham Drive-Sherrill Drive connections, both recreational and nonrecreational visits by automobile would cease north of Broad Branch Road. This change in the pattern of park use would be a major, adverse impact on the existing visitor experience.

Weekday visitation to the northern portion of the park would be substantially reduced. This alternative would eliminate weekday motorized visitation on the segment of Beach Drive between Broad Branch Road and Joyce Road which, under Alternative B, would total about 15,000 visits per day (11,700 vehicles per day containing 1.3 people per vehicle). Most of the reduced park use under Alternative C would be in nonrecreational visits.

The experience of automobile travel along the length of Beach Drive would be eliminated in this alternative but the other activities described in the “Affected Environment” section would remain. The experience of driving along Beach Drive north of Broad Branch Road would be replaced by enhanced opportunities for nonmotorized use of this area. A portion of the increased weekday visits would be by nonrecreational cyclists. However, substantially increased use for multiple forms of nonmotorized recreation would occur during weekdays from groups that formerly avoided the park because of fast-moving traffic on Beach Drive. These would include individuals who do not work a traditional Monday through Friday workday schedule, caregivers with small children, retired people, and school groups. A long-term, beneficial effect of moderate intensity would result from the improved ability for park visitors to participate in nonmotorized recreation along Beach Drive throughout the week.

Even with the permanent closure of segments of Beach Drive, all visitor-use facilities such as picnic grounds and trailheads would continue to be accessible via motorized vehicle. However, visitors would have to use city streets to drive around the closed sections to access other portions of the park. This could be confusing, particularly to out-of-town visitors.

Continued weekend road closures north of Broad Branch Road under Alternative C would maintain current opportunities for nonmotorized recreation in the valley. The number of weekend users would probably be similar to those occurring under Alternative B on weekends.

South of the road closures on Beach Drive, high-occupancy vehicle restrictions, speed limit enforcement, and traffic-calming measures would create a less congested driving experience compared to Alternative B. High-occupancy vehicle restrictions would inconvenience some nonrecreational visitors who did not carpool during weekday rush hours. The experience for motorists and cyclists on Beach Drive south of Broad Branch Road would be similar to what it is today (and less crowded than under Alternative B), because cars would still be present in large numbers during weekday rush hours.

Weekday noise levels in Rock Creek valley north of Broad Branch Road would change considerably under Alternative C. Traffic noise would be eliminated along much of northern portion of Beach Drive, except for substantial cross-park traffic using the Wise Road-West Beach Drive and Bingham Drive-Sherrill Drive connections. Natural sounds and the sounds of people recreating would be dominant, similar to the conditions currently occurring on weekends. The long-term, beneficial effect of reduced noise in these areas would be minor to moderate.

Noise levels in the valley south of Broad Branch Road would follow the existing pattern, where weekday noise levels within 60 feet of Beach Drive and within 125 feet of the Rock Creek and Potomac Parkway would exceed the Federal Highway Administration's noise abatement criteria during high-traffic periods.

Alternative C would have similar weekend use levels and experiences as Alternative B. This would occur because weekend traffic management would be similar for both alternatives.

Alternative C components that would be similar to Alternative A would include upgraded recreation trails, rehabilitation of the cultural landscape at the Peirce Mill complex, improvements to the Rock Creek Nature Center and Planetarium, and improved working conditions for park and U.S. Park Police staff. All of these would have moderate, long-term, beneficial effects on park character and visitor experience, although the perceived benefit by the public to improved administrative staff conditions probably would only be minor.

Analysis of Effects on Visitor Recreational Opportunities

Table 21 summarizes the relative advantages of Alternative C relative to Alternative B for recreational opportunity quality, quantity, spectrum, and interpretation and education. Alternative C would have a negligible effect on recreational opportunities relative to Alternative B. It would be more advantageous than Alternative B for two attributes and less advantageous for two attributes, for no net difference in numbers of advantages relative to Alternative B.

Alternative C would be considerably more advantageous than Alternative B with regard to the quality of the experience. The permanent closure of three segments of

Beach Drive would provide an unhurried experience with the ability to enjoy natural sounds and smells and to view park resources.

Alternative C would be substantially less advantageous than Alternative B with regard to the number of visitors who use the park. Based on traffic patterns, it is estimated that total visitation to Rock Creek Park could decrease by 75 percent or more. Many of the visitors who would be displaced currently drive through the park without stopping.

Alternative C would reduce the spectrum of recreation opportunities relative to Alternative B. The lowest variety of recreational opportunities would be available because the opportunity to drive the length of Beach Drive in a motorized vehicle would be eliminated.

Interpretation and education opportunities would experience substantial advantages under Alternative C. Increased opportunities to learn about and experience the park's natural and cultural resources would result from upgraded interpretation and education facilities in the park. Six additional staff positions for interpretation and education would substantially improve opportunities for visitor contact, programming, and outreach.

Analysis of Effects on Access for Visitors with Impaired Mobility

For site improvements associated with trails, buildings, and historic scenes, the same long-term, moderate, beneficial effects for individuals with impaired mobility that were described for Alternative A would occur.

The effects of permanent closures of three segments of Beach Drive on access for visitors with impaired mobility would vary, based on the individual's perception. Comments on the draft general management plan identified two very different viewpoints.

Many people stated that an adverse effect would occur on people with impaired mobility because they would no longer be able to drive through and enjoy the closed segments of Beach Drive, particularly the gorge area between Joyce Road and Broad Branch Road.

Many others perceived a beneficial effects on people with impaired mobility because they would be able to enjoy the use of the broad, level, smooth surface of Beach Drive throughout the week. They noted that their experience would be enhanced not only by the absence of cars but also by the lower numbers of other visitors, such as inattentive children who can pose a risk to people with impaired mobility. They also noted that once they reached areas such as the gorge, they could stop and enjoy the experience, which they could not do from a car.

The intensity of the Alternative C impact on individuals with impaired mobility would be moderate because changes in access from this component of Alternative C would only affect the Beach Drive area. Whether this long-term impact was beneficial or adverse would depend on each individual's viewpoint.

Cumulative Impacts

The Maryland Office of Planning (1993) predicted that demand for bicycling, hiking, and picnicking facilities in the state would increase by 6 to 14 percent between the years 2000 and 2010. Rock Creek Park and the Rock Creek and Potomac Parkway would continue to contribute to the regional mix of recreational opportunities and would be compatible with regional recreational plans. Alternative C would provide a pedestrian and bicycling route through Rock Creek Park that would be relatively free from interference by automobiles and would provide an effective connection with regional pedestrian and bicycle trails.

Cumulative effects of Alternative C on access for individuals with impaired mobility would be much the same as described for Alternative A. However, depending on their viewpoint, individuals may see the permanent closure of Beach Drive as an additional restriction on their ability to access important natural and cultural resources in the area or an opportunity that increases their ability to enjoy high-value resources.

Conclusions

The loss of the existing visitor experience of automobile travel along the length of the park would be a major, long-term, adverse impact of Alternative C. However, because the roadbed would not be greatly altered, this use could be returned at some future date if management goals changed.

A long-term, beneficial effect of moderate intensity would result from the improved ability for park visitors to participate in nonmotorized recreation along Beach Drive throughout the week.

Many other effects of Alternative C would be like those described for Alternative A. These would include moderate, beneficial, long-term effects associated with upgraded trails throughout the park; improvements to visitor contact, interpretation, and education facilities and services; and improved access for visitors with impaired mobility at buildings, historic scenes, and trails. Improved working conditions for park administrative staff and personnel in the U.S. Park Police District 3 substation would result in a moderate beneficial effect on park operations, but the intensity of the beneficial impact perceived by the public probably would be minor. Compared to Alternative B, this alternative would have a negligible effect on the park's recreational opportunities.

For the closed segments of Beach Drive, Alternative C would have a long-term, moderate effect on access for individuals with impaired mobility. Each person's viewpoint would determine whether this effect was adverse or beneficial.

IMPACTS ON PUBLIC HEALTH AND SAFETY

Analysis of Effects on Safety along Roadways

Traffic management measures associated with Alternative C that could affect public health and safety would include

- permanently closing portions of Beach Drive to vehicular traffic
- enhanced enforcement

use of traffic-calming measures, such as speed humps and speed tables, all-way stops, rumble strips, or raised intersections

reconfiguration of the intersection of the parkway with Beach Drive near Connecticut Avenue to improve safety

discontinuation of the one-way traffic restrictions on the Rock Creek and Potomac Parkway during peak periods

high-occupancy vehicle restrictions on the parkway and on Beach Drive south of Broad Branch Road during rush hours

High-occupancy vehicle restrictions might improve safety by reducing traffic volumes. However, without other controls, traffic speeds in high-occupancy vehicle zones might increase, which could increase the frequency or severity of accidents. Because of these potentially conflicting effects, the safety effects of high-occupancy vehicle restrictions were not considered extensively in this section. The effects of the other traffic management measures on safety are described below, with a summary of effects on vehicle occupants and to pedestrians and cyclists.

Beach Drive Closures. The segments of Beach Drive that would be permanently closed by Alternative C were the site of 16 accidents between 2001 and 2003. These represent less than two percent of the accidents that occurred in the park and on the parkway in this period. Closing these segments to motorized vehicle traffic would reduce accidents involving motorized vehicles in the area covered by this plan by approximately the same percentage.

Closing portions of Beach Drive may move accidents to other nearby areas. Traffic volumes along Wise Road, Oregon Avenue, Military Road, and 16th Street are projected to increase compared to Alternative B, and the numbers of accidents on these roads may also increase.

Enhanced Enforcement. The effectiveness of improved speed enforcement measures was described for Alternative A. The enhanced enforcement elements of Alternative C would have a similar minor to moderate beneficial effect on visitor safety. However, if traffic enforcement levels were reduced because of budget cuts or the need to assign U.S. Park Police staff to other duties, the beneficial effects would not be expected to continue for very long.

Traffic Calming Measures. The use of traffic-calming techniques to reduce speeds and enhance safety was described in the analysis of Alternative A. As with that alternative, the use of traffic-calming devices in Alternative C would have a major, beneficial effect on visitor safety in the park and parkway compared to Alternative B. As long as the traffic-calming devices were maintained, these would be long-term effects.

Discontinue One-Way Traffic Restriction during Peak Periods. Generally, one-way streets lead to higher speeds. One-way streets can also be more confusing for pedestrians. Both of these factors can increase the number of accidents.

There also are features of one-way streets that can reduce the number of accidents. These include reduced conflicts at intersections, more orderly traffic flow, and the creation of gaps for both pedestrians and vehicles to enter or cross the traffic stream.

The safety of one-way street systems typically has been assessed by comparing accidents before and after conversion to one-way operation, and most often has been studied for streets in central business districts. Most of these studies indicate that one-way streets are safer, by perhaps 20 to 30 percent. However, other studies have found that in locations outside of central business districts, accident rates were higher on one-way streets.

For the Rock Creek and Potomac Parkway, it is difficult to conclude whether converting this road to two-way operation during peak periods would improve safety along the corridor. A detailed analysis of accidents and volumes by time of day would be useful in determining whether accident rates are currently lower during one-way or two-way operation.

Effects on Vehicle Occupants. As described for Alternative A, speed is the major factor affecting the probability of injury or death in vehicle-only traffic accidents. By reducing speeds, differences in speeds, and traffic volumes on park roads and the parkway, the traffic management measures of Alternative C would have a long-term, major, beneficial effect in reducing the number and severity of motor-vehicle-only accidents. Monitoring would be needed to determine if the Alternative C closure of segments of Beach Drive and traffic-reducing measures, which would divert some traffic onto nearby city streets, was increasing the number of injury and fatal accidents outside of the park.

Effects on Pedestrians and Cyclists. Speed is the primary factor affecting the outcome of collisions between motorized vehicles and pedestrians or cyclists. By slowing traffic speeds and reducing traffic volumes, the traffic management measures of Alternative C would have a long-term, beneficial effect in reducing the number and severity of collisions between automobiles and pedestrians or cyclists in the park and along the parkway.

Pedestrians and cyclists would have a continuous trail throughout the park and parkway that would be separated from motor vehicles. This would probably reduce the number of accidents involving automobiles and cyclists or pedestrians compared to Alternative B. However, because of the low number of this type of accident (average of two per year throughout the park and parkway for the 2001-2003 period), some year-to-year fluctuation in the number of collisions between cars and pedestrians or cyclists would be expected.

Some accidents involving cyclists, skaters, and/or pedestrians would occur in the segments of Beach Drive that would be closed to vehicular traffic. Some of the factors that could influence the number and severity of nonmotorized vehicle accidents are identified below. Both individually and collectively, these factors would have only a negligible to minor effect on the total number and ratio of accidents in the park and on the parkway.

The weekday use of the closed segments for recreation and nonmotorized travel is expected to be about 30 percent of weekend use. However, the availability of a car-free route could increase the number of bicycle recreationists and travelers. While this would probably increase the number of cycle accidents, it probably would not change the ratio of accidents to the number of cyclists.

As with automobiles, a difference in speed can cause accidents. On weekdays, the occasional presence of stopped or slow-moving recreationists may be more likely to result in an accident with a fast-moving cyclist than would occur on a weekend when many slow-moving visitors are present and tend to limit the speed of cyclists.

Bicycle commuters may travel at higher speeds than many recreationists. Also, the absence of motorized vehicles may encourage higher speeds among some cyclists and skaters. Both of these could increase the severity of bicycling and skating injuries.

Analysis of Effects on Personal Safety

Alternative C would permanently close three segments of Beach Drive to motorized vehicle use. In comments on the draft general management plan, some people felt that assaults would be reduced in these segments because cries for help could be easily heard in the quiet setting. Others felt that the absence of large numbers of people in motor vehicles in the area would lead to increases in assaults.

Alternative C is expected to have a negligible effect on crimes against persons compared to Alternative B. There currently are many secluded locations within the park where homicides, sexual assaults, or aggravated assaults could occur, but do not. Removing traffic on three segments of Beach Drive would not make the segments into magnets for violent offenders. Under any alternative, visitors should continue to use common-sense measures such as making sure others are around and reporting suspicious conditions to authorities.

Analysis of Effects on Emergency Evacuations

For Alternative C, portions of Beach Drive would be permanently closed to the driving public. The narrow width of the roadway that formerly was Beach Drive (16 feet) would probably discourage most drivers from using this as an evacuation route, even if some considered driving around the gates. However, Beach Drive is not a designated evacuation route and is already gated on weekends. As a result, the effects of Alternative C on emergency evacuations would be negligible compared to Alternative B.

Cumulative Impacts

Cumulative effects of Alternative C would be the same as those described for Alternative A.

Conclusions

Effects of Alternative C on public health and safety would include a long-term, major, beneficial effect because of the effectiveness of traffic calming measures in reducing the numbers and severity of traffic accidents. Alternative C would have negligible effects on crimes against persons or the effectiveness of emergency evacuations.

IMPACTS ON REGIONAL AND LOCAL TRANSPORTATION

Analysis

Average Daily Traffic. Compared to Alternative B, the predicted changes in weekday average daily traffic volumes on Beach Drive, the Rock Creek and Potomac Parkway, and other roadways in the park under Alternative C are summarized in table 23 and table G.1 in appendix G. Visual representations of estimated traffic levels are shown in the Alternative C Year 2020 Average

TABLE 23: AVERAGE DAILY TRAFFIC UNDER ALTERNATIVE C COMPARED TO AVERAGE DAILY TRAFFIC UNDER ALTERNATIVE B IN THE YEAR 2020

Road Segment	Alternative C	Alternative B	Change	Percent Change
Beach Drive – Wyndale to East Beach Drive	0	13,800	-13,800	-100
Beach Drive – Wise Road to Sherrill Drive	0	16,900	-16,900	-100
Beach Drive – Bingham Drive to Joyce Road	300	12,600	-12,300	-98
Beach Drive – Joyce Road to Broad Branch Road	0	11,700	-11,700	-100
Beach Drive – Blagden Avenue to Tilden/Park Road	20,000	26,700	-6,700	-25
Beach Drive – Porter Street to Zoo	27,900	33,800	-5,900	-17
Beach Drive – Zoo to 24 th /Cathedral	30,800	36,000	-5,200	-14
Rock Creek and Potomac Parkway – 24 th /Cathedral to Waterside	56,400	64,600	-8,200	-13
Rock Creek and Potomac Parkway – Waterside to P Street	71,600	77,900	-6,300	-8
Rock Creek and Potomac Parkway – K Street/Whitehurst to Virginia	71,100	75,200	-4,100	-5
Rock Creek and Potomac Parkway – Virginia to Teddy Roosevelt Bridge	56,100	55,100	+1,000	+2
West Beach – Wise Road	11,300 and 15,200	17,100 and 14,100	-5,800 and +1,100	-34 and +8
Bingham Drive – Sherrill Drive	1,900 and 1,600	1,800 and 7,700	+100 and -6,100	+6 and -79
Joyce Road – Morrow Drive	0 and 1,000	1,500 and 3,400	-1,500 and -2,400	-100 and -71
Broad Branch Road – Blagden Avenue	9,200 and 11,200	9,000 and 9,400	+200 and +1,800	+2 and +19
Tilden Street – Park Road	12,900 and 12,900	11,800 and 12,100	+1,100 and +800	+9 and +7
Piney Branch Parkway – Porter Street	14,000 and 19,100	13,300 and 18,700	+700 and +400	+5 and +2

Weekday Traffic Volumes map and the Alternative A and B Year 2020 Average Weekday Traffic Volumes map.

Alternative C would eliminate traffic along some sections of Beach Drive, would substantially reduce automobile traffic in other sections of the park and on the parkway, and would cause mixed changes in traffic flow from park roads onto the city's commuter corridors. Permanent full-time closure of sections of northern Beach Drive would transfer from 11,700 to 16,900 vehicles per day, compared to Alternative B, from park roads to city streets.

As shown in table 23, an estimated 4,100 to 8,200 vehicles per day, compared to Alternative B, would use other portions of the city grid rather than the southern portion of Beach Drive and the parkway. These shifts in the southern park and most of the parkway would result from high-occupancy vehicle restrictions on portions of Beach Drive and the parkway during morning and evening peak periods, Beach Road closures to the north, and full-time, two-way traffic on the parkway. The only area of the park and parkway where traffic would increase would be at the southern end of the parkway, where traffic would increase by 1,000 vehicles (2 percent) per day.

Vehicles that would otherwise travel Beach Drive between the Maryland border and Broad Branch Road would have to find alternate routes. Single occupancy vehicles currently using the southern portion Beach Drive and Rock Creek and Potomac Parkway would also have to use alternate routes during high-occupancy vehicle restrictions. Some commuter vehicles carrying two or more people and currently using routes on the city street grid would likely re-route onto lower Beach Drive and the parkway.

Providing for two-way travel at all times on the parkway would allow new access to those wishing to travel against the rush-hour flow along the parkway. Since high-occupancy vehicle restrictions would only be in effect for the predominant flow of commuter traffic on Beach Drive and the parkway, there would be no impact on vehicles traveling in the opposite direction during these times.

Road closures and high-occupancy vehicle restrictions on Beach Drive would not restrict the cross flow of traffic between the east and west sides of the park on routes such as West Beach-Wise, Bingham-Sherrill, Joyce-Morrow, Broad Branch-Blagden, Tilden-Park, or Piney Branch-Porter. As shown in table 23, effects on these routes would vary, with traffic reductions of more than 70 percent on the Joyce-Morrow route and traffic increases of about 5 percent to 10 percent on most of the other routes, compared to Alternative B.

Traffic-calming measures applied to Beach Drive between Broad Branch Road and the parkway would reduce vehicle speeds. However, slower speeds are not anticipated to cause vehicles to re-route. Proposed safety modifications to the intersection of Beach Drive and the parkway near Connecticut would reduce vehicle conflicts and help minimize traffic congestion and delays.

High-occupancy vehicle restrictions and changes in parkway management would not change the volume of vehicles going to and from the National Zoological Park. Zoo visitors riding alone in a vehicle would not be allowed to use Beach Drive in the direction of rush-hour flow during the morning and evening peak-hours. However, because most visits to the zoo are part of a social activity, vehicles with the zoo as a destination would usually have more than one occupant. High-occupancy vehicle restrictions would not affect zoo visitors during the middle of the day from Monday through Friday, or at any time on weekends.

The decreases in traffic that would occur on Beach Drive, the Rock Creek and Potomac Parkway, and some cross-park roads would result in increases in traffic on other routes. In addition to those already identified on table 23, road segments where traffic would increase by 3 percent or more compared to Alternative B include the following:

Road Segment	Percent Increase
16th Street from Alaska to Florida	3 - 10
Alaska Avenue from Georgia to Morningside	6
Georgia Avenue from Alaska to Kennedy	3 - 8
Oregon Avenue from Chestnut to Nebraska	8
Broad Branch Road from Western to 27 th Street	13 - 41
Connecticut Avenue from Columbia to DuPont Circle	4 - 6
Wisconsin Avenue from Albemarle to Newark	5
Massachusetts Avenue from the state line to 49th Street	3
Nebraska Avenue from Oregon to Utah	20
Harvard Street from Adams Mill to 16th Street	8
New Hampshire Avenue from 19th Street to Virginia	7 - 13
Constitution Avenue from 23rd Street to Henry Bacon	5

Goals of Alternative C include managing northern portions of the park as an exclusion zone from urban automobile traffic to promote nonmotorized recreation throughout the week, asserting more control over nonrecreational use of park roads, and improving visitor safety. To determine the effectiveness of Alternative C in meeting these goals, average daily traffic estimates in the year 2020 were compared to traffic counts in the year 1990. This analysis determined the following:

North of Broad Branch Road, traffic would be eliminated on Beach Drive, except for 300 vehicles per day on the segment between Bingham Drive and Joyce Road.

South of Broad Branch Road, traffic on Beach Drive would increase modestly, by about 11 percent on the segment to Tilden/Park, 16 percent on the segment south to the zoo, and 25 percent from the zoo to 24th/Cathedral.

Based on these results, it is concluded that Alternative C would be very effective in reducing or excluding traffic from the northern portion of the park and limiting nonrecreational traffic on other park roads. In concert with reduced speeds that would result from the traffic restrictions and calming measures, Alternative C would also meet the objective of improving visitor safety south of the road closure area.

Effects on Levels of Service on Beach Drive and the Rock Creek and Potomac Parkway. Table 24 summarizes the effects of the Alternative C traffic management measures on the levels of service on Beach Drive and the Rock Creek and Potomac Parkway compared to Alternative B. The terms “noticeable,” “considerable,” and “major” were defined in the “Methodology” section that preceded the Alternative A analysis. Evaluation of the information in table 24 showed the following:

TABLE 24: BEACH DRIVE AND ROCK CREEK AND POTOMAC PARKWAY SEGMENTS EXPERIENCING NOTICEABLE OR GREATER CHANGES IN TRAFFIC LEVELS OF SERVICE BETWEEN ALTERNATIVE C AND ALTERNATIVE B

Road Segment	Peak-Hour Period	Alternative C LOS	Alternative B LOS	Change^{a/}
Traffic eliminated – Beach Drive				
Wyndale to West Beach Drive	A.M.	Closed	C	M
Wyndale to West Beach Drive	P.M.	Closed	C	M
Wise Road to Sherrill Drive	A.M.	Closed	C	M
Wise Road to Sherrill Drive	P.M.	Closed	D	M
Joyce Road to Broad Branch Road	A.M.	Closed	B	M
Joyce Road to Broad Branch Road	P.M.	Closed	C	M
Improved level of service – Beach Drive				
Bingham to Joyce Road	A.M.	A	B	N
Bingham to Joyce Road	P.M.	A	C	C
Blagden to Tilden/Park	A.M.	C	D	N
Blagden to Tilden/Park	P.M.	E	F	N
Porter Street to zoo	A.M.	C	E	C
Porter Street to zoo	P.M.	E	F	N
Improved level of service – Rock Creek and Potomac Parkway				
Zoo to 24th/Cathedral	P.M.	E	F	N
24th/Cathedral to Waterside ramps	A.M.	C	D	N
24th/Cathedral to Waterside ramps	P.M.	C	D	N
Waterside ramps to P Street ramps	A.M.	D	E	N
K Street/Whitehurst to Virginia	A.M.	B	D	C
K Street/Whitehurst to Virginia	P.M.	D	E	N
Reduced level of service				
Virginia to T. Roosevelt Bridge	P.M.	D	C	N

a/ N = noticeable. C = considerable. M = major.

The three closed segments of Beach Drive would exhibit major changes in levels of automobile traffic compared to Alternative B.

Park visitors in the vicinity of Beach Drive would observe considerable improvements in levels of automobile traffic from Porter Street to the zoo in the morning peak hour and from Bingham Drive to Joyce Road in the afternoon. Both of these stretches would have noticeable improvements in traffic levels during the other rush hour.

Noticeable improvements in traffic levels would be observed by park visitors on Beach Drive from Blagden Avenue to Tilden/Park during both the morning and afternoon rush hours.

Noticeable improvements in levels of traffic would be seen by visitors along several portions of the Rock Creek and Potomac Parkway in the morning and afternoon. In the morning, the improvement from K Street/Whitehurst to Virginia Avenue would be considerable.

A noticeable decrease in the level of service compared to Alternative B would occur from Virginia Avenue to the Theodore Roosevelt Bridge during the afternoon period.

Morning Rush-Hour Traffic. During the weekday morning rush hour, many road segments would have identical levels of service (LOS) in the year 2020 under Alternative C and Alternative B. Table 24, table 25 and the Alternative C Year 2020 A.M. Peak-Hour Volume Changes with Respect to Alternative B map show segments where the level of service between the two alternatives would vary by at least one step. Additional information on year 2020 peak-hour traffic volumes and levels of service for both the morning and evening are provided in tables G.2 and G.3 in appendix G.

There would be two major changes in weekday morning rush-hour traffic patterns associated with Alternative C compared to Alternative B.

Traffic on Beach Drive would be eliminated north of picnic grove 10, except for the short road segment between West Beach Drive and Wise Road.

Northbound traffic would be permitted on the Rock Creek and Potomac Parkway during morning rush hour, where it is estimated to be substantial (level of service C) to heavy (level of service D). Under Alternative B, traffic on the Rock Creek and Potomac Parkway would be one-way southbound.

Fifteen road segments would have improved levels of service during the morning rush hour with Alternative C, compared to Alternative B. Three of these would have considerable improvements (two level of service steps), including Beach Drive from Porter Street to the Zoo, the Rock Creek and Potomac Parkway southbound from K Street/Whitehurst Parkway to Virginia Avenue, and West Beach Drive from Beach Drive to Portal. The other 12 road segments would have noticeable improvements (one level of service step) compared to Alternative B. All 15 segments would have level of service D (heavy traffic) or better, compared to Alternative B, where six of the segments would experience very heavy traffic (level of service E).

TABLE 25: OTHER ROAD SEGMENTS EXPERIENCING NOTICEABLE OR GREATER CHANGES IN TRAFFIC LEVELS BETWEEN ALTERNATIVE C AND ALTERNATIVE B

Road Segment	Peak-Hour Period	Alternative C LOS	Alternative B LOS	Change ^{a/}
Improved level of service				
Georgia Avenue - Arkansas to Upshur	A.M.	D	E	N
Georgia Avenue - Arkansas to Upshur	P.M.	D	E	N
Oregon Avenue – Chestnut to Nebraska	A.M.	C	D	N
West Beach Drive - Beach Drive to Portal	A.M.	C	E	C
West Beach Drive - Beach Drive to Portal	P.M.	E	F	N
Kennedy -14th to 13th	A.M.	B	C	N
Kennedy -14th to 13th	P.M.	B	C	N
Adams Mill Road - Park Street to Irving	A.M.	B	C	N
Cathedral Avenue – Calvert to Beach/24th	A.M.	D	E	N
Cathedral Avenue – Calvert to Beach/24th	P.M.	D	E	N
New Hampshire Avenue –21st to M Street	A.M.	B	C	N
Pennsylvania Avenue - M Street to L Street	A.M.	D	E	N
Pennsylvania Avenue - K Street to I Street	A.M.	D	E	N
Reduced level of service				
Georgia Avenue – Missouri to Kennedy	A.M.	E	D	N
Georgia Avenue – Missouri to Kennedy	P.M.	E	D	N
Oregon Avenue - Moreland to Military Road	P.M.	B	A	N
Wisconsin Avenue – Calvert to Reservoir	A.M.	E	D	N
Blagden Avenue - Upshur to Decatur	P.M.	C	B	N
Park Road - Beach Drive to Piney Branch Parkway	P.M.	E	D	N
Military Road – 16th to 14th	A.M.	E	D	N
Military Road - 16th to 14th	P.M.	E	D	N
New Hampshire Avenue –19th to 20th	A.M.	E	C	C
New Hampshire Avenue – 19th to 20th	P.M.	E	D	N
New Hampshire Avenue - Washington Circle to Virginia	A.M.	C	B	N
M Street - New Hampshire to 22nd	P.M.	D	C	N
New Hampshire Avenue – 21st to M Street	P.M.	E	C	C

a/ N = noticeable. C = considerable. M = major.

Five road segments would have worse levels of service during the morning rush hour with Alternative C, compared to Alternative B. One of these, New Hampshire Avenue from 19th Street to 20th Street, would have a considerable decline in service (two level of service steps). The other four road segments would have noticeable decreases in service (one level of service step) compared to Alternative B. Four of the five segments would have very heavy traffic (level of service E) with Alternative C, while all five segments would be level of service D or better under Alternative B.

Evening Rush-Hour Traffic. During the weekday evening rush hour, most road segments would have identical levels of service in the year 2020 under Alternative C and Alternative B. Table 24,

table 25, and the Alternative C Year 2020 P.M. Peak-Hour Volume Changes with Respect to Alternative B map show segments where the level of service between the two alternatives would vary by at least one step.

There would be two major changes in weekday evening rush-hour traffic patterns associated with Alternative C compared to Alternative B.

Traffic on Beach Drive would be eliminated north of picnic grove 10, except for the short road segment between West Beach Drive and Wise Road.

Southbound traffic would be permitted on the Rock Creek and Potomac Parkway during evening rush hour, where it is estimated to be substantial (level of service C) to very heavy level of service E). Under Alternative B, traffic on the Rock Creek and Potomac Parkway would be one-way northbound.

Eleven road segments would have improved levels of service during the evening rush hour with Alternative C, compared to Alternative B. One of these, the Rock Creek and Potomac Parkway northbound from K Street/Whitehurst Parkway to Virginia Avenue, would have a considerable improvement in service (two level of service steps). Four of the segments would have very heavy traffic (level of service E), compared to eight segments with very heavy or extremely heavy traffic (level of service F) under Alternative B.

Nine road segments would have worse levels of service during the morning rush hour with Alternative C, compared to Alternative B. One of these, New Hampshire Avenue from 21st Street to M Street, would have a considerable decline in service (two level of service steps). The other eight road segments would have noticeable decreases in service (one level of service step) compared to Alternative B. Five of the nine segments would have very heavy traffic (level of service E) with Alternative C, while all nine segments would be level of service D or better under Alternative B.

Neighborhood Traffic. Alternative C would likely increase the volume of traffic on weekdays that would turn off Beach Drive at the northernmost closure location and enter the surrounding neighborhoods to the north of the park. Because most commuters know their preferred routes and would be aware that Beach Drive was closed, traffic entering the neighborhoods would be uncommon during the rush hours. Most would probably occur during the day between the rush hours.

As shown in table 17, 1,500 vehicles currently travel on Beach Drive north of Rock Creek Park during the mid-day period and could potentially enter neighborhood streets north of the park. Most of these drivers would quickly learn alternate patterns to accommodate the Beach Drive closures and there would not be any long-term changes in the levels of service on these roads.

Nonmotorized Travel. Alternative C would improve conditions for cyclists and pedestrians in the park, particularly north of Broad Branch Road. Permanent closure of three segments of Beach Drive and improvements to existing recreation trails would provide an almost continuous automobile-free route the length of the park and parkway at all times.



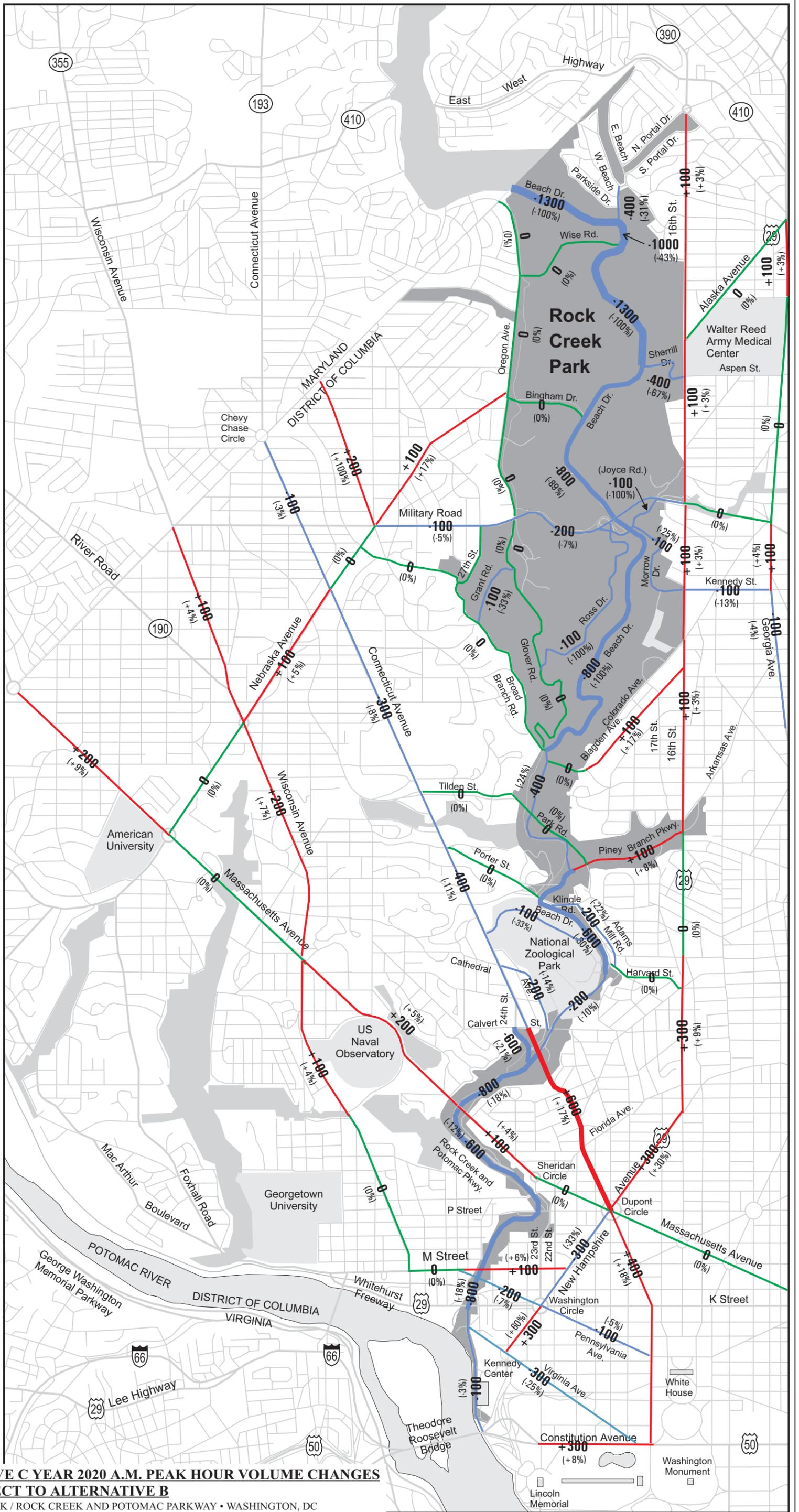
Map Scale: 1" = 0.5 Miles

Rock Creek Park



+900 = Volume Change With Respect to Alternative B in The Year 2020.

(+5%) = % Volume Change With Respect to Alternative B in The Year 2020.



ALTERNATIVE C YEAR 2020 A.M. PEAK HOUR VOLUME CHANGES WITH RESPECT TO ALTERNATIVE B

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 DCS • January 2002 • 821 / 20051



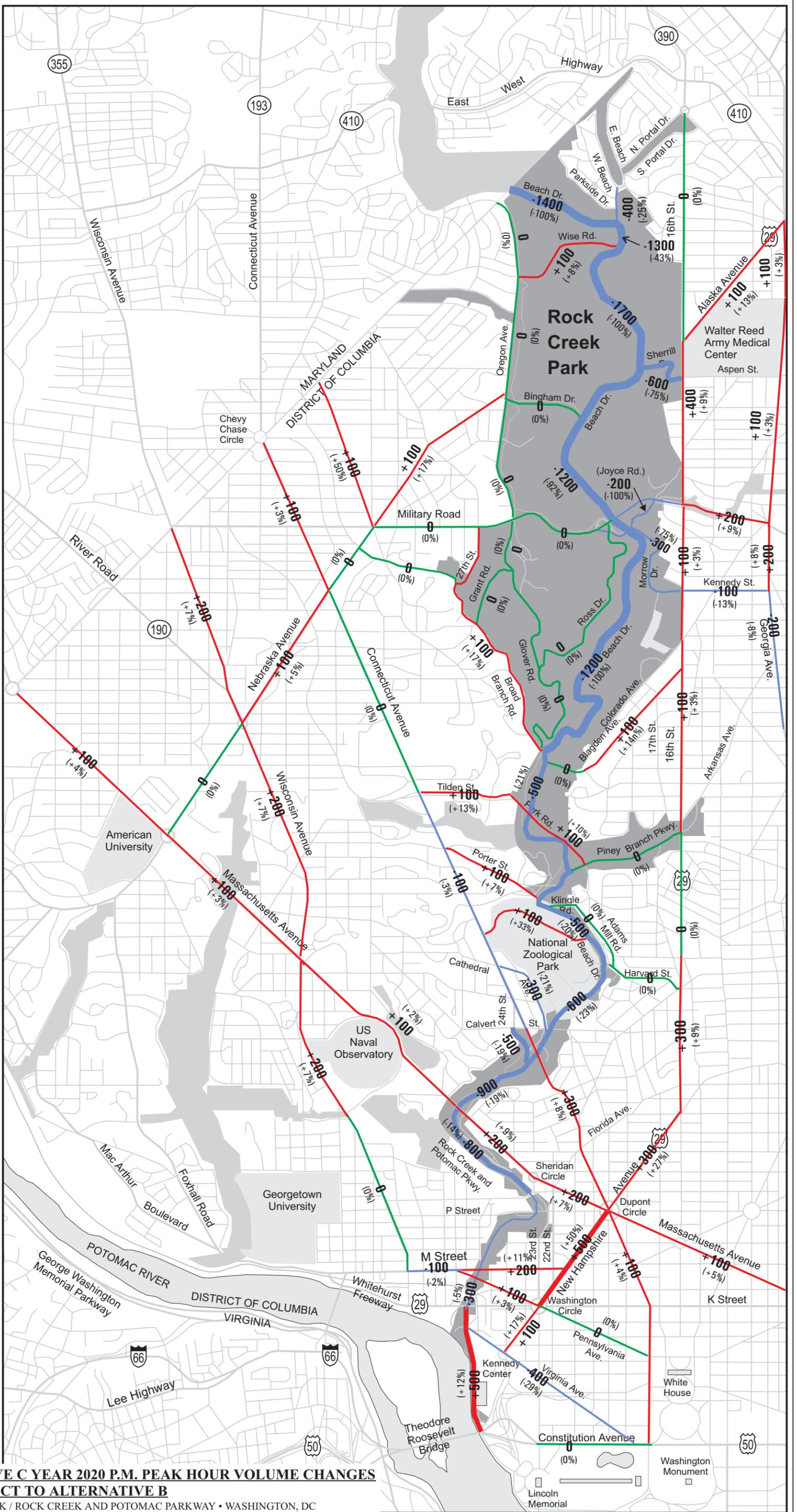
Map Scale: 1" = 0.5 Miles

Rock Creek Park



+900 = Volume Change With Respect to Alternative B in The Year 2020.

(+5%) = % Volume Change With Respect to Alternative B in The Year 2020.



ALTERNATIVE C YEAR 2020 P.M. PEAK HOUR VOLUME CHANGES WITH RESPECT TO ALTERNATIVE B

ROCK CREEK PARK / ROCK CREEK AND POTOMAC PARKWAY • WASHINGTON, DC
 United States Department of Interior • National Park Service
 DCS • January 2002 • 821 / 20052

Motor-vehicle-related safety problems on the closed sections of Beach Drive would be eliminated. The closed portions of Beach Drive would be available for recreational uses by park visitors, creating a corridor for such activities as bicycling, skating, walking, and jogging. The availability of this corridor would likely encourage some people to use bicycles and other nonmotorized modes for commuting and other travel, which would slightly reduce motor vehicle travel on other park roads and on other routes in the area.

Speed-related problems would be anticipated from some bicyclists and skaters. Some individuals or groups would use the corridor for high-speed travel that would endanger walkers, joggers, and other park users who travel at slower speeds. Cyclists who ran stop signs and refused to yield to pedestrians using crosswalks would also create safety hazards. These problems currently occur during the weekend road closures and probably would worsen during weekday closures when recreational use was lighter and a greater proportion of cyclists were using the corridor as a commuting route or, possibly, a training route or race track. Therefore, the two additional traffic enforcement positions that would be included in Alternative C would focus in part on controlling speeds of bicyclists in the park. As a result, the impacts would be negligible compared to Alternative B.

Cumulative Impacts

As described for Alternative A, regional growth in the counties around the District of Columbia, especially to the north in Montgomery County, Maryland, is the primary reason for the projected increases in traffic volumes around the park. No matter which action is taken in Rock Creek Park or on the parkway, traffic in the region is expected to increase by at least 70 percent above 1990 levels by the year 2020 (Metropolitan Washington Council of Governments 1998b). Growth-induced increases in traffic would have a detrimental impact on traffic on all of the roads in the area with or without Alternative C.

In addition to Beach Drive and the Rock Creek and Potomac Parkway, 70 road segments around the park were modeled (Robert Peccia & Associates 1997). Of these, compared to Alternative B

26 would have average daily traffic increases of between 3 percent and 10 percent

5 would have average daily traffic increases of greater than 10 percent

4 would have average daily traffic decreases of between 3 percent and 10 percent

10 would have average daily traffic decreases of greater than 10 percent

25 would be little affected by Alternative C, with an average daily traffic increase or decrease of 3 percent or less

Maryland Department of Transportation does not anticipate any impacts on state roads because of the implementation of Alternative C (Simpson 2003).

As described for Alternative A, there will be ongoing projects throughout the area that transportation departments will implement to improve travel conditions for citizens. After each project is completed, area-wide traffic patterns will adjust to take advantage of the changes.

The greatest effect of Alternative C on nonmotorized travel in the region would be associated with providing an almost automobile-free corridor for bicyclists and pedestrians from the Mary-

land state line to the core of the city. The corridor would improve the linkage of the Rock Creek Trail with the regional system. The Rock Creek corridor would become the route of choice for some bicyclists who, under Alternative B, would have used other routes on city streets because of convenience and safety considerations.

Bicycling as a means of personal transportation, as well as a form of recreation, would likely to grow in the region with or without Alternative C. However, the presence of the automobile-traffic-free corridor may encourage more individuals to try bicycle or other nonmotorized commuting or travel.

Conclusions

Alternative C would eliminate traffic on closed sections and would considerably curtail automobile traffic on open sections of Beach Drive north of Broad Branch Road. Traffic on Beach Drive south of Broad Branch Road would be noticeably to considerably reduced. Changes in traffic management on Beach Drive in combination with implementing two-way traffic on the Rock Creek and Potomac Parkway would have noticeable to considerable positive effects on most parkway levels of service. Changes in traffic volumes in the neighborhoods to the north of the park because of the closure of Beach Drive would not result in any long-term changes in levels of service. Conditions for nonmotorized travel through the park would be substantially enhanced.

Alternative C would cause mixed changes in traffic patterns on city streets. Some segments would improve noticeably while others would have noticeable declines in levels of service. Segments of three major arterials – Military Road, New Hampshire Avenue, and Wisconsin – would be negatively affected and major arterial, Pennsylvania Avenue, would be positively affected.

There would be a change in the use of Beach Drive from the historic use of scenic driving to other uses. Because the roadbed would not be greatly altered, the historic use could be returned at some future date if management goals changed.

IMPACTS ON COMMUNITY CHARACTER

Analysis

Traffic volume changes caused by Alternative C, and any associated changes in community character, would be minor compared to the substantially increased traffic volumes that are expected to result from continued regional population growth. For instance, Metropolitan Washington Council of Governments (1998b) forecasts as much as a 70 percent increase in traffic in the region because of population growth by 2020. Residents adjacent to the park would be affected by this regional change regardless of traffic management actions in the park.

The closure of portions of Beach Drive to automobiles and conversion of these road segments to a recreational trail in Alternative C would fill a void in the regional trail system. The trail improvements would make it easier for area residents to reach the valley, and would increase recreation opportunities such as walking, jogging, and biking through the valley. This would be a beneficial effect on all citizens who use the regional trails and paths that would be linked by the availability of a trail through the length of the Rock Creek valley.

The Alternative C Year 2020 A.M. and P.M. Peak-Hour Volume maps show the projected traffic changes for streets in the park vicinity. These projections were compared to projected traffic volumes that would occur without a change in traffic management (Alternative B).

Traffic modeling suggests that the closure of segments of Beach Drive and other traffic management restrictions in Alternative C would reinforce current commuter patterns. It is unlikely that traffic would be introduced onto streets where substantial commuter traffic does not currently exist.

Table 26 summarizes the roads outside the park and parkway where the community would experience a noticeable or greater traffic change in level of service between Alternative C and Alternative B. As shown in the table, eight road segments would experience noticeably improved community characteristics associated with lower traffic levels during one or both of the peak-hours on weekdays. These include one segment in each of the following zip code tabulation areas: 20012, 20011, 20015, 20008, and 20009; and two segments in 20037.

Nine road segments would experience a decline in traffic-related community quality characteristics because of higher traffic levels during one or both of the peak-hours on weekdays, compared to Alternative B. Three segments would be located in zip code tabulation area 20037, three in 20011, and one segment each in 20007, 20015, and 20036. The changes would be considerable on New Hampshire Avenue from 19th to 20th (zip code tabulation area 20036) during the morning peak-hour, and on New Hampshire Avenue from 21st Street to M Street (zip code tabulation area 20037) during the evening peak-hour. All other declines in community characteristics because of increased traffic would be noticeable.

An environmental justice evaluation was conducted to determine if inequitable distributions of adverse effects from declines in traffic levels of service would occur for ethnic or economically disadvantaged neighborhoods or groups. As shown in table 26, nine road segments would experience noticeable declines in community characteristics related to traffic, relative to Alternative B.

Three of the segments would be in zip code tabulation area 20011 which, among the nine zip code tabulation areas presented in table 18, could be considered ethnically or economically disadvantaged based on the following characteristics:

highest percentage of non-white population

second greatest median household size, second lowest median household income, lowest median gross rent, and lowest median value of owner-occupied units

second highest percentage of citizens not completing high school and lowest percentage of citizens with a college degree

The other six segments, including both segments that would have considerable declines in community characteristics related to traffic, would be located within zip code tabulation areas that would not be considered ethnically or economically disadvantaged. All have

predominantly white populations, ranging from 75 to 87 percent, compared to 31 percent for the District of Columbia

TABLE 26: ZIP CODE TABULATION AREAS EXPERIENCING NOTICEABLE OR GREATER CHANGES IN COMMUNITY CHARACTERISTICS ASSOCIATED WITH TRAFFIC BETWEEN ALTERNATIVE C AND ALTERNATIVE B

Zip Code Tabulation Area	Road Segment	Peak-Hour Period	Alt. C LOS	Alt. B LOS	Change
Improved level of service					
20009	Adams Mill Road – Park Street to Irving	A.M.	B	C	N ^{a/}
20037	New Hampshire Avenue – 21st to M	A.M.	B	C	N
20037	Pennsylvania Avenue – K to I	A.M.	C	D	N
20007	Pennsylvania Avenue – M to L	A.M.	D	E	N
20008	Cathedral Ave. – Calvert to Beach/24 th	A.M.	D	E	N
	Cathedral Ave. – Calvert to Beach/24 th	P.M.	D	E	N
20015	Oregon Avenue – Chestnut to Nebraska	A.M.	C	D	N
20011	Georgia Avenue – Arkansas to Upshur	A.M.	D	E	N
	Georgia Avenue – Arkansas to Upshur	P.M.	D	E	N
20012	Kennedy – 14th to 13 th	A.M.	B	C	N
	Kennedy – 14th to 13 th	P.M.	B	C	N
Reduced level of service					
20037	M Street – New Hampshire to 22 nd	P.M.	D	C	N
20036	New Hampshire Avenue – 19th to 20 th	A.M.	E	C	C
	New Hampshire Avenue – 19th to 20 th	P.M.	E	D	N
20037	New Hampshire Avenue – 21st to M	P.M.	E	C	C
20037	New Hampshire Avenue – Washington Circle to Virginia	A.M.	C	B	N
20007	Wisconsin Avenue – Calvert to Reservoir	A.M.	E	D	N
20015	Oregon Ave – Moreland to Military Road	P.M.	B	A	N
20011	Blagden Avenue – Upshur to Decatur	P.M.	C	B	N
20011	Georgia Avenue – Missouri to Kennedy	A.M.	E	D	N
	Georgia Avenue – Missouri to Kennedy	P.M.	E	D	N
20011	Military Road – 16th to 14 th	A.M.	E	D	N
	Military Road – 16th to 14 th	P.M.	E	D	N

a/ N = noticeable. C = considerable. M = major.

median household incomes greater than that of the District of Columbia

high education attainment levels, with college degrees ranging from 69 to 84 percent of households, compared to 39 percent for the District of Columbia

median values of owner-occupied units that are at least twice those of the District of Columbia median

The distribution of adversely affected road segments predominantly in advantaged zip code tabulation areas indicates an absence of ethnic or economic bias in the location of adverse effects.

Alternative C would have the same negligible economic effects on nearby neighborhoods and the city that were described for Alternative A.

The closure of segments of Beach Drive to automobile traffic would not adversely affect police or emergency operations in the vicinity of the park. These services would be managed throughout the week in a similar manner to that currently associated with the weekend closures of Beach Drive, Sherrill Drive, and Bingham Drive.

There would be no irretrievable or irreversible commitment of resources with this alternative. Management actions that altered community character in association with traffic could be reversed. There would be a change in the use of Beach Drive from the historic use of scenic driving to other uses. Because the roadbed would not be greatly altered, the historic use could be returned at some future date if management goals changed.

Cumulative Impacts

Most of the cumulative impacts of Alternative C would be the same as those described for Alternative A. Differences are described below.

Alternative C would contribute incremental increases in traffic volume on streets and highways that would receive traffic displaced from the park. However, this incremental increase would be masked by the cumulative effects of traffic volume increases of 70 percent that are expected throughout the Washington, D.C. metropolitan area (Metropolitan Washington Council of Governments 1998b).

The high-occupancy vehicle restrictions included in Alternative C would be consistent with the goals of the *Transportation Planning Board Vision Document* (Metropolitan Washington Council of Governments 1998b) and the District's strategic transportation plan (District of Columbia 1997b) that propose reducing congestion problems in the region by reducing dependency on single occupancy vehicles.

Expanded recreational opportunities would create benefits for area residents. The closure of sections of Beach Drive would complete an important link in the regional trail system and could substantially increase regional nonmotorized recreational opportunities throughout the week. Development of the trail would be consistent with goals and improvements advocated in the Transportation Planning Board's vision document (Metropolitan Washington Council of Governments 1997 and 1998a) and the District's strategic transportation plan (District of Columbia 1997b).

Conclusions

Alternative C would produce regional beneficial effects of moderate intensity for citizens who participate in nonmotorized recreation such as jogging, walking, and bicycling by filling a void in the regional trail system.

Alternative C would produce noticeable beneficial changes in the community character associated with traffic along eight road segments, and detrimental changes along nine road segments. Six of the segments that would experience detrimental effects, including both segments with considerable detrimental changes, would be in zip code tabulation areas that would be considered privileged when compared to social and economic characteristics for the population of the entire District of Columbia. As a result, Alternative C would not produce inequitable distributions of adverse effects from declines in traffic levels of service for ethnic or economically disadvantaged neighborhoods or groups.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

The Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Actions associated with Alternative C would be consistent with a long-term management strategy for ensuring natural, archeological, and historic resources and improving park visitor experiences.

The closure of portions of Beach Drive to automobiles, and the implementation of traffic-reducing and traffic-calming measures elsewhere in the park, would inconvenience some motorists who use park roads as a nonrecreational travel route. This inconvenience would be offset by an improved weekday visitor experience that is more compatible with the park's purpose and character.

Other relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity would be identical to those described in Alternative A.

Any Irreversible or Irretrievable Commitments of Resources that Would Be Involved Should the Alternative Be Implemented

The irreversible or irretrievable commitments of resources under Alternative C would be identical to those described for Alternative A.

Any Adverse Impacts that Cannot Be Avoided Should the Action Be Implemented

Permanent closure of sections of Beach Drive north of Broad Branch Road would eliminate the current visitor experience of automobile travel along the length of the park, including the gorge area. This would be a major, adverse impact on the existing visitor experience. However, the elimination of this activity would not result in impairment of any resources that would affect the basic purposes of Rock Creek Park and the Rock Creek and Potomac Parkway.

None of the other effects identified in this assessment of Alternative C would be considered major adverse effects. Alternative C would not result in impairment of any resources that would affect the basic purposes of Rock Creek Park and the Rock Creek and Potomac Parkway.

ENVIRONMENTAL IMPACTS OF ALTERNATIVE D: MID-WEEKDAY RECREATION ENHANCEMENT

IMPACTS ON AIR QUALITY

Analysis

Table 20 summarizes the effects of Alternative D on air quality in the year 2020. As with the other alternatives, the area of Rock Creek Park and the Rock Creek and Potomac Parkway would be affected more by emissions throughout the regional airshed than by tailpipe emissions from vehicles using the park and parkway.

Alternative D would close three segments of Beach Drive to traffic for 6 hours during the middle part of each workday. As a result, average daily traffic counts in 2020 and their associated emissions of carbon monoxide would be between the values calculated for Alternative B, which would continue current management of Beach Drive, and Alternative C, which would permanently close the Beach Drive segments.

As shown in table 20, Alternative D would have negligible to minor beneficial effects on air quality at the intersections of Beach Drive/Military Road and Beach Drive/Broad Branch Road/Blagden Avenue. Minor beneficial effects would be expected at the Beach Drive/Wise Road intersection. During the mid-day period, Alternative D would have negligible adverse effects on air quality at intersections outside the park.

Outside of the mid-day closure period, the air quality effects of Alternative D would be the same as Alternative B. At all times, the worst 1-hour carbon monoxide concentration that would be associated with Alternative D (12.6 parts per million at the intersection of Beach Drive, Broad Branch Road, and Bladgen Avenue) would be well below the 1-hour National Ambient Air Quality Standard of 35 parts per million that is protective of human health and the environment.

Alternative D would include some construction in the park that would not occur with Alternative B. This would include preserving historic structures, expanding the Rock Creek Nature Center and Planetarium, and possibly constructing new buildings at the maintenance yard or the H-3 area. Best management practices and prompt revegetation would be applied in association with all construction to ensure that dust and construction-vehicle emissions associated with these activities would not be substantially greater than those that would occur with Alternative B.

Cumulative Impacts

No changes would occur in air emissions from vehicles in the region because of Alternative D's management actions at Rock Creek Park and the Rock Creek and Potomac Parkway. Instead, Alternative D would redistribute the same mid-day traffic volume onto different roadways, compared to Alternative B. This redirection of the same volume of traffic would have negligible effects on the regional air quality.

Provisions of Alternative D to reduce traffic speeds in the park and on the parkway, and to provide an automobile-free corridor during the mid-weekday period may encourage some travelers to use

bicycles rather than automobiles. This change in transportation mode would result in a beneficial but negligible effect on the regional air quality.

Conclusions

Alternative D would result in negligible effects on air quality at intersections outside the park compared to Alternative B. At intersections within the park under reasonable worst-case conditions, it would have a negligible to minor beneficial effect on air quality, as represented by carbon monoxide concentrations. It would not result in the exceedence of the 1-hour National Ambient Air Quality Standard for carbon monoxide. In addition, it would not cause any impairment of resources or values associated with air quality.

IMPACTS ON ROCK CREEK AND ITS TRIBUTARIES

Alternative D would decrease average daily traffic counts on Beach Drive, which would reduce pollutant loadings (sediments, oils and grease, and metals from the road surface) draining into Rock Creek from this park road. However, all of the alternate routes, both in and outside the park, are within the Rock Creek drainage. Therefore, changes in traffic patterns related to Alternative D would redistribute rather than reduce pollutant loadings in the Rock Creek watershed. The effect on water quality in the Rock Creek drainage would be negligible.

Aside from roadway runoff, Alternative D would have the same effects as Alternative A on Rock Creek and its tributaries. This would include identical cumulative impacts and conclusions.

IMPACTS ON WETLANDS AND FLOODPLAINS

Alternative D would have the same effects as Alternative A on wetlands and floodplains. This would include identical cumulative impacts and conclusions.

IMPACTS ON DECIDUOUS FORESTS

Alternative D would have the same effects as Alternative A on deciduous forests. This would include identical cumulative impacts and conclusions.

IMPACTS ON PROTECTED AND RARE SPECIES

Alternative D would have the same effects as Alternative A on protected and rare species and their associated habitats. This would include identical cumulative impacts and conclusions.

IMPACTS ON OTHER NATIVE WILDLIFE

Except as noted below, Alternative D would have the same effects as Alternative A on native wildlife. This would include identical cumulative impacts and conclusions. There would be no impairment of resources or values associated with native wildlife.

Mid-day closures of segments of Beach Drive during workdays, and other actions to reduce traffic speeds on park roads and the parkway, could reduce the number of wildlife killed or injured by motor vehicles. The greatest reduction would occur among groups that are active during the day, including reptiles such as box turtles and black rat snakes. Compared to Alternative B, this would produce long-term, beneficial effects on the park's native wildlife.

For all park species, the reductions in mortality from closing segments of Beach Drive would be negligible. As shown in table 9, only two box turtles and four black rat snakes were recorded as roadkill along the entire length of Beach Drive in the 10-year period from 1991 through 2000. Neither of these species was recorded as killed on the Rock Creek and Potomac Parkway during this period.

Measures to reduce traffic speeds could reduce roadkill throughout the park compared to Alternative B, but would have little effect on the populations of most park species because their populations are stable or expanding. As with Alternative A, the effects on box turtles would be moderate, long-term, and beneficial. Effects on gray foxes would be major, long-term, and beneficial.

IMPACTS ON ARCHEOLOGICAL RESOURCES

Alternative D would have the same effects as Alternative A on archeological resources. This would include identical cumulative impacts and conclusions.

IMPACTS ON HISTORIC STRUCTURES AND CULTURAL LANDSCAPES

Alternative D would have the same effects as Alternative A on historic structures and cultural landscapes. This would include identical cumulative impacts and conclusions.

IMPACTS ON TRADITIONAL PARK CHARACTER AND VISITOR EXPERIENCE

Analysis of Effects on Continuation and Quality of Traditional Park Uses

The traditional character of the park would not change under Alternative D. Recognition of cultural landscape values and management for those values would help maintain the traditional appearance of the park. As under Alternative A, the appearance of park historic structures, grounds, and roadways would be preserved or enhanced, maintaining the traditional ambiance of the park setting. Development of design standards for park facilities and signs would also enhance the traditional ambiance.

As described under "Impacts on Regional and Local Transportation," Alternative D would not have noticeable effects on rush-hour traffic volumes compared to Alternative B. However, new

traffic-control structures and traffic-calming measures would reduce the speed of traffic in the park and on the parkway.

The experience of automobile travel throughout the length of the park on workdays would be maintained under Alternative D during the evening, throughout the night, and during both rush-hour periods. This would allow continued use of the park by commuters who chose to drive park roads because they enjoyed the slower pace and scenery. The inability to access the three closed Beach Drive segments during the mid-day periods would be a minor adverse effect.

Automobile travel on northern segments of Beach Drive would cease during the mid-day closure period. Between 9:30 A.M. and 3:30 P.M. on workdays, the driving experience in the Rock Creek valley north of Broad Branch Road would be replaced by enhanced opportunities for nonmotorized use. It is expected that substantially increased use for multiple forms of nonmotorized recreation probably would occur during the mid-day period from groups that formerly avoided the park because of fast-moving traffic on Beach Drive. These could include individuals who do not work a traditional Monday through Friday workday schedule, caregivers with small children, retired people, and school groups. A long-term, beneficial effect of moderate intensity would result from the improved ability for park visitors to participate in nonmotorized recreation along Beach Drive during the mid-day period.

During the closure period, traffic noise would be eliminated along most of northern Beach Drive, except for cross-park traffic noise. Natural sounds and the sounds of people recreating would be dominant, similar to the condition that currently occurs on weekends. The beneficial effect of reduced noise in these areas would be minor to moderate. When Beach Drive was open to traffic, noise levels would follow the existing pattern, where noise levels within 60 feet of Beach Drive and within 125 feet of the parkway exceed the Federal Highway Administration's noise abatement criteria during high-traffic periods.

Visitors would continue to have access to all of the traditional activities in the park that were described in the "Affected Environment" section. Even with the mid-day closure of segments of Beach Drive, visitor-use facilities such as picnic grounds and trailheads would continue to be accessible via motorized vehicle. However, visitors would have to drive around the closed sections via city streets to access other portions of the park. This could be confusing, particularly to out-of-town visitors.

Weekday visitation to the northern portion of the park would be substantially reduced. As described under "Impacts on Regional and Local Transportation," up to 1,400 vehicles per hour that would use Beach Drive under Alternative B would have to use an alternate route under Alternative D. South of Broad Branch Road and on the Rock Creek and Potomac Parkway, use would decrease by about 10 percent during the mid-day closure period. Most of the traffic reductions in the park under Alternative D would be in nonrecreational visits.

Opening and closing Beach Drive each day would pose a labor and logistical challenge that would not occur with any of the other alternatives. The closing and opening of barriers would have to occur nearly simultaneously at six points to accommodate traffic entering both from the north and south ends of Beach Drive and from east-west roads that cross the park. However, this function could be performed by park staff rather than the U.S. Park Police and would represent a negligible to minor adverse effect on operations compared to Alternative B.

The installation of automated barriers would reduce staff labor commitments. However, enforcement activities such as patrolling “no waiting” zones would continue to make demands on officers that would not occur with any of the other alternatives.

Weekend road closures would continue current opportunities for nonmotorized recreation in the valley. Alternative D would have similar use levels as Alternative B, because weekend traffic management would be similar for both alternatives.

Alternative D components that would be similar to Alternative A would include upgraded recreation trails, rehabilitation of the cultural landscape at the Peirce Mill complex, improvements to the Rock Creek Nature Center and Planetarium, and improved working conditions for park and U.S. Park Police staff. All of these would have moderate, long-term, beneficial effects on park character and visitor experience, although the perceived benefit by the public to improved administrative staff conditions probably would only be minor.

Analysis of Effects on Visitor Recreational Opportunities

Table 21 summarizes the relative advantages of Alternative D relative to Alternative B for recreational opportunity quality, quantity, spectrum, and interpretation and education. As shown in the table, Alternative D would have a moderate, beneficial effect on recreational opportunities relative to Alternative B. It would be more advantageous than the alternative to continue current management for three attributes and less advantageous for one attribute.

Alternative D would be considerably more advantageous than Alternative B with regard to the quality of the experience. The closure of three segments of Beach Drive during the middle of the day when many people recreate would provide an unhurried experience with the ability to enjoy natural sounds and smells and to view park resources in a manner consistent with to the intent of its establishing legislation.

Alternative D would be somewhat less advantageous than Alternative B with regard to the number of visitors who used the park. For 18 hours each workday, the number of park users would be the same as Alternative B. During the mid-day closures, visitors who would drive through the park under Alternative B would be displaced to other roads. Some increased use probably would occur during the mid-day period from groups that avoided the park because of fast-moving traffic on Beach Drive. These could include individuals who do not work a traditional Monday through Friday workday schedule, caregivers with small children, retired people, and school groups. However, based on numbers, there probably would be a decrease in total park visitation.

Alternative D would be the most advantageous of all alternatives in providing a broad spectrum of use of Beach Drive. The existing activity of traveling the length of Beach Drive by automobile would be available for 18 hours on each workday. During the 6-hour mid-day period, visitors could enjoy a complete range of nonmotorized recreation opportunities on the broad, level, smooth surface of Beach Drive without interference from automobiles.

Interpretation and education opportunities would experience substantial advantages under Alternative D. Increased opportunities to learn about and experience the park’s

natural and cultural resources would result from upgraded interpretation and education facilities in the park. Six additional staff positions for interpretation and education would substantially improve opportunities for visitor contact, programming, and outreach.

Analysis of Effects on Access for Visitors with Impaired Mobility

For site improvements associated with trails, buildings, and historic scenes, the same long-term, moderate, beneficial effects for individuals with impaired mobility that were described for Alternative A would occur.

The effects of mid-day closures of three segments of Beach Drive on access for visitors with impaired mobility would vary, based on the individual's perception. Comments on the draft general management plan identified two very different viewpoints.

Many people stated that an adverse effect would occur on people with impaired mobility because they would no longer be able to drive through and enjoy the closed segments of Beach Drive, particularly the gorge area between Joyce Road and Broad Branch Road, during the mid-day period.

Many others perceived a beneficial effects on people with impaired mobility because they would be able to enjoy the use of the broad, level, smooth surface of Beach Drive during mid-day periods of the work week. They noted that their experience would be enhanced not only by the absence of cars but also by the lower numbers of other visitors, such as inattentive children who can pose a risk to people with impaired mobility. They also noted that once they reached areas such as the gorge, they could stop and enjoy the experience, which they could not do from a car.

The intensity of the Alternative D impact on individuals with impaired mobility would be moderate. Whether this long-term impact was beneficial or adverse would depend on each individual's viewpoint.

Cumulative Impacts

The Maryland Office of Planning (1993) predicted that demand for bicycling, hiking, and picnicking facilities in the state would increase by 6 to 14 percent between the years 2000 and 2010. Rock Creek Park and the parkway would continue to contribute to the regional mix of recreational opportunities and would be compatible with regional recreational plans. During the middle part of weekdays, on weekends, and on holidays, Alternative D would provide a bicycling route through Rock Creek Park that would be relatively free from interference by automobiles and would provide an effective connection with regional pedestrian and bicycle trails.

Cumulative effects of Alternative D on access for individuals with impaired mobility would be much the same as described for Alternative A. However, depending on their viewpoint, individuals may see mid-day closures of Beach Drive as an additional restriction on their ability to access important natural and cultural resources in the area or an opportunity that increases their ability to enjoy high-value resources.

Conclusions

The traditional character of the park would be maintained under Alternative D.

A long-term, beneficial effect of moderate intensity would result from the improved ability for park visitors to participate in nonmotorized recreation along Beach Drive during the mid-day period on weekdays. A minor, adverse effect on the existing visitor experience of automobile travel along the length of the park would result from restrictions on driving the length of Beach Drive during the mid-day period.

Many other effects of Alternative D would be like those described for Alternative A. These would include moderate, beneficial, long-term effects associated with upgraded trails throughout the park; improvements to visitor contact, interpretation, and education facilities and services; and improved access for visitors with impaired mobility at buildings, historic scenes, and trails. Improved working conditions for park administrative staff and personnel in the U.S. Park Police District 3 substation would result in a moderate beneficial effect on park operations, but the intensity of the beneficial impact perceived by the public probably would be minor. Compared to Alternative B, this alternative would have a moderate beneficial effect on the park's recreational opportunities.

For the mid-day closure segments of Beach Drive, Alternative D would have a long-term, moderate effect on access for individuals with impaired mobility. Each person's viewpoint would determine whether this effect was adverse or beneficial.

IMPACTS ON PUBLIC HEALTH AND SAFETY

Analysis of Effects on Safety along Roadways

Traffic management measures associated with Alternative D that could affect public health and safety would include

- enhanced enforcement

- use of traffic-calming measures, such as speed humps and speed tables, all-way stops, rumble strips, or raised intersections

- reconfiguration of the intersection of the parkway with Beach Drive near Connecticut Avenue to improve safety

- closure of segments of Beach Drive to motorized vehicles during mid-weekday periods

Mid-Weekday Beach Drive Closures. Mid-day closures of segments of Beach Drive would have negligible to minor effects on traffic safety. These stretches of Beach Drive were the sites of just 16 accidents between 2001 and 2003 (NPS, Pettiford 2004c), and accidents consistently occurred at a rate of five (2002 and 2003) or six (2001) per year. The same data indicate that fewer than 45 percent of all accidents on Beach Drive occur during the Alternative D closure period. The prevention of 2 or 3 accidents annually along these segments would not change any of the accident ratios occurring in the park and parkway, and may not be measurable, based on year-to-year fluctuation in the number of accidents.

Mid-workday closures of portions of Beach Drive may move accidents to other nearby areas. However, because of the low levels of traffic on roads around the park during this period, the change in number of accidents outside of the park probably would be negligible.

Enhanced Enforcement. The effectiveness of the improved speed enforcement measures was described for Alternative A. The enhanced enforcement elements of Alternative D would have a minor to moderate beneficial effect on visitor safety. However, if traffic enforcement levels were reduced because of budget cuts or the need to assign U.S. Park Police staff to other duties, the beneficial effects would not be expected to continue for very long.

Traffic Calming Measures. The use of traffic-calming techniques to reduce speeds and enhance safety was described in the analysis of Alternative A. As with that alternative, the use of traffic-calming measures in Alternative D would have a major beneficial effect on visitor safety in the park and parkway compared to Alternative B. As long as the traffic-calming devices were maintained, these would be long-term effects.

Effects on Vehicle Occupants. As described for Alternative A, speed is the major contributing factor to the probability of injury or death in vehicle-only traffic accidents. By reducing speeds on park roads and the parkway, the traffic management measures of Alternative D would have a long-term, major, beneficial effect in reducing the number and severity of motor-vehicle-only accidents.

Effects on Pedestrians and Cyclists. Speed is also the primary factor affecting the outcome of collisions between motorized vehicles and pedestrians or cyclists. By slowing traffic speeds, the traffic management measures of Alternative D would have a long-term, beneficial effect in reducing the number and severity of collisions between automobiles and pedestrians or bicyclists in the park and along the parkway.

During the mid-workday closures, pedestrians and cyclists would have a continuous trail throughout the park and parkway that would be separated from motor vehicles. This would probably reduce the number of accidents involving automobiles and pedestrians or cyclists compared to Alternative B. However, because of the low number of this type of accident (average of two per year for the 2001-2003 period), some year-to-year fluctuation in the number of collisions between cars and pedestrians or cyclists would be expected.

Alternative D would have unique safety concerns for visitors who may not be familiar with the concept of reopening Beach Drive each weekday mid-afternoon or may have lost track of time. Rush-hour traffic along narrow stretches that do not have a recreation trail and little or no shoulder may hinder the ability of these visitors to exit the park. This may be of particular concern for visitors with limited mobility and those accompanied by small children. Possible mitigation could include having park staff travel each segment before it reopened and warn recreationists using Beach Drive that the primary road use was about to change. This approach would require a commitment of time and would limit the availability of park staff for other activities. However, with the implementation of this type of mitigation, the effects on public health and safety would be negligible.

Some accidents involving cyclists, skaters, and/or pedestrians would occur in the segments of Beach Drive that would be closed to vehicular traffic during the mid-day period. Factors that could influence the number and severity of nonmotorized vehicle accidents were described in the

Alternative C analysis. For Alternative D, these factors would have a negligible to minor effect on the total number and ratio of accidents in the park and on the parkway.

Analysis of Effects on Personal Safety

As described for Alternative C, the additional closures of Beach Drive segments under would have a negligible effect on the numbers of crimes against persons that would occur within Rock Creek Park.

Analysis of Effects on Emergency Evacuations

For Alternative D, gates would close portions of Beach Drive to automobile traffic during work-day mid-day periods. These road segments already are gated on weekends. If an evacuation occurred during these periods, drivers could choose to drive around the gates. However, Beach Drive is not a designated evacuation route. As a result, the effects of Alternative D on emergency evacuations would be negligible compared to Alternative B.

Cumulative Impacts

Cumulative effects of Alternative D would be identical to those described for Alternative A.

Conclusions

Under Alternative D, there would be major improvements in visitors' safety compared to Alternative B, primarily because of the effectiveness of this alternative's traffic-calming measures. Mid-workday closures of portions of Beach Drive would have a negligible to minor effect on safety. Alternative D would have negligible effects on crimes against persons or the effectiveness of emergency evacuations.

IMPACTS ON REGIONAL AND LOCAL TRANSPORTATION

Analysis

Morning and Evening Rush-Hour Traffic. Alternative D was developed in response to a letter from the Mayor of the District of Columbia. The mayor asked the National Park Service to consider "weekday vehicular traffic restrictions on sections of upper Beach Drive in non-rush-hour periods." As a result, Alternative D was designed so that all of its management actions that would change traffic volumes or patterns would be applied only during periods outside of rush hours.

Alternative D would incorporate the same types of traffic-calming measures as Alternative A. As described in the transportation analysis for Alternative A, these measures would reduce vehicle speeds through the park but would cause relatively few vehicles to re-route.

Because of these conditions, Alternative D would have negligible traffic differences from Alternative B during weekday peak-travel periods. Alternative D would have same levels of service summarized for Alternative B in table G.2 in appendix G. The entire length of Beach Drive and all of the east-west connecting routes through the park would continue to be available to the driving public during the typical weekday commuting times.

Weekday Non-Rush-Hour Traffic. East-west flow of traffic through the park would not be affected by the mid-day road closures proposed in Alternative D. The traffic impacts primarily would be associated with the north-south traffic flow that, under Alternative B, would use Beach Drive and the parkway during the non-peak hours of weekdays.

Changes in the year 2020 are quantified in table 27 for the weekday, off-peak, maximum-hour, traffic volume. The values in the table were estimated using the projected 2020 average weekday traffic volume for each road segment for Alternative B and factoring it to represent the maximum off-peak hour. According to traffic count data, the maximum off-peak hour of the day occurs between 10:00 A.M. and 11:00 A.M. and accounts for approximately 8.3 percent of the weekday total traffic volume.

TABLE 27: MAXIMUM HOURLY VOLUME OF TRAFFIC THAT WOULD BE DIVERTED BY ALTERNATIVE D ROAD CLOSURES BY ROAD SEGMENT IN THE YEAR 2020

Road Segment	Alternative B Maximum Hourly Volume between 9:30 A.M. and 3:30 P.M.	Maximum Estimated Hourly Traffic that Would Use Another Route under Alternative D
Beach Drive – Maryland Line to West Beach Drive	1,150 vehicles	1,150 vehicles
Beach Drive – Wise Road to Joyce Road	1,400 vehicles	1,400 vehicles
Beach Drive – Joyce Rd. to Broad Branch Rd.	970 vehicles	970 vehicles
Beach Drive – Broad Branch Rd. to Parkway	3,000 vehicles	750 vehicles
Parkway – Beach Drive to P Street	6,500 vehicles	650 vehicles
Parkway – P Street to Constitution Avenue	6,250 vehicles	625 vehicles

On non-holiday weekdays between 9:30 A.M. and 3:30 P.M., Alternative D would eliminate all motorized traffic on the closed sections of Beach Drive in the northern part of the park. This traffic would reroute itself to other north-south corridors.

About 25 percent of the traffic that would use Beach Drive between Broad Branch Road and the north end of the parkway under Alternative B would choose another route during the closure period of Alternative D.

Closure of the north end of Beach Drive would cause as much as 10 percent of the Alternative B traffic on the Rock Creek and Potomac Parkway to choose another route.

Table 28 shows the likely selection of alternate routes by diverted traffic. The most likely corridors would include 16th Street NW, Georgia Avenue, Connecticut Avenue, Wisconsin Avenue, Broad Branch Road, and Oregon Avenue.

TABLE 28: TRAFFIC IMPACT SUMMARY FOR ALTERNATIVE D IN THE YEAR 2020

Alternate Route	Maximum Non-Peak Hourly Traffic Increase	Estimated Traffic Impact^{a/}
Connecticut Avenue north of Tilden	500 vehicles	Would result in a perceptible increase in traffic. Would increase traffic congestion at several intersections. Would not cause any intersections to fail.
Wisconsin Avenue north of Massachusetts Ave.	140 vehicles	No noticeable impact.
16th Street NW north of Blagden	560 vehicles	Would result in a perceptible increase in traffic. Would not cause any intersections to fail.
Georgia Avenue	140 vehicles	No noticeable impact.
Broad Branch Road	500 vehicles	Would result in a minor increase in traffic. Would not cause any intersections to fail. Would increase traffic related noise.
Oregon Avenue	140 vehicles	Would result in a perceptible increase in traffic.
Blagden Avenue	500 vehicles	Would result in a minor increase in traffic. Would not cause any intersections to fail. Would increase traffic related noise.
Porter Street	250 vehicles	Would result in a perceptible increase in traffic.
Piney Branch	250 vehicles	Would result in a perceptible increase in traffic.

a/ Traffic impacts were determined in comparison to the average daily traffic volumes estimated to occur in the year 2020 under Alternative B. A change with no noticeable impact would increase maximum non-peak hourly traffic by less than 0.5 percent relative to the Alternative B average daily traffic volume. A perceptible increase would result in an increase of 0.5 to 2.0 percent. A minor increase would increase the maximum non-peak hourly traffic by 2.0 to 10.0 percent. A substantial increase would be more than 10 percent.

On all of these routes, mid-day closure of Beach Drive would increase traffic volumes by fewer than 10 vehicles per minute. On the roadways where traffic increased by two or three vehicles per minute, this change probably would not be noticeable. Little effect also would occur on high-capacity streets such as Connecticut Avenue, which routinely handles more than 50 vehicles per minute during rush hours. The most obvious changes would occur on Broad Branch Road and Blagden Avenue, where the mid-day traffic volumes would more than double. However, on both of these streets, this doubling would represent only about eight vehicles per minute (four in each direction).

During weekday non-peak hours, the roads shown in table 28 and most other north-south corridors in the vicinity of the park and parkway would be operating well below their capacities. Therefore, none of the routes onto which traffic would divert would experience a change in the level of service compared to Alternative B, as defined in the "Methodology" section for "Impacts on Regional and Local Transportation."

Increased traffic outside of the park would increase noise and decrease the safety of pedestrians and cyclists using the alternate routes. However, traffic volumes would be lower than the volumes typically handled by these roads during rush-hour periods. The estimated traffic increase would not cause any of the intersections on these routes to fail.

Some localized, minor traffic effects could occur shortly before 3:30 P.M. if drivers blocked a traffic lane or pulled their vehicles to the side of the road and waited at the closure points for Beach Drive to open. This could be mitigated by creating and enforcing “no waiting” zones in areas where this activity would create a safety hazard.

Alternative D would include traffic-calming measures such as speed humps and speed tables, raised intersections, and four-way stop control at selected intersections. Some of these traffic-calming measures may create minor traffic congestion within its local vicinity. These measures would help reduce speeding along Beach Drive. They also would help to regulate the bicycle speeds during times when the road was closed to motorized vehicle traffic. As described in Alternative C, the two additional traffic enforcement positions that would be included in this alternative also would help control speeds of motorists and bicyclists throughout the park and on the parkway.

Neighborhood Traffic. In the short-term, Alternative D would likely increase the volume of mid-day traffic on weekdays that would turn off Beach Drive at the northernmost closure location and enter the surrounding neighborhoods to the north of the park. However, most drivers would quickly learn alternate patterns to accommodate the mid-day Beach Drive closures and there would not be any long-term changes in the levels of service on these roads.

Nonmotorized Travel. During mid-weekday closures, motor-vehicle-related safety problems on the closed sections of Beach Drive would be eliminated. The closed portions of Beach Drive would be available for recreational uses by park visitors, creating a corridor for such activities as bicycling, skating, walking, and jogging. The availability of this corridor would likely encourage some people to use bicycles and other nonmotorized modes for commuting and other purposes, which would slightly reduce motor vehicle travel on other park roads and on other routes in the area.

Speed-related problems would be anticipated from some bicyclists and skaters. Some individuals or groups would use the corridor for high-speed travel that would endanger walkers, joggers, and other park users who travel at slower speeds. Cyclists who ran stop signs and refused to yield to pedestrians using crosswalks would also create safety hazards. These problems currently occur during the weekend road closures and probably would worsen during weekday closures when recreational use was lighter and a greater proportion of cyclists were using the corridor as a commuting route or, possibly, a training route or race track. As described previously, this alternative’s two additional traffic enforcement positions would help control speeds of bicyclists in the park so that impacts would be negligible compared to Alternative B.

Cumulative Impacts

As described for Alternative A, regional growth in the counties around the District of Columbia, especially to the north in Montgomery County, Maryland, is the primary reason for the projected increases in traffic volumes around the park. No matter which action is taken in Rock Creek Park or on the parkway, traffic in the region is expected to increase by at least 70 percent above 1990 levels by the year 2020 (Metropolitan Washington Council of Governments 1998b). Growth-induced increases in traffic would have a detrimental impact on traffic on all of the roads in the area with or without Alternative D.

Maryland Department of Transportation does not anticipate any impacts to state roads because of the implementation of Alternative D (Simpson 2003).

During the middle portion of each weekday, Alternative D would provide an almost automobile-free corridor for bicyclist and pedestrians from the Maryland state line to the core of the city. However, because it would not be automobile-free during rush hours, it would do little to encourage people who worked during traditional office hours to commute by nonmotorized modes such as bicycles.

As described for Alternative A, there will be ongoing projects throughout the area that transportation departments will implement to improve travel conditions for citizens. After each project is completed, area-wide traffic patterns will adjust to take advantage of the changes.

Conclusions

Alternative D would have little effect on rush-hour traffic volumes or patterns compared to Alternative B. However, on non-holiday weekdays between 9:30 A.M. and 3:30 P.M., Alternative D would eliminate all motorized traffic on the closed sections of Beach Drive in the northern part of the park, and would reduce traffic on other park roads. This would provide an almost automobile-free corridor for bicyclist and pedestrians from the Maryland state line to the core of the city. During this non-peak period, traffic diverted from the park would be noticeable on some of the alternate routes motorists would choose, but would not adversely affect the level of service on any roads. There also would not be any changes in levels of service on roads in the neighborhoods to the north of the park.

IMPACTS ON COMMUNITY CHARACTER

Analysis

As described in the “Methodology” section under Alternative A, changes in community character were assumed to be related to changes in traffic management during peak-travel periods (rush-hours). Alternative D was designed so that all of its management actions that would change traffic volumes or patterns would be applied only during periods outside rush hours. Therefore, the impacts of Alternative D on community character would be identical to those described for Alternative B.

Cumulative Impacts

The cumulative impacts of Alternative D on community character would be identical to those described for Alternative A.

Conclusions

The impacts of Alternative D on community character would be identical to those described for Alternative A.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

The Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Actions associated with Alternative D would be consistent with a long-term management strategy for ensuring natural, archeological, and historic resources and improving park visitor experiences.

The closure of portions of Beach Drive to automobiles during the middle portion of weekdays, and the implementation of traffic-calming measures elsewhere in the park, would inconvenience some motorists who use park roads during this period. This inconvenience would be offset by an improved weekday visitor experience that was more compatible with the character of the park.

Other relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity would be identical to those described in Alternative A.

Any Irreversible or Irrecoverable Commitments of Resources that Would Be Involved Should the Alternative Be Implemented

The irreversible or irretrievable commitments of resources under Alternative D would be identical to those described for Alternative A.

Any Adverse Impacts that Cannot Be Avoided Should the Action Be Implemented

None of the effects identified in this assessment of Alternative D would be considered major adverse effects. Alternative D would not result in impairment of any resources that would affect the basic purposes of Rock Creek Park and the Rock Creek and Potomac Parkway.

