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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 only recently attained compliance with the National Ambient Air Quality Standard (NAAQS) for carbon monoxide 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 because of improved controls on tailpipe emissions. It is believed that improvements will continue into the future. However, there is no basis for quantifying these improvements. Therefore, this evaluation assumed a worst-case condition where emissions per vehicle in the year 2020 will be identical to those that occurred during the December 1996 air quality monitoring described in Robert Peccia & Associates *et al.* (1997). Another assumption made for the analysis was that the highest monitored carbon monoxide concentration detected during the December 1996 study is representative of a “worst case meteorological condition” in the park and parkway area.

During the December 1996 sampling, the highest concentrations of carbon monoxide were recorded at 16th Street and Colorado Avenue near Military Road. At this location, 2,500 vehicles passing this point during the peak-hour (estimated from the Year 1990 Average Weekday Traffic

Volumes map) resulted in a carbon monoxide concentration of 3.38 parts per million (ppm). From these values, it was calculated that the emission contribution from each vehicle was about 0.00135 ppm or 1.35 parts per billion (ppb). This value was then multiplied by the anticipated peak-hour traffic count in the year 2020 at various intersections to estimate carbon monoxide concentrations at each location.

Each car both enters and exits an intersection. To avoid double-counting of cars, all of the peak-hour traffic counts around an intersection were summed, and the total was divided by two. For example, using values from the Alternative A Year 2020 Average Weekday Traffic Volumes map at the intersection of 16th Street and Military Drive, the morning peak-hour counts (which at this site would be equal to or slightly higher than the evening peak-hour counts) were summed (total equals 13,200) and divided by two to determine that 6,600 vehicles pass through the intersection during the highest-use hour of the day. The exception is at the intersection involving the one-way Rock Creek and Potomac Parkway, where traffic only enters the intersection from one direction and therefore was not being double-counted.

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 to 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).

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. The analysis focused on changes that would occur at individual intersections.

The geographic area that was included in the air quality analysis is the area shown on the Year 1990 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.

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.

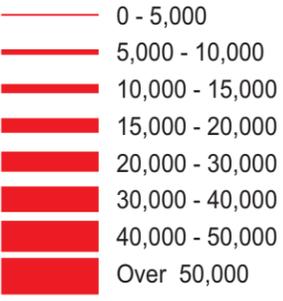
Wisconsin Avenue north of Nebraska Avenue, Connecticut Avenue north of Nebraska Avenue, and the 16th Street/Military Road intersection, since these are the locations that would receive the greatest increases in traffic if traffic management procedures were implemented in the park and along the parkway.

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).

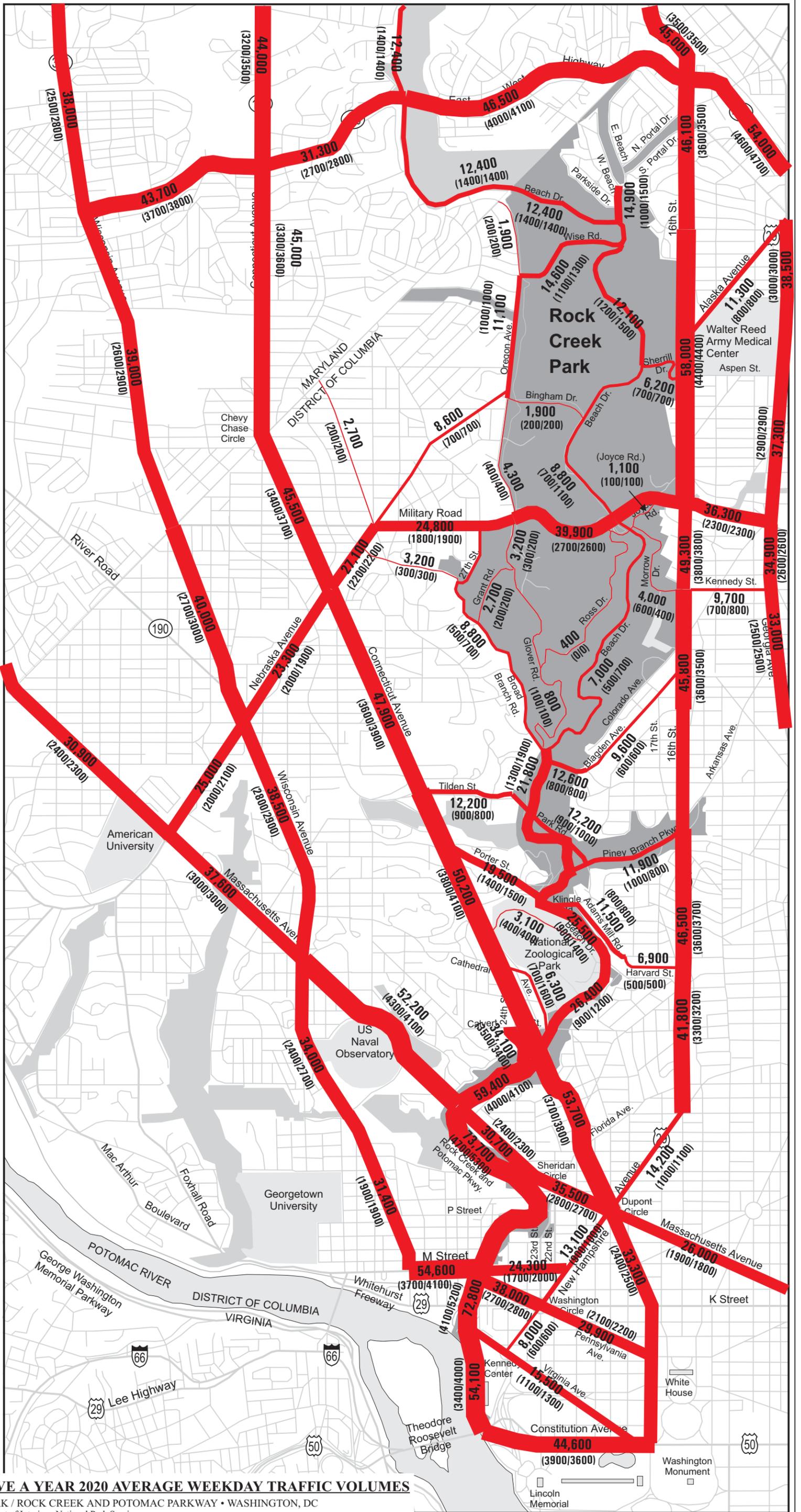


Map Scale: 1" = 0.5 Miles

Rock Creek Park



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



ALTERNATIVE A YEAR 2020 AVERAGE WEEKDAY TRAFFIC VOLUMES
 ROCK CREEK PARK / ROCK CREEK AND POTOMAC PARKWAY • WASHINGTON, DC
 United States Department of Interior • National Park Service
 DCS • January 2002 • 821 / 20046

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 to air quality was defined as a change resulting from an alternative that would cause the concentration of carbon monoxide at any intersection to change by less than 2 ppm relative to Alternative B.

A minor impact to air quality was defined as a change resulting from an alternative that would cause the concentration of carbon monoxide at any intersection to change by 2 ppm to 5 ppm relative to Alternative B.

A major impact to air quality was defined as a change resulting from an alternative that would cause the concentration of carbon monoxide at any intersection to change by more than 5 ppm relative to Alternative B. In addition, any change resulting from an alternative that would cause a change in carbon monoxide NAAQS 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 does not meet the ozone NAAQS. 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 18 summarizes the effects of Alternative A on air quality in the year 2020 compared to Alternative B. The analysis showed the following.

The differences between Alternative A and Alternative B would be negligible at all intersections, and would differ by only a few tenths of a part per million (ppm)

TABLE 18: AIR QUALITY IMPACT EVALUATION BASED ON ESTIMATED 3-HOUR AVERAGE CARBON MONOXIDE (CO) CONCENTRATIONS

Location	Alternative A	Alternative B	Alternative C	Alternative D
Rock Creek and Potomac Parkway/M Street/Pennsylvania Avenue				
Peak-hour traffic count (vehicles)	9,650	10,000	9,900	10,000
	(evening)	(evening)	(evening)	(evening)
3-hour average CO conc. at 1.35 ppb/vehicle	13.03 ppm	13.50 ppm	13.36 ppm	13.50 ppm
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Exceeds 8-hour NAAQS of 9 ppm	yes	yes	yes	yes
Change relative to Alternative B	negligible	-	negligible	negligible
Beach Drive/Wise Road				
Peak-hour traffic count (vehicles)	2,850	3,000	1,300	3,000
	(evening)	(evening)	(evening)	(evening)
3-hour average CO conc. at 1.35 ppb/vehicle	3.85 ppm	4.08 ppm	1.76 ppm	4.08 ppm
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Exceeds 8-hour NAAQS of 9 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible
Beach Drive/Military Drive				
Peak-hour traffic count (vehicles)	3,500	3,750	2,800	3,750
	(evening)	(morning)	(both)	(morning)
3-hour average CO conc. at 1.35 ppb/vehicle	4.72 ppm	5.06 ppm	3.78 ppm	5.06 ppm
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Exceeds 8-hour NAAQS of 9 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible
Beach Drive/Broad Branch Road/Blagden Avenue				
Peak-hour traffic count (vehicles)	2,100	2,600	1,800	2,600
	(evening)	(evening)	(evening)	(evening)
3-hour average CO conc. at 1.35 ppb/vehicle	2.84 ppm	3.51 ppm	2.43 ppm	3.51 ppm
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Exceeds 8-hour NAAQS of 9 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible
Wisconsin Avenue north of Nebraska Avenue				
Peak-hour traffic count (vehicles)	3,000	2,900	3,100	2,900
	(evening)	(evening)	(evening)	(evening)
3-hour average CO conc. at 1.35 ppb/vehicle	4.05 ppm	3.92 ppm	4.18 ppm	3.92 ppm
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Exceeds 8-hour NAAQS of 9 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible
Connecticut Avenue north of Nebraska Avenue				
Peak-hour traffic count (vehicles)	3,700	3,600	3,700	3,600
	(evening)	(evening)	(evening)	(evening)
3-hour average CO conc. at 1.35 ppb/vehicle	5.00 ppm	4.86 ppm	5.00 ppm	4.86 ppm
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Exceeds 8-hour NAAQS of 9 ppm	no	no	no	no
Change relative to Alternative B	negligible	-	negligible	negligible
16th Street/Military Road intersection				
Peak-hour traffic count (vehicles)	6,600	6,750	6,900	6,750
	(morning)	(morning)	(evening)	(morning)
3-hour average CO conc. at 1.35 ppb/vehicle	8.91 ppm	9.11 ppm	9.32 ppm	9.11 ppm
Exceeds 1-hour NAAQS of 35 ppm	no	no	no	no
Exceeds 8-hour NAAQS of 9 ppm	no	yes	yes	yes
Change relative to Alternative B	negligible	-	negligible	negligible

The worst 3-hour average carbon monoxide concentrations for Alternative A (13.03 ppm) at the busiest intersection near the park would be well below the 1-hour NAAQS of 35 ppm.

The 3-hour average carbon monoxide concentrations for Alternative A would exceed the 8-hour average NAAQS of 9 ppm at the intersection of the Rock Creek and Potomac Parkway/M Street/Pennsylvania Avenue. However, it is anticipated that when this 3-hour concentration is averaged over the entire 8-hour period, the 8-hour standard would not be exceeded.

Alternative A would include some construction in the park that would not occur with Alternative B. This would include preserving historic structures, expanding the 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.

There would not be any irretrievable or irreversible commitment of air quality resources with this alternative.

Cumulative Impacts

No changes would occur in air emissions from vehicles in the region because of Alternative A's management actions at Rock Creek Park and the Rock Creek and Potomac Parkway. Instead, Alternative A 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 A to reduce traffic volumes and speeds in the park and on the parkway may encourage some commuters 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 or 8-hour NAAQS 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

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 (BMPs) 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 BMPs 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 were 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 met in all 57 monitoring events summarized in *Baseline Water Quality Data, Inventory and Analysis: Rock Creek Park* (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 (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 BMPs and corrective measures to stop discharges were implemented. The result of these activities would produce beneficial, long-term, negligible to measurable effects on water quality.

Continued cooperation 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 BMPs 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 BMPs to minimize pollution are presented in the *Best Management Practices for Water Quality – Rock Creek Park* (URS Greiner Woodward Clyde 1999). Implementation of BMPs at these sites would produce beneficial, long-term, measurable effects on water quality.

Alternative A would include preservation of historic features, expansion of the nature center and planetarium, and relocation of the park administrative offices and the D-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 BMPs 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 BMPs, construction activities could cause temporary increases in sedimentation and turbidity in surface water as a result of soil disturbance. However, the sites are already disturbed, are well removed from streams (at least 1,200 feet), and are buffered by surrounding natural

vegetation cover. When combined with BMPs, these factors should result in negligible adverse, short-term effects on water quality and hydrology compared to conditions under Alternative B.

If administrative and U.S. Park Police functions were relocated within the park, new impervious surfaces, such as building roofs and parking areas, could cause small, long-term increases in runoff volumes and pollutant loadings. However, the mitigating factors described above for construction would also reduce these changes to produce negligible effects on either water quality or hydrology compared to conditions under Alternative B. The new facilities also could be designed to minimize impervious surfaces, and modifications could be made to existing areas such as parking lots so that no net increase in runoff occurred.

Automobile traffic on Beach Drive and the parkway adjacent to Rock Creek would be reduced by an average of about 25 percent compared to Alternative B. This reduction could result in lower pollutant loadings (sediments, oils and grease, and metals washed from the road surface) of the creek during and after storm events. This reduced loading would produce beneficial, long-term, negligible to measurable effects on water quality. This beneficial effect would be further increased when combined with such actions as the revegetation of road shoulders with dense ground cover, another BMP frequently applied to improve stream water quality.

There would be no irretrievable or irreversible commitment of the resources of Rock Creek and its tributaries with this alternative.

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 BMPs would 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 of water pollution control regulations in Maryland, especially storm water controls, would improve water quality and storm water flows in the park.

Use of BMPs 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 BMPs 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.

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, measurable to major effects on water quality.

As described in the “Affected Environment” section, the Washington, D.C. Water and Sewer Authority has proposed a \$1 billion 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. Collectively, these could have measurable to major, beneficial, long-term effects on water quality of Rock Creek and its tributaries.

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 was described in the “Connected, Cumulative, and Similar Actions” section. Environmental compliance for these projects, including federal permitting to dredge and fill under Section 404 of the Clean Water Act, would be completed prior to initiation of work.

Intermittently throughout the 35-week construction period for improvements for migratory fish, disturbances in the streambed would cause increases in turbidity. Turbidity effects generally would not persist more than 2 to 3 days after sediment-disturbing activities at any site were completed. Use of silt containment curtains would minimize potential silting of downstream aquatic invertebrate community. Higher flows associated with spring rains would flush sediment deposits out of Rock Creek and into the Potomac River, where they would represent only a short-term, small proportional increase in the river’s sediment load. Streambed disturbance activities would be an adverse, short-term, measurable effect on water quality.

Conclusions

Compared to future conditions occurring under the alternative of no action/continue current management (Alternative B), Alternative A would produce long-term improvements in water quality and storm water hydrology. Cumulatively, the incremental effects of the improvements would be major and beneficial.

Compared to Alternative B, construction proposed by Alternative A could have short-term, adverse effects on both water quality and hydrology. Short-term water quality effects would be produced by soil disturbance associated with construction, while long-term effects of higher runoff volumes could result from increases in impervious surfaces. Recognizing that both conditions would be mitigated with BMPs, these conditions would result in negligible net adverse effects on either water quality or to stream hydrology.

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

NPS Floodplain Management Guidelines, Special Directive 93-4 (NPS 1993a)

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

Director’s Order 77-1, Wetland Protection (NPS 1999a)

Management Policies (NPS 2001b)

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 a 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 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 under *NPS Floodplain Management Guidelines* (NPS 1993a). Prior to rehabilitation, the National Park Service would perform a floodplain analysis and would include appropriate mitigation to prevent adverse, long-term impacts to 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 *NPS Floodplain Management Guidelines* (NPS 1993a). 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.

There would be no irretrievable or irreversible commitment of the park's wetland or floodplain resources with this alternative. Floodplain alterations could be reversed and new structural facilities could be removed if unanticipated future wetland or floodplain effects developed.

Cumulative Impacts

Alternative A would not produce any adverse, long-term impacts to wetlands, seeps, or floodplains. Therefore, it would not contribute to any cumulative adverse impacts to 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 (BMPs) 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, would represent a new construction action in the 100-year floodplain. These actions will be 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 BMPs 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 the park’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 guidance policies. 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 present 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 that possessed difficult-to-revegetate conditions.

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 to 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 is the reconstruction of 2.5 miles of existing trails from about 6 feet to a width of 9 feet where possible, and the net construction of 500 feet of new, 8-foot-wide foot/horse trail. This latter action would involve the construction of 3,500 feet of new trail and the restoration of 3,000 feet of former trail. The total deciduous forest area that would be permanently converted to new trail area would be about a half acre. This would represent a minor, long-term, adverse effect on the upland deciduous forest resource of Rock Creek Park.

As much as 4 to 5 additional acres of forest could be disturbed by trail rehabilitation. Following completion of trail work, this construction zone would promptly be planted with native grasses to stabilize the soil, and would then be allowed to revegetate naturally with native woody species. This would be a minor, short-term, adverse effect on the park's upland deciduous forest resource.

Prior to any trail construction, the National Park Service would perform research and detailed field investigations to select the optimal trail alignment. 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.

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, the trail may be relocated to more appropriate areas and the former alignment would be revegetated. This 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.

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, 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 of 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.

There would be no irretrievable or irreversible commitment of deciduous forest resources with this alternative. Forest alterations could be reversed with sufficient time using such measures as site protection, discontinuation of maintenance activities, or active plant restoration and revegetation.

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 woodlands in the region.

Conclusions

Compared to Alternative B, trail reconstruction and new trail segments associated with Alternative A would result in the permanent, long-term loss of about a half-acre of upland deciduous forest. This would represent a minor, long-term, adverse effect on this resource. 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, park policy and management actions include maintaining these uncommon native species.

Methodology

This analysis evaluated impacts to protected and rare species in the area described in the section entitled “Geographic Area Covered by the General Management Plan.” Lists of 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 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 destruction 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 would 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.

There would be no irretrievable or irreversible commitment of protected or rare plant or animal resources.

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 effects 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 of 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 support 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 would 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.

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 (BMPs). 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 and volumes 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. Reductions in traffic volumes 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 of the park, new administrative or U.S. Park Police facilities could be constructed at the park maintenance yard or H-3 stable areas, respectively. These actions would be in already-disturbed areas with low habitat values and would have little effect on 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.

There would be no irretrievable or irreversible commitment of native wildlife resources under Alternative A.

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 municipal sewer district and other agencies to reduce or eliminate pollutant discharges in currently developed areas of the drainage.

As described in the section entitled “Connected, Cumulative, and Similar Actions,” mitigation for the Woodrow Wilson Bridge will be constructed in Rock Creek Park. 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 are anadromous, returning 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 is catadromous, living primarily in freshwater but migrating 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 of 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 to 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 any major 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 of the park would have much larger effects than those actions associated with Alternative A. Woodrow Wilson Bridge mitigation, which would restore upper watershed access for at least three species of migratory fish in Rock Creek, would produce a major, long-term, beneficial effect within the park and the entire creek system. Adverse effects to 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 on the National Register of Historic Places (NRHP) and provides a procedure for nominating such properties to the NRHP. The regulations also define what constitutes an impact or effect on an archeological or historic property listed on or eligible for listing on the NRHP. 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 on the NRHP.

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 pre-historic 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 to 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 (DCSHPO), and Advisory Council on Historic Places. Properties that have been evaluated and are deemed ineligible for listing on the NRHP following consultation may be altered without further consultation among the three parties. Properties that are listed on the NRHP 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 an NRHP evaluation for any site was completed, it would be assumed that the site is eligible for listing on the NRHP. 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 NRHP eligibility

determination eligibility in concert with the DCSHPO and Advisory Council on Historic Places

avoid locating any proposed facilities in areas that would disturb NRHP-eligible sites, 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 due to construction activity during the historic period. Therefore, it is important that the archeological resources 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 is scheduled to begin in 2003. 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 to

the Peirce Mill Barn, 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 returned to their original uses, while others 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. The evaluation consists of comparing conditions that would occur under Alternative A, Alternative C, and Alternative D to those under Alternative B, which would strive to maintain current park conditions.

Information for this analysis was obtained from park visitation records collected by Rock Creek Park staff and processed by the National Park Service Public Use Statistics Office in Denver, Colorado. Data related to vehicle use and nonmotorized recreation come from studies conducted by Robert Peccia & Associates for the National Park Service (Robert Peccia & Associates 1997; Robert Peccia & Associates *et al.* 1997)

Public comments submitted during scoping were used as an indication of the range of public concerns regarding the park. 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. Safety of park users along roadways also was a commonly expressed concern related to visitor experience.

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.

This analysis uses the following definitions of common terms.

“Visitor” refers to members of the public within the boundaries of Rock Creek Park or the parkway.

“Visit” means a recorded entry into the park.

“Nonrecreational visit” means an entry by a visitor who is passing through the park to some other destination, rather than coming to the park specifically to recreate. As noted in the “Affected Environment” section, nonrecreational visits make up more than 85 percent of visitation at Rock Creek Park and the parkway.

“Traditional character” means that the park’s natural scenery and rustic structures would predominate.

“Traditional visitor experiences” include all of the activities that currently occur in the park and along the parkway.

A major adverse effect on traditional park character and visitor experience would be the elimination of a traditional visitor experience or a visual change such that the park's natural scenery and rustic structures would no longer predominate. 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.

Changes in traditional park character and visitor experience associated with traffic were described as noticeable, considerable, and major. These modifiers were defined in terms of a change in level of service (LOS) for traffic as follows:

A change of one LOS would be considered a noticeable change.

A change of two LOSs would be considered a considerable change.

A change of three or more LOSs or the elimination of traffic would be considered a major change.

See the "Impacts on Regional and Local Transportation" section for definitions of LOS and data related to projected LOS changes.

Safety of visitors along roadways also was considered as part of the visitor experience. Effects were defined as followed.

A negligible effect would not measurably change the safety of park visitors.

A minor effect would be measurable, but would not change any ratios of accidents.

A moderate effect would change the ratio of accidents to the number of visitors or the ratio of injury to non-injury accidents.

A major effect would cause a change in the number of fatal accidents that would be expected to occur annually on park roads, along the parkway, and on nearby city streets that would handle traffic diverted from 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 Traditional Character and Experiences

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,

photographic speed monitors, and signs would be necessary to implement controls on automobile speeds and volumes 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.

As described under “Impacts on Regional and Local Transportation,” Alternative A would reduce traffic volume on Beach Drive by 10 to 40 percent and traffic volume on the parkway by 3 to 8 percent compared to Alternative B (Robert Peccia & Associates 1997). These reductions would be almost exclusively in nonrecreational, automobile-based visits, and most would occur during the morning and afternoon rush-hour periods. The effects of these changes on the levels of service (LOSs) on Beach Drive and the Rock Creek and Potomac Parkway compared to Alternative B are presented in table 19. As shown in the table,

Park visitors in the vicinity of Beach Drive would observe major improvements in levels of automobile traffic from Porter Street south to 24th/Cathedral during both the morning and evening.

Park users would probably observe noticeable decreases in traffic on the segments of Beach Drive from Joyce Road to Broad Branch Road and from Blagden Avenue to Tilden/Park during both the morning and evening. A decrease in traffic on Beach Drive from Wise Road to Sherrill Drive during the afternoon also would be evident.

Noticeable improvements in levels of traffic would be seen by visitors along much of the Rock Creek and Potomac Parkway during the morning.

TABLE 19: BEACH DRIVE AND ROCK CREEK AND POTOMAC PARKWAY SEGMENTS EXPERIENCING NOTICEABLE OR GREATER CHANGES IN TRAFFIC LEVELS OF SERVICE BETWEEN ALTERNATIVE A AND ALTERNATIVE B

Road Segment	Peak-Hour Period	Alternative A LOS	Alternative B LOS	Change ^{a/}
Improved level of service – Beach Drive				
Wise Road to Sherrill Drive	P.M.	C	D	N
Joyce Road to Broad Branch Road	A.M.	A	B	N
Joyce Road to Broad Branch Road	P.M.	B	C	N
Blagden Avenue to Tilden/Park	A.M.	C	D	N
Blagden Avenue to Tilden/Park	P.M.	E	F	N
Porter Street to zoo	A.M.	B	E	M
Porter Street to zoo	P.M.	C	F	M
Improved level of service – Rock Creek and Potomac Parkway				
Zoo to 24th/Cathedral	A.M.	B	E	M
Zoo to 24th/Cathedral	P.M.	C	F	M
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.	C	D	N
Reduced level of service				
None				

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

HOV restrictions during rush-hours would inconvenience visitors who did not carpool. Nonrecreational cyclists, who represent about 65 to 85 percent of weekday nonmotorized visitors (Sacks 1994; Metropolitan Washington Council of Governments 1995a), would benefit with a less-stressful commute through the park.

Noise levels in the Rock Creek valley would follow the existing pattern. However, because of this alternative's traffic-reducing and traffic-calming measures, the Beach Drive segments shown in table 19 would have lower noise levels 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.

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, since 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.

The use of Peirce Mill Barn for interpretation and education would provide visitors with greater opportunities to understand 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.

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. It would also greatly improve services to school and youth groups. As a result, more young people would have opportunities to participate in quality, resource-based environmental education programs.

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.

Analysis of Effects on Safety along Roadways

Traffic management measures associated with Alternative A would include

- enhanced enforcement

- use of traffic-calming measures, such as speed humps, 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 restriction on the Rock Creek and Potomac Parkway during peak periods

HOV restrictions on segments of Beach Drive during rush hours

HOV restrictions might improve safety by reducing traffic volumes. However, without other controls, traffic speeds in HOV zones might increase, which could increase the frequency or severity of accidents. Because of these potentially conflicting effects, the safety effects of HOV 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.

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 over the posted 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 to the posted speed limit of 25 miles per hour (mph) along Beach Drive and 35 mph along 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 that

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 8 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 3 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).

The effect of automated enforcement (speed cameras) was variable. Rogerson *et al.* (1994) found that in 35 mph and 45 mph zones, such devices decreased the percentage of

vehicles that exceeded the speed limit by 10 mph or more. This produced a statistically significant reduction in casualty crashes within about a half mile of the speed camera. However, no significant change in the mean speed was detected, and the distribution of vehicle speeds recorded in 60 mph zones did not change.

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 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 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 mechanism 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 large volumes of 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 mph and 35 mph, 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 moderate to 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 have moderate beneficial effects by substantially altering both the ratio of accidents to the number of visitors and the ratio of injury to non-injury accidents. A major beneficial effect would occur if they reduced fatalities by a similar amount. 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 automobile accidents in the park and parkway do not involve cyclists or pedestrians (see table 14). For these accidents, the risk of injury to vehicle occupants depends on the change in speed on 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 mph or less, was more than 50 percent at changes in speed up to 40 mph, and was almost 70 percent for changes in speed greater than 50 mph.

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 3-year period investigated by Robert Peccia & Associates (1997). Because of this low number compared to the 14.5 million visits to the park and parkway each year, 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 reduction in fatalities also would be expected. Monitoring would be needed to determine if the alternative’s traffic-reducing measures (HOV requirements), which would divert some traffic onto nearby city streets, was increasing the number of fatal accidents outside of the park.

Alternative A would have a long-term, moderate to major, beneficial effect in reducing the number and severity of motor-vehicle-only accidents in the park and along the parkway. The reduced traffic levels caused by the HOV restrictions and 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.

Effects on Pedestrians and Cyclists. 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 mph. Fatalities were about 5 percent when the pre-crash speed of the vehicle was below 35 mph. Speeds up to 45 mph 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 14, only 28 of the 1,175 accidents recorded in the park and along the parkway from 1993 through 1995 involved pedestrians or cyclists. Among these, seven cyclists or pedestrians were injured and two were killed. Contributing factors for both fatalities involved a pedestrian illegally on the roadway in rainy weather wearing clothing that was not visible.

By slowing traffic speeds, the traffic management measures of Alternative A would have a long-term, moderate to major, 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 fewer than 10 per year) compared to

the 14.5 million annual visits to the park and parkway, some year-to-year fluctuation in the number of pedestrian and cyclist accidents would be expected.

Commitment of Resources

There would not be any irretrievable or irreversible commitment of park character and visitor experience resources with this alternative. Any management actions that altered traditional park character and visitor experience could be reversed.

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.

Conclusions

The traditional character of the park would be maintained, and there would be moderate to major improvements in visitors' safety under Alternative A, compared to Alternative B. Traffic control measures in Alternative A would retain a driving experience in the Rock Creek valley, but traffic would be lighter than in Alternative B. Improvements to visitor facilities and facilities used for administration and operations would enhance educational and interpretive experiences. There would be no impairment of resources or values associated with traditional park character and visitor experience.

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* (2001b) 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 (NRHP). The Rock Creek and Potomac Parkway appears to be eligible for nomination to the NRHP. 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 Year 1990 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 Alternative A 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

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 (MWCOC) 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 MWCOC. 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 following maps show the modeling results used for the Alternative A evaluation:

Alternative A Year 2020 Average Weekday Traffic Volumes map

Alternative A Year 2020 A.M. Peak-hour Volume Changes with Respect to Alternative B

Alternative A Year 2020 P.M. Peak-hour Volume Changes with Respect to Alternative B

Alternative B Year 2020 Average Weekday Traffic Volumes map

As appropriate, the maps for the other alternatives are provided with their respective analyses.

Results of the model are also presented as potential “levels of service” (LOS) along road segments. The LOS scale was defined by the American Association of State Highway and Transport-

tation 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 20.

TABLE 20: 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 due to 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 LOS 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:

LOS A: volume/capacity = 0 to 28 percent

LOS B: volume/capacity = 29 to 47 percent

LOS C: volume/capacity = 48 to 66 percent



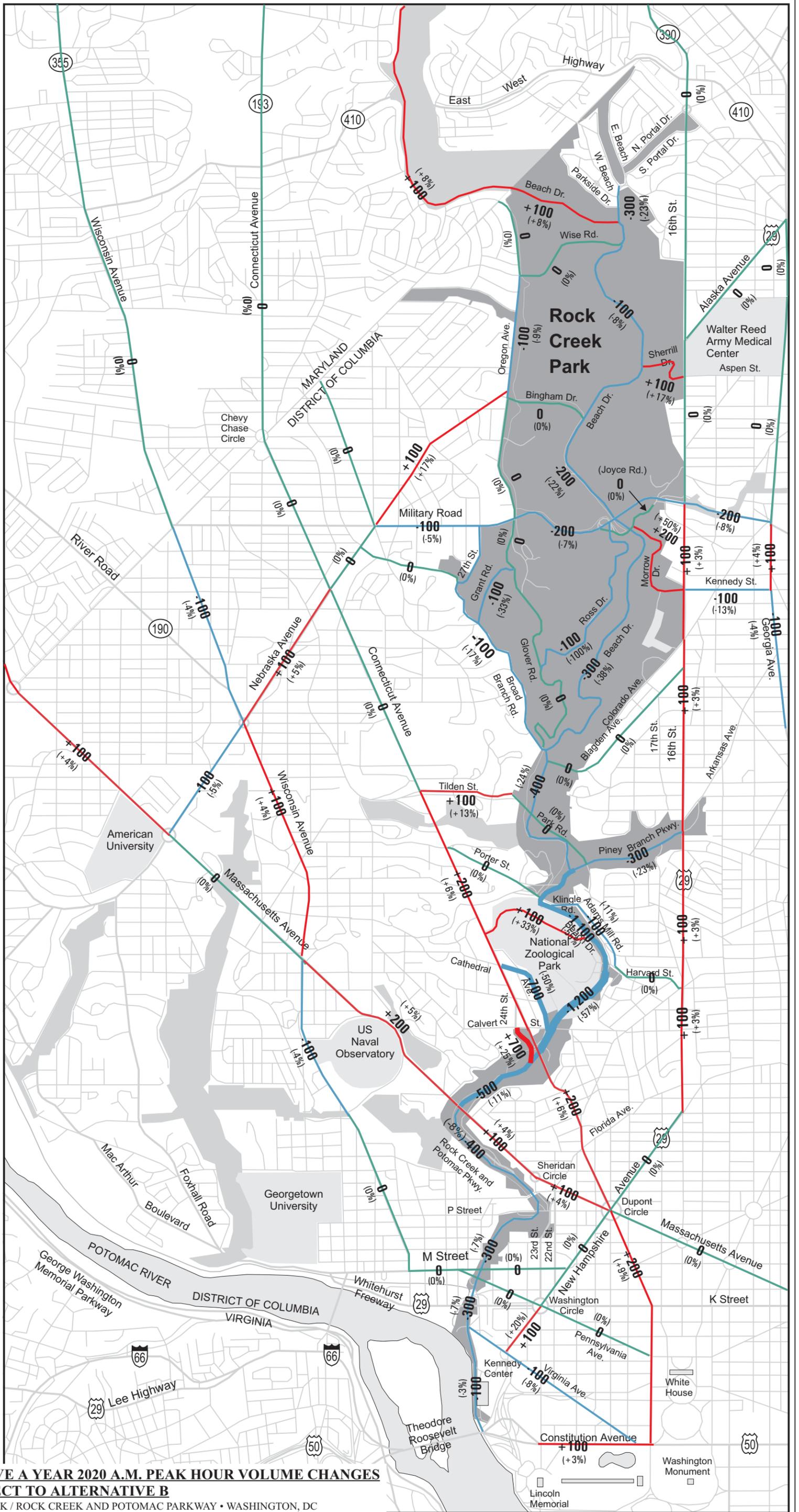
Map Scale: 1" = 0.5 Miles

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 A YEAR 2020 A.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 / 20047



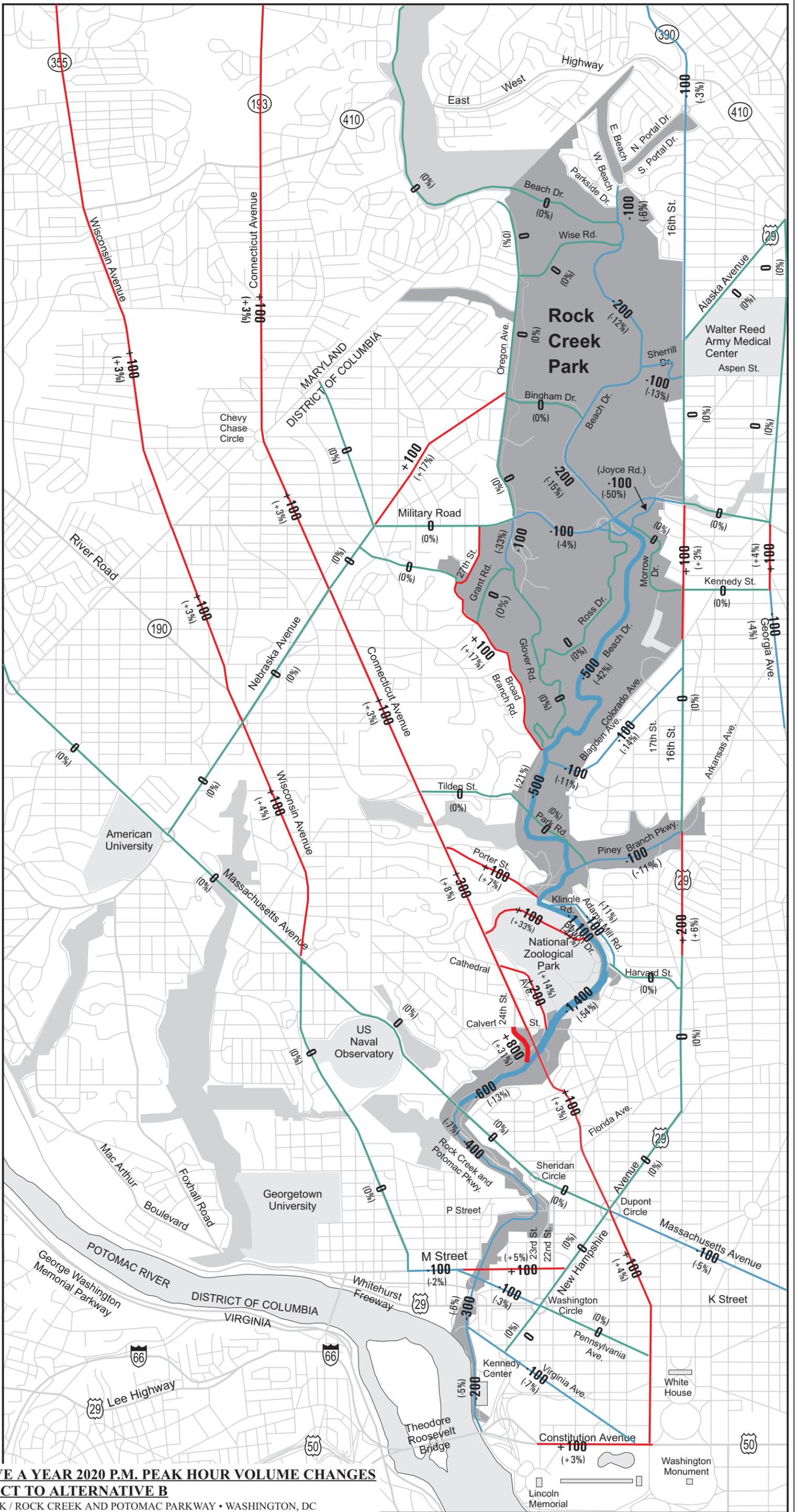
Map Scale: 1" = 0.5 Miles

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

ROCK CREEK PARK / ROCK CREEK AND POTOMAC PARKWAY • WASHINGTON, DC
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LOS D: volume/capacity = 67 to 79 percent

LOS E: volume/capacity = 80 to 100 percent

LOS F: volume/capacity = 100+ percent

The LOS 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 LOS. 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 LOS B, moderate traffic, because the flow is steady with few traffic-related delays.

The LOS 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 LOS 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 LOS E/F during the morning and evening peak-hours. These poor LOS 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, LOS D to C) is characterized in this analysis as a noticeable effect.

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

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

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 A are summarized in table 21 and table G.1 in appendix G. Visual representations of estimated traffic levels are shown in the Alternative A Year 2020 Average Weekday Traffic Volumes map and the Alternative B Year 2020 Average Weekday Traffic Volumes map.

TABLE 21: AVERAGE DAILY TRAFFIC UNDER ALTERNATIVE A COMPARED TO AVERAGE DAILY TRAFFIC UNDER ALTERNATIVE B IN THE YEAR 2020

Road Segment	Alternative A	Alternative B	Change	Percent Change
Beach Drive – Wyndale to East Beach Drive	12,400	13,800	-1,400	-10
Beach Drive – Wise Road to Sherrill Drive	12,100	16,900	-4,800	-28
Beach Drive – Bingham Drive to Joyce Road	8,800	12,600	-3,800	-30
Beach Drive – Joyce Road to Broad Branch Road	7,000	11,700	-4,700	-40
Beach Drive – Blagden Avenue to Tilden/Park Road	21,800	26,700	-4,900	-18
Beach Drive – Porter Street to Zoo	25,500	33,800	-8,300	-25
Beach Drive – Zoo to 24 th /Cathedral	26,400	36,000	-9,600	-27
Rock Creek and Potomac Parkway – 24 th /Cathedral to Waterside	59,400	64,600	-5,200	-8
Rock Creek and Potomac Parkway – Waterside to P Street	73,700	77,900	-4,200	-5
Rock Creek and Potomac Parkway – K Street/Whitehurst to Virginia	72,800	75,200	-2,400	-3
Rock Creek and Potomac Parkway – Virginia to Teddy Roosevelt Bridge	54,100	55,100	-1,000	-2
West Beach – Wise Road ^{a/}	14,900 and 14,600	17,100 and 14,100	-2,200 and +500	-13 and +4
Bingham Drive – Sherrill Drive ^{a/}	1,900 and 6,200	1,800 and 7,700	+100 and -1500	+6 and -19
Joyce Road – Morrow Drive ^{a/}	1,100 and 4,000	1,500 and 3,400	-400 and +600	-27 and +18
Broad Branch Road – Blagden Avenue ^{a/}	8,800 and 9,600	9,000 and 9,400	-200 and +200	-2 and +2
Tilden Street – Park Road ^{a/}	12,200 and 12,200	11,800 and 12,100	+400 and +100	+3 and +1
Piney Branch Parkway – Porter Street ^{a/}	11,900 and 19,500	13,300 and 18,700	-1,400 and +800	-11 and +4

^{a/} Varies by segment. The order in which the segments are presented is consistent between alternatives so that comparisons can be made from the table.

Alternative A would divert 10 percent to 40 percent of the year 2020 weekday traffic flow from Beach Drive onto the city's commuter corridors. Traffic reductions on Beach Drive would be the greatest from Sherrill Drive to Broad Branch Road, including the gorge section of the park, where the number of vehicles per day would be reduced by about 40 percent compared to Alternative B.

High-occupancy-vehicle (HOV) restrictions on portions of Beach Drive during the morning and evening peak periods would be the primary cause of these shifts. Although HOV restrictions would only be applied to portions of Beach Drive, the impact would be felt the full length of Beach Drive and onto the Rock Creek and Potomac Parkway, where average daily traffic would be reduced by an estimated 8 percent at the northern end and 2 percent at the southern end. Within the park, traffic volumes are also projected to decline on Glover Road (varying by segment from 16 percent to 38 percent decrease), Grant Road (10 percent decrease), and Sherrill Drive (19 percent decrease).

All single-occupancy vehicles (SOV) currently using the restricted portions of Beach Drive would have to use alternate routes during HOV restrictions. Some commuter vehicles carrying two or more people and currently using the city street grid may relocate to Beach Drive. However, because there currently are approximately four SOVs for each HOV in the traffic mix using Beach Drive (Robert Peccia & Associates 1997), the net result of HOV restrictions would be a decrease in traffic volumes through the park during the morning and evening commute times, compared to Alternative B.

HOV restrictions would only be in effect for the predominant direction of commuter traffic. Therefore, there would be no impact on vehicles traveling in the opposing direction.

HOV 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, and Piney Branch-Porter. As shown on table 21, Alternative A would have varying effects on the traffic on these routes, ranging from a decrease of 27 percent on Joyce Road to an increase of 18 percent on Morrow Drive, relative to Alternative B.

HOV restrictions in the southern portion of Beach Drive may affect the number and travel direction 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. HOV restrictions would not affect zoo visitors during the middle of the day from Monday through Friday, or at any time on weekends.

Modeling indicates that the HOV restrictions could increase cut-through commuter traffic taking advantage of the zoo circulation road by as much as 33 percent during morning and evening rush-hours. This could result in action by the zoo to limit through traffic. However, because the zoo road would carry only about 3,000 vehicles per day in 2020, such measures would not have a major effect on other roads in the area.

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. Morrow Drive, shown in table 21, would experience the greatest increase, 18 percent, as a result of implementing

Alternative A. In addition to those already identified on table 21, 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 Park to Irving	4
Georgia Avenue from Missouri to Kennedy	8
Oregon Avenue from Chestnut to Nebraska	4
Broad Branch Road from 32nd Street to 27th Street	3
Nebraska Avenue from Oregon to Utah	12
Harvard Street from Adams Mill to 16th Street	3
24th/Calvert access from 24th/Calvert to Beach Drive	14
New Hampshire Avenue from 21st Street to M Street	6
Constitution Avenue from 23rd Street to Henry Bacon	4

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. These measures are not anticipated to cause any vehicles to reroute. Proposed safety modifications to the intersection of Beach Drive and the parkway would reduce vehicle conflicts and help minimize traffic congestion and delays.

One of the goals of Alternative A is to assert more control over nonrecreational use of park roads and improve visitor safety. To determine the effectiveness of Alternative A in meeting this goal, average daily traffic estimates in the year 2020 were compared to traffic counts in the year 1990. This analysis determined the following.

North of Bingham Drive, traffic on Beach Drive would be more than 150 percent greater in the year 2020 than in 1990.

Between Bingham Drive and Joyce Road, average daily traffic on Beach Drive would be virtually identical after 30 years.

Traffic would be reduced by more than 20 percent on Beach Drive between Joyce Road and Broad Branch Road in the year 2020 compared to 1990.

South of Blagden Avenue, traffic would increase modestly over the 30-year period, by about 20 percent on the segment to Tilden/Park, and by about 7 percent from there south to 24th/Cathedral.

Based on these results, it is concluded that Alternative A would be very effective in reducing nonrecreational traffic in the park south of Bingham Drive. In concert with reduced speeds that would result from the traffic restrictions and calming measures, Alternative A would meet the objective of improving visitor safety, even compared to 1990 conditions, while preserving the traditional visitor experience of automobile touring through the park.

Morning Rush-Hour Traffic. During the weekday morning rush-hour, most road segments would have identical levels of service (LOSs) in the year 2020 under Alternative A and Alternative B. Table 19, table 22, and the Alternative A Year 2020 A.M. Peak-Hour Volume Changes with Respect to Alternative B map show segments where the LOS between the two alternatives would vary by at least one step. Additional information on year 2020 peak-hour traffic volumes and LOSs for both the morning and evening are provided in tables G.2 and G.3 in appendix G.

TABLE 22: OTHER ROAD SEGMENTS EXPERIENCING NOTICEABLE OR GREATER CHANGES IN TRAFFIC LEVELS BETWEEN ALTERNATIVE A AND ALTERNATIVE B

Road Segment	Peak-Hour Period	Alternative A LOS	Alternative B LOS	Change ^{a/}
Improved level of service				
West Beach Drive - Beach Drive to Portal	A.M.	C	E	C
West Beach Drive - Beach Drive to Portal	P.M.	E	F	N
Sherrill Drive - Beach Drive to 16th Street	P.M.	B	C	N
Georgia Ave - Arkansas to Upshur	A.M.	D	E	N
Georgia Ave - Arkansas to Upshur	P.M.	D	E	N
Oregon Ave - Chestnut to Nebraska	A.M.	C	D	N
Kennedy - 14th to 13th	A.M.	B	C	N
Piney Branch Parkway - Beach Drive to 16th	A.M.	C	E	C
Cathedral Avenue - Calvert to Beach Drive/24th	A.M.	B	E	M
Reduced level of service				
Morrow Drive - Joyce Road to Carter-Barron	A.M.	B	A	N
Georgia Ave - Missouri to Kennedy	A.M.	E	D	N
Georgia Ave - Missouri to Kennedy	P.M.	E	D	N
Cathedral Avenue - Calvert to Beach Drive/24th	P.M.	F	E	N

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

Alternative A would result in a noticeable to major improvement in weekday morning rush-hour traffic on Beach Drive south of Joyce Road. Morning traffic would be light (LOS A) through the gorge section between Joyce Road and Broad Branch Road. Beach Drive traffic between Blagden and Tilden would be substantial (LOS C), but would be considerably improved over future conditions with Alternative B (LOS E, very heavy). There would be a major improvement in traffic levels on Beach Drive between Porter Street and the north end of the Rock Creek and Potomac Parkway.

The morning traffic LOS on Piney Branch Parkway and West Beach Drive would see considerable improvement. Traffic along Glover Road, Ross Drive, Grant Road, Bingham Drive, Morrow Drive, and Joyce Road would remain light (LOS A).

There would be an improvement in level of service during weekday morning rush-hours on the Rock Creek and Potomac Parkway north of Virginia Avenue. Morning peak-hour traffic conditions on the parkway would range from substantial (LOS C) to heavy (LOS D), similar to today's conditions. However, these would be a noticeable improvement from the heavy to very heavy traffic that would occur under Alternative B.

Two road segments were identified as having a noticeably reduced LOS relative to Alternative B. These include Georgia Avenue between Missouri and Kennedy, and Morrow Drive between Joyce Road and Carter-Barron.

Evening Rush-Hour Traffic. During the weekday evening rush-hour, most road segments would have identical levels of service (LOS) in the year 2020 under Alternative A and Alternative B. Table 19, table 22, and the Alternative A 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 a noticeable to considerable improvement in traffic conditions on Beach Drive during evening weekday rush-hours. North of Joyce Road, evening traffic would be to substantial. The LOS would improve along Beach Drive south of Joyce Road through the gorge section, where it would be moderate (LOS B). Traffic on Beach Drive between Blagden and Tilden Street/Park Road would be very heavy, as opposed to extremely heavy with Alternative B. There would be a major improvement to LOS C for the segment between Porter Street and the southern end of Beach Drive at the parkway. Under Alternative B, this area would continue to have extremely heavy traffic.

Weekday evening rush-hour traffic on the parkway would be noticeably improved at the northern end on the parkway above Waterside Drive. South of Waterside parkway traffic would be very heavy with or without Alternative A. Georgia Avenue, West Beach Drive and Sherrill Drive all would have noticeable improvements in LOS relative to Alternative B.

Two road segments were identified as having a noticeably reduced weekday evening rush-hour LOSs relative to Alternative B. These include Georgia Avenue between Missouri and Kennedy, and Cathedral Avenue between Calvert and Beach Drive/24th.

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 reduced automobile traffic traveling at slower speeds on most of 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.

As stated in the section on average daily traffic, Alternative A would improve conditions for bicyclists and pedestrians using most of Beach Drive compared both to Alternative B and year 1990 conditions. The greatest effects would occur during rush-hours. The largest benefit would result from the reduction of automobile traffic through the gorge section of Beach Drive.

The reductions in traffic through the park could be sufficient to influence a some people to commute by bicycle on weekdays. However, bicyclists and other nonmotorized recreationists would still have to use park roads with extreme caution because of the narrowness of the roadways and continued, albeit less heavy, automobile traffic on Beach Drive north of Broad Branch Road.

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 1998). 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.

As noted in the section on average daily traffic, Alternative A would result in traffic changes on various roads ranging from decreases of 40 percent to increases of 18 percent, relative to Alternative B. Major commuter routes in the city would be unaffected by Alternative A.

Alternative A would have little influence on nonmotorized travel outside the park. While automobile traffic would decrease or increase slightly to moderately on some city street segments, the level of change would not be likely to influence individuals' decision to walk or ride a bicycle.

Conclusions

Alternative A would reduce both the average weekday and the peak-hour traffic volumes throughout Beach Drive, while allowing weekday vehicle access to all existing road segments and preserving the traditional visitor experience of automobile touring through the park. Traffic volumes on the Rock Creek and Potomac Parkway would remain substantial to very heavy. The decreased weekday traffic volumes and congestion on Beach Drive would reduce, but not eliminate, conflicts among automobile use and nonmotorized travel in Rock Creek valley.

The shift in commuter traffic from park roads to other commuter routes within the city would have very little effect on city traffic conditions. There would be no impairment of resources or values associated with regional and local transportation.

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 of the jurisdiction of the National Park Service.

Methodology

This analysis evaluated impacts to community character in the area described in the Washington, D.C. neighborhoods adjacent to Rock Creek Park and the Rock Creek and Potomac Parkway.

Changes in community character were assumed to be related to changes in traffic management because traffic changes are the one element of the alternatives that would have recurring, detectable effects outside the park. As a result, traffic changes associated with Alternative A were analyzed in relation to the wards and neighborhoods 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 disadvantaged or minority neighborhoods or wards.

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 (LOS) as follows:

A change of one LOS would be considered a noticeable change.

A change of two LOS would be considered a considerable change.

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

See the “Impacts on Regional and Local Transportation” section for definitions of LOS and the data related to the projected LOS 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 ward and neighborhood boundary maps were superimposed on the forecast traffic volume increases for the traffic corridors that were analyzed.

Analysis

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

The Alternative A 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 restrictions in Alternative A would tend to reinforce current commuter patterns. It is unlikely that traffic would be introduced onto streets where substantial commuter traffic does not currently exist.

Table 23 identifies the wards that contain the roads outside of the park and parkway where the community would experience a noticeable or greater traffic change between Alternative A and Alternative B. None of these changes would occur within Wards 1 or 2.

TABLE 23: WARDS EXPERIENCING NOTICEABLE OR GREATER CHANGES IN COMMUNITY CHARACTERISTICS ASSOCIATED WITH TRAFFIC BETWEEN ALTERNATIVE A AND ALTERNATIVE B

Ward	Road Segment	Peak-Hour Period	Alt. A LOS	Alt. B LOS	Change ^{a/}
Improved level of service					
3	Cathedral Ave - Calvert to Beach/24th	A.M.	B	E	M
3	Oregon Avenue - Chestnut to Nebraska	A.M.	C	D	N
4	Georgia Avenue - Arkansas to Upshur	A.M.	D	E	N
4	Georgia Avenue - Arkansas to Upshur	P.M.	D	E	N
4	Kennedy - 14th to 13th	A.M.	B	C	N
Reduced level of service					
3	Cathedral Ave - Calvert to Beach/24th	P.M.	F	E	N
4	Georgia Avenue - Missouri to Kennedy	A.M.	E	D	N
4	Georgia Avenue - Missouri to Kennedy	P.M.	E	D	N

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

Within Ward 3, the community around Cathedral Avenue from Calvert to Beach Drive/24th would experience major improvements in traffic-related community quality characteristics during the morning peak traffic hour, and a noticeable decline in these characteristics during the evening peak traffic hour. Georgia Avenue from Missouri to Kennedy in Ward 4 would be the only other location that would have a decline in traffic-related community quality characteristics relative to Alternative B. These detrimental effects would be noticeable during both the morning and afternoon peak traffic hours.

The environmental justice evaluation did not show any inequitable distributions of adverse effects from declines in traffic levels of service on ethnic or economically disadvantaged neighborhoods or groups. Citizens along one road segment in Ward 3 and one road segment in Ward 4 would experience noticeable declines in community characteristics related to traffic. Economically, these two wards are relatively advantaged, ranking first and second among the four wards in median household income and percent of housing units that are owner-occupied (table 16). Ward 3 has the highest white population, while Ward 4 has the highest percentage of non-white citizens. The location of one adversely affected road segment in each of these wards indicates an absence of ethnic bias in the location of adverse effects.

Alternative A would not have substantial economic impacts on any neighboring communities. Locating a new NPS headquarters office or U.S. Park Police substation outside of the park would generate new lease income at the local level. However, this income would not have a sizeable effect area business income or diversity.

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.

Cumulative Impacts

Alternative A 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 (MWCOG 1998).

The HOV restrictions included in Alternative A are consistent with the goals of the *Draft Vision Document* (MWCOG 1997) and the Strategic Transportation Plan (District of Columbia Government 1997) that propose reducing congestion problems in the region by reducing dependency on single occupancy vehicles.

Regional economic patterns would not be substantially affected by the scale of the changes proposed in Alternative A.

Conclusions

Alternative A would produce noticeable adverse changes in the community character of only two road segments near the park, while four locations would experience beneficial changes that were noticeable to major. There would be no impairment of resources or values associated with community character.

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 natural, archeological, and historic resources and improving park visitor experiences.

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

The development of new administrative and interpretive facilities would support the NPS mission while having no adverse cumulative impacts to 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 (BMPs). 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 and roadways.

Short-term localized soil erosion (largely prevented by BMPs) and degradation 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

Alternative A would result in the unavoidable adverse effect of reducing the traffic level of service on three road segments, one of which is within the park boundaries. This would be an unavoidable consequence of reducing commuter traffic through the park, a major goal of the alternative. Community characteristics associated with traffic also would be degraded along the two road segments outside of the park that experienced reduced traffic levels of service.

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 18 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 1990 traffic counts shown in the "Affected Environment" section. For example, at the intersection of 16th and Colorado where monitoring was performed in 1996, traffic volumes with associated tailpipe emissions of carbon monoxide would have increased by 40 percent.

Despite traffic increases, the 3-hour average carbon monoxide concentrations for Alternative B (13.50 ppm) at the busiest intersection near the park would be well below the 1-hour NAAQS of 35 ppm.

The 3-hour average carbon monoxide concentrations for Alternative B would exceed the 8-hour average NAAQS of 9 ppm at the intersection of Rock Creek and Potomac Parkway/M Street/Pennsylvania Avenue and the intersection of 16th Street/Military Road. However, it is anticipated that when these 3-hour concentrations were averaged over the entire 8-hour period, the 8-hour standard would not be exceeded at either site.

There would be no irretrievable or irreversible commitment of resources with this alternative.

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 or 8-hour NAAQS 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 BMPs 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 BMPs to minimize pollution are presented in the *Best Management Practices for Water Quality – Rock Creek Park* (URS Greiner Woodward Clyde 1999). Implementation of BMPs at these sites would produce beneficial, long-term measurable effects on water quality.

Alternative B would include repair and rehabilitation of the Carter Barron Amphitheater. During construction activities and throughout long-term operations, the National Park Service would employ conventional soil erosion and runoff prevention BMPs that have proven effectiveness in minimizing both the volume and sediment loading of runoff. Anticipated effects during construction would be non-measurable, adverse, and short-term, lasting only 2 to 3 months after construction was completed. Long-term effects from an improved drainage system at the site would be beneficial but negligible.

There would be no irretrievable or irreversible commitment of resources with this alternative. All actions, such as installation of BMPs, could be replaced or reversed.

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 inside the park. However, the incremental effects of reducing pollutant loading inside the park through the application of BMPs would benefit stream water quality.

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 include the \$1 billion program for temporary storage of combined storm runoff and sewage, proposed by the Washington, D.C. Water and Sewer Authority, which was described for Alternative A. Collectively, these actions would produce major, long-term, beneficial effects on water quality. As with Alternative A, alignments for the storage tunnel project would require extensive coordination to ensure that park resources and values were not adversely affected.

As described for Alternative A, the installation of a fish bypass at the dam at Peirce Mill and the removal of other impediments to fish migration in Rock Creek would produce adverse, short-term, measurable effect on water quality.

Conclusions

Compared to current conditions, the implementation of BMPs under Alternative B would produce long-term improvements in water quality. However, these benefits potentially could be masked by effects from storm and combined sewer discharges, and from the upstream 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 any 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. There would be no irretrievable or irreversible commitment of the park’s wetland or floodplain resources with this alternative

Cumulative Impacts

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

Conclusions

Alternative B would not produce any adverse, 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.

There would be no irretrievable or irreversible commitment of deciduous forest resources with this alternative. Forest alterations could be reversed with sufficient time using such measures as site protection, discontinuation of maintenance activities, or active plant restoration and revegetation.

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.

There would be no irretrievable or irreversible commitment of resources. There would be no substantial change from present conditions in the management of protected and rare species.

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.

There would be no irretrievable or irreversible commitment of native wildlife resources.

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 of 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 of 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 an archeological inventory and analysis of the park and parkway scheduled for 2003, 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

Archeological resources in most of the Washington, D.C. area have been lost due to construction activity during the historic period. Therefore, it is important that the archeological resources 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 is scheduled to begin in 2003. 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

Following the scheduled year 2003 park-wide archeological inventory and evaluation, archeological resources should have adequate protection. 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

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. Continuing protection and preservation of these resources by Alternative B would have a significant beneficial effect in preserving them for the future.

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* (NPS 2001b). 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 Traditional Character and Experiences

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 north of Sherrill Drive would more than double from 1990 levels and south of that point traffic volumes would increase between 30 percent and 50 percent. Parkway daily traffic would increase between 38 percent and 50 percent over 1990 levels.

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, speeding would continue to be a problem in the park. Visitors attempting to use park roads for auto touring, recreational bicycling, or

walking 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 the 300 visitors per hour now occurring on portions 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.

Park visitors would continue to have an opportunity to see works by local artists in the historic Peirce Mill Barn.

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.

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' esthetic experience and, potentially, on their safety.

Analysis of Effects on Safety along Roadways

Alternative B would not materially change how traffic was managed in the park and on the parkway. As a result, as discussed below 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 do little to mitigate existing safety problems, vehicle accident numbers and rates would either continue at present levels or increase. However, the stop-and-go nature of the overly congested traffic may reduce the *severity* of accidents that occur during peak periods.

Under Alternative B, increased numbers of 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.

Commitment of Resources

There would not be any irretrievable or irreversible commitment of resources with this alternative. Any management actions that altered traditional park character and visitor experience could be reversed.

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.

Conclusions

Visitors' safety and esthetic 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 be the greatest cause for a deteriorated visitor experience and threat to safety. However, there would be no impairment of resources or values associated with traditional park character and visitor experience.

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 those in the year 1990. 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

Average Daily Traffic. Alternative B average daily traffic projections for the year 2020 are shown in table 21, table G.1 in appendix G, and the Alternative B Year 2020 Average Weekday Traffic Volumes map. Modeling shows that relative to the year 1990, 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 year 1990. 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 LOS C or better on most side roads.

Traffic on the Rock Creek and Potomac Parkway also would to 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 shows year 1990 levels of service (LOSs) and the LOSs that would occur with implementation of Alternative B. During both the morning and afternoon peak-hours, 57 percent of the modeled roadways would have very heavy (LOS D) to extremely heavy (LOS F) traffic. In contrast, fewer than 44 percent of these roadways were LOS D or worse in 1990.

During the morning rush-hour, the LOS would noticeably decline on four of seven segments of Beach Drive as compared to current conditions. There would be a considerable deterioration in LOS 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 (LOS C) to very heavy (LOS E). On three of the four segments modeled, this would be a noticeable decrease in LOS.

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 LOS 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. Level 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 (LOS F).

Except on the south end where traffic would be substantial, the parkway would see heavy (LOS D) and very heavy (LOS 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 very heavy level (LOS E) to extremely heavy traffic (LOS F) by 2020. Traffic on Wise and Blagden would noticeably increase, and traffic on Sherrill Drive would considerably increase from light to substantial levels.

Nonmotorized Travel. Bicycling, walking, and in-line skating as personal transportation, as well as for recreation, have been increasing in recent decades. Although this trend would be likely to continue with Alternative B, the alternative would not provide any incentive to additional individuals to bike or walk in the park. Moreover, increasing traffic volumes, particularly on sections of Beach Drive where there is no parallel trail, could discourage potential cyclists. The frequency of accidents involving cyclists, pedestrians, and vehicles would probably increase on park roads. Maintaining the current width and alignment of the recreation trails in the park and along the parkway would lead to increase conflicts among users and increasing numbers of accidents associated with conflicting uses.

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 1998). 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 (LOS D) to extremely heavy (LOS 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 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 contribute to regional efforts to promote nonmotorized transportation and could, to an unknown extent, discourage weekday nonmotorized travel.

Conclusions

Alternative B would result in steadily increasing traffic volumes on park roads with deteriorating levels of service on Beach Drive and the Rock Creek and Potomac Parkway as compared to current conditions. 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 nonmotorized travelers 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. There would be no impairment of resources or values associated with regional and local transportation.

IMPACTS ON COMMUNITY CHARACTER

Analysis

Continuing current management practices with Alternative B would not adversely 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.

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 1998). For example, traffic projections indicate residents of the Brightwood neighborhood can expect a 57 percent increase in traffic on 16th Street by the year 2020 over 1990 levels. Mount Pleasant residents would experience a 48 percent increase in traffic on 16th Street by the year 2020 over 1990 levels. Similar increases would occur on the western side of the park as well. Cleveland Park residents can expect a 32 percent increase in traffic on Connecticut Avenue by the year 2020 over 1990 levels and Barnaby Woods residents would see a 26 percent increase in traffic along Oregon Avenue north of Bingham Drive.

Although there would be economic impacts from continued regional growth, it is unlikely that area economic patterns would be substantially altered by continuing current management of the park as contained in Alternative B.

There would be no irretrievable or irreversible commitment of resources with this alternative. This alternative does not include management actions that would alter community character.

Conclusions

Alternative B would have mixed effects on the quality of life of area residents. Current traffic patterns would continue to worsen but park actions would not introduce additional traffic onto the roadways surrounding the park. However, opportunities to walk, jog, and bicycle in the area would be further decreased by anticipated levels of traffic congestion and noise. It is unlikely that Alternative B would produce substantial economic impacts. There would be no impairment of resources or values associated with community character.

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 would jeopardize the long-term protection and enjoyment of park resources.

Any Irreversible or Irretrievable 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

Alternative B would result in steadily increasing traffic volumes on park roads with deteriorating levels of service on Beach Drive and the Rock Creek and Potomac Parkway. Conflicts and safety problems among nonmotorized travelers and automobile users would likely increase on park roads. Visitors' esthetic and recreational enjoyment of the park also would decline over time because of high traffic volumes.

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 18 summarizes the effects of Alternative C on air quality in the year 2020 compared to Alternative B. The analysis showed the following.

The differences between Alternative C and Alternative B would be negligible at all intersections, and would differ by only a few tenths of a part per million (ppm).

The worst 3-hour average carbon monoxide concentrations for Alternative C (13.36 ppm) at the busiest intersection near the park would be well below the 1-hour NAAQS of 35 ppm.

The 3-hour average carbon monoxide concentrations for Alternative C would exceed the 8-hour average NAAQS of 9 ppm at the intersection of Rock Creek and Potomac Parkway/M Street/Pennsylvania Avenue and at the intersection of 16th Street and Military Road. However, it is anticipated that when these 3-hour concentrations were averaged over the entire 8-hour period, the 8-hour standard would not be exceeded.

Alternative C would include some construction in the park that would not occur with Alternative B. This would include preserving historic structures, expanding the 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 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.

There would be no irretrievable or irreversible commitment of air quality resources with this alternative.

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 commuters 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 compared to Alternative B. It would not result in the exceedence of the 1-hour or 8-hour NAAQS 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 decrease by 97 percent to 100 percent relative to Alternative B. 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 traffic would result in lower pollutant loadings (sediments, oils and grease, and metals from the road surface) draining into Rock Creek and its tributaries during and after storm events. The reduced loading would produce negligible to measurable beneficial, long-term effects on water quality.

There would be no irretrievable or irreversible commitment of resources with this alternative. All actions could be replaced or reversed.

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

IMPACTS ON WETLANDS AND FLOODPLAINS

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

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. Consequently, 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 Traditional Character and Experiences

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, four-way-stop intersections, photographic speed monitors, 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.

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 traditional visitor experience of automobile touring along the length of the park, including the gorge area. This would be a major adverse impact on the traditional visitor experience. 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.

Weekday visitation to the northern portion of the park would be substantially reduced. For example, motorized visitation on the segment of Beach Drive between Broad Branch Road and Joyce Road would be reduced on weekdays from about 15,000 visits per day (11,700 vehicles per day containing 1.3 people per vehicle) under Alternative B to an estimated 200 to 500 visits per day under Alternative C. Most of the traffic reductions in the park under Alternative C would be in nonrecreational visits.

With the exception of automobile touring along the length of the park, visitors would continue to have access to all of the traditional activities that were described in the "Affected Environment" section. The experience of driving along Beach Drive north of Broad Branch Road would be replaced by greatly enhanced opportunities for nonmotorized use. If current patterns continue, 65 to 85 percent of weekday visits would be nonrecreational commuter cyclists. The remainder would be recreational visitors such as joggers, hikers, in-line skaters, and birders. Conditions would be similar to those currently occurring during weekend periods when segments of Beach Drive are closed, although weekday use would be only about 30 percent of weekend use.

Even with the permanent 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 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, HOV restrictions, speed limit enforcement, and traffic-calming measures would create a less congested driving experience compared to Alternative

B. HOV 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.

Table 24 summarizes the effects of the Alternative C traffic management measures on the levels of service (LOSs) 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. As shown in the table,

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.

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.

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.

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. 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.

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.

With Alternative C, effects on traditional park character and visitor experience that are not related to traffic would be identical to those described for Alternative A. These would include improved opportunities at Peirce Mill Barn, the Lodge House, and the Rock Creek Nature Center and Planetarium. Improvements in park services associated with a more efficient and cohesive working environment and the dispersed park police presence would be similar to Alternative A.

Analysis of Effects on Safety along Roadways

Traffic management measures associated with Alternative C would include

- permanently closing portions of Beach Drive to vehicular traffic

- enhanced enforcement

- use of traffic-calming measures, such as speed humps, 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 one-way traffic restriction during peak periods

HOV restrictions on the parkway and on Beach Drive south of Broad Branch Road during rush hours

HOV restrictions might improve safety by reducing traffic volumes. However, without other controls, traffic speeds in HOV zones might increase, which could increase the frequency or severity of accidents. Because of these potentially conflicting effects, the safety effects of HOV 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 57 accidents between 1993 and 1995 (Robert Peccia & Associates 1997). These represent approximately 5 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 minor to moderate beneficial effect on visitor safety, particularly when combined with reductions in volumes resulting from HOV restrictions. 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. The use of traffic-calming techniques to reduce speeds and enhance safety was described in the analysis of Alternative A. The use of traffic-calming devices in Alternative C would have a moderate to 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 in studies reviewed by the Federal Highway Administration (1998) and National Highway Traffic Safety Administration (1999), they would have moderate beneficial effects by substantially altering both the ratio of accidents to the number of visitors and the ratio of injury to non-injury accidents. A major beneficial effect would occur if they reduced fatalities by a similar amount. 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 and traffic volumes on park roads and the parkway, the traffic management measures of Alternative C would have a long-term, moderate to major, beneficial effect in reducing the number and severity of motor-vehicle-only accidents. The reduced traffic levels and reduced speeds that would result from Alternative C 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 the number of visitors, the ratio of injury to non-injury accidents, and the frequency of fatal accidents. Monitoring would be needed to determine if Alternative C's 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 n 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 and reducing traffic volumes, the traffic management measures of Alternative C would have a long-term, moderate to major, 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 fewer than 10 per year throughout the park and parkway), 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 commuting is expected to be about 30 percent of weekend use. However, the availability of a car-free route could increase the number of bicycle commuters. 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 bicycle injuries.

Commitment of Resources

There would be no irretrievable or irreversible commitment of resources with this alternative. Any management actions that altered traditional park character and visitor experience could be reversed.

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 bicycling route through Rock Creek Park that would be relatively free from interference by automobiles and would provide an effective connection with regional bicycle trails.

Conclusions

The loss of the traditional visitor experience of automobile touring along the length of the park would be a major adverse impact of Alternative C. However, this alternative would also have substantial beneficial impacts associated with improved enjoyment by recreational visitors in areas where traffic was reduced or eliminated.

Moderate to major improvements in visitors' safety would occur under Alternative C, compared to Alternative B. Improvements to visitor facilities and facilities used for administration and operations would enhance educational and interpretive experiences.

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. Consequently, there would be no impairment of resources or values associated with traditional park character and visitor experience.

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 25 and table G.1 in appendix G. Visual representations of estimated traffic levels are shown in the Alternative C Year 2020 Average Weekday Traffic Volumes map and the Alternative B Year 2020 Average Weekday Traffic Volumes map.

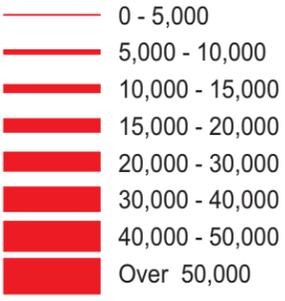
TABLE 25: AVERAGE DAILY TRAFFIC UNDER ALTERNATIVE C COMPARED TO AVERAGE DAILY TRAFFIC UNDER ALTERNATIVE B IN THE YEAR 2020

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

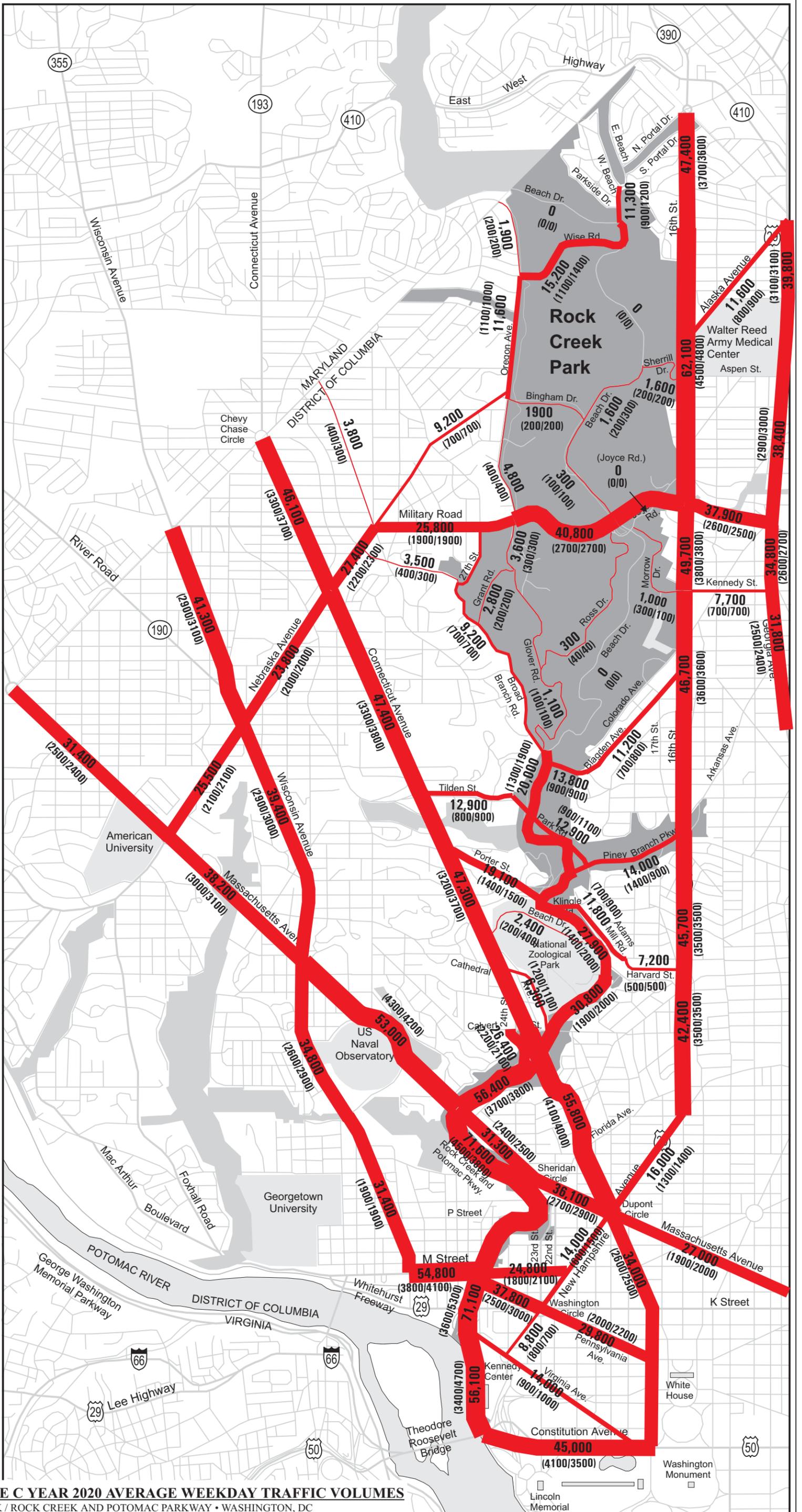


Map Scale: 1" = 0.5 Miles

Rock Creek Park



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



ALTERNATIVE C YEAR 2020 AVERAGE WEEKDAY TRAFFIC VOLUMES

ROCK CREEK PARK / ROCK CREEK AND POTOMAC PARKWAY • WASHINGTON, DC
 United States Department of Interior • National Park Service
 DCS • January 2002 • 821 / 20050

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 25, 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 HOV 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 (SOV) currently using the southern portion Beach Drive and Rock Creek and Potomac Parkway would also have to use alternate routes during HOV 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 HOV 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 HOV 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 25, 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.

HOV 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. HOV 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 25, 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 27th 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 over the 30-year period, 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.

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 26 and the Alternative C Year 2020 A.M. Peak-Hour Volume Changes with Respect to Alternative B map show segments where the LOS between the two alternatives would vary by at least one step. Additional information on year 2020 peak-hour traffic volumes and LOSs for both the morning and evening are provided in tables G.2 and G.3 in appendix G.

TABLE 26: 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

TABLE 26: OTHER ROAD SEGMENTS EXPERIENCING NOTICEABLE OR GREATER CHANGES IN TRAFFIC LEVELS BETWEEN ALTERNATIVE C AND ALTERNATIVE B (Continued)

Road Segment	Peak-Hour Period	Alternative C LOS	Alternative B LOS	Change ^{a/}
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.

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 (LOS C) to heavy (LOS 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 LOS 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 LOS step) compared to Alternative B. All 15 segments would have LOS D (heavy traffic) or better, compared to Alternative B, where six of the segments would experience very heavy traffic (LOS E).

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 LOS steps). The other four road segments would have noticeable decreases in service (one LOS step) compared to Alternative B. Four of the five segments would have very heavy traffic (LOS E) with Alternative C, while all five segments would be LOS 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 (LOS) in the year 2020 under Alternative C and Alternative B. Table 23, Table 26, 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 (LOS C) to very heavy (LOS 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 LOS steps). Four of the segments would have very heavy traffic (LOS E), compared to eight segments with very heavy or extremely heavy traffic (LOS 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 LOS steps). The other eight road segments would have noticeable decreases in service (one LOS step) compared to Alternative B. Five of the nine segments would have very heavy traffic (LOS E) with Alternative C, while all nine segments would be LOS D or better under Alternative B.

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, construction of a recreation trail between West Beach Drive and Wise Road, and improvements to existing recreation trails would provide an almost continuous automobile-free route the length of the park and parkway at all times.

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 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 rec-

reational 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.

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 1998). 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

The greatest effect of Alternative C on nonmotorized travel in the region would be associated with providing an almost automobile-free corridor for bicyclist and pedestrians from the Maryland state line to the core of the city. The corridor would improve the linkage within the Rock Creek Trail in the regional system. The Rock Creek corridor would become the route of choice for some bicycle commuters currently using other routes on city streets due to 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. Conditions for nonmotorized travel through the park, particularly bicycling, would be substantially enhanced.

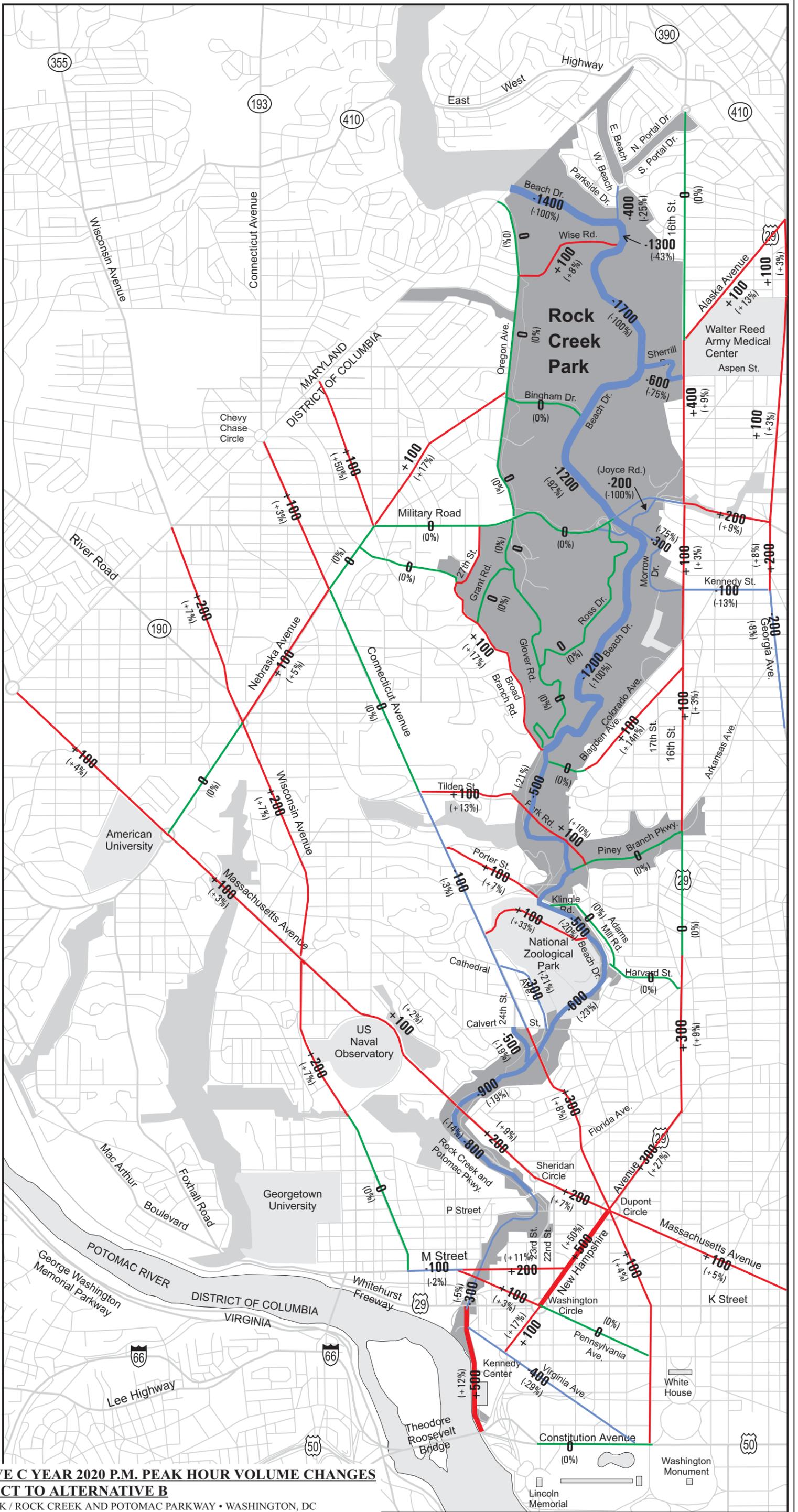


Map Scale: 1" = 0.5 Miles

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

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. Consequently, there would be no impairment of resources or values associated with regional and local transportation.

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 substantial increased traffic volumes that are expected to result from continued regional population growth. For instance, MWCOG forecasts as much as a 70 percent increase in traffic in the region due to population growth by 2020 (Metropolitan Washington Council of Governments 1998). 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 the proposed recreation trail improvements 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 community citizens who use these park facilities.

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 27 summarizes the roads outside of the park and parkway where the community would experience a noticeable or greater traffic change 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 Ward 1, three segments in Ward 2, two segments in Ward 3, and two segments in Ward 4.

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. None of these road segments are within Ward 1. Five segments are in Ward 2, one segment is in Ward 3, and three segments are in Ward 4. The changes would be considerable on New Hampshire Avenue from 19th to 20th during the morning peak-hour, and on

**TABLE 27: WARDS EXPERIENCING NOTICEABLE OR GREATER CHANGES IN
COMMUNITY CHARACTERISTICS ASSOCIATED WITH TRAFFIC
BETWEEN ALTERNATIVE C AND ALTERNATIVE B**

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

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

New Hampshire Avenue from 21st Street to M Street during the evening peak-hour. All other declines in community characteristics because of increased traffic would be noticeable.

The environmental justice evaluation did not show any inequitable distributions of adverse effects from declines in traffic levels of service (LOS) on ethnic or economically disadvantaged neighborhoods or groups. As shown in Table 27, nine road segments would experience noticeable declines in community characteristics related to traffic, relative to Alternative B.

None of these road segments would be located in Ward 1, which could be considered ethnically or economically disadvantaged based on the following characteristics from table 16:

- highest population density
- lowest median household income
- second lowest levels of education attainment
- lowest percentage of owner-occupied housing units

Six of the segments would be in Wards 2 or 3, each of which ranked first or second among the four wards in the following categories in table 16:

- highest percentage of white population
- smallest median household size
- lowest population density
- lowest percentage of citizens not completing high school and highest percentage of citizens with a college degree

Three of the segments would be in Ward 4, which could be considered ethnically or economically disadvantaged based on the following characteristics from table 16:

- highest percentage of non-white population
- greatest median household size
- highest percentage of citizens not completing high school and lowest percentage of citizens with a college degree

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

Alternative C would not have substantial economic impacts on any neighboring communities. Locating a new NPS office or U.S. Park Police substation outside of the park would generate new lease income at the local level. However, this income would not have a sizeable effect on business income or economic diversity.

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.

Cumulative Impacts

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 1998).

The HOV restrictions included in Alternative C would be consistent with the goals of the *Draft Vision Document* (Metropolitan Washington Council of Governments 1997) and the Strategic Transportation Plan (District of Columbia Government 1997) that propose reducing congestion problems in the region by reducing dependency on single occupancy vehicles.

Regional economic patterns would not be substantially affected by the scale of the changes proposed in Alternative C.

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 *Draft Vision Document* (Metropolitan Washington Council of Governments 1997) and the Strategic Transportation Plan for the District of Columbia (1997).

There would be no irretrievable or irreversible commitment of community character or visitor experiences with Alternative C. All of the proposed measures could be reversed or changed if future community perceptions concluded that the incremental changes in neighborhood traffic patterns and volume linked to park management were unacceptable.

Conclusions

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. However, four of the nine adversely affected areas, including both segments with considerable effects, would be located on arterial roads in the Foggy Bottom neighborhood, and would have little effect on residential communities.

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. Consequently, there would be no impairment of resources or values associated with community character.

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 commuter route. However, 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

Alternative C would result in the unavoidable adverse effect of reducing the traffic level of service on eleven road segments, two of which are within the park and parkway boundaries. This would be an unavoidable consequence of reducing commuter traffic through the park, a major goal of the alternative. Community characteristics associated with traffic also would be degraded along the nine road segments outside of the park that experienced reduced traffic levels of service.

ENVIRONMENTAL IMPACTS OF ALTERNATIVE D: MID-WEEKDAY RECREATION ENHANCEMENT

IMPACTS ON AIR QUALITY

Analysis

Table 18 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.

As discussed in the transportation section, traffic patterns and numbers during rush-hour periods would be similar to those occurring with Alternative B. Therefore, effects on air quality during the critical morning and evening rush-hour periods would be negligible compared to Alternative B. During the mid-day closure period, air emissions would be lower along the closed segments and higher in areas that accommodated the diverted traffic, compared to Alternative B. This redistribution of the same volume of traffic would have negligible effects on the regional air quality.

Alternative D would include some construction in the park that would not occur with Alternative B. This would include preserving historic structures, expanding the 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.

There would not be any irretrievable or irreversible commitment of air quality resources with this alternative.

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 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 commuters 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 compared to Alternative B. It would not result in the exceedence of the 1-hour or 8-hour NAAQS for carbon monoxide. In addition, it would not cause any impairment of resources or values associated with air quality.

There would be no major adverse impacts on resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of 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. Consequently, there would be no 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 volumes on park roads for Alternative D would be similar to those of Alternative B whenever Beach Drive was open to motorized vehicles. When closures were implemented during the middle of each workday, traffic would be eliminated on the closed portions of Beach Drive, would be reduced by about 25 percent on Beach Drive between Joyce Road and the north end of the parkway, and would be reduced by about 10 percent on the parkway. These decreases in traffic would result in slight reductions of the pollutant loadings (sediments, oils and grease, and metals from the road surface) washed into Rock Creek and its tributaries during and after storm events. The reduced loadings would produce negligible to measurable, beneficial, long-term effects on water quality.

There would be no irretrievable or irreversible commitment of resources with this alternative. All actions could be replaced or reversed.

Aside from roadway runoff, Alternative D would have the same effects as Alternative A to 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 to 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 to 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 to protected and rare species. 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 to native wildlife. This would include identical cumulative impacts and conclusions.

Midday closures of segments of Beach Drive during workdays, 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. 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 would 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 to 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 to 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 Traditional Character and Experiences

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. Rush-hour traffic volumes for Alternative D would be higher than those occurring under either Alternative A or Alternative C. 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 touring 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.

Auto touring 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. If current patterns continued, more than two-thirds of weekday visits would be nonrecreational commuter cyclists. The remainder would be recreational visitors such as picnickers, joggers, hikers, in-line skaters, and birders. Both of these groups would exceed the number of workday visitors that would occur under Alternatives A or B, but would be smaller than those under Alternative C. Weekday use would be expected to be about 30 percent of weekend use.

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. 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 to the U.S. Park Police 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. Typically, there are only three officers on any shift, and two of them would have to be dedicated to barrier placement twice each weekday. The commitment of officers to barrier placement would limit their availability for other activities, such as patrolling other areas of the park. This would be a minor, adverse effect on U.S. Park Police resources.

The installation of automated barriers would reduce labor commitments by the U.S. Park Police. 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, since 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.

Alternative D traffic management measures would result in rush-hour traffic levels on Beach Drive and the Rock Creek and Potomac Parkway that would be similar to those occurring in Alternative B. Therefore, there would be negligible differences in the levels of service (LOSs) occurring under Alternative D and Alternative B.

With Alternative D, effects on traditional park character and visitor experience that are not related to traffic would be identical to those described for Alternative A. These would include improved opportunities at Peirce Mill Barn, the Lodge House, and the nature center and planetarium.

Analysis of Effects on Safety along Roadways

Traffic management measures associated with Alternative D would include

- enhanced enforcement

- use of traffic-calming measures, such as speed humps, 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 closure of segments of Beach Drive would have negligible to minor effects on traffic safety. These stretches of Beach Drive were the site of 57 accidents between 1993 and 1995 (Robert Peccia & Associates 1997), for an average of about 20 accidents per year. The same report indicates that just under half of all accidents in the park and parkway occur between 9:00 A.M. and 4:00 P.M. The prevention of about 10 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 (negligible to minor effect).

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 Devices. The use of traffic-calming techniques to reduce speeds and enhance safety was described in the analysis of Alternative A. The use of traffic-calming devices in Alternative D would have a moderate to 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 in studies reviewed by the Federal Highway Administration (1998) and National Highway Traffic Safety Administration (1999), they would have moderate beneficial effects by substantially altering both the ratio of accidents to the number of visitors and the ratio of injury to non-injury accidents. A major beneficial effect would occur if they reduced fatalities by a similar amount. 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, moderate to major, beneficial effect in reducing the number and severity of motor-vehicle-only accidents. The reduced speeds that would result from Alternative D 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 the number of visitors, the ratio of injury to non-injury accidents, and the frequency of fatal 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, moderate to major, beneficial effect in reducing the number and severity of collisions between automobiles and pedestrians or cyclists 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 fewer than 10 per year throughout the park and parkway), these effects may not be measurable, based on year-to-year fluctuation in the number of accidents.

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 nonmotorized recreationists using Beach Drive that the road was about to become a commuter highway. However, this approach would require a commitment of time and would limit the availability of park staff for other activities.

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. Some of the 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.

Commitment of Resources

There would be no irretrievable or irreversible commitment of resources with Alternative D. Any management actions that altered traditional park character and visitor experience could be reversed.

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 bicycle trails.

Conclusions

The traditional character of the park would be maintained under Alternative D. There would be moderate to 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, but would improve nonmotorized recreationists' esthetic enjoyment and would provide a more relaxing experience for pedestrians and cyclists. It would also maintain the traditional activity of driving the length of the park during commuting periods, evenings, and nights. Improvements to visitor and administration/operations facilities would enhance educational and interpretive experiences and options. There would be no impairment of resources or values associated with traditional park character and visitor experience.

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 Washington, D.C. 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. Most of the traffic

volume changes in the park and nearby roads that were summarized in table 19 and table 22 would result from Alternative A’s high-occupancy vehicle (HOV) requirements on Beach Drive during rush-hour periods. As explained previously, Alternative D was designed to conform with the mayor’s request to continue current rush-hour traffic patterns. As a result, it does not include HOV requirements and, therefore, would not produce the traffic shifts that would occur with Alternative A.

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 19 and table 22. 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 28 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 28: 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 Road to Broad Branch Road	970 vehicles	970 vehicles
Beach Drive – Broad Branch Road 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 29 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 29: TRAFFIC IMPACT SUMMARY FOR ALTERNATIVE D IN THE YEAR 2020

Alternate Route	Maximum Non-Peak Hourly Traffic Increase	Estimated Traffic Impact
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 minor 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 minor 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 minor increase in traffic.
Piney Branch	250 vehicles	Would result in a minor increase in traffic.

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 29 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 (LOS) compared to Alternative B, as defined in the “Methodology” section for

“Impacts on Regional and Local Transportation.” Little if any of rerouted traffic would use local neighborhood streets.

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.

As discussed in the “Impacts on Traditional Park Character and Visitor Experience” section, Alternative D would require increased U.S. Park Police resources to implement the road closures. The road closures also would require some modifications to maintenance and law enforcement practices in the northern portion of the park.

Alternative D would include traffic-calming measures such as speed humps, 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.

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.

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 1998). 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.

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.

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.

The availability of this corridor would likely encourage some people to use bicycles and other nonmotorized travel modes, which would reduce motor vehicle travel on other park roads and on other routes in the area. Problems would be anticipated from some bicyclists and skaters who would run stop signs, travel at excessive speeds, and refuse to yield to pedestrians. There would be no impairment of resources or values associated with regional and local transportation.

IMPACTS ON COMMUNITY CHARACTER

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 of rush hours. Therefore, the impacts of Alternative D on community character would be identical to those described for Alternative B.

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. However, 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 Irretrievable 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

Alternative D would result in steadily increasing traffic volumes on park roads during rush hours, with deteriorating levels of service on Beach Drive and the Rock Creek and Potomac Parkway. Conflicts and safety problems among nonmotorized travelers and automobile users during rush hours would likely increase on park roads. Visitors' esthetic and recreational enjoyment of the park also would decline during these periods because of high traffic volumes.

