Environmental Assessment
Reconstruct Washington State Route 410

Mather Memorial Parkway

MOUNT RAINER
National Park • Washington
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INTRODUCTION

On a visit to Mount Rainier National Park in 1928, Stephen T. Mather, the first director of the National Park Service, inspected the new state highway that followed the White River toward Chinook Pass, connecting the Yakima Valley to the cities on Puget Sound. At the time, Mather suggested calling the highway the "Cascade Parkway" and commented that the natural beauty along it be preserved. Later, he added details to his suggestion, saying that the timber and scenery should be saved along a 75-mile section of the road from a point east of Enumclaw to a point west of Naches, Washington.

In January 1929, Mather left Washington, D.C., enroute to the Pacific Northwest to promote a campaign for saving the trees along the road. On the way he suffered a severe stroke that ultimately caused his death a year later.

In 1931, the Secretaries of Interior and Agriculture designated a 75-mile section of what is now State Route 410 (SR 410) as the "Mather Memorial Parkway" in honor of Mather.\(^1\) This designation included the entire length of the road within Mount Rainier National Park. It also included the length of the road on either side of the park within what was then designated the Rainier National Forest (today the Mount Baker-Snoqualmie and Wenatchee national forests [see location map, p. 2]).

Since the road was already built at the time of the parkway designation, the classification provided no design standard for the roadway. Instead, the designation provided that "...utilization [of timber, forage, water power and other economic resources] shall not be permitted to impair the scenic value of the area, nor its value for public campgrounds, municipal or health camps, sanitaria, club houses, hotels, summer homes, or public utilities requisite for the comfort and convenience of the people using the area for recreational purposes" (U.S.D.A. Land Classification Order 1931). Because the parkway traverses Mount Rainier National Park, its presence must also conform to the purposes for which the park was established, namely, the protection and public enjoyment of the greatest single-peak glacial system in the continental U.S. and its surrounding forests and subalpine meadows.

\(^1\)The parkway has since been scaled back to approximately 53 miles and includes that portion of SR 410 within the Mount Baker-Snoqualmie National Forest, Mount Rainier National Park, and Wenatchee National Forest.
PURPOSE AND NEED FOR ACTION

GENERALIZED ROAD PROBLEMS

The National Park Service (NPS), in cooperation with the Federal Highway Administration (FHWA), proposes to reconstruct the 11.6 miles of SR 410 within the boundary of Mount Rainier National Park. The work is necessary to correct structural and design deficiencies in the existing road. These deficiencies include drainage problems, surface slumps, soft spots, pavement warping and cracking, narrow shoulders, deteriorating and ineffective guardrail, few paved turnouts, and overly-steep, unprotected side slopes adjacent to the roadway.

Beginning at the north entrance of the park, the road generally follows the valley floor through a stand of old-growth conifers. In this area, the road has a favorable alignment and a posted speed limit of 50 mph. However, the driving surface is rough and too narrow for the volume of traffic using it. This portion of the road is in need of rehabilitation and spot safety improvements.

As the road begins ascending Cayuse Pass, the alignment is still favorable and the speed limit remains 50 mph, but the road becomes more of a challenge for motorists. Extended tangents combined with curves in mountainous terrain pose a safety hazard. In this area the road surface is rough and narrow and needs to be replaced. Additional width is also needed to safely accommodate the current (as well as anticipated future) traffic volume and vehicle mix.

Between Cayuse and Chinook Passes, the road provides even greater challenges to motorists because it climbs a steep grade through a series of switchbacks (photo 1). This section of the road was constructed with stone masonry retaining walls that are in excellent to poor condition, with some walls no longer considered safe. The existing road varies in width from 24 to 26 feet and has minimal ditches. The irregular and narrow alignment in this area poses additional hazards for motorists.

The existing road was originally constructed without the benefit of a geometric alignment. This was done intentionally to achieve a better fit of the road to the local topography. However, current advances in design, survey tools, and construction equipment make it possible to convert the original irregular road layout to a precision geometric alignment with little affect on existing road character. This change would help improve the driveability of the road and facilitate construction efforts.

SPECIFIC ROAD PROBLEMS

In addition to the generalized problems already mentioned, specific problems exist at the following locations: the slide area at milepost 64.43; the Sunrise Road intersection; the SR 123 intersection at Cayuse Pass; the stone masonry retaining walls between Cayuse and Chinook Passes; and the Tipsoo Lake area near Chinook Pass (see project map, p. 6). Each of these problem areas is described below:

Slide Area (Milepost 64.43)

Approximately 1.4 miles south of Deadwood Creek bridge, the road crosses a large natural slide area (photo 2). This unstable area extends several hundred feet above and below the road. Despite the relatively small road failures that have occurred at this location during the past several years, there appears to be little danger of losing this section of the road due to a catastrophic slope failure. The underlying instability, however, has caused numerous
Photo 1. Series of switchbacks between Cayuse and Chinook Passes.

Photo 2. Slide area (milepost 64.43), approximately 1.4 miles south of Deadwood Creek bridge.
pavement cracks, drainage problems, and an uneven vertical alignment. Although the magnitude of the problem is beyond economic feasibility to fully correct, there are some interim measures that can be used to help reduce the potential for future slides. Some of the methods to be investigated include improving road drainage, installing horizontal wells to dewater the slope, and stabilizing barren slopes with vegetation.

Sunrise Road Intersection

Because of its poor design, this intersection causes recurring confusion for park visitors (photo 3). When approaching SR 410 from the Sunrise Road, motorists cannot see the actual intersection until they have made a sharp right turn contiguous to the intersection. Rangers report numerous rolling stops and near-accidents at this location each year. Additionally, when making a right turn from the Sunrise Road southbound onto SR 410, the turning radius is too tight, forcing vehicles into the opposing traffic lane. For vehicles northbound on SR 410 making a left turn onto the Sunrise Road, the potential for rear-end collisions is great.

State Route 123 Intersection at Cayuse Pass

This Y-intersection presents the visitor with a wide expanse of asphalt, providing minimal delineation to guide travelers through this somewhat confusing area (photo 4). People traveling east on SR 410 are often unsure about the direction they should follow and many turn onto SR 123 by mistake. Motorists often stop in the middle of the intersection to get their bearings or park on the excess pavement which can obscure the vision of other drivers. Furthermore, the super-elevation of the curve at this location causes recurring problems for motorists. Vehicles trying to stop or turn at the intersection when the road is snow-covered or icy often lose control and slide into the opposing traffic lane.

Photo 3. Sunrise Road intersection.
Stone Masonry Retaining Walls

Between Cayuse and Chinook Passes there are seven stone masonry retaining walls\(^2\) that range in height from 6-28 feet (photo 5). The upper parts of the walls have been damaged and repaired over the years, and the mortar from these repairs is deteriorating. Portions of the stone masonry guardwalls have also been damaged extensively and are too deteriorated in many locations to adequately protect motorists.

Based on geotechnical investigations conducted in 1995 and 1996, the structural integrity of each wall has been determined and varies from excellent to poor. Of the seven existing walls, three are proposed for replacement due to their poor condition. With repairs, the remaining four walls are expected to last an additional 50 years. Needed structural repairs include replacing the exterior grout; pressure grouting behind the walls; and reinforcing the walls in localized areas. Below the damaged guardwall sections the stone and mortar visually appear to be in good condition.

Tipsoo Lake Area

The Tipsoo Lake area receives a large amount of visitor use because of its location proximate to SR 410. It is the first scenic spot along the roadway that has a significant pullout/parking area after entering the park from the east (via Wenatchee National Forest). Currently no barrier exists east of the lake between the road shoulder and meadows to prevent runoff (water and gravel) from entering the lake below. Furthermore, roadside parking and lake access is poorly defined in this area (photo 6). As part of this project, the National Park Service would like to reduce the potential for runoff flowing into the lake and improve roadside parking and trailhead access along SR 410.

\(^2\) Retaining walls lie below grade and support the road prism; guardwalls (parapet walls) lie above grade and act as a barrier to vehicles.
Photo 5. Retaining wall located between Cayuse and Chinook Passes.

Photo 6. Roadside parking, Tipsoo Lake area.
PAST PUBLIC INVOLVEMENT

Interagency planning efforts for the reconstruction of SR 410 began in the mid-1980s. A draft environmental assessment was prepared by the National Park Service in consultation with the Federal Highway Administration, Washington State Department of Transportation (WSDOT), and the U.S. Forest Service (USFS) and released for public review in July 1990. Two meetings were held locally to solicit public comments; one in the community of Naches on August 1, and another in Enumclaw on August 2, 1990. The 30-day comment period ended on August 17, 1990. During this period 142 responses were received from individuals; nine from conservation organizations; one from the U.S. Forest Service; and one from a forest management group (Appendix A). The majority of the comments involved concerns about the number of trees that would be eliminated, the proposed width of the road, and resulting impacts on the park's natural resources and the road corridor’s visual character. Onsite project reviews were also held with representatives from several local and national conservation organizations including the Mount Rainier National Park Associates, National Parks and Conservation Association, and the Sierra Club.

More recently, several interest groups have been formed by local business representatives and private citizens. These groups were formed primarily in response to concerns about SR 410 construction activities occurring within the Mount Baker-Snoqualmie National Forest (north of the park). Even though that work is now completed, the proposed project within the park continues to evoke their attention and concern. The issues attracting the most interest involve impacts to the natural and scenic resources of the park, as well as impacts on local and visitor traffic and area businesses.

Several meetings, including one organized by Congresswoman Jennifer Dunn's office in the fall of 1996, have been held locally with representatives of these interest groups to identify their concerns and explore options to mitigate perceived impacts. A draft road closure study was also prepared by the Federal Highway Administration and National Park Service in late 1996 and distributed to these groups to explain the issues related to various traffic management options. As a result of these discussions, two local citizens have been appointed as ad hoc advisors to the Mather Memorial Parkway Steering Committee, and another two have been appointed as ad hoc advisors to the design team.

ISSUES AND IMPACT TOPICS

In addition to analyzing the environmental, social, and economic impacts associated with each alternative, this environmental assessment evaluates a range of alternatives to help eliminate structural and design deficiencies along SR 410 within Mount Rainier National Park. Evaluation of the project site has identified the following issues of potential concern and provides the basis for the analysis of alternatives: impacts on natural resources such as soils, vegetation, and wildlife (including threatened and endangered species); impacts on cultural resources, including historic and archeological resources; and impacts on park visitors, motorists, and local communities.
INTERRELATIONSHIPS WITH OTHER PROJECTS AND PLANS

Reconstruction of SR 410 within Mount Rainier National Park is consistent with previously approved plans and existing or proposed projects of the National Park Service and other agencies. Some of the more relevant projects and planning efforts are discussed briefly below:

MATHER MEMORIAL PARKWAY STEERING COMMITTEE

An interagency steering committee was formed in 1989 consisting of representatives from the National Park Service, U.S. Forest Service, Federal Highway Administration, and the Washington State Department of Transportation, to provide management coherence along the entire length of the Mather Memorial Parkway. The committee has agreed upon the following goals and objectives for the parkway:

Objectives

Scenic and Recreational Values
1. To enable observation and enjoyment of both near and far views.
2. To provide parking and access to areas of special interest.

Accommodates Travelers
1. To provide opportunity for motorists, bicyclists and pedestrians to travel among communities and to destinations along the route.
2. To provide optimum safety and functional characteristics.

Protects and Conserves Natural and Cultural Resources
1. To minimize intrusion on and potential for damage to natural and cultural resources.
2. To provide a managed transition zone between the roadway and adjacent natural resources.
3. To dispose of waste materials in an environmentally acceptable manner.

Provides Consistency
1. To design roadside architecture to conform with the "rustic Cascadian" design theme.
2. To develop integrated signing and interpretive concepts.
3. To treat roadside vegetation in a consistent manner.
4. To maintain the roadway and roadsides under a well-developed maintenance plan.

Goals

The goals for the Mather Memorial Parkway are to develop and maintain a route that:

- Enhances scenic and recreation values
- Accommodates travelers' needs
- Protects and conserves natural and cultural resources
- Provides an overall consistent design and interpretive theme
- Enhances the objectives of adjacent land management agencies
MATHER MEMORIAL PARKWAY
DEVELOPMENT GUIDELINES

The National Park Service, U.S. Forest Service, Federal Highway Administration, and Washington State Department of Transportation have developed guidelines (NPS 1991a) that prescribe a unified approach to design, detailing, maintenance, and interpretation along the parkway. The design theme established for the parkway is "rustic Cascadian" which is characterized by large-scale design elements of native materials such as stone and timber. This theme will guide modifications of site and architectural detailing and new construction along the parkway.

RECONSTRUCTION OF THE MATHER MEMORIAL PARKWAY NORTH OF MOUNT RAINIER NATIONAL PARK

Washington State Department of Transportation Environmental Checklists for SR 410 Reconstruction East of Chinook Pass

Four separate environmental checklists were prepared between 1984 and 1987 by the Washington State Department of Transportation in compliance with the Washington State Environmental Policy Act for construction activities along SR 410 to the east of Mount Rainier. They are titled as follows: SR 410, Pierce County Line to Morse Creek Bridge (1984); SR 410, Morse Creek Bridge to Union Creek Bridge (1985); SR 410, Union Creek Bridge to Wash Creek Road (1987); and SR 410, Wash Creek Bridge to M.P. 84.5 (1987). All of these checklists resulted in a "determination of nonsignificance" by the WSDOT District Administrator in Yakima, Washington. Approximately 31.3 miles of the roadway to the east of Mount Rainier has since been reconstructed by the Washington State Department of Transportation.

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
ENVIROMENTAL CHECKLISTS FOR SR 410 RECONSTRUCTION EAST OF CHINOOK PASS

The original Deadwood Creek bridge, located at milepost 62.96 of the Mather Memorial Parkway within Mount Rainier National Park, was built in 1935. Due to structural deficiencies in this two-lane concrete arch structure, the bridge was replaced during the summer of 1995. Prior to demolition and replacement, the National Park Service had determined, and the State Historic Preservation Officer had concurred that the bridge was ineligible for the National Register of Historic Places. A complete Historic American Engineering
Record was prepared to document the original bridge and has been submitted to the Library of Congress.

MOUNT RAINIER TRANSPORTATION FEASIBILITY STUDY

A comprehensive evaluation of the park’s transportation needs, including determining the feasibility of implementing a Visitor Transportation System (VTS) as a means of reducing automobile congestion, was completed in 1995. Five alternatives representing distinct approaches to managing private vehicle access in Mount Rainier were evaluated. Three of these approaches relied on alternative transportation modes (requiring either voluntary, mandatory, or a hybrid form of visitor compliance), while the other two approaches (no action, parking restrictions) relied on the continued use of private vehicles as the primary means for visitor access.

The five alternative transportation modes were later screened to a single concept involving a parkwide "hybrid" VTS. Although through traffic would still be permitted along SR 410 and SR 123 under the hybrid concept, day use visitors would be required to leave their vehicles at staging areas and use mass transit, once parking area capacities were met, to reach various destinations in the park.

The transportation feasibility study is being coordinated with the park’s multi-year General Management Plan (GMP) planning process (currently underway) to help define management objectives regarding visitor transportation and use. Environmental issues associated with the VTS have been addressed in a preliminary manner in the transportation study and will be analyzed in greater detail in the GMP and accompanying environmental impact statement.

MOUNT RAINIER TRAFFIC ENGINEERING SAFETY IMPROVEMENT STUDY

This study, completed in 1996, not only provides a detailed evaluation of traffic operations and accidents that have occurred along park roads such as SR 410 between 1989 and 1993, but also offers recommendations to improve the safety and operation of the park’s road system. Long-term recommendations for SR 410 include (1) reconfiguring the intersection and installing a left-turn lane at both the Sunrise Road and SR 123 intersections, and (2) reducing the speed limit to 50 mph between Cayuse Pass and the park’s north entrance, and to 40 mph between the east entrance and SR 123.

COW FLAT ROCK PIT EXPANSION AND REHABILITATION

In May 1996, the U.S. Forest Service prepared an environmental assessment analyzing the environmental consequences associated with a proposal to issue the Federal Highway Administration a special use permit for the Cow Flat rock pit. The pit is located at milepost 56 of the Mather Memorial Parkway in the White River Ranger District of the Mount Baker-Snoqualmie National Forest. The Federal Highway Administration requested use of the pit as a source of approximately 117,000 cubic yards of aggregate material needed for the proposed reconstruction of SR 410 within Mount Rainier National Park. The site will also serve as a staging/storage area to crush and stockpile aggregates, to mix asphalt, for fuel storage, and as a refueling station and staging area for project equipment. Use of the Cow Flat pit is desired because the pit is the only material source on federal land near the project site that meets the Federal Highway Administration’s aggregate quality specifications. Use of the pit will result in significant savings when compared to the use of
commercial sources. The U.S. Forest Service issued a special use permit to the Federal Highway Administration in July 1996. Development of the rock pit would be staged to coincide with the National Park Service's proposed reconstruction of SR 410, described herein, which is scheduled to begin in the fall of 1997. Reclamation of the pit would be partially completed at the end of each project phase and the site fully restored upon project completion.

REMOVAL OF WASHINGTON STATE DEPARTMENT OF TRANSPORTATION MAINTENANCE FACILITY AT CRYSTAL CREEK, MOUNT RAINIER NATIONAL PARK

Based on recent discussions among the National Park Service, Washington State Department of Transportation, and Mount Baker-Snoqualmie National Forest, the WSDOT maintenance facility at Crystal Creek, located at milepost 61.8 of the Mather Memorial Parkway (approximately two miles south of the northern park boundary), would be relocated outside the park. A new facility may be constructed on USFS land in the SnoPark area on the road to Crystal Mountain Resort.

The Washington State Department of Transportation would be responsible for removing the Crystal Creek facility, taking remedial action on contaminated soil beneath the existing building (the location precluded remedial action from being taken several years ago when the underground diesel fuel tanks were removed), and removing sand and gravel stockpiled at pullouts adjacent to the roadway. The National Park Service would be responsible for restoring disturbed lands to a natural condition. This work would be accomplished as part of the mitigation for the proposed project to reconstruct the Mather Memorial Parkway within Mount Rainier National Park.
AFFECTED ENVIRONMENT

LOCATION AND ACCESS

Mount Rainier National Park is located in west-central Washington. Nearby metropolitan areas include Seattle/Tacoma, approximately 50 miles to the north, Olympia, approximately 55 miles to the west, and Yakima, approximately 65 miles to the east (refer to vicinity map, p. 1). The park, established in 1899, comprises 235,612 acres and lies on the western slope of the Cascade Mountain Range.

The west side of the park is accessible via SR 706 to the Nisqually entrance, or SR 165 to the Carbon River or Mowich Lake entrances. State Route 410 affords access to the northeast section of the park and serves as a link between Yakima and the Seattle area. From the south, the park is accessible via SR 123.

STATE ROUTE 410 CORRIDOR

The Mather Memorial Parkway consists of a 53-mile-long section of SR 410. It begins at milepost 47.7 in the Mount Baker-Snoqualmie National Forest, and ends at milepost 100.5 in the Wenatchee National Forest. The parkway provides access to recreational areas in the Mount Baker-Snoqualmie National Forest, Mount Rainier National Park, and the Wenatchee National Forest (see location map, p. 2). It also provides an important cross-state link between the east and west sides of the Cascade Mountain Range.

The 11.6-mile section of SR 410 within Mount Rainier extends from the northeastern corner of the park to Chinook Pass along its eastern boundary (see project map, p. 6). At the northeast edge of the park, the road lies on the floor of the White River Valley. From there to the south, the road gradually ascends the valley and remains beside the river for the first two miles (mileposts 57.6-59.6; elevation, 2,700 ft). Continuing south, the road ascends more steeply up the mountain slopes on the eastern side of the valley to Cayuse Pass at the top of the watershed (milepost 65.5; elevation, 4,694 ft). From Cayuse Pass, the road turns east and makes several switchbacks up very steep slopes to Chinook Pass (milepost 69.2; elevation, 5,432 ft) at the park’s eastern boundary.

State Route 410 serves a dual function as a park access road and an integral part of the state highway system. It accommodates both seasonal through-traffic between coastal and interior destinations, as well as providing access to east-side park facilities such as the Sunrise area, White River campground, and numerous trailheads. Although the road is a designated state highway and is maintained by the Washington State Department of Transportation, it is under the jurisdiction of the National Park Service within Mount Rainier National Park. No commercial traffic is allowed on this portion of the Mather Memorial Parkway. Most accidents occurring along SR 410 within the park are relatively minor and can generally be attributed to motorists driving too fast for the prevailing weather and road conditions. Some serious multiple-fatality accidents have occurred.

The section of SR 410 between Cayuse Pass (the intersection of SR 123) and Chinook Pass is closed for approximately five to six months each year between mid-November and mid-May due to heavy snow accumulations and avalanche danger. The lower section of the road between Cayuse Pass and the park’s northern boundary is closed for approximately four to five months between December and April. Closure dates are highly variable depending upon snowfall and avalanche activity.
State Route 410 is constructed on an excavated bench through most of the park. In some of the steeper areas, the road is on a cut/fill bench with very steep sideslopes that were blasted into rock. In the lower two miles (mileposts 57.6-59.6), sections of the roadway are on raised fill (i.e., the road is elevated above the valley floor); however, these segments are short, isolated, and confined to areas where the roadway crosses the apparent floodplain of the White River.

Within the park, SR 410 has a paved topwidth of 20-24 feet, consisting of two, 10-foot travel lanes with 0-2 foot paved shoulders. Ditch and fill slopes vary from 4:1 to 1:1, with steeper slopes predominating (see figures 1 and 2 below). Ditches and unpaved shoulders are discontinuous and vary in width from 0-8 feet. Both are generally grassy with shoulders normally absent along the steeper cut sections where the road ascends out of the valley. In sections with steep fill slopes, steel or log guardrail is often present along the outside road shoulder (photos 7 and 8).

TRAFFIC PATTERNS AND VOLUMES

Travelers intending to arrive at the park and/or commute through the park from surrounding areas have several east-west routes to choose from. U.S. Highway 90 serves as a primary east-west link from the northern half of the Puget Sound metropolitan area to interior destinations, including connections on U.S. Highway 82 to Yakima. Park visitors and commuters traveling on SR 410 have the choice of connecting to U.S. Highway 12 or SR 706 via SR 123. Highway 12 offers east-west access from interior cities such as Yakima, to southwestern Washington and Portland, Oregon. It also serves the communities of Randle and Packwood located south of Mount Rainier, and offers connections to the communities of Elbe and Ashford on SR 706 via Forest Road 52. State Route 706 provides access to the Nisqually entrance of Mount Rainier, and serves as another east-west route with connections to U.S. Highway 7 west of the park (see vicinity map, p. 1).

Figure 1. Typical section (existing conditions), north park entrance to Sunrise Road intersection (mileposts 57.6-62.2).
Figure 2. Typical section (existing conditions), Deadwood Creek bridge to Cayuse Pass (mileposts 62.96-69.2).

Photo 7. Typical section (existing conditions), north park entrance to Sunrise Road intersection (mileposts 57.6-62.2).
Traffic counts within Mount Rainier National Park are recorded by counters on a 24-hour basis. A recent transportation feasibility study (NPS 1995) found that approximately 50% of the visitors to Mount Rainier on a peak summer day entered through the Nisqually entrance on the southwestern side of the park. The Stevens Canyon entrance in the southern portion of the park and the White River entrance on the northern side both receive 25% of the park's visitation. Approximately 70% of the annual visitation occurs between the months of June and September, with July and August being the peak months.

On the busiest summer weekends, traffic counts and parking occupancy inventories indicate that visitor traffic in Mount Rainier exceeded the capacity of existing parking facilities. The heaviest traffic volumes in the park occur between the hours of 2:00 p.m. and 6:00 p.m. on both weekdays and weekends. The roadways between the Nisqually entrance and Paradise, and SR 410 from the northern park entrance to the junction of SR 410 and SR 123 (Cayuse Pass) typically receive the highest volume of traffic. Although the volume of visitor traffic entering through the park's northern entrance is half that of the Nisqually entrance, overall traffic volume is higher on SR 410 than on any other route in the park. It is estimated that approximately 60% of the traffic on SR 410 is through traffic.

State Route 410 is closed in winter, and access via this route in the fall and spring is weather dependent. The average opening dates for Cayuse Pass and Chinook Pass are May 2 and May 26, respectively. Average closing dates for these same areas are December 6 and November 14. A visitor survey administered at Sunrise during the 1993 summer season found
that over 68 percent of all visitors to Sunrise arrived via SR 410 through the northern park entrance. The remaining visitors surveyed arrived along SR 410 from the east (10.3%), SR 123 from the south (7.9%) and the Stevens Canyon road from Paradise (12.5%) (NPS 1996a).

Seasonal average daily traffic volumes on SR 410 east of Cayuse Pass are lower than traffic volumes on SR 410 north of the SR 123 intersection, however, traffic counters located on SR 410 just west of the SR 410/SR 12 junction near Naches show traffic volumes on the west leg of this route (4,300 vehicles) are almost twice that of the volume on this leg within the park (2,750 vehicles). Approximately 91% (2,500 vehicles) of the traffic on the east leg of SR 410 continues north along SR 410 and exits the park via the northern entrance, while the remaining 9% travel southbound onto SR 123.

**SOCIOECONOMIC ENVIRONMENT**

**State Route 410 Corridor**

Land uses along the 30-mile section of the SR 410 corridor from Enumclaw to the northern boundary of Mount Rainier National Park consist of retail, industrial, timber and recreation lands, the Federated Forest State Park, Mount Baker-Snoqualmie National Forest, private residences and businesses within the community of Greenwater, and privately-owned cabins located on USFS lands. Several camping and recreation areas are also accessed along this corridor. Lands east of Mount Rainier are managed by the Naches District of the Wenatchee National Forest, and consist of numerous campgrounds, rivers, and some lakes that are popular with recreationists year-round. Private residences, seasonal cabins, and commercial establishments are located near or along SR 410 from the eastern boundary of Mount Rainier to the SR 410/SR 12 junction.

**Enumclaw**

The city of Enumclaw is located in King County approximately 34 miles northwest of the park and 25 miles east of Tacoma. Located just outside the designated Puget Sound urban growth boundary, the city has an estimated population of 10,200 persons. Although Enumclaw has been able to retain its small town character, a significant amount of growth has occurred in the southern and western sections of the city, allowing residents in these sections to commute a reasonable distance to the Puget Sound area. Between 1980 and 1990, Enumclaw’s growth rate was approximately 10% higher than the regional average of 15.6%. Employment estimates based on 1990 census data indicate that services (44%) and retail (26%) make up 70% of the workforce, compared to 1990 King County labor force percentages of 32% services and 18% retail. Government, manufacturing, and agriculture also play an important role in Enumclaw’s economy.

State Routes 164, 169, and 410 either intersect or terminate in the Enumclaw business district, allowing the state transportation system to play an integral part in the economic success of the downtown area. Recreational traffic on these routes is high throughout the summer and winter months because of access to Mount Rainier National Park and Crystal Mountain Resort. Recreational traffic on SR 410 occurs in morning and afternoon peaks and is highest on weekends and holidays. Other attractions near Enumclaw include Flaming Geyser State Park, Federated Forest State Park, and the King County Fairgrounds.

**Greenwater**

The unincorporated community of Greenwater is located along SR 410 approximately 20 miles east of Enumclaw and 14 miles northwest of the park’s northern boundary. The population
of Greenwater is sparsely distributed and is estimated to be approximately 200 residents, although the summer seasonal population is estimated to be higher. The Pierce County Comprehensive Plan designates Greenwater as a gateway community, characterized in the plan as having established commercial and other businesses catering to tourists and the local surrounding community, and having immediate access onto state routes or major arterials. Greenwater closely fits this plan designation as approximately all of the 10-12 commercial businesses that currently exist along SR 410 depend on tourism, recreation, and through traffic for their economic viability. In turn, the flow of traffic along SR 410 is dependent upon the maintenance and improvement of the road system.

Crystal Mountain Resort

Crystal Mountain Resort is accessed via a 6.5-mile road intersecting with SR 410 just outside the northern park boundary. The area consists of 4,350 acres leased from the Mount Baker-Snoqualmie National Forest, and contains skiing and lift operations, 177 hotel rooms and condominium units, a small grocery, sport shop, restaurant at the summit of Crystal Mountain, and a small cafe. Lodging and food services are available year-round, and the resort’s clientele includes scheduled conference guests as well as vacationers and one-day visitors. The Alta Crystal Resort, located approximately 8 miles northwest of the ski area, is also accessed by SR 410 and consists of 24 units available year-round.

Other Recreational Uses

Other recreational uses occurring along or accessed from the SR 410 corridor include camping, hiking, hunting, mountain biking, and some fishing. Designated campgrounds in the area include the Dalles campground containing 45 campsites, and the Silver Springs campground with 50 sites. There are also opportunities for primitive camping north of the SR 410 corridor in checkerboard lands managed by Weyerhauser and the U.S. Forest Service. The Silver Creek Guard Station - Visitor Information Center, located just outside the northern boundary of the park, is a small historic cabin located on USFS land that was recently improved to accommodate visitors. The visitor information center is operated by the U.S. Forest Service and the National Park Service, and has informational materials for the public on activities and recreational opportunities in the surrounding area.

Mount Rainier National Park

The northern boundary of Mount Rainier National Park is closed to traffic when Cayuse Pass closes, depending on snow depth. The White River entrance inside the park typically opens in late May. Early season activities include backpacking, climbing above the high camps, and glacier trekking. The White River campground includes 117 campsites and also offers day hiking, picnicking and campfire programs. Sunrise Visitor Center is located 16 miles from the White River entrance and typically opens at the end of June. Recreational opportunities at Sunrise include day hiking, climbing, picnicking, and camping. Concession services consist of a cafeteria and gift shop. There is a proposal for guided climbing services out of the White River area on the Camp Schurman/Emmons Glacier route.

The Tipsoo Lake area, located near Chinook Pass, is a series of three small lakes surrounded by subalpine meadows, that are a popular daytime stop or destination. Facilities consist of rest rooms, a picnic area, and a loop trail around the middle lake. A portion of the Pacific Crest trail is accessed from the Tipsoo Lake area.
Wenatchee National Forest

The Naches Ranger district of the Wenatchee National Forest manages lands east of Mount Rainier along SR 410. There are eighteen developed campgrounds that are accessible from SR 410 between Chinook Pass and the community of Cliffdell. In addition, there is a heavy amount of dispersed primitive camping in the summer and during hunting season in the fall. Other activities include boating, fishing, and swimming at Bumping Lake. Services for seasonal cabins and recreational visitation at Bumping Lake are concentrated at Goose Prairie, and include a marina, boat house, outfitter guides, groceries and some lodging.

Hunting is a popular fall activity in the area surrounding SR 410. The Washington Department of Fish and Game estimates that approximately 8,000 hunters use the area east of the park to the SR 410/U.S. 12 junction from mid-October until mid-November. Winter recreational activities include snowmobiling, cross-country skiing and other snow-play activities. The Wenatchee National Forest reports that 50-80 percent of the summer visitors in the area surrounding SR 410 originate from the Seattle-Tacoma area.

Cliffdell

The community of Cliffdell is a small inholding within the Naches district of the Wenatchee National Forest, approximately 26 miles east of Mount Rainier National Park. There are approximately 50 people in the community, residing in both private homes and cabins on leased USFS land. Year-round residents are employed in Naches, Yakima, or are retired. Services are limited and consist of approximately five establishments from Cliffdell to Naches that offer food, gas, lodging, and recreation-oriented supplies.

Naches

The incorporated community of Naches lies 40 miles east of Mount Rainier National Park, and is located four miles east of the junction of SR 410 and U.S. Highway 12. The Washington Office of Financial Management estimates the 1995 population at 685 persons. Services are limited, consisting mainly of a few produce stands and convenience stores.

Yakima

The city of Yakima is located in Yakima County, approximately 70 miles east of the park via SR 410 or U.S. Hwy 12. The U.S. Census Bureau indicates that the 1990 population of the City of Yakima was 54,831 persons and the population of Yakima County was 188,823 persons. In 1995, the City of Yakima population was estimated at 60,850 persons, and the County was estimated at 204,100 persons.

The agricultural sector is a major component of Yakima and Yakima county's economy. Seasonal and other fluctuations that occur in an agricultural-based economy contribute to high unemployment rates experienced in Yakima County. The 1990 unemployment rate for Yakima County was 10.0%, compared to a state unemployment rate of 5.7% and a national rate of 6.3%. Lower wages as well as a higher unemployment rate in Yakima County also contribute to a high percentage of the population living below the poverty level (20.2%) compared to state (10.9%) and national (13.1%) averages. Other employment sectors such as manufacturing and services continue to counterbalance fluctuations that occur in the agricultural sector. Manufacturing lags behind the state average share, yet it still exerts considerable strength and is a growing sector in Yakima and Yakima County. The services industry responds to population and
tourist trade growth, and has also been experiencing steady growth over the years.

NATURAL RESOURCES

Climate

Mount Rainier lies in a temperate, maritime climate. Typically, winters are cool and wet, while summers are relatively warm and much drier. During winter, storms approaching predominately from the southwest off the Pacific Ocean, deposit tremendous amounts of precipitation on Mount Rainier and the surrounding lowlands. Above elevations of 2,500 feet, the majority of the precipitation falls as snow. Snow depths at Paradise (elevation, 5,400 ft), on the south side of Mount Rainier, generally exceed 20 feet.

Air Quality

Mount Rainier National Park is designated a class I area by the Clean Air Act of 1977. Air quality within the park is generally good; however, high ambient sulfate levels, low pH levels of airborne water droplets, and high ozone levels have been documented in the park. Activities such as campfires and the operation of vehicles and equipment cause temporary minor air quality degradation, but slash burning activities in nearby forests and industrial and automobile emissions from the Puget Sound area are the major sources of air pollution in the park.

Slash burning in Washington is regulated by the state’s Smoke Management Plan, which was developed to improve visibility during the main visitor season. The plan requires that burning be performed under the best meteorological conditions. No burning is allowed within the park.

Topography/Geology/Soils

The park landscape is dominated by Mount Rainier, a rugged ice-covered volcanic peak. Glaciated, U-shaped valleys radiate from the mountain in all directions. Glacial ice covers more than 34 square miles of the park. Much of the rock of Mount Rainier is unconsolidated, soft, and often sandwiched between layers of volcanic ash. Consequently, most steep slopes are very unstable and rockfall is a common occurrence year-round. At lower elevations, soils are composed of poorly sorted glacial till, colluvial deposits, and volcanic tephra. Higher elevations are characterized by very shallow soils interspersed between rock and talus. Soils of the subalpine meadows are generally very erodible, infertile, and shallow.

Within the park, SR 410 lies on the floor of the White River Valley for its most northerly two miles then traverses steep hillsides for the remaining distance to Chinook Pass. Most of the cut slopes along the roadbed are very steep, consist of a mixture of rock and soil, and are sparsely vegetated. Rockfall and avalanches are a recurring problem, which in addition to heavy snowfall, cause the road to be closed during winter months.

Hydrology

Originating from the Emmons, Fryingpan, and Sarvant Glaciers high on Mount Rainier, the White River parallels SR 410 for four miles within the park. It is one of five major river drainages in Mount Rainier. The others are the Puyallup, Carbon, Cowlitz, and Nisqually rivers.

As is typical of glacial streams, the White River carries a high suspended sediment load and periodically transports a large amount of bedload. After leaving the park, the White River flows north, eventually joining the
Puyallup River before flowing into Puget Sound near Tacoma.

Since over half of the park's annual precipitation accumulates in the winter snowpack, snowmelt results in high levels of runoff in early summer. This can cause flooding both within the park and in valleys outside the park boundary.

During autumn, warm winds and rain can melt early fallen snow, causing floods that may wash out trails and bridges and create high water in the valleys downstream from the park. Heavy rains occasionally produce pools beneath glaciers, causing huge mudslides and localized flash floods that carry large amounts of rock and debris.

Rivers carrying large sediment loads such as the White River frequently change channels. Occasionally these channel shifts will damage or wash out roads and trails. This often necessitates bank hardening or major rerouting of roads and trails to correct the problem.

Although the floodplain of the White River has never been mapped within the park, it is likely that the lower two miles of SR 410 is at least partially built on the floodplain. However, the road is sufficiently elevated so that floodwaters rarely, if ever, rise over its surface.

Wetlands

Wetlands are areas transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface, or the land is covered by shallow water (FWS 1979). Ranging in size and variety, they provide valuable functions including flood control, nutrient recharge, water quality enhancement, and habitat for various plants and animals, including rare and sensitive species. Based on field observations and information appearing on National Wetlands Inventory maps (FWS 1987), several wetlands occur along the SR 410 corridor in the vicinity of Tipsoo Lake. These wetlands are classified as palustrine emergent, semipermanently flooded, and palustrine open water, permanently flooded. Forested wetlands also occur along the lower two miles of the road near the northern park boundary. Some of these wetlands were created incidentally by highway construction and receive hydrologic support from culverts and roadside ditches.

Vegetation

Four broad vegetation types are represented within Mount Rainier: (1) lowland forest (elevations 1,500-3,000 ft); (2) intermediate forest (3,000-5,000 ft); (3) subalpine parkland (5,000-7,000 ft); and (4) alpine vegetation (generally above 6,000 ft where the ground is not covered by snow and ice). State Route 410 passes through all but the alpine vegetation type (refer to forest types map, p. 25). A description of each vegetation type follows.

Lowland Forest. This vegetation type occurs at low elevations along the park perimeter. It covers about 30 percent of the park's forested area. It is dominated by thick forests of western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*) and Douglas-fir (*Pseudotsuga menziesii*). Occasionally, stands of grand fir (*Abies grandis*) and noble fir (*Abies procera*) also occur. Common understory shrub
species include vine maple (*Acer circinatum*), Oregon grape (*Berberis* spp.), red huckleberry (*Vaccinium parvifolium*), vanilla leaf (*Achlys triphylla*) and devil’s club (*Oplopanax horridum*). Riparian vegetation is dominated by red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), and bigleaf maple (*Acer macrophyllum*).

Trees in this vegetation type grow quickly and to great dimensions, commonly reaching heights above 250 feet and diameters exceeding 10 feet. Much of this forest type is in old-growth stands that are of particular concern since they contain many rare species dependent upon this habitat. Within the park the lower and most northerly 2.75 miles of SR 410 is within this vegetation type.

**Intermediate Forest.** This vegetation type makes up about 50 percent of the forested area within the park and is characterized by trees of smaller size and less dense stands than the lowland forest type. Dominant tree species include Pacific silver fir (*Abies amabilis*), noble fir, western white pine (*Pinus monticola*), Alaska cedar (*Chamaecyparis nootkatensis*), and Engelmann spruce (*Picea engelmannii*). Understory species include Alaska huckleberry (*Vaccinium alaskaense*), ovalleaf huckleberry (*V. ovalifolium*), dwarf blackberry (*V. caespitosum*), Oregon grape, and salal (*Gaultheria shallon*). Queen cup beadlily (*Clintonia uniflora*), one-sided wintergreen (*Pyrola secunda*), common beargrass (*Xerophyllum tenax*), twinflower (*Linnaea borealis*) and western coolwart (*Tiarella trifoliata*) are prevalent herbs. The middle section of SR 410, between 2.75 miles and 8 miles from the northern park boundary, lies within this vegetation type.

**Subalpine Parkland.** This zone is a mosaic of tree clumps and meadow vegetation. Subalpine meadows are perhaps the most striking feature of this vegetation type in Mount Rainier National Park. The Cascade Range of Washington state supports subalpine meadows that span elevational gradients larger than any other mountain range in North America (Franklin and Dyrness 1973). Dominant tree species include mountain hemlock (*Tsuga mertensiana*), subalpine fir (*Abies lasiocarpa*), Pacific silver fir, Alaska cedar, whitebark pine (*Pinus albicaulis*), and Engelmann spruce. Shrub species commonly exist adjacent to stands of trees and occasionally in the lower elevation avalanche areas. Dominant shrubs along the road corridor include willows (*Salix* spp.), rosy spirea (*Spirea densiflora*), pink mountain heather (*Phyllodoce empetriformis*), white heather (*Cassiope mertensiana*), and huckleberries (*Vaccinium* spp.). Many different herbs are present in the subalpine meadows. Magnificent wildflower displays in these meadows during the summer months have contributed to Mount Rainier’s worldwide reputation for mountain scenery. The upper section of SR 410, between 8 miles from the park’s northern boundary and Chinook Pass, lies within this vegetation type.
Forest Stand Age Classes

The road corridor passes through forest stands representing three different age classes. Table 4 (below) and the Forest Stand Age Class map (page 27), summarize the age class distribution of stands along the SR 410 corridor. In deriving these age classes, the oldest appearing trees in each distinct stand were aged using an increment bore. The resulting figure represents the age of the stand or the number of years since the last stand-replacing event (usually a forest fire, avalanche, or flood).

Table 1. Age Classes of Tree Stands Along State Route 410, Mount Rainier National Park

<table>
<thead>
<tr>
<th>Distance from North Boundary (miles)</th>
<th>Age of Oldest Trees in Stand (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 to 0.92</td>
<td>301 - 400</td>
</tr>
<tr>
<td>0.92 to 2.28</td>
<td>501 - 600</td>
</tr>
<tr>
<td>2.28 to 3.56</td>
<td>101 - 200</td>
</tr>
<tr>
<td>3.56 to 4.01</td>
<td>501 - 600</td>
</tr>
<tr>
<td>4.01 to 4.96</td>
<td>101 - 200</td>
</tr>
<tr>
<td>4.96 to 5.04</td>
<td>unknown</td>
</tr>
<tr>
<td>5.04 to 5.43</td>
<td>501 - 600</td>
</tr>
<tr>
<td>5.43 to 6.66</td>
<td>101 - 200</td>
</tr>
<tr>
<td>6.66 to 6.94</td>
<td>unknown</td>
</tr>
<tr>
<td>6.94 to 7.89</td>
<td>501 - 600</td>
</tr>
<tr>
<td>7.89 to 9.27</td>
<td>unknown</td>
</tr>
<tr>
<td>9.27 to 9.78</td>
<td>501 - 600</td>
</tr>
<tr>
<td>9.78 to Chinook Pass</td>
<td>unknown</td>
</tr>
</tbody>
</table>

"Forest Stand Age Class" refers to the period between the present and the last major forest disturbance (e.g., fire, avalanche, flood) that resulted in major stand replacement (i.e., the death of the previous stand and the regeneration of the present stand). This is determined by boring dominant trees in the stand with an increment bore and counting annual rings. The dominant trees represent the first wave of stand regeneration after disturbance.
Threatened and Endangered Plant Species

Based on information provided by the U.S. Fish and Wildlife Service (Appendix B), there are no federally listed or proposed plant species likely to occur within the project area. However, the indigenous herb *Castilleja cryptantha* has been identified as a species of concern and may occur in the vicinity.

The Washington Natural Heritage Program maintains an official list of state endangered, threatened, and sensitive plant species. A recent search of this database in June 1996 indicated no records for rare plants in the immediate vicinity of the proposed project. However Mount Rainier lousewort (*Pediculans rainierensis*), a state sensitive plant, is reported to occur in the general area in moist, subalpine meadows and open coniferous forests, from 4,000-7,000 feet. To date, a comprehensive survey of rare and sensitive plants has not been conducted in the project area.

Non-native Plant Species

A variety of non-native plant species are found in the park. These species normally spread easily and are often the first plants to revegetate disturbed areas. In Mount Rainier non-native plants are generally concentrated around developments and disturbed sites such as road shoulders and cuts. It is NPS policy to eliminate all non-native plant species within the park and to use only native plant materials for revegetating disturbed areas.

Wildlife

Many wildlife species inhabit Mount Rainier seasonally and throughout the year. Mammals found in the park include black-tailed deer (*Odocoileus hemionus columbianus*), elk (*Cervus elaphus*), mountain goat (*Oreamnos americanus*), black bear (*Ursus americanus*), mountain lion (*Felis concolor*), hoary marmot (*Marmota caligata*), Douglas squirrel (*Tamiasciurus douglasi*), raccoon (*Procyon lotor*), beaver (*Castor canadensis*), striped skunk (*Mephitis mephitis*), marten (*Martes americana*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), and Townsend chipmunk (*Eutamias townsendi*).

Among the park’s year-round resident birds are white-tailed ptarmigan (*Lagopus leucurus*), blue grouse (*Dendragapus obscurus*), great horned owl (*Bubo virginianus*), northern spotted owl (*Strix occidentalis caurina*), northern pygmy owl (*Glaucidium gnoma*), red-shafted flicker (*Colaptes auratus*), pileated woodpecker (*Dryocopus pileatus*), Clark’s nutcracker (*Nucifraga columbiana*), gray jay (*Perisoreus canadensis*), and Steller’s jay (*Cyanocitta stelleri*). Many other bird species migrate through the park or are seasonal residents.

Native fish species include cutthroat trout (*Oncorhynchus clarki*), bull trout (*Salvelinus confluentus*), and whitefish (*Coregonus clupeaformis*). Rainbow trout (*O. mykiss*), brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and kokanee salmon (*O. nerka* have been introduced in the past.

Threatened and Endangered Wildlife

The U.S. Fish and Wildlife Service has identified four listed wildlife species and one candidate fish species as potentially occurring within the project vicinity (Appendix B). Listed avian species include the marbled murrelet (*Brachyramphus marmoratus marmoratus*) and northern spotted owl, both of which are classified as threatened. In addition, the National Park Service reports that the bald eagle (*Haliaeetus leucocephalus*), listed as threatened, and the American peregrine falcon (*Falco peregrinus anatum*), listed as endangered, may also occur within the project vicinity. Listed mammals include the gray wolf.
(Canis lupus) and grizzly bear (Ursos arctos), as well as the bull trout, a candidate fish species. No species proposed for listing or critical habitat (designated or proposed) has been identified within the project area although critical habitat for the northern spotted owl occurs nearby in a portion of T17N R10E S04 on USFS land.

Northern spotted owls are known to occur along the SR 410 corridor throughout the year. Although suitable nesting habitat exists for the marbled murrelet, surveys conducted during the spring and summer of 1994 and 1995 did not reveal the presence of murrelets within the project area. Bald eagles and peregrine falcons are seasonal migrants and neither species is known to roost or nest along the SR 410 corridor. Bull trout are known to occur in park waters. Recent surveys conducted in the fall of 1993 confirm the presence of bull trout in the White River and one of its tributaries (Fryingpan Creek), as well as spawning activity in the White River.

Other federally listed species that may occur within the project area are the gray wolf and grizzly bear. The gray wolf is listed by the Fish and Wildlife Service as endangered in the state of Washington. Although suitable wolf habitat exists within Mount Rainier, there have been no confirmed records of wolves inhabiting the park within the last 50 years. In the past, the gray wolf was a component of the Cascade Mountains and historically was documented in the park, including the White River drainage, by early park rangers and climbers. Sporadic sightings of possible wolves have occurred over the years by the public and park employees, but none have been confirmed by biologists.

The grizzly bear is listed by the Fish and Wildlife Service as a threatened species in the conterminous U.S. (lower 48 states). During June 1993, animal tracks were confirmed as those made by two grizzlies west of the park on private Champion International Timber Company land (Braaten, pers. comm.). Mount Rainier National Park contains areas large enough to provide suitable grizzly bear spring and fall foraging habitat, but the amount of secluded habitat away from human influence is limited. There have been no confirmed tracks or sightings of bears with physical identifying characteristics of grizzlies (e.g., humpback, dished face, and long claws) since the park's establishment in 1899.

Wildlife species of concern that have been identified by the Fish and Wildlife Service as potentially occurring within the project area include the California wolverine (Gulo gulo luteus), Cascades frog (Rana cascadae), long-eared myotis (Myotis evotis), long-legged myotis (Myotis volans), North American lynx (Felis lynx canadensis), northern goshawk (Accipiter gentilis), olive-sided flycatcher (Contopus borealis), Pacific fisher (Martes pennanti pacifica), Pacific lamprey (Lampetra tridentata), Pacific western big-eared bat (Corynorhinus townsendii townsendii), river lamprey (Lampetra ayresi), and tailed frog (Ascaphus truei). Although suitable habitat exists within Mount Rainier, confirmed sightings of the above species are rare. However, the Cascades frog and tailed frog are numerous in the park, distributed widely and are found in the project vicinity.

CULTURAL RESOURCES

Archeological Resources

Few systematic archeological surveys have been conducted in Mount Rainier National Park. The dense vegetation, extensive glaciation and glacial outwash, and the deposition of volcanic pumice and ash, have produced conditions that are not conducive to the ready identification or preservation of archeological remains. For that reason, surveys have concentrated on areas possessing a good probability for sites (e.g., natural features such
as caves and rock shelters), or areas scheduled to be impacted by development activities. Previous archaeological surveys in the northeast quadrant of the park have identified a number of prehistoric sites: the Fryingpan rock shelter, located within the Fryingpan Creek drainage (Daugherty n.d.; Rice 1965); the Frozen Lake lithic scatter, probably a kill or butchering site (Bergland 1986); and the Berkeley Park rock shelters, a pair of base camps with prehistoric and historic components (Bergland 1988). Test excavations have been conducted of the Fryingpan and Berkeley Park rock shelters.

An archaeological survey conducted in 1989 of the SR 410 road corridor between milepost 57.7 (north park entrance) and milepost 62.2 (Sunrise Road intersection) identified a possible prehistoric site consisting of two lithic artifacts (Forrest 1989). Recommendations were made at the time to monitor construction along the west side of the highway between mileposts 58.5 and 59.0, the area encompassing the presumed site location. However, no lithic artifacts were identified in the area as a result of a recent (June 1996) resurvey by the park archeologist. Large amounts of dark, angular volcanic stone were present which could easily be mistaken for stone tool manufacturing debris. These materials weather naturally and fall off a rock outcrop on the east side of the road; they are then transported into the site area by snow/road clearing operations. These observations, along with the depositional environment of the site (on the annual floodplain of the White River), argue against the presence of prehistoric archeological resources. Therefore, monitoring of construction at this location is no longer recommended.

The 1989 survey also documented two additional sites (both low density lithic scatters) in the immediate vicinity of Tipsoo Lake south of Chinook Pass. One site (45-PI-406) was first recorded the previous year. A recent resurvey of the site as part of a larger archeological reconnaissance of the park resulted in the identification of additional lithic artifacts and an extension of the site boundaries (Sullivan 1996; Burtchard and Hamilton 1996). In addition to thinning flakes from a variety of chert and chalcedony source materials, two bifaces were identified.

Test excavations of 45-PI-406 were conducted in July/August 1996. Testing confirmed the site's potential to yield significant archeological information, and the site was recommended potentially eligible for the National Register of Historic Places (Sullivan, pers. comm., 12/10/96). The portion of the site nearest the parking lot has lost integrity as a consequence of erosion, foot traffic, revegetation and other construction-related disturbances. This portion of the site (which could face further disturbance as a result of proposed improvements at the picnic and parking areas) does not substantially contribute to the overall significance of the site. However, archeological monitoring is recommended during proposed construction to ensure that other more intact portions of the site are avoided. A report of the test results and consultation with the Washington State Office of Archaeology and Historic Preservation (State Historic Preservation Office) regarding the site's National Register eligibility are underway.

Another prehistoric site (45-PI-426) was also identified in 1989 (rerecorded in 1995) a short distance south of 45-PI-406 and the Tipsoo Lake picnic area. It is also a low density lithic scatter. Flakes are from one source material suggesting a single lithic reduction event. Although the National Register eligibility of the site is undetermined, testing is not recommended at this time because the site lies outside the area of potential effects and would not be disturbed by the proposed project.

Also surveyed as part of the 1995 field investigations was a small area (about 1 acre) on the south side of SR 123 near the
intersection with SR 410. The area was originally proposed for a pullout and parking area. No archeological sites were identified in this area, although a naturally occurring source of chert nodules was identified nearby that could have been exploited prehistorically for tool manufacture. Subsequent to the survey, the paved Y-intersection of SR 123 and SR 410 was selected for temporary parking. There is little likelihood that archeological resources are present at the intersection as a consequence of previous construction disturbance (Sullivan 1996).

The area comprising the northeastern sector of the park has been claimed and/or utilized on a seasonal basis by several Native American tribes, for example, the Puyallup, Muckleshoot and Yakama. Little specific historic or ethnographic information exists regarding Native American use of the Chinook and Cayuse Pass areas. However, Sunrise Park (formerly known as Yakima Park) on the northeast side of the mountain was a popular destination for the Yakama to hunt game and procure plants and berries. A 1914 map shows a trail leading northwest from Chinook Pass to Yakima Park; the trail may have served as a travel route for the Yakama and other groups on late summer hunting and gathering forays. Sites identified in the Chinook and Cayuse Pass areas may be temporary camps associated with these seasonal visits, and the abundant plant and animal life in the vicinity of the passes would also have provided a readily exploitable resource base (Sullivan 1996).

An NPS archeological survey was completed in September, 1996 of the SR 410 corridor between Cayuse Pass north to the intersection with the White River/Sunrise Road. Although no significant archeological resources were identified, the area north from Cayuse Pass to where the historic trail from Chinook Pass to Yakima Park purportedly intersects the roadway (about 1.25 miles) can be considered archeologically sensitive (Sullivan, pers. comm., 6/19/96).

Historic Resources

Historic resources within the park are associated primarily with the early exploration of Mount Rainier and attempts to reach its summit, early visitor resort and tourist accommodations, and structures/roads associated with the early administration of the national park following its establishment by the federal government in 1899. The Oscar Brown cabin at the Nisqually entrance (constructed in 1908 and named for one of the first permanent park rangers) is the oldest remaining government-constructed building in the park. The present project area of SR 410 falls within additional lands acquired by the park in 1931, that extended the park's boundary eastward to the crest of the Cascades.

Many of the park buildings are superior examples of the rustic architectural style that evolved primarily between the late 1910s and the early 1940s. The design style was distinguished by the use of native materials (e.g. rocks and log timbers) and the careful siting of structures to blend and harmonize with the natural environment.

The park's historic buildings and structures were inventoried in 1982 by a NPS team of historians and architects. Results of the survey were incorporated into a National Register of Historic Places multiple property nomination, "Historic Resources of Mount Rainier National Park" (NPS 1990). The nomination identified 118 park buildings and structures as eligible for listing on the National Register; these were subsequently listed in 1991 either individually or as contributing properties within six historic districts (Nisqually Entrance, Longmire, Paradise, Sunrise, Camp Muir and White River Entrance) and three thematic groupings (fire lookouts, patrol cabins/trail shelters, and
bridges). Miscellaneous rustic buildings and structures listed on the National Register include several comfort stations (including the Tipsoo Lake comfort station, O-060) and the Chinook Pass entrance arch (TL-301). Eight of the park’s National Register properties were previously recognized for exceptional significance by their designation as National Historic Landmarks: the administration building, community building and service station at Longmire; the Paradise Inn; and the north and south blockhouses, stockade and visitor center at Sunrise.

A National Historic Landmark (NHL) historic district has recently been designated at Mount Rainier National Park encompassing essentially all the park’s roads, historic developed areas, and historic backcountry structures. The six previously designated National Register districts were incorporated into the NHL district. The park’s road system and developed areas comprise the NHL district’s contiguous core, the result of comprehensive master planning beginning in the late 1920s. Under the direction of NPS landscape architect Thomas Vint, Mount Rainier’s master plan was the first and most complete to be developed by the NPS landscape division. The plan represented an overarching design philosophy that restricted development to a narrow corridor to reduce resource impacts, and integrated facilities and circulation/utility systems in a unified fashion. The resources contributing to the district retain a high degree of integrity, and Mount Rainier is recognized as an exemplary representation of early NPS planning and development (NPS 1996b).

The nomination for the NHL district divided contributing resources into seven categories: spatial organization, circulation, topography, vegetation, structures, buildings, and sites. Spatial organization refers to the composition and sequence of outdoor spaces within the district. Circulation refers to the means and patterns of movement through the district.

Topography refers to the ways in which landscape planning responds to the topographic features of the site, as well as to modifications of that topography. Vegetation refers both to the response to existing vegetation, as well as the management of vegetation through pruning, removal, or addition of trees and shrubs. Structures include all the contributing structures in the district, including roads, trails, retaining walls, etc. Buildings are defined as fully enclosed structures designed to shelter human activities. And finally, sites are defined as discrete areas designed for a specific use, such as picnic areas.

Using these categories, the 11.6-mile segment of SR 410 through the northeastern portion of the park is recognized as a structure contributing to the significance of the NHL district. Constructed between 1926 and 1931, it represents a portion of the Mather Memorial Parkway, designated upon completion by the Secretaries of Agriculture and Interior. Dedication ceremonies that included the placement of a bronze commemorative plaque were held at Tipsoo Lake in July, 1932. The road continues to exhibit many of its original design characteristics as a rustic and scenic byway, allowing visitors the opportunity to view the relatively unaltered natural scenery along the corridor. However, the pleasure-drive qualities of the road have been compromised in part by its inclusion within the larger intra-state highway system. This has resulted in increased traffic volumes and speeds by non-recreational users traveling across this portion of the park.

Along the road corridor, the NHL district extends 30 feet from the centerline on either side and includes all historic features associated with road construction. Associated structures previously listed on the National Register include the Chinook Pass entrance arch and the Tipsoo Lake comfort station. The rustic arch, designed by the NPS Branch of Plans and Designs in 1933, was constructed by the
Civilian Conservation Corps in 1936. Constructed of heavy log structural members and railings supported by stone masonry columns, it marks the eastern entry to the park and originally provided a horse trail crossing point across the top of the arch; it presently serves to link a segment of the Pacific Crest National Scenic Trail. The Tipsoo Lake comfort station was constructed by the Civilian Conservation Corps in 1933-34 and is still in use. The one story, log and masonry structure (13 ft x 27 ft) has a gable roof and log rafters. A companion comfort station (no longer in existence) was constructed at the same time at Tipsoo Lake. The cutstone/masonry "Mather Memorial Parkway" sign at the junction of SR 410 and the Sunrise/White River turnoff was constructed in 1941. Although its inscription has been altered, the sign is identified as an object contributing to the significance of the NHL district.

Several extensive cutstone/masonry rock retaining walls and parapet guardwalls are located along SR 410 that contribute to the road's rustic design characteristics. Rock used in construction of the walls (predominantly andesite) was obtained in the immediate vicinity from material excavated for road construction. The walls range in height between 3.6 and 27.2 feet, and average between 3.3 and 5 feet thick. Geotechnical evaluations were recently conducted on the seven walls between Cayuse Pass and Chinook Pass because of observed deterioration (FHWA 1996). The evaluation determined that while the stone and mortar used in construction were of high quality, the masonry construction appeared to be of only average quality. In some locations, voids that were identified between the irregularly-shaped rock surfaces within the interior of the walls were only partially filled by smaller rock chinking and mortar, reducing their structural strength and durability. Recommendations were made to repoint deteriorated mortar joints, grout and repair wall sections where possible, and to replace all parapets and damaged/cracked wall sections that were beyond repair.

The entrance arch on SR 410 at the north entrance to the park has been determined a non-contributing resource. This large log arch spanning the roadway was constructed in the 1960s.

VISITOR USE

Visitation

In 1993, Mount Rainier recorded over 1.7 million visits. Between 1983 and 1993, annual visitation has fluctuated between 1.1 and 1.8 million visits, with an overall increase of 23 percent and an annual average increase of 2.1 percent (NPS 1995). The park is open year-round, but only the Nisqually-Paradise road remains open throughout the winter. WSDOT maintenance crews usually open SR 410 over Chinook Pass on or before the Memorial Day weekend. Snowfall usually forces the road to be closed by November 15.

The Mather Memorial Parkway seasonally adjusted traffic volume in 1991 was 1,750 vehicles per day (average daily traffic) and is projected to be 2,850 vehicles per day in 2001. The parkway is a recreational route and can have as many as 3,074 vehicles per day on peak summer weekends. The Tipsoo Lake area receives heavy visitor use in summer and is a main attraction for those visiting Mount Rainier.

While the majority of park visitors originate from the Seattle area, many of those traveling SR 410 originate from the Yakima area. Recreational opportunities within the park include sightseeing, nature study, picnicking, hiking, camping, mountain climbing, snowshoeing, cross-country skiing, winter snowplay, photography, and fishing. Sightseeing from a vehicle is a very common
and popular activity. The road system in the park presents outstanding views of both Mount Rainier and surrounding mountain ranges.

Visitor Facilities

Major NPS administrative and visitor facilities in the immediate vicinity of SR 410 include the White River ranger station and campground, and the visitor center and lodge at Sunrise. At the eastern end of SR 410 near Chinook Pass, there is a picnic area and interpretive display located at Tipsoo Lake. In addition, there are numerous pullouts and viewpoints of the White River Valley and of the east side of Mount Rainier along the highway.
A range of practicable design alternatives has been considered for reconstructing SR 410 from the north park boundary (milepost 57.6) to Chinook Pass (milepost 69.2). Separate alternatives have also been considered for the Sunrise Road and SR 123 intersections, the Tipsoo Lake area, and traffic management options. In each case a preferred alternative has been identified based upon public safety, environmental and socioeconomic impacts, cost-effectiveness, aesthetic qualities, and the potential for disruption of park visitors and motorists.

ROAD DESIGN ALTERNATIVES

Alternative A - No Action

No work other than routine maintenance would be performed on the existing roadway. Annual maintenance activities include roadside brushing, ditch and culvert cleaning, pavement patching, crack repairs, restriping, and hazard tree and snow removal. No attempt would be made to permanently correct the numerous structural and design deficiencies that currently exist. Some of the deficiencies that would not be addressed include surface slumps, soft spots, pavement warping and cracking, narrow shoulders, deteriorating and ineffective guardrail and stone masonry retaining walls/guardwalls, a lack of paved turnouts, and overly-steep, unprotected side slopes adjacent to the roadway.

Alternative B - Pavement Overlay of Existing Road Surface

This alternative would primarily address pavement deficiencies and minor drainage issues in the existing road. Major structural and safety deficiencies would not be repaired. Most of the effort would be concentrated on repairing those areas where the pavement has failed or that require frequent maintenance. Excavation of the roadway to repair base and sub-base failures in selected locations would be accomplished. The existing pavement would be milled and recycled to remove cracking patterns and a new hot-mix asphalt surface would be applied. Some culverts would be repaired or replaced. Minor ditch and shoulder improvements would be made in selected areas along with minor spot improvements to resolve traffic or safety issues. This alternative would only postpone the major repairs that are needed to eliminate structural and design deficiencies in the road.

Alternative C - Resurface, Restore, and Rehabilitate Existing Road Surface (Preferred)

**Design Speed.** Between the north park boundary and Cayuse Pass, the road would be designed for a 50-mph vehicle speed, but the posted speed limit would be 45 mph. From Cayuse Pass to Chinook Pass the design speed and posted speed limit would be 35 mph, except for that portion of the road between mileposts 66.30 and 67.25 (the steep switchback area between the two hairpin curves). Here the posted speed limit would be 25 mph due to the reduced road width in this area.

**Travel Lanes.** Between the north park entrance and Cayuse Pass the road would be reconstructed to a paved topwidth of 26 feet with 11-foot travel lanes and 2-foot paved shoulders (figure 3). Between Cayuse and Chinook Passes, the typical section would be the same as that found between Cayuse Pass and the north park entrance, except for the segment between the two major switchbacks.
(mileposts 66.30-67.25). In this area the road would be 24-feet wide, with 11-foot travel lanes and a 1-foot paved shoulder (figure 4). The pavement would be narrower than the remainder of the road to allow for retention and repair of the historic stone masonry retaining walls in the area. The new roadway would be striped to identify the centerline, no passing zones, and lane edges.

**Curve Widening.** The inside lane of tight curves would be widened to accommodate larger vehicles, improve safety, and to prevent damage to the unpaved portion of the road shoulder. This would prevent large vehicles from dropping one of their inside wheels off the road edge when negotiating tight curves, causing ruts and eventual damage to the pavement.

**Road Bench Widening.** An effort would be made to keep the new road on the existing bench to the extent possible. Where bench width is inadequate to accommodate the proposed topwidth, additional width would be gained by various methods including the use of fills, cuts, and retaining walls. Fill-slope retaining walls would be the preferred method for obtaining additional width. However, there are some locations where fills, cuts, and toe walls are advantageous and would be used.

Adjustments would be made to the road's horizontal and vertical alignment to improve vehicle ride, handling, and safety, and to correct alignment errors made during original road construction. These adjustments would cause minor horizontal and vertical shifts of the centerline. In most instances these adjustments would be only a few inches to a couple of feet. However, in isolated locations, the changes could exceed seven feet horizontally and two feet vertically.
Repairs to the pavement would be made based upon the recommendations of a geotechnical engineer. In addition to removing the existing pavement, some base course and subgrade material may require removal. Depending upon the structural quality of the material that was excavated, it would either be reused as base course, used in the subgrade, or disposed of outside the park. Following excavation, new or recycled base course would be added atop the subgrade and new asphalt would be used to pave the road surface.

**Stone Masonry Retaining Walls and Guardwalls.** The stone masonry retaining walls located between Cayuse and Chinook Passes were evaluated by a geotechnical engineer and a stone mason in the summer of 1996. Visual inspection and core samples were used to evaluate the structural integrity of the walls. Most of the walls were found to be in reasonably good condition or were not so seriously deteriorated that they could not be repaired. Two walls and a section of another wall were determined to be in extremely poor structural condition and beyond repair. All of the guardwalls were also found to be in poor condition due to impacts from rock fall and/or snow plows and require replacement.

The retaining walls found to be beyond repair would be removed and replaced in approximately the same location by new reinforced concrete core walls that would be covered with a stone veneer designed to emulate the appearance of the historic walls (figure 5). All of the existing guardwalls would be removed and replaced with reinforced concrete core walls that would be veneered with stone masonry designed to blend with the existing stone work. Due to the steep terrain in the switchback area and the high probability of
injury to occupants if a vehicle were to leave the roadway in this section, some of the new guardwalls would be extended, where needed, to help prevent vehicles from leaving the roadway.

**New Retaining Wall/Guardwall Construction.** Several types of new walls would be built. Types to be considered include gabion, reinforced concrete core wall with a native stone veneer, and rockery/dry-laid stone. The decision on which type of wall to use would be based upon several factors including soils, height, visual appearance, and cost.

**Drainage.** Many of the structural problems of the roadway pavement are related to poor drainage. Existing roadside ditches, in most locations along the road, would be enlarged to increase capacity and improve safety. A 4:1 inslope would be constructed to provide a recoverable area for vehicles and correct the steep dropoffs that now exist in many places. All existing culverts and other drainage structures would be evaluated and repaired or replaced as needed. Several culverts would receive inlet treatments that would include installing concrete below-ground catch basins and metal grates across catch basin inlets. New drainage structures would be added where required. Underdrains may be provided in locations where adequate ditch capacity cannot be obtained. Various types of special ditch sections and drainage structures would be used to avoid new impacts where existing bench width is inadequate to construct conventional ditches.

**Barrier Requirements.** Along the first two miles of roadway starting at the north entrance (mileposts 57.6-59.6), no guardrail would be used, and a minimal clear zone of five feet.
would be adopted. The remainder of the road would be evaluated on a case-by-case basis for the placement of guardrail or guardwall. In locations where guardwall is needed, reinforced concrete core wall with a native stone veneer would be used to match other stone walls in the park. Guardwall would be used where barriers are needed between Cayuse and Chinook Passes. Where barriers are needed between Cayuse Pass and the north park entrance, either guardwall or steel-backed timber guardrail would be used.

**Other Design Issues.** At milepost 67.7, a location known as Windy Point, numerous accidents occur during winter driving conditions. The hazards here would be reduced by eliminating a gravel pullout on the outside edge of the curve, providing a wider shoulder on the inside of the curve, and increasing the radius of the curve itself. A vegetated berm with strategically placed boulders to prohibit vehicles would replace the current pullout.

Many of the existing gravel pullouts along the road corridor would be paved. These pullouts would be evaluated by a landscape architect and possibly lengthened, shortened, or eliminated.

The entrance arch would remain undisturbed at the north park boundary. The Chinook Pass entrance arch would also remain unaltered at the east park boundary.

Along with correcting structural and design deficiencies in the road, interpretive pullouts, parking areas, and signage would be redesigned and enhanced along the roadway. Interpretive pullouts would be located at the new roadside parking area to the east of Tipsoo Lake, and at existing pullouts near the Tipsoo Lake parking area and the Mount Rainier viewpoint between Deadwood Creek and the Sunrise Road intersection. These improvements would conform to the development guidelines established for the Mather Memorial Parkway (NPS 1991a).

The WSDOT maintenance facility at Crystal Creek would be removed and the area restored to natural conditions. The building and grounds would be evaluated for any hazardous substances and appropriate mitigation measures would be implemented.

**Selective Vista Thinning.** Thick stands of second-growth vegetation line the road shoulder in many locations. To enhance views into the surrounding forest, vegetation would be selectively thinned in these areas on a case-by-case basis based on the recommendations of a NPS landscape architect, in consultation with a natural resource specialist. Trees would be individually marked prior to removal. No trees over 8 inches dbh (diameter at breast height) would be removed and no wholesale clearing along the roadway would be permitted. Vista thinning would be confined to those areas within the NHL District (30 linear feet on either side of the road centerline) where a bona fide improvement to the visitor experience can be clearly demonstrated and where appropriate to the NHL District and original road conditions.

**Slope Stabilization.** Beginning at milepost 64.43, the roadway crosses an unstable hillside. The unstable section is approximately 1,000 feet in length. Geologic studies were conducted to determine the best approach for stabilizing the hillside. Preliminary data indicate that the area involved is so massive that other than rerouting the road around this section, efforts to fully correct the problem do not appear feasible. However, there are interim measures that can be used to help reduce the potential for future slides. Some of the methods to be investigated include revegetating barren slopes and improving road drainage by increasing the size and capacity of ditches and installing horizontal drains to dewater the slope.
Existing over-steepened cut slopes that exhibit large eyebrows or other evidence of instability such as continuous ravelling or lack of vegetation (photo 9) would be evaluated for remediation on a case-by-case basis. Where stabilization is deemed possible without creating large new areas of disturbance, slopes would be laid back to a stable angle as determined by a geotechnical engineer and NPS landscape architect. Slopes would be planted or seeded with a mix of vegetation that is native to the local area and approved by the park botanist. Unstable slopes that are determined not to have a high probability of success for recovery or that cannot be adequately evaluated would be maintained in their present condition.

Alternative D - Reconstruct Road to a 26-28-Foot Topwidth (11-Foot Travel Lanes and 2-3-Foot Paved Shoulders)

Proposals involving design speed, curve widening, new retaining wall/guardwall construction, drainage, other design issues, selective vista thinning, and slope stabilization would be the same as those previously described for Alternative C. Proposals involving travel lanes, road bench widening, stone masonry retaining walls and guardwalls, and barrier requirements differ from those proposed under Alternative C and are described below.

Travel Lanes. The roadway would be reconstructed from the north park boundary to Chinook Pass, as previously described under Alternative C, but the paved topwidth would vary from 26-28 feet. The road would be 28-feet wide from the north park entrance to Deadwood Creek bridge and 26-feet wide from Deadwood Creek bridge to Chinook Pass. Travel lanes would be 11-feet wide. The paved shoulders would generally be 2-3 feet wide except for wider widths that would occur at numerous locations for pullouts, chainup areas, overlooks, or other areas where additional width would enhance visitor enjoyment and fit on the existing road prism.
**Road Bench Widening.** Additional width would be necessary to obtain the minimum 26-foot or 28-foot topwidth and guardrail placement in several locations. This additional width could be obtained by filling with rock or constructing new retaining walls. The final decision on the preferred method would be made on a case-by-case basis based upon site conditions and aesthetic considerations. This alternative would utilize typical sections as diagrammed below (figures 6 and 7) as the standards for the reconstructed roadway.

**Stone Masonry Retaining Walls and Guardwalls.** Between Cayuse and Chinook Passes where bench width is inadequate to achieve the desired topwidth or where the existing walls are deteriorated beyond repair, new walls would be constructed using a reinforced concrete core and stone veneer finish designed to emulate the appearance of the existing walls.

Based on available design information and results from the recent geotechnical investigation, all of the existing walls, except one, would be demolished and replaced to gain the additional road width. The wall located at milepost 66.65 would be retained and the typical section would be slightly modified in this area to accommodate the change.

**Barrier Requirements.** Guardrail would not be required on the fill side of the road where a 4:1 slope intersects the ground surface within 19 feet from the outside edge of the travel lane. (This area is referred to as the "recovery zone" since vehicles leaving the pavement would be able to negotiate the 4:1 slopes and return to the roadway without difficulty.) Where this would not be the case, or where trees greater than 18 inches dbh (over 50 years old) exist within the 19-foot recovery zone, guardrail would be installed and fill slopes would remain at existing angles. The cut side of the roadway would not require guardrail or other protection unless a rock outcropping protrudes from the normal slope or trees greater than 18 inches dbh are encountered.

Figure 6. Typical section (Alternative D); where guardrail is not required.
Fill slopes and the establishment of a recovery zone would not be permitted to impact the following resources: (1) trees with a dbh greater than 18 inches; (2) any wetland (as defined by the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands); or (3) any flood channel where fill would obstruct more than 50 percent of the channel's existing cross-sectional area. Where these resources exist adjacent to the road and the above typical section cannot be established without impacting them, guardrail would be used to protect the visitor from the hazard while still preserving park resources. Guardrail also would be placed along the outer section of the road where significant drops occur and the terrain would make it impossible to establish recoverable foreslopes. In general, this is the case in the southerly 9.6 miles of this project (mileposts 59.6-69.2).

**Figure 7. Typical section (Alternative D); where guardrail is required.**

**Road Design Alternatives Considered but Rejected**

Three additional alternatives were considered early in the design process but were rejected because of environmental, aesthetic, and visitor use impacts. These alternatives included (1) widening SR 410 using a similar typical roadway section to that constructed by the Washington State Department of Transportation to the east of Mount Rainier; (2) widening SR 410 using a similar typical roadway section to that constructed by the Federal Highway Administration to the north of Mount Rainier; and (3) constructing designated bicycle lanes adjacent to the roadway. Each of these alternatives is described below along with rationale for dismissing them from further consideration.
(1) **Widen SR 410 Using a Similar Typical Roadway Section to that Constructed by the Washington State Department of Transportation to the East of Mount Rainier.**

This alternative would involve widening the road surface to 28 feet with 12-foot travel lanes and 2-foot shoulders. Where feasible given the terrain, slopes adjacent to the road would be reconstructed on flat (10:1 - 6:1) slope ratios with generous rounding of ditch bottoms. All cuts would be rounded where slopes change. A safety and recovery zone would be provided along the edges of the pavement. Roadside slopes would be vegetated with grass and maintained as cleared areas. This typical section was used for reconstructing SR 410 to the east of the park because of the more gentle terrain present there and because of the agencies' objective to construct a roadway that optimized both safety characteristics and opportunities for scenic views.

(2) **Widen SR 410 Using a Similar Typical Roadway Section to that Constructed by the Federal Highway Administration to the North of Mount Rainier.**

This alternative is similar to the above alternative except that the road surface would be widened to 32 feet with 12-foot travel lanes and 4-foot shoulders. A 32-foot paved surface was selected for the 9.9-mile section of the parkway to the north of the park to improve traffic flow and provide safer passing conditions in this area. Twelve-foot travel lanes would accommodate oversized vehicles such as buses and large recreational vehicles, while 4-foot shoulders would better accommodate bicycle traffic within the park.

(3) **Construct Designated Bicycle Lanes Adjacent to the Roadway.**

This alternative would require expanding the existing width of the road surface by a minimum of 8 feet (4-foot paved shoulders on each side of the roadway). While this could conceivably be accomplished in the lower two miles of the project where the road is on the floor of the White River Valley, extensive excavation would be required to obtain this additional width for the remaining 10 miles.

**Rationale for Dismissing the Above Alternatives from Further Consideration.**

Park roads have a unique purpose, which differs significantly from the purpose of roads within the federal and state highway systems. As stated in the Park Road Standards (NPS 1984), "Park roads are for leisurely driving only. If you are in a hurry, you might do well to take another route now, and come back when you have more time."

Implementing any of the above alternatives would change the character of the NHL District and the visitor experience along SR 410 within Mount Rainier National Park. In the lower two miles of the road, views of Mount Rainier and the White River would be expanded; however, the experience of driving in the midst of an old-growth forest would be diminished by the expansion of the cleared area along the road edge from 35-40 feet to 100 feet or more.

The additional clearing necessary to reconstruct the road to the above standards would require the removal of over 6,000 trees of varying age and size classes from mature stands. In addition, greater excavation and blasting would be necessary to expand the bench to the degree necessary to accommodate the required road width. This would create a prominent scar visible from the Sunrise area as well as many other high points in the park. Moreover, the National Park Service believes that the impacts resulting from this amount of excavation are not warranted by the existing or projected use of the road by cyclists.
As stated in the Mount Rainier Statement for Management, "the purpose of the park is to protect, preserve, and interpret the natural scenic and historical resources in Mount Rainier" (NPS 1988). Removing large numbers of trees and conducting extensive excavation in the public use corridor would conflict with the park's purpose.
INTERSECTION ALTERNATIVES

SUNRISE ROAD INTERSECTION

Alternative A - Redesign and Reconstruct Sunrise Road Intersection (Preferred)

Under this alternative, the intersection would be redesigned to provide a left-turn lane for north-bound traffic along SR 410. The curve at the southwest corner of the intersection along the Sunrise Road also would be reconstructed with a larger radius to provide a right-turn lane for southbound traffic and more stacking distance for north-bound traffic turning left. A retaining wall would be built to keep the fill required for this larger radius from extending past the toe of the existing fill slope and covering the roots of large trees. The pullout located on the east side of the intersection would be removed.

The extensive paved area in the present intersection would be reduced in size by removing approximately one-third of the existing pavement and returning the subgrade to a more natural contour. Several small deciduous trees (red alder) and brush would be cut from the understory of the tree group at the intersection to provide better sight distance for motorists coming from Sunrise (see Sunrise Road Intersection map, p. 46). The Mather Memorial Parkway sign would be moved slightly to the east (to pull it further from the road for safety reasons), but would remain directly opposite the intersection.

Alternative B - No Action

The intersection would remain as it currently exists (see Sunrise Road Intersection map, p. 47). No vegetation would be removed, and no realignment of either the Sunrise Road or SR 410 would occur. A left-turn lane would not be constructed on SR 410. No excavation, fill, or other disturbance would occur other than that associated with the general rehabilitation of the roadway.

Other Alternatives Considered but Rejected

Each of the additional alternatives considered was similar in concept to the preferred alternative but would have utilized longer tapers for turning lanes, provided more stacking distance, and used larger turning radii. Since the loss of vegetation associated with each of these alternatives was deemed unacceptable, all were dismissed from further consideration.
SUNRISE ROAD INTERSECTION
ALTERNATIVE A – REDESIGN INTERSECTION (PREFERRED)
STATE ROUTE 123 INTERSECTION
AT CAYUSE PASS

Alternative A - Redesign and Reconstruct
State Route 123 Intersection (Preferred)

Under this alternative the intersection would be redesigned to eliminate the Y-configuration and create a T-intersection for traffic entering from SR 123 (see SR 123 Intersection map, p. 49). The proposed redesign should clarify the traffic pattern and improve safety.

The SR 123 intersection at Cayuse Pass is also used as an informal parking area in early/late winter for cross-country skiers' access to Tipsoo Lake and Chinook Pass when that portion of the road is closed due to heavy snow accumulations. Presently there is no other parking available in the area during that time of year. Parking would continue at the SR 123 intersection on an interim basis until another parking area can eventually be developed. (Once potential parking areas are identified, further environmental analysis would be necessary prior to any new construction). In the meantime, a portion of the excess pavement in the middle of the SR 123 intersection would be striped to accommodate parking. Following construction of a new parking area, the excess pavement and parking spaces at the SR 123 intersection would be removed.

Alternative B - No Action

There would be no changes made to the SR 123 intersection (see SR 123 Intersection map, p. 50). The broad expanse of asphalt at this intersection would continue to confuse motorists, impede traffic flow, and pose a safety concern.

Other Alternatives Considered but Rejected

Several other design alternatives were considered for improving traffic flow and enhancing safety at the SR 123 intersection. All but one of the alternatives considered was a variation of the preferred alternative that would have employed a higher design standard. These alternatives were rejected because of the level of environmental impacts associated with their implementation. Another alternative considered would have reconfigured the intersection so that through traffic from SR 410 would flow directly onto SR 123. This alternative was rejected because of various safety concerns including the disparity in traffic volumes entering the intersection from different routes.
SR 123 INTERSECTION
ALTERNATIVE A – REDESIGN INTERSECTION (PREFERRED)
TIPSOO LAKE AREA

Alternative A - Improve Parking and Reduce Resource Impacts (Preferred)

The existing Tipsoo Lake parking area would be redesigned to improve parking, provide spaces for large vehicles such as recreational vehicles and trailers, and enhance vehicle and pedestrian safety by improving egress/ingress from SR 410. The new design would be structured to fit approximately on the existing footprint with minimal disturbance. Accessible parking spaces would be provided and a new accessible rest room would be constructed. Several picnic tables would also be available adjacent to the parking area (see Tipsoo Lake Area map, p. 52).

The informal parking that occurs along the north shoulder of the road as it loops around Lower Tipsoo Lake would be removed. This change is needed to help reduce resource impacts to the subalpine meadows around the lake and to eliminate a safety concern (motorists travelling east on the highway currently pull across oncoming traffic to park, open their doors into the traffic lane, and walk onto the roadway).

A formal parking area would be provided along the road corridor approximately 0.25-mile east of the existing parking area. The new parking area, which would accommodate approximately seven vehicles, would concentrate visitor use in one location so that vehicular and pedestrian traffic can be controlled. The additional parking along the roadway would serve both visitors wishing to stop briefly to admire the view, or those desiring to walk down to the lake.

Stone guardwall would be located on the road shoulder in areas where it is needed for visitor safety or resource protection. For pedestrian areas such as viewpoints and wayside exhibits, a combination of stone pillars and wood railings would be used. The guardrail would serve to channel visitors along designated trails, alleviating the social trailing that now exists in the subalpine meadows. Just east of Lower Tipsoo Lake a walkway would be provided along the west side of the road to link the various parking areas, wayside exhibits, and viewpoints with the trails that provide access to the lake and meadows.

Alternative B - No Action

Under this alternative, the existing parking area would not be redesigned and parking along the road shoulder would continue (see Tipsoo Lake Area map, p. 53). No barriers of any type would be placed along the road shoulder for visitor safety or resource protection.
ALTERNATIVE A – RECONFIGURE PARKING AREAS (PREFERRED)
TIPSOO LAKE AREA
ALTERNATIVE B – NO ACTION (EXISTING CONDITIONS)
TRAFFIC MANAGEMENT AND CONSTRUCTION TIMING

There would be no planned road closures associated with road design Alternative A (No Action). However, under the no-action alternative, routine maintenance could occasionally close the road. In addition, eventual structural failure of the stone masonry retaining walls between Cayuse and Chinook Passes would result in extensive road closures.

Road design Alternative B (Pavement Overlay of Existing Road Surface) could be accomplished with minimal road closures. Most of the work could be conducted so that at least one traffic lane remains open at all times. However, some drainage work would require complete closure of the road for brief periods (from one-half day to as much as one to two full days). In addition, Alternative B has the same potential for unscheduled road closures as Alternative A since none of the road’s major structural problems would be corrected.

The four traffic management options outlined below apply only to road design Alternatives C (Resurface, Restore, and Rehabilitate Existing Road Surface) and D (Reconstruct Road to a 26-28-Foot Topwidth). However, the costs provided are only applicable to Alternative C. Costs associated with Alternative D would be proportionally higher due to the greater cost of building a higher standard of road.

Public Notification of Road Closures

Regardless of the traffic management option chosen, a public notification plan would be prepared that details the nature of the closures and delays to be expected. The plan would also identify the process and tools that would be used to inform the public of the closures and to ensure that the widest practical distribution of the information is achieved in a timely fashion.

Contractor Incentives/Disincentives

Incentives and/or disincentives for the contractor are being considered for inclusion in the construction contract. The purpose of these incentives/disincentives is to minimize the amount of time that the road would be closed. The concepts of “lane rental” and “bidding time against money” are contract ideas that could be used to keep road closures to a minimum.

Experience with the lane rental concept suggests that if a dollar value is assigned to closing a traffic lane, a contractor will typically try very hard to avoid such costs. In a time against money bid, the contractor with the lowest bid and fewest proposed road closures would be awarded the contract. In this case, a set and predictable road closure schedule could be based on the contractor’s bid.

Project Phasing

Construction phasing would vary for all of the alternatives depending upon the complexity of the work and funding availability. If one of the action alternatives (Alternatives B, C, or D) is implemented, the project would be broken into a minimum of three phases: Phase I - Chinook Pass to Cayuse Pass; Phase II - Cayuse Pass to Deadwood Creek bridge; and Phase III - Deadwood Creek bridge to the north park entrance. Each phase would take approximately one to two seasons to complete depending upon the alternative chosen. (Some subphases may be necessary within each phase due to funding constraints. For example, two separate contracts may be required to complete the work between Cayuse Pass and Chinook Pass.)

Construction phasing is necessary for two reasons: (1) sufficient funding from the Federal Lands Highway Program is not available for a single contract, and (2) there would be significant impacts on local businesses, area traffic patterns, and park visitation if a project of this magnitude were undertaken all at once.
Phase I: Cayuse Pass (Milepost 65.5) to Chinook Pass (Milepost 69.2)

Providing for safe and efficient travel for the general public during the reconstruction of SR 410 from Cayuse Pass to Chinook Pass is a major concern. The difficulty of rehabilitating the stone masonry retaining walls, many of which are located directly above the previous road section, combined with high construction and traffic control costs, make it unreasonable to keep the road continually open to traffic while construction is underway. It also presents a safety concern to park visitors and construction personnel.

The traffic management options outlined below apply only to Phase I construction. Each of the options considered not only addresses safety issues, but would have minimal impact on park resources. A preferred option has been identified based upon an analysis of the anticipated impacts to motorists, nearby businesses, and the cost-effectiveness of each option.

The range of traffic management options considered, as well as the anticipated progress each year and total project cost for Phase I construction are outlined below. Overall completion dates and road closure schedules are summarized in Table 2. Under each option, the road would be open to two-way traffic during the peak visitor use periods of Memorial Day, Fourth of July, and Labor Day weekends.

Option A

First Season 1997.

Traffic Management:

The road would be open to two-way traffic during spring, summer, and early fall. There would be a total road closure beginning October 1.

Progress:

Walls 0% complete
Drainage 0% complete
Grading 0% complete
Companion sites 0% complete
Surfacing 0% complete
Guardwall and guardrail 0% complete


Traffic Management:

There would be a total road closure for the entire season (spring-fall).

Progress:

Walls 100% complete
Drainage 100% complete
Grading 100% complete
Companion sites 90% complete
Surfacing 0% complete
Guardwall and guardrail 100% complete

The project would be substantially completed by November 30, 1998 with some minor work remaining (1-2 weeks) in 1999.

Third Season 1999.

Traffic Management:

The road would be open to two-way traffic during the spring and summer with possible weekday closures, as necessary, for paving (1-2 weeks).

Progress:

Walls 100% complete
Drainage 100% complete
Grading 100% complete
Companion sites 100% complete
Surfacing 100% complete
Guardwall and guardrail 100% complete
Table 2. Phase I Construction: Chinook Pass to Cayuse Pass

<table>
<thead>
<tr>
<th>Traffic Option</th>
<th>Total Cost (millions)</th>
<th>Start Date</th>
<th>Completion Date</th>
<th>Road Closure Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7.9</td>
<td>10/01/97</td>
<td>11/30/98</td>
<td>Total closure in 1998</td>
</tr>
<tr>
<td>B-1</td>
<td>8.2</td>
<td>10/01/97</td>
<td>09/01/99</td>
<td>Fall and spring season closures; summer weekday closures</td>
</tr>
<tr>
<td>B-2 (Preferred)</td>
<td>8.3</td>
<td>10/01/97</td>
<td>11/30/99</td>
<td>Spring, summer, and fall weekday closures</td>
</tr>
<tr>
<td>C</td>
<td>8.9</td>
<td>10/01/97</td>
<td>11/30/99</td>
<td>Shoulder season closures; summer weekday shift closures</td>
</tr>
</tbody>
</table>

The project would be completed by July 31, 1999.

Total Project Cost:

$7,936,338 (refer to Appendix C for cost breakdown)

Due to the substantial similarities between Options B-1 and B-2, both are viewed as a slight variation of the same option, rather than representing totally distinct options. The major difference between the two is that under Option B-2, weekday road closures are proposed during spring, summer, and fall. Under Option B-1, total closures are proposed during fall and spring, and weekday closures are proposed during summer.

Option B-1

First Season 1997.

Traffic Management:

The road would be open to two-way traffic during spring, summer, and early fall. There would be a total road closure beginning October 1.

Progress:

Walls 0% complete
Drainage 20% complete
Grading 0% complete
Companion sites 0% complete
Surfacing 0% complete
Guardwall and guardrail 0% complete


Traffic Management:

There would be a total road closure during spring and early summer (from approximately April 15 to July 1). There would be a weekday road closure from mid-summer through early fall from 11:00 p.m. Sunday to 5:00 p.m. Thursday, with the road open to two-way traffic on weekends (Friday-Sunday). There

4On weekends that the road would be open under Options B-1, B-2, and C, only one traffic lane would be open during 20%, 30%, and 40% of the time, respectively. Flaggers and/or signal devices would be used to manage traffic flow during these periods.
would be a total road closure beginning October 1.

Progress:

Walls 80% complete
Drainage 100% complete
Grading 70% complete
Companion sites 50% complete
Surfacing 0% complete
Guardwall and guardrail 80% complete

Third Season 1999.

Traffic Management:

There would be a total road closure during spring and early summer (from approximately April 15 to July 1). There would be a weekday road closure from mid-summer through early fall from 11:00 p.m. Sunday to 5:00 p.m. Thursday, with the road open to two-way traffic on weekends (Friday-Sunday). There would be a total road closure beginning October 1.

Progress:

Walls 100% complete
Drainage 100% complete
Grading 100% complete
Companion sites 100% complete
Surfacing 100% complete
Guardwall and guardrail 100% complete

Total Project Cost:

$8,218,985 (refer to Appendix C for cost breakdown)

Option B-2 (Preferred)

First Season 1997.

Traffic Management:

The road would be open to two-way traffic during spring, summer, and fall.

Progress:

Walls 0% complete
Drainage 10% complete
Grading 0% complete
Companion sites 0% complete
Surfacing 0% complete
Guardwall and guardrail 0% complete


Traffic Management:

There would be a weekday road closure during spring, summer and fall from 11:00 p.m. Sunday to 5:00 p.m. Thursday, with the road open to two-way traffic on weekends (Friday-Sunday). There would be a total road closure beginning October 1.

Progress:

Walls 65% complete
Drainage 100% complete
Grading 70% complete
Companion sites 50% complete
Surfacing 0% complete
Guardwall and guardrail 65% complete

Third Season 1999.

Traffic Management:

There would be a weekday road closure during spring, summer and fall from 11:00 p.m. Sunday to 5:00 p.m. Thursday, with the road open to two-way traffic on weekends (Friday-Sunday).

Progress:

Walls 65% complete
Drainage 100% complete
Grading 70% complete
Companion sites 50% complete
Surfacing 0% complete
Guardwall and guardrail 65% complete

*On weekends that the road would be open under Options B-1, B-2, and C, only one traffic lane would be open during 20%, 30%, and 40% of the time, respectively. Flaggers and/or signal devices would be used to manage traffic flow during these periods.
open to two-way traffic on weekends (Friday-Sunday)\(^4\).

**Progress:**

Walls 100% complete  
Drainage 100% complete  
Grading 100% complete  
Companion sites 100% complete  
Surfacing 100% complete  
Guardwall and guardrail 100% complete

*The project would be completed by November 30, 1999.*

**Total Project Cost:**

$8,314,713 (refer to Appendix C for cost breakdown)

**Option C**

**First Season 1997.**

**Traffic Management:**

The road would be open to two-way traffic during spring, summer, and early fall. There would be a total road closure beginning October 1.

**Progress:**

Walls 0% complete  
Drainage 20% complete  
Grading 0% complete  
Companion sites 0% complete  
Surfacing 0% complete  
Guardwall and guardrail 0% complete

**Second Season 1998.**

**Traffic Management:**

There would be a total road closure during spring and early summer (from approximately April 15 to July 1). There would be a partial weekday closure (from 5:00 a.m. to 2:00 p.m. daily) from mid-summer through early fall, with the road open to two-way traffic on Saturday and Sunday\(^4\). There would be a total road closure beginning October 1.

**Progress:**

Walls 65% complete  
Drainage 70% complete  
Grading 60% complete  
Companion sites 50% complete  
Surfacing 0% complete  
Guardwall and guardrail 65% complete

**Third Season 1999.**

**Traffic Management:**

There would be a total road closure during spring and early summer (from approximately April 15 to July 1). There would be a partial weekday closure (from 5:00 a.m. to 2:00 p.m. daily) from mid-summer through early fall, with the road open to two-way traffic on Saturday and Sunday\(^4\). There would be a total road closure beginning October 1.

**Progress:**

Walls 100% complete  
Drainage 100% complete  
Grading 100% complete  
Companion sites 100% complete  
Surfacing 100% complete  
Guardwall and guardrail 100% complete

*The project would be completed by November 30, 1999.*

\(^4\)On weekends that the road would be open under Options B-1, B-2, and C, only one traffic lane would be open during 20%, 30%, and 40% of the time, respectively. Flaggers and/or signal devices would be used to manage traffic flow during these periods.
Total Project Cost:

$8,941,643 (refer to Appendix C for cost breakdown)

Phase I: Road Closure Options Considered but Rejected

A fourth traffic management option which proposed two-hour openings on weekdays, and 30-minute delays on weekends with some total road closures (2-3 weeks minimum) was considered but later rejected based on the anticipated impacts to motorists, park visitors, local businesses, and related construction costs. This option would significantly affect motorists because the vehicle backups during the two-hour road closure might effectively make some vehicles wait three to four hours before passing through the construction zone. The National Park Service and Federal Highway Administration believe that given the existing volumes of traffic, especially during the peak summer months, a closure of two hours is unacceptable both to the traveling public and the efficiency of the contractor.

The old Naches Pass Road (USFS Road 70) also was considered as an alternative route to accommodate SR 410 traffic during road closures. The road leaves SR 410 just east of Greenwater and returns to SR 410 near the town of Clifldell. It is a one-lane gravel road with limited turnouts. The road travels through public (U.S. Forest Service) and private lands with both landowners sharing the cost of maintenance and improvements.

Forest Service roads are not public roads and only some are open to public travel. Drastic improvements to the old Naches Pass Road would be necessary to accommodate an average daily traffic (ADT) flow of at least 100 vehicles (between Chinook and Cayuse Passes the current ADT is approximately 1,500 vehicles).

Due to restrictions on how funding can be spent, project dollars cannot be used to improve the old Naches Pass Road for public use. Additionally, permission would be required from private landowners before road improvements could be made. Therefore, based on funding limitations and safety concerns, the option of rerouting SR 410 traffic onto the old Naches Pass Road has been dropped from further consideration.

Phase II: Cayuse Pass (Milepost 65.5) to Deadwood Creek Bridge (Milepost 62.96)

Work would be substantially complete on Phase I before Phase II begins. Construction for Phase II is scheduled to commence in the fall of 1999, and is expected to be completed by the fall of 2000 (Table 3).

Limited road closures (up to one month) would occur between Deadwood Creek bridge and Cayuse Pass during spring (April-May) and late fall (October-December) to facilitate construction of retaining walls. No road closures are planned during the peak summer months (June-September). However, brief delays (up to 30 minutes) can be expected on weekdays. No delays are anticipated on weekends. The total cost of Phase II construction is estimated at $4,100,000.

Table 3. Phases II and III Construction: Cayuse Pass to North Park Boundary

<table>
<thead>
<tr>
<th>Phase</th>
<th>Start Date</th>
<th>Completion Date</th>
<th>Total Cost (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Fall 1999</td>
<td>Fall 2000</td>
<td>4.1</td>
</tr>
<tr>
<td>III</td>
<td>Fall 2000</td>
<td>Fall 2001</td>
<td>4.6</td>
</tr>
</tbody>
</table>
Phase III: Deadwood Creek Bridge (Milepost 62.96) to North Park Entrance (Milepost 57.6)

Traffic delays associated with Phase III construction are not to exceed 30 minutes during peak summer months (June-September). Limited road closures (up to 1 day) may be necessary; however, they would occur only during early spring (March-April) or late fall (October-December). Work would be substantially complete on Phase II before Phase III begins. Construction for Phase III is scheduled to begin in the fall of 2000 and is expected to be completed by the fall of 2001 (Table 3). The total cost of Phase III construction is estimated at $4,600,000.

COMMON ELEMENTS AND MITIGATING MEASURES OF ALL ACTION ALTERNATIVES

The description below applies to all but the no action alternative.

The roads in Mount Rainier National Park are unlike those in many other Pacific Northwest areas. The proximity of large trees to the roadway creates a unique driving experience that is unusual to many motorists who enter the park expecting to drive at higher speeds. While the National Park Service would attempt to inform motorists of the unique qualities of the park’s roads, approximately sixty percent of the traffic on SR 410 is through traffic. Because of this and the lack of park entrance stations along this route, park staff would have little opportunity to personally contact the drivers of many vehicles.

Road Closures and Construction Timing

Due to heavy snowfall, SR 410 is normally closed from late fall to late spring. The exact dates vary from year to year depending on the weather. Limited plowing is done in autumn to keep the road open as long as possible, but once heavy snows begin to fall, the road remains closed until spring. Cayuse Pass is typically opened by mid-April, at which time snow removal begins in earnest between Cayuse and Chinook Passes. Traditionally Chinook Pass is opened the week before Memorial Day weekend.

The severe weather experienced along SR 410 leaves a very short window for construction activities. Paving can take place only when daytime temperatures are relatively warm, therefore limiting paving to the warmer, snow-free months of June through September. Construction activities requiring excavation, such as drainage and intersection improvements, could begin by May and extend into late October or early November. Work at higher elevations between Cayuse and Chinook Passes would be more seasonally restricted because of greater and longer lasting snowfall and the generally cooler temperatures occurring at higher elevations.

Material Sources

Stone Masonry Retaining Walls and Guardwalls. Rehabilitating the stone masonry retaining walls and guardwall between Cayuse and Chinook Passes pose the greatest challenge. Rock of similar color, quality, durability, density, and texture is not readily available from commercial sources outside the park. Stone for the existing walls came from sources within the park, primarily from rock cuts created during construction of the original road corridor. The best available in-park source of this stone lies on unvegetated slopes below the masonry retaining walls that was sidecast during roadway construction or the result of rockfall. The quantity of rock available is substantial and estimated to be sufficient to meet the needs of this project.
Rockery/Dry-Laid Stone Walls. Rockery/dry-laid stone walls would be constructed using rock obtained from existing stockpiles, the result of previous SR 410 construction activities on USFS land to the north of the park. Additional stone would be obtained from rock salvaged from rockfall and avalanche debris collected off the Stevens Canyon Road. All material would be stockpiled at the Cow Flat rock pit, located at milepost 56 of the Mather Memorial Parkway in the Mount Baker-Snoqualmie National Forest.

Borrow Material. The Cow Flat rock pit would serve as an approved borrow source for surfacing, subgrade fill, and loose aggregate materials. Approximately 117,000 cubic yards of aggregate material would be removed from the pit. NPS special directive 91-6 (NPS 1991b) prohibits the creation or use of borrow pits within park boundaries unless it is determined based upon a written analysis, that economic factors make it totally impractical to import such material.

Batch Plants. As specified in the special use permit obtained from the U.S. Forest Service, the hot asphalt batch plant would be located at the Cow Flat rock pit. The concrete batch plant may be located within the park, but only if a suitable location can be found within the construction zone immediately adjacent to SR 410 and only if the siting of the plant is for a short duration. Three possible locations for the concrete batch plant include the Tipsoo Lake parking lot (only during full road closures), Windy Point, or one of the current WSDOT stockpile areas within the lower two miles of the road. Concrete may also be acquired from commercial sources outside the park. Water needed for construction purposes would be obtained from the WSDOT maintenance facility at Crystal Creek.

Staging Areas. Equipment staging areas would be at existing developed areas along the road corridor such as the WSDOT maintenance area at Crystal Creek, the Tipsoo Lake parking lot (only during full road closures), and at designated pullouts along the road.

Construction Constraints

Construction Limits. To minimize unnecessary environmental impacts, construction would be restricted to the minimum area required. In areas with sensitive resources such as wetlands, large trees, or streambanks, increased attention would be given to protect these resources from mechanical damage from equipment, erosion, siltation, or other impairment with the potential to adversely affect these resources.

During construction, a NPS landscape architect would be onsite working directly with the FHWA project engineer on a regular basis to ensure that all work conforms with the design objectives for Mount Rainier’s roads and that work methods minimize resource impacts to areas adjacent to the road corridor. An NPS natural resource specialist would make periodic inspections of the project area and be available for consultation.

Tree Removal and Disturbance. In some areas, it would be necessary to remove certain trees to facilitate public safety. Selection of trees to be removed along the road corridor would be considered on an individual basis. An NPS landscape architect, working closely with a natural resource specialist, would identify and monitor tree removal during construction. This person would be responsible for minimizing damage to adjacent trees.

In fill areas, tree wells (small rock retaining structures) would be created near the base of trees where necessary to protect the root zone from damage. Care would be taken to ensure that at least half of the root zone of any tree near the toe of a fill slope remain at the existing grade. If more than half of the root zone is
covered by fill, either the tree would be removed or the fill removed from around the tree. Each tree in the toe slope of any fill would be evaluated individually by the National Park Service to ensure that impacts to the old-growth forest are minimized. Felled trees would remain on site unless determined by the National Park Service to be suitable for use as construction materials (e.g., repair of historic structures; use as footlogs). Tree butts would be obscured from view or blasted onsite to simulate blowdown conditions. An effort would be made to protect snags, wherever possible.

Sensitive Species. Wildlife—Actions would be taken in consultation with the U.S. Fish and Wildlife Service, as needed, to protect the northern spotted owl and other listed or candidate species and their habitats that may be affected by this project. Consideration would also be given to any state-listed species within or affected by the project area. Should northern spotted owls be found nesting and rearing young in the immediate vicinity of the project site, the National Park Service would consult with the Fish and Wildlife Service to determine appropriate mitigation measures.

Plants—To ensure that sensitive plant species are not adversely affected by construction activities, surveys would be conducted during the prime growing season. If such plants are found within the project area, the National Park Service would determine appropriate mitigation to avoid adverse impacts. These measures may include signing or fencing areas in the field to protect sensitive plants from disturbance.

Air Quality. To minimize dust levels in the project area, soils would be moistened with a fine water mist, as necessary. To further decrease the amount of soil subject to wind erosion, disturbed areas would be revegetated with native plants to stabilize soils.

Water Resources. Where proposed construction would occur adjacent to creeks, streams or side channels of the White River, some temporary water quality degradation may occur when culverts are replaced, riprap installed, or where excavation is necessary in water-saturated soils beneath the road surface or in ditches adjacent to the roadway. Bank armoring may also be necessary in a few isolated locations where the White River is adjacent to the road. All material used for bank hardening would be obtained outside the park unless excavation within the scope of this project produces suitable material.

When riprap is installed or culverts are replaced or extended at flowing streams, mitigating measures as described in the Hydraulic Project Permit obtained from the Washington Department of Fish and Wildlife would be followed. These measures may include installing culverts on a "flat" (zero percent) slope to allow fish passage, or timing culvert work to avoid sedimentation at critical periods for fish reproduction and rearing. A Clean Water Act, Section 404 permit would be acquired from the U.S. Army Corps of Engineers for the discharge of dredged or fill material into waters of the United States. A Section 401 water quality certification would be obtained from the U.S. Environmental Protection Agency in conjunction with the 404 permit.

Revegetation and Topsoil Preservation

The National Park Service is responsible for restoring disturbed areas to a natural condition following construction. Construction activities would be planned and implemented in a way that facilitates restoration of native plant communities in disturbed areas. A roadside rehabilitation plan would be formulated to guide restoration efforts. The plan would include specifications regarding revegetation, soil restoration, grading, fill material, native seed mixes, elimination of non-native species, and pollution prevention measures. Native plant
material collected close to the site would be used to revegetate roadside ditches, denuded road edges and erosion prone slopes. Revegetation would use a variety of methods including native seed mixtures and greenhouse propagated plants. All plant materials would be collected close to the site to protect genetic and biologic integrity of the area. No non-native species would be introduced into the road corridor. Restoration activities would be accomplished within one year after construction is completed.

Prior to construction, the National Park Service would identify areas where vegetation and topsoil would be salvaged. Construction specifications would designate areas to be stripped and requirements for the removal, handling, storage, and replacement of the topsoil and plant material mixture. Topsoil-vegetation mixtures would be returned to the forest type from which they were obtained.

All material removed would be stockpiled as close to the disturbed area as possible. The preferred method of storage would be windrowing salvaged material in piles generally less than three feet high along the section of road from which it was removed and where it would be replaced. Topsoil would not be stored in areas subject to seasonal flooding or in areas infested with noxious weeds. Nor would it be used as general fill. Contamination of the topsoil and plant mixture with subsoil, asphalt, aggregate, or other material would be avoided.

In the event that topsoil stockpiles are insufficient to cover disturbed areas, subsoil of suitable texture would be salvaged and amended to provide a growth medium or sterilized topsoil would be obtained from commercial sources. To further reduce the potential spread of non-native vegetation, the contractor would be required to steam clean all heavy equipment prior to its use within the park.

Accommodation of Bicycles

Bicycles and pedestrians would be accommodated to the extent possible within environmental considerations. Although bicycle use would be considered throughout the design process, separate designated bicycle lanes would not be provided under any alternative. All bicycle use along SR 410 must conform to the park's Bicycle Management Plan (NPS 1989).

Preservation of Historic Resources and Cultural Resources Compliance

All proposed undertakings described in this environmental assessment with the potential to affect cultural resources will be reviewed in accordance with the National Historic Preservation Act of 1966, as amended, and the 1995 programmatic agreement among the National Park Service, the National Conference of State Historic Preservation Officers, and the Advisory Council on Historic Preservation. Inventories and evaluation of historic properties affected by these undertakings will be completed prior to construction, as will efforts to mitigate potential adverse effects to significant properties. The National Park Service will consult as necessary with concerned tribal representatives, the State Historic Preservation Officer, the Advisory Council on Historic Preservation, and other interested parties, in fulfilling cultural resources responsibilities. Should presently unidentified cultural resources be discovered during the course of the project, work in that location would stop until the resources are properly recorded by the National Park Service and evaluated under the eligibility criteria of the National Register of Historic Places. If (in consultation with the State Historic Preservation Officer) the resources are determined eligible, appropriate measures would be implemented either to avoid further resource impacts or to mitigate their loss or
disturbance. In compliance with the Native American Graves Protection and Repatriation Act of 1990, the National Park Service would also notify and consult concerned tribal representatives for the proper treatment of human remains, funerary and sacred objects should these be discovered during the course of the project.
### TABLE 4. IMPACT MATRIX: COMPARISON OF ROAD DESIGN ALTERNATIVES

<table>
<thead>
<tr>
<th>Natural Resources</th>
<th>Alternative A: No Action</th>
<th>Alternative B: Pavement Overlay of Existing Road Surface</th>
<th>Alternative C: Resurface, Restore, and Rehabilitate Existing Road Surface (Preferred)</th>
<th>Alternative D: Reconstruct Road to a 26-28-Foot Topwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine maintenance would cause some additional resource impacts, while other impacts would still remain or may occur due to unexpected road failures.</td>
<td>Natural resource impacts would generally be confined to the previously disturbed road corridor. Although additional resource impacts would occur, each is expected to be localized, short term, and insignificant. Other impacts would still remain or may occur due to unexpected road failures.</td>
<td>Total ground disturbance for all phases of construction would be 1.88 acres with the majority of new disturbance (1.53 acres) occurring within 10 feet of previously disturbed areas on either side of the road. The only anticipated adverse impact on natural resources would result from the loss of 0.1 acre of palustrine wetland. Actions such as improving trail access to the meadows around Lower Tipsoo Lake and remediating over-steepened cut slopes would have a beneficial effect by reducing existing resource impacts along the road corridor.</td>
<td>Approximately 8-10 acres of new ground disturbance, with most impacts occurring between the north park entrance and Cayuse Pass. Guardrail and guardwall would be used to help minimize habitat losses, particularly potential nest trees for marbled murrelets and spotted owls. The only anticipated adverse impact on natural resources would result from the loss of 0.1 acre of palustrine wetland. Beneficial effects include remediation of over-steepened cut slopes and increased resource protection at Tipsoo Lake, including proposed wetland enhancement and improved trail access.</td>
<td></td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>No effect from routine maintenance; Tipsoo Lake archeological site (45-PI-406) would be affected by continuing social trail traffic and erosion.</td>
<td>Effects on cultural resources would be the same as described under Alternative A.</td>
<td>No adverse effect on cultural resources; rustic/scenic characteristics of SR 410 as an NHL structure would be preserved; archeological monitoring would accompany construction in the vicinity of site 45-PI-406.</td>
<td>Adverse effect on cultural resources; increased topwidth would result in significant loss of historic fabric (e.g., rock retaining walls); historic appearance of SR 410 would be altered.</td>
</tr>
</tbody>
</table>
### TABLE 4. IMPACT MATRIX: COMPARISON OF ROAD DESIGN ALTERNATIVES (CONTINUED)

<table>
<thead>
<tr>
<th>Visitor Use and Park Operations</th>
<th>Alternative A: No Action</th>
<th>Alternative B: Pavement Overlay of Existing Road Surface</th>
<th>Alternative C: Resurface, Restore, and Rehabilitate Existing Road Surface (Preferred)</th>
<th>Alternative D: Reconstruct Road to a 26-28-Foot Topwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Routine maintenance would not remedy the underlying structural deficiencies in the road and the potential to create lengthy road closures and escalating maintenance costs; nor would it alleviate the safety hazards that currently exist.</td>
<td>Although motorists would experience a smoother driving surface, impacts would be the same as Alternative A (No Action).</td>
<td>Park visitors and motorists would benefit from improved safety and better driving conditions along SR 410. Proposed improvements would also extend the service life of the road and reduce cyclic maintenance requirements.</td>
<td>Impacts would be the same as Alternative C. In addition, the visitor experience could be adversely affected due to a reduction in the overhanging tree canopy, widening of the visual corridor, and a subsequent loss of the road's historic character.</td>
</tr>
<tr>
<td>Socioeconomic Environment</td>
<td>No effect on surrounding businesses, concessions within the park, or recreation activities. However, continued deterioration of the roadway could necessitate unexpected emergency road closures, which would result in reduced traffic volumes on the roadway and a loss of sales to surrounding gateway communities.</td>
<td>Minor traffic delays would inconvenience park and commuter traffic. It is not anticipated that commuters would change their route due to minor delays, therefore, impacts to surrounding businesses are thought to be moderate and short term.</td>
<td>See table 6.</td>
<td>See table 6.</td>
</tr>
<tr>
<td></td>
<td>Sunrise Road Intersection</td>
<td>Highway 123 Intersection</td>
<td>Tipsoo Lake</td>
<td></td>
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<td>----------------------</td>
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<tr>
<td><strong>Natural Resources</strong></td>
<td>A maximum of 0.3 acre of ground disturbance and elimination of approximately 30-50 trees less than 16&quot; dbh. Losses offset by the removal of 0.14 acre of pavement.</td>
<td>No additional impacts on natural resources.</td>
<td>Reduced impacts on vegetation by channeling use along maintained trails, revegetation of social trails; also curtailment of soil erosion and siltation of meadow and Lower Tipsoo Lake.</td>
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<td></td>
<td></td>
<td>No additional impacts on natural resources.</td>
<td>Tipsoo Lake site (45-PI-406) would be affected by parking area improvements (site would be monitored during construction).</td>
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<td></td>
<td></td>
<td>No effect on identified cultural resources.</td>
<td>Tipsoo Lake site (45-PI-406) would be affected by continuing social trail traffic and erosion.</td>
<td></td>
</tr>
<tr>
<td><strong>Cultural Resources</strong></td>
<td>No adverse effect on cultural resources (including relocation of Mather Memorial Parkway sign).</td>
<td>No effect on identified cultural resources.</td>
<td>Safety concerns would be alleviated and visitor safety and resource protection would be enhanced by channeling use along designated trails.</td>
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<tr>
<td></td>
<td></td>
<td>No effect on identified cultural resources.</td>
<td>Safety concerns would still persist as would the proliferation of social trails between Lower Tipsoo Lake and SR 410.</td>
<td></td>
</tr>
<tr>
<td><strong>Visitor Use and Park Operations</strong></td>
<td>Proposed improvements would enhance motorist safety by providing a safer approach to the intersection and improved traffic flow.</td>
<td>Travelers and park visitors would benefit through enhanced traffic flow and improved parking at this intersection.</td>
<td>Inadequate parking and safety concerns would persist at this intersection.</td>
<td></td>
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<tr>
<td></td>
<td>The intersection would remain as it currently exists; no safety improvements would be made.</td>
<td>Safety concerns would be alleviated and visitor safety and resource protection would be enhanced by channeling use along designated trails.</td>
<td>Safety concerns would still persist as would the proliferation of social trails between Lower Tipsoo Lake and SR 410.</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 6. IMPACT MATRIX: COMPARISON OF TRAFFIC MANAGEMENT OPTIONS - PHASE I

<table>
<thead>
<tr>
<th>Socioeconomic Environment</th>
<th>Alternative A: No Action</th>
<th>Alternative B: Pavement Overlay of Existing Road Surface</th>
<th>Alternative C: Resurface, Restore, and Rehabilitate Existing Road Surface (Preferred)</th>
<th>Alternative D: Reconstruct Road to a 26-28-Foot Topwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Option A</td>
<td>Option B-1 (Preferred)</td>
<td>Option C</td>
</tr>
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<td></td>
<td></td>
<td>Minor traffic delays would inconvenience park and commuter traffic. It is not anticipated that commuters would change their route due to minor delays, therefore, impacts to surrounding businesses are thought to be moderate and short term.</td>
<td>This option requires the least amount of time to complete Phase I, but would not result in the greatest economic impacts to businesses in year 2. Complete closures in year 2 could have significant impacts on businesses that survive on a steady flow of traffic each year for their economic viability. Total loss in sales to businesses resulting from actions proposed in this option is estimated at $2,159,387.</td>
<td>Work shift strategies of morning closures would have the least economic impact to businesses over the duration of Phase I. Avoiding total closures and extending the time needed to complete Phase I construction allows the greatest amount of traffic to pass through the construction area, thereby minimizing economic losses to gateway communities. Total loss in sales to businesses resulting from actions proposed in this option is estimated at $2,572,170.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This option requires the least amount of time to complete Phase I, but would not result in the greatest economic impacts to businesses in year 2. Complete closures in year 2 could have significant impacts on businesses that survive on a steady flow of traffic each year for their economic viability. Total loss in sales to businesses resulting from actions proposed in this option is estimated at $2,159,387.</td>
<td>This option would have the least economic impact to businesses over the duration of Phase I. Avoiding total closures and extending the time needed to complete Phase I construction allows the greatest amount of traffic to pass through the construction area, thereby minimizing economic losses to gateway communities. Total loss in sales to businesses resulting from actions proposed in this option is estimated at $1,780,330.</td>
<td>Work shift strategies of morning closures would have the least economic impact to businesses over the duration of Phase I. Avoiding total closures and extending the time needed to complete Phase I construction allows the greatest amount of traffic to pass through the construction area, thereby minimizing economic losses to gateway communities. Total loss in sales to businesses resulting from actions proposed in this option is estimated at $2,572,170.</td>
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<td>Option B-2 (Preferred)</td>
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<td>Weekday road closures would impact park visitors and through traffic, but not to the extent of Option A. Total loss in sales to businesses resulting from actions proposed in this option is estimated at $2,159,387.</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Work shift strategies of morning closures would have the least economic impact to businesses over the duration of Phase I. Avoiding total closures and extending the time needed to complete Phase I construction allows the greatest amount of traffic to pass through the construction area, thereby minimizing economic losses to gateway communities. Total loss in sales to businesses resulting from actions proposed in this option is estimated at $2,572,170.</td>
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</table>
TRAFFIC MANAGEMENT OPTIONS - ALTERNATIVES C AND D:

OPTION A: YR 1: road open to two-way traffic during spring, summer, and early fall; total road closure beginning October 1. YR 2: total road closure for entire season (spring-fall). YR 3: road open to two-way traffic during spring and summer with possible weekday closures, as necessary, for paving (1-2 weeks).

OPTION B-1: YR 1: road open to two-way traffic during spring, summer, and early fall; total road closure beginning October 1. YR 2: total road closure during spring and early summer (April 15-July 1 [approx.]); weekday road closure from mid-summer through early fall from 11:00 p.m. Sunday to 5:00 p.m. Thursday, with road open to two-way traffic on weekends (Friday-Sunday); total road closure beginning October 1. YR 3: total road closure during spring and early summer (April 15-July 1 [approx.]); weekday road closure from mid-summer through early fall from 11:00 p.m. Sunday to 5:00 p.m. Thursday, with road open to two-way traffic on weekends (Friday-Sunday); total road closure beginning October 1.

OPTION B-2: (PREFERRED) YR 1: road open to two-way traffic during spring, summer, and fall. YR 2: weekday road closure during spring, summer and fall from 11:00 p.m. Sunday to 5:00 p.m. Thursday, with road open to two-way traffic on weekends (Friday-Sunday). YR 3: weekday road closure during spring, summer and fall from 11:00 p.m. Sunday to 5:00 p.m. Thursday, with road open to two-way traffic on weekends (Friday-Sunday).

OPTION C: YR 1: road open to two-way traffic during spring, summer, and early fall; total road closure beginning October 1. YR 2: total road closure during spring and early summer (April 15-July 1 [approx.]); partial weekday closure (from 5:00 a.m. to 2:00 p.m. daily) from mid-summer through early fall, with road open to two-way traffic on Saturday and Sunday; total road closure beginning October 1. YR 3: total road closure during spring and early summer (April 15-July 1 [approx.]); partial weekday closure (from 5:00 a.m. to 2:00 p.m. daily) from mid-summer through early fall, with road open to two-way traffic on Saturday and Sunday; total road closure beginning October 1.

*On weekends that the road would be open under Options B-1, B-2, and C, only one traffic lane would be open during 20%, 30%, and 40% of the time, respectively. Flaggers and/or signal devices would be used to manage traffic flow during these periods.
### TABLE 7. IMPACT MATRIX: COMPARISON OF TRAFFIC MANAGEMENT OPTIONS - PHASES II AND III

<table>
<thead>
<tr>
<th>Socioeconomic Environment</th>
<th>Alternative A: No Action</th>
<th>Alternative B: Pavement Overlay of Existing Road Surface</th>
<th>Alternative C: Resurface, Restore, and Rehabilitate Existing Road Surface (Preferred)</th>
<th>Alternative D: Reconstruct Road to a 26-28-Foot Topwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No effect on surrounding businesses, concessions within the park, or recreation activities. However, continued deterioration of the roadway could necessitate unexpected emergency road closures, which would result in reduced traffic volumes on the roadway and a loss of sales to surrounding gateway communities.</td>
<td>Minor traffic delays would inconvenience park and commuter traffic. It is not anticipated that commuters would change their route due to minor delays, therefore, impacts to surrounding businesses are thought to be moderate and short term.</td>
<td>Closures would occur in shoulder seasons or when the pass is normally closed and traffic volumes are significantly lower. Overall, yearly impacts to surrounding businesses are considered short term and moderate. Two-hour closures proposed in subsequent years of Phase II could have minimal to moderate impacts on traffic, depending on location and timing of closure information, and the commuter tolerances regarding construction delays. Impacts to surrounding businesses would be moderate.</td>
<td>Road closures could result in significant impacts to traffic volumes, but would occur in early spring when traffic volumes are not at peak levels. Impacts to businesses would, therefore, be short term and moderate. Traffic delays may cause minor inconveniences to commuters during the visitor season. It is not anticipated that a majority of commuters would choose an alternative route to avoid temporary closures. Impacts to businesses along the SR 410 corridor would be considered short term and moderate.</td>
</tr>
</tbody>
</table>

**TRAFFIC MANAGEMENT OPTIONS - ALTERNATIVES C AND D:**

**PHASE II:** limited road closures (up to one month) during spring (April-May) and late fall (October-December); no road closures planned during peak summer months (June-September); brief delays (up to 30 minutes) expected on weekdays; no delays anticipated on weekends.

**PHASE III:** traffic delays not to exceed 30 minutes during peak summer months (June-September); limited road closures (up to 1 day) possible, but would occur only during early spring (March-April) or late fall (October-December).
ENVIRONMENTAL CONSEQUENCES

There would be several general impacts on natural and cultural resources, visitor use and park operations, and the socioeconomic environment due to construction activities. These impacts would be essentially the same for all alternatives except the no action. General impacts are discussed below, and specific impacts associated with each alternative are addressed in the following sections.

GENERAL IMPACTS

Natural Resources

Air Quality. Machinery emissions and increased airborne dust resulting from construction activities would decrease air quality in the vicinity of the project site. Impacts on air quality would be temporary; normal conditions would return once construction is completed.

Wildlife. Noise and human presence associated with construction activities would disturb wildlife in the immediate vicinity of the project area. Individual mammals and birds would be expected to avoid these areas to a certain extent during construction and some wildlife may be permanently displaced. However, the effect on overall populations of affected species is not expected to be significant.

Additional impacts on wildlife would be associated with minor modification of suitable habitat due to changes in road alignment and removal of individual trees. Specific acreages to be affected are included in the discussion of impacts for each alternative. The National Park Service anticipates no long-term significant impact on wildlife populations since the total affected acreage under each alternative would be small.

Sensitive Species. Wildlife—There would be no known adverse impact on any federally proposed or listed threatened or endangered wildlife species. The National Park Service has determined that each of the alternatives considered would have no effect on the gray wolf or grizzly bear based on the lack of either animal’s confirmed presence in the project area, coupled with the small amount of habitat that would be lost or disturbed, the relatively large amount of undisturbed habitat nearby, no anticipated adverse effects on prey populations, and the project’s location along an existing highway corridor where human disturbance is frequent. In addition, there would be no effect on the bald eagle, American peregrine falcon, or any wildlife species of concern (California wolverine, Cascades frog, long-eared myotis, long-legged myotis, North American lynx, northern goshawk, olive-sided flycatcher, Pacific fisher, Pacific lamprey, Pacific western big-eared bat, river lamprey, and tailed frog). This determination is based on limited or no accounts of the above species within the project vicinity and a lack of actions that would result in long-term adverse effects on habitat or prey. Impacts on the northern spotted owl, marbled murrelet, and bull trout are addressed separately under each alternative.

Vegetation—None of the alternatives would have a known adverse effect on sensitive plant species. To ensure this is true, surveys would be conducted during the prime growing season to determine the presence of sensitive plants within the project area. If any are discovered, the location would be fenced or signed in the field to avoid disturbance.

Water Resources. Some temporary water quality degradation may occur in adjacent creeks, streams, or side channels of the White River when culverts are replaced, riprap installed, or where excavation is necessary in
water-saturated soils beneath the road surface or in ditches adjacent to the roadway. Separator devices (e.g., silt fences, sand bags) would be used where feasible to protect aquatic resources from adverse impacts caused by runoff and accidental spills of petroleum products during road paving.

For actions resulting in wetlands degradation or loss, an equivalent amount of in-kind mitigation would be accomplished within park boundaries to compensate for lost wetlands acreage, functions, and values (refer to specific design alternatives for acreage to be impacted). Because internal roads within park units are excepted actions under the NPS Floodplain Management Guideline (NPS 1993), a statement of findings to comply with Executive Order 11988 (Floodplain Management) will not be prepared.

Cultural Resources

The National Park Service has completed archeological surveys of the SR 410 corridor within the park boundaries to identify and evaluate potential archeological resources that could be affected by project activities. One identified site (45-PI-406 at Tipsoo Lake) was tested and found to meet the criteria of eligibility for the National Register. Construction activities with the potential to affect this site and perhaps other archeologically sensitive areas will be monitored by the park archeologist to ensure that impacts to significant resources are avoided.

The portion of SR 410 within the park boundaries has been determined a structure contributing to the park's recently designated National Historic Landmark (NHL) district. Therefore, under all alternatives, the effects of project undertakings on the roadway surface, configuration/alignment and associated structures would be evaluated in accordance with applicable cultural resources regulations and policies to ensure that historic properties are adequately taken into account and protected. The Chinook Pass entrance arch and the Tipsoo Lake comfort station (both National Register properties) would be avoided by all construction activities. Under all alternatives, project designs and construction activities would ensure (to the greatest extent possible) preservation of the roadway's rustic and scenic characteristics to ensure its continued compatibility with other park roads.

Visitor Use and Park Operations

During construction, visitors in the vicinity of the project area would be subject to noises, smells, and visual intrusions associated with heavy machinery and road construction. The most significant disturbance would be in concentrated visitor use areas such as at trailheads and the Tipsoo Lake area. Visitor use generally received by these areas would be expected to temporarily shift to other areas. This might increase visitor use pressure at various trails and other areas not involved in construction.

At times visitors would also experience traffic delays and reduced travel speed. Contract specifications would allow full closure of the road during specific periods of the visitor use season. In addition to these visitor impacts within the park, there would be increased impacts to travelers on roads outside the park due to construction delays and the hauling of construction materials.

Once construction is completed, the resulting road would have a smoother traveling surface making it easier and more pleasant to drive. Roadside turnouts would be paved and better defined, providing frequent places for the visitor to stop and enjoy the views and resources of the park.
Socioeconomic Environment

Gateway communities would be subject to short-term inconveniences resulting from road closures and delays, including traffic congestion and periodic presence of heavy equipment. Other short-term social impacts associated with road design alternatives and closure options may include impeded access to trails, scenic areas, and other attractions within the park. Long-term benefits could include a safer, scenic and more efficient transportation route for tourists and commuters.

Demands for construction jobs and materials would bring a negligible amount of short-term sales and tax benefits to the region. Gateway communities would experience modest short-term benefits resulting from construction-related demands for food, gas, and possibly lodging. Demands for services associated with construction jobs would not likely offset potential local tourist-related economic losses that could result from road delays and closures. Local business marketing, coupled with delayed or limited access to destinations, could further offset potential economic losses by capturing tourist and commuter traffic not accustomed to stopping in gateway communities.

ROAD DESIGN ALTERNATIVES

ALTERNATIVE A - NO ACTION

Impacts to Natural Resources

There would be no further impacts to natural resources other than those generally associated with routine maintenance of the road corridor (e.g., vegetation removal due to roadside brushing, elimination of hazard trees). Under the no action alternative, there would be no anticipated loss of wildlife habitat or potential nest trees for marbled murrelets or spotted owls. Nor would there be additional impacts on wetlands or the White River, its tributaries, or floodplain. Likewise, there would be no direct or indirect effects on bull trout. However, unexpected road failures could cause further resource impacts including soil erosion, tree loss, and slope instability. Some adverse impacts to park resources would remain such as the continued raveling of cut slopes and social trails leading to the meadows around Tipsoo Lake.

Conclusion. Routine maintenance would cause some additional resource impacts, while other impacts would still remain or may occur due to unexpected road failures.

Impacts to Cultural Resources

The decision to provide routine maintenance of SR 410 would have no effect on identified historic properties or cultural resources. The qualities contributing to the significance of SR 410 as a contributing NHL structure would not be diminished. However, routine maintenance may not adequately check ongoing deterioration of the rock retaining walls and guardrails; these would likely require substantial repairs or replacement at some future date.

Although outside the area of effect of road maintenance activities, the archeological site at Tipsoo Lake (45-PI-406) would continue to be affected by social trail traffic and erosion. The National Park Service would decide on an appropriate strategy for preserving the site’s potential to yield significant information. Any mitigation proposal would be developed and implemented in consultation with the State Historic Preservation Office, affected American Indian tribes, and the Advisory Council on Historic Preservation as necessary.

Conclusion. Routine maintenance would have no effect on cultural resources. The Tipsoo Lake archeological site would continue to face
potentially adverse effects from social trail traffic and erosion.

Impacts on Visitor Use and Park Operations

As the road surface and rock walls continue to deteriorate, defects in the roadway would cause an increasing safety hazard and rough ride for visitors traveling along the parkway. Periodic failures due to inadequate drainage and catastrophic failure of the rock walls have the potential to create lengthy road closures and escalating maintenance costs. The potential for serious accidents resulting from vehicles leaving the roadway in steep unprotected areas would remain as would the potential for less severe accidents at the poorly designed Sunrise Road and SR 123 intersections.

The lack of adequate parking at Tipsoo Lake would continue to force motorists to park along the road shoulder. This situation not only perpetuates a safety concern, but also presents problems to NPS personnel overseeing visitor use of the area.

Conclusion. Routine maintenance would not remedy the underlying structural deficiencies in the road and the potential to create lengthy road closures and escalating maintenance costs; nor would it alleviate the safety hazards that currently exist.

ALTERNATIVE B - PAVEMENT OVERLAY OF EXISTING ROAD SURFACE

Impacts to Natural Resources

Pavement overlay of the existing road surface would generally confine natural resource impacts to the previously disturbed road corridor and would be similar to those impacts previously described for Alternative A (No Action). Although there would be no loss of wildlife habitat or potential nest trees for marbled murrelets or spotted owls, noise generated from construction activities could potentially affect spotted owls in the vicinity of the construction site (previous surveys have not revealed the presence of murrelets within the project area). If nesting owls are discovered in the area after work commences, timing restrictions may be imposed on the contractor to minimize the potential for disturbance. Additionally, the National Park Service would consult with the U.S. Fish and Wildlife Service to determine appropriate mitigation measures.

Construction activities such as road paving and the use of diesel-powered equipment could be expected to increase airborne pollutants (e.g., carbon monoxide, sulfur dioxide, nitrogen oxides, volatile organic compounds, particulates) over existing levels during construction and for a short time after construction is completed. However, these increases would be localized, short term, and insignificant in relation to the park’s overall air quality. Nor would they exceed the NAAQS (National Ambient Air Quality Standards) or allowable class I increments.

Impacts on vegetation would be limited to those generally associated with routine maintenance of the road corridor. Because work would occur in areas of previous disturbance, there would be no anticipated impacts on wetlands or the White River, its tributaries, and floodplain. Although rainwater runoff may transport some hydrocarbons into park waters after paving is completed, concentrations are expected to be at low levels since asphalt is very adhesive and relatively insoluble. Consequently, no adverse effects on bull trout or other aquatic resources are anticipated.

Since structural deficiencies in the roadbed would still exist, unexpected road failures could cause further resource impacts including soil erosion, tree loss, and slope instability. Some adverse impacts to park resources would
remain such as the continued raveling of cut slopes and social trails leading to the meadows around Tipsoo Lake.

**Conclusion.** Pavement overlay of the existing road surface would generally confine natural resource impacts to the previously disturbed road corridor. Although additional resource impacts would occur, each is expected to be localized, short term, and insignificant. In addition, other impacts would still remain, or may occur due to unexpected road failures.

**Impacts to Cultural Resources**

The effects on cultural resources under this alternative would be essentially the same as those described under Alternative A. Any subsequent mitigation of archeological site 45-PI-406 would also proceed as described under Alternative A.

**Conclusion.** Overlay of the existing road surface would have no effect on cultural resources.

**Impacts on Visitor Use and Park Operations**

Although motorists would experience a smoother driving surface, impacts on visitor use and park operations would generally be the same as those previously described for Alternative A (No Action) since structural inadequacies would still exist in the roadbed.

**Conclusion.** Although motorists would experience a smoother driving surface, repaving alone would not remedy the underlying structural deficiencies in the road and the potential to create lengthy road closures and escalating maintenance costs; nor would it alleviate the safety hazards that currently exist.

**ALTERNATIVE C - RESURFACE, RESTORE, AND REHABILITATE EXISTING ROAD SURFACE (PREFERRED)**

**Impacts to Natural Resources**

Construction activities would generally be limited to the previously disturbed road corridor. Guardrail and guardwall would be used throughout the project area in an effort to minimize habitat losses and reduce impacts on natural resources. Approximately 25 of the 28 large trees (> 18 in. dbh) to be removed are located within the lower two miles of the road (mileposts 57.6-59.6). Between Cayuse Pass (milepost 65.5) and Chinook Pass (milepost 69.2), only one tree greater than 18 inches dbh would be removed. This tree is located near the Tipsoo Lake parking lot, along the edge of the pavement and next to a ditch where a culvert would be replaced. The two remaining large trees to be eliminated are located near mileposts 60.78 and 61.4.

In an attempt to further minimize the loss of large trees along the road corridor, each tree slated for removal would be evaluated individually by a NPS landscape architect and the park ecologist and park botanist. In fill areas, tree wells (small rock retaining structures) would be created near the base of trees where necessary to protect the root zone from damage. An effort would be made to protect snags, wherever possible.

Total ground disturbance for all phases of construction would be 1.88 acres with the majority of new disturbance (1.53 acres) occurring within 10 feet of previously disturbed areas on either side of the road.

A biological assessment (Appendix B) evaluating the effects of the proposal on federally protected species within the project area has been submitted to the Fish and Wildlife Service for concurrence that the
The proposed action is not likely to adversely affect the marbled murrelet or northern spotted owl, nor result in the destruction or adverse modification of critical habitat. This determination is based partly upon the limited occurrence of the spotted owl and the lack of a confirmed presence of the marbled murrelet along the SR 410 corridor, the fact that very little habitat for either species would be eliminated, and the conservation measures that the National Park Service would employ to ensure that murrelets and spotted owls would not be adversely affected by construction activities.

Loss of potential murrelet habitat would not exceed 0.9 acre, whereas loss of potential spotted owl habitat would not exceed 1.8 acres. Habitat removal would generally be confined to a linear segment on either side of the road within 10 feet of the existing area of disturbance, along a road corridor where human disturbance is frequent. (Total habitat losses for Phase I, II, and III construction are approximately 0.61 acre, 0.48 acre, and 0.69 acre, respectively.) Because habitat losses would occur adjacent to a road, the increase in forest edge is not expected to significantly alter the interior forest, increase the potential for blowdowns to occur, or adversely affect populations of prey species. Nor is it expected to encourage predation of murrelet nest sites by corvids or other avian predators, increase the vulnerability of spotted owls to great horned owl (Bubo virginianus) predation, or encourage encroachment of spotted owl competitors such as the barred owl (Strix varia). No take of marbled murrelets or spotted owls is anticipated since road reconstruction is not expected to result in the direct or indirect mortality of either species and habitat losses would be relatively insignificant.

Although 27 trees (each ≥ 24 in. diameter at breast height [dbh]) are slated for removal along the road corridor between mileposts 57.6 and 66.68 (below 5,000 feet elevation), few of these trees meet the requirements for potential murrelet nest trees (e.g., >32 in. dbh; availability of suitable nest platforms; high canopy closure and low exposure) (Ralph et al. 1995). Nor do they possess characteristics typically associated with spotted owl nest trees (broken tops, naturally occurring cavities), roost sites (relatively dense vegetation with high canopy closure), or foraging areas (high canopy closure and complex structure) (U.S. Department of the Interior 1992). All of the 27 trees to be removed are located within four miles of the park’s northern boundary and would be cut during Phase III construction.

It is possible that construction activities (e.g., noise, dust, increased human presence) could adversely affect individual spotted owls or marbled murrelets if they were found nesting and rearing young in the immediate vicinity of the project area. To help minimize the potential for disturbance during the nesting season, all blasting would occur during spring (before June 1) and late summer (after August 15), to the extent possible. Blasting would be limited to no earlier than two hours after sunrise and no later than two hours before sunset (generally between 8:00 a.m. and 6:00 p.m.).

If nest sites were discovered after construction activities began, work would be halted in that particular area until the young birds were fully fledged. The National Park Service also would consult with the U.S. Fish and Wildlife Service to determine appropriate mitigation measures.

Minor channel realignment resulting from the replacement of two culverts in the Tipsoo Lake area would not have an adverse effect on the hydrology of Lower Tipsoo Lake. However, temporary degradation of water quality could be expected in Chinook Creek for two consecutive weeks while culverts are being replaced. To minimize adverse impacts on water quality, instream work would occur during periods of lowest water flow, and the banks of the realigned channel would be...
planted with riparian vegetation to stabilize slopes.

To comply with Executive Order 11990 (Protection of Wetlands), a Statement of Findings (Appendix D) has been prepared documenting the anticipated adverse impacts on wetland functions and values resulting from the proposed action. One small palustrine wetland located on the south side of the road at milepost 67.84 (approximately 0.5 mile west of the Tipsoo Lake parking lot) would be affected by the placement of fill material during Phase I construction. This 0.51 acre wetland lies on a bench at the toe of an existing fill slope, roughly 10-15 feet below the road surface, and is hydraulically charged by water seeping through the fill. The proposed extension of the fill slope would reduce the size of this wetland by a maximum of 0.1 acre due to the placement of approximately 340 cubic yards of class I riprap, two feet in depth. However, because perforated pipe would be installed beneath the riprap, no adverse effects on wetland hydrology are anticipated since water flow through the wetland would remain unimpeded. Nor is the addition of fill material expected to adversely affect wetland functions (e.g., ground water recharge, erosion and sediment control, habitat diversity).

To compensate for lost acreage and values resulting from the wetland fill at milepost 67.84, approximately 0.1 acre of in-kind mitigation would be accomplished at Lower Tipsoo Lake. Although details of the proposed enhancement project are still being worked out, park staff are exploring the possibility of replacing all or a portion of the turnpiking that surrounds the lake with a raised, accessible trail to help reestablish natural drainage patterns currently hindered by the turnpiking. Additional enhancement efforts may also include removing introduced fish from the lake. Details of the proposed enhancement project would be further refined once the area is free of snow and site visits can be made by park resource personnel later this summer.

Although the design has yet to be finalized for Phase III construction, work along the lower section of the road would generally be limited to the existing road prism. In compliance with the NPS Protection of Wetlands Guideline (NPS 1977), this project would adhere to the policy of "no-net-loss" of wetland acreage and functions on NPS lands, and strive to achieve the broader goal of net gain of wetland acreage and functions by avoiding wetland impacts and restoring wetlands that have been degraded or lost due to human activities. As the design for Phase III construction proceeds, and if wetland impacts appear unavoidable, the Statement of Findings will be amended to address the extent of the anticipated wetland impacts, the alternatives considered to avoid or minimize these impacts, and the compensation proposed to offset losses of wetland acreage and functions.

Impacts on air quality and water resources resulting from construction activities such as road paving would be the same as those described for Alternative B (i.e., localized, short term, and insignificant). Likewise, no adverse effects on bull trout or other aquatic resources are anticipated. Although there would be 1.88 acres of additional soil and vegetation disturbance along the road corridor, remediation of over-steepened cut slopes would reduce slope raveling and subsequent soil erosion, tree loss, and slope instability commonly associated with these sites. Improved trail access to the meadows around Lower Tipsoo Lake also would have a beneficial effect by curtailing soil compaction and vegetation trampling caused by visitors.

**Conclusion.** Total ground disturbance for all phases of construction would be 1.88 acres with the majority of new disturbance (1.53 acres) occurring within 10 feet of previously disturbed areas on either side of the road. To
minimize habitat losses and reduce impacts on natural resources, construction activities would generally be limited to the previously disturbed road corridor. The only anticipated adverse impact on natural resources would result from the loss of 0.1 acre of palustrine wetland. To compensate for lost wetland acreage, approximately 0.1 acre of in-kind mitigation would be accomplished at Lower Tipsoo Lake. Actions such as improving trail access to the meadows around Lower Tipsoo Lake and remediating over-steepened cut slopes would have a beneficial effect by reducing existing resource impacts along the road corridor.

**Impacts to Cultural Resources**

Undertakings proposed to restore and rehabilitate SR 410 under this alternative have the potential to affect character-defining features of the roadway. Because SR 410 within the park has been determined a structure contributing to the significance of the park’s National Historic Landmark (NHL) district, effects to the road and ancillary structures along its corridor must be assessed in accordance with regulations of the Advisory Council on Historic Preservation addressing the criteria of effect and adverse effect (36 CFR 800.9).

Although modifications to the roadway are required to address modern safety requirements and ensure the continued use of the road for both visitors and through traffic, project designs have strived to retain to the greatest extent possible the road’s rustic and scenic characteristics that were incorporated into its original design and construction in the late 1920s and early 1930s. The road will continue to offer visitors the scenic views and pleasurable motoring experiences envisioned by early designers, but with greater consideration for the safety requirements of the present motoring public. Continuity with the park’s overall historic road system will similarly be retained.

Of the seven resource categories identified for the larger NHL district, the project will only affect certain physical attributes of SR 410 as a contributing structure. Its functional characteristics as an integral component of the park’s overall circulation system will remain intact. The project will have no (or negligible) effect on resources identified as contributing to NHL district significance under the categories of spatial organization, circulation, topography, vegetation, buildings and sites.

Identified National Register structures, namely the Chinook Pass entrance arch and the Tipsoo Lake comfort station, will be avoided by project undertakings and will not be affected. However, the directional stone sign at the intersection of SR 410 and the White River/Sunrise Road will be relocated a few feet away from the edge of the road as part of the proposed reconfiguration of the intersection. The wooden portion of the sign (made in the 1970s) would be replaced. The sign (an object identified as contributing to the NHL district) would be affected by relocation and replacement of its wood inscription, although the overall setting and historic association of the sign would remain intact.

As part of the undertakings proposed by this alternative, improvements to the parking lot at Tipsoo Lake have the potential to affect archeological site 45-PI-406. Although test excavations of the site have resulted in its evaluation as potentially eligible for the National Register, the portion of the site nearest the parking area (and most apt to be disturbed by project activities) has already lost integrity from prior disturbance. Construction will be monitored by the park archeologist to ensure avoidance of significant portions of the site. There are no recommendations for further data recovery at this time based on the scope of the project. Should the project be altered to
threaten greater disturbance of the site, the National Park Service would carry out data recovery in accordance with a mitigation plan developed in consultation with the State Historic Preservation Office, affected Native American tribes, and the Advisory Council on Historic Preservation. Another proposed mitigative measure is the NPS preparation and placement of a wayside exhibit in the site vicinity to interpret the nature of Native American use and occupation of the area.

In consideration of the project objectives for preserving and protecting the historic design elements that characterize SR 410, the National Park Service anticipates that the proposed project will result in no adverse effect to historic properties. To a limited degree, undertakings such as replacement of deteriorated rock retaining walls and guardwalls, the introduction of other new walls and drainage structures, alignment modifications/widening, and slight relocation of the directional sign at the White River/Sunrise Road turnoff, have the potential to alter the road’s historical appearance. However, these undertakings would not substantially diminish the overall rustic and scenic qualities of SR 410 that have been perpetuated from the time of its initial construction, and that provide the road its historic feeling and association as a structure contributing to the NHL district at Mount Rainier National Park.

The National Park Service will ensure that project designs and construction are carried out in conformance with the "Secretary of the Interior’s Standards for the Treatment of Historic Properties" and other applicable cultural resource policies and guidelines. The NPS construction inspector will be a professional landscape architect knowledgeable of SR 410’s historic significance and character-defining features to ensure that significant resources are protected and project objectives are carried out.

The Washington State Office of Archaeology and Historic Preservation (State Historic Preservation Office) has reviewed the project and concurred with the NPS finding of no adverse effect on historic properties as presented by this proposed alternative (see Appendix E; letter of May 8, 1997). The National Park Service will consult further with the SHPO should project plans be substantially altered. In accordance with 36 CFR 800.5(d)(1)(I), the National Park Service has submitted summary documentation of the finding and the SHPO’s concurrence with the no adverse effect determination to the Advisory Council on Historic Preservation.

Conclusion. Restoration and rehabilitation of SR 410 would result in no adverse effect to cultural resources, or historic properties determined contributing to SR 410’s significance as a National Historic Landmark structure.

Impacts on Visitor Use and Park Operations

This alternative would extend the service life of SR 410. A new traveling surface would provide a smoother ride for travelers and reduce cyclic maintenance requirements.

The installation of guardrail and minor widening would provide a safer road, reducing the potential for motor vehicle accidents, especially during winter driving conditions. Informing visitors of the road’s unique features and road conditions, and enforcing the speed limit would further reduce the likelihood of accidents.

Improving drainage ditches and the ragged toe slopes above these ditches would enhance drainage along the road. Installation of catchment basins and culvert inlet improvements would improve drainage as well as safety and roadside aesthetics. Currently, many culvert inlets are large gaping holes.
Paving the many turnouts along the road would reduce pavement cracking from traffic entering and leaving turnouts and make it much easier to distinguish turnouts and viewpoints from other wide spots in the road. Paving the turnouts would also ensure that the turnout and road edge have the same vertical alignment providing a smoother entrance to and exit from the roadway.

**Conclusion.** Park visitors and motorists would benefit from improved safety and better driving conditions along SR 410. Proposed improvements would also extend the service life of the road and reduce cyclic maintenance requirements.

**ALTERNATIVE D - RECONSTRUCT ROAD TO A 26-28-FOOT TOPWIDTH (11 FOOT TRAVEL LANES AND 2-3-FOOT PAVED SHOULDERS)**

**Impacts to Natural Resources**

In the lower two miles of the project area (mileposts 57.6-59.6), most impacts would be limited to the previously disturbed road corridor. Secondary vegetation adjacent to the road would be disturbed by road base excavation and by construction equipment. Approximately 1.2 acres of presently undisturbed land would be impacted by fills necessary to obtain the 4:1 foreslopes.

Between mileposts 57.6 and 59.6, a minimum of 85 trees larger than 18 inches dbh would be removed. Approximately 1,100 trees between 5 inches and 18 inches dbh would be eliminated due to the excavation necessary for establishing the 4:1 foreslopes, ditch improvements, and culvert inlet treatments. Table 8 represents a preliminary count of trees of four different size classes that would be removed.

<table>
<thead>
<tr>
<th>Size Class (dbh)</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10&quot;</td>
<td>620</td>
</tr>
<tr>
<td>10-14&quot;</td>
<td>300</td>
</tr>
<tr>
<td>14-18&quot;</td>
<td>180</td>
</tr>
<tr>
<td>&gt;24&quot;</td>
<td>85</td>
</tr>
</tbody>
</table>

Most impacts occurring between mileposts 59.6 and 69.2 (Chinook Pass) would also occur within the previously disturbed road corridor. Secondary vegetation adjacent to the road would be disturbed by road base excavation and by construction equipment. In some fill slopes, secondary vegetation would be disturbed by isolated placement of fill material.

No trees larger than 18 inches dbh would be removed between milepost 59.6 and Chinook Pass. Approximately 15-30 trees, 5-18 inches dbh would be removed due to the excavation necessary for ditch improvements and culvert inlet treatments. Implementation of this alternative would result in nearly 8-10 acres of new ground disturbance, with most impacts occurring between the north park entrance and Cayuse Pass. Guardrail and guardwall would be used to help minimize habitat losses, particularly potential nest trees for marbled murrelets and spotted owls.

Impacts associated with Phase I construction (between Cayuse and Chinook Passes) would be essentially the same as those described for Alternative C due to the similar road width proposed for this section of the road.

Despite the loss of nearly 10 acres of suitable marbled murrelet and spotted owl habitat within the project area, actions contained in this alternative are not likely to adversely affect the marbled murrelet or northern spotted owl, nor
result in the destruction or adverse modification of critical habitat for the same reasons mentioned under Alternative C (i.e., limited occurrence or lack of a confirmed presence within the project area, the fact that very little habitat for either species would be eliminated, and the conservation measures that the National Park Service would employ to ensure that murrelets and spotted owls would not be adversely affected by construction activities).

Wetland impacts would be the same as those described for Alternative C. Impacts on air quality and water resources resulting from construction activities such as road paving would be the same as those stated for Alternative B (i.e., localized, short term, and insignificant). Likewise, no adverse effects on bull trout or other aquatic resources are anticipated. As previously described for Alternative C, remediation of over-steepened cut slopes would reduce slope raveling and subsequent soil erosion, tree loss, and slope instability commonly associated with these sites. Improved trail access to the meadows around Lower Tipsoo Lake also would have a beneficial effect by curtailing soil compaction and vegetation trampling caused by visitors.

**Conclusion.** Implementation of this alternative would result in approximately 8-10 acres of new ground disturbance, with most impacts occurring between the north park entrance and Cayuse Pass. Guardrail and guardwall would be used to help minimize habitat losses, particularly potential nest trees for marbled murrelets and northern spotted owls. The only anticipated adverse impact on natural resources would result from the loss of 0.1 acre of palustrine wetland. Beneficial effects include remediation of over-steepened cut slopes and increased resource protection at Tipsoo Lake, including proposed wetland enhancement and improved trail access.

**Impacts to Cultural Resources**

While the effects on cultural resources are anticipated to be generally the same as those described for Alternative C (preferred), the increased topwidth proposed under this alternative has the potential to more substantially alter SR 410’s historical appearance and fabric. Perhaps most significantly, the road widening would require replacement of all but one of the existing stone masonry retaining walls between Cayuse Pass and Chinook Pass. Although the replacement walls (constructed of stone veneer facing over a concrete core), would be designed to be visually compatible with the historic walls, a significant loss of historic fabric would nevertheless occur. A Memorandum of Agreement (MOA) would be prepared among the National Park Service, the State Historic Preservation Office and the Advisory Council on Historic Preservation stipulating measures that would be undertaken by the NPS to mitigate any adverse effects determined to result from implementation of this alternative.

**Conclusion.** The widened topwidth proposed by this alternative would adversely effect SR 410’s historic characteristics and features contributing to its National Historic Landmark significance.

**Impacts on Visitor Use and Park Operations**

With the exception of impacts associated with the establishment of 4:1 foreslopes and cleared areas, effects on visitor use and park operations would generally be the same as those described for Alternative C. Establishing 4:1 foreslopes and cleared areas on the fill side of the road would, to a certain degree, change the visitor experience along the lower section of the road, particularly within the first few miles of the north park entrance. The overhanging tree canopy would be reduced and the visual corridor of the road would be widened,
allowing more sunlight to reach the road. The additional guardrail that would be added would alter the road’s historic character, change the appearance of roadsides and, in some areas, block views downslope or of the forest floor.

**Conclusion.** Park visitors and motorists would benefit from improved safety and better driving conditions along SR 410. Proposed improvements would also extend the service life of the road and reduce cyclic maintenance requirements. However, the visitor experience could be adversely affected due to a reduction in the overhanging tree canopy, widening of the visual corridor, and a subsequent loss of the road’s historic character.

**SUNRISE ROAD INTERSECTION**

**ALTERNATIVE A - REDESIGN AND RECONSTRUCT INTERSECTION (PREFERRED)**

**Impacts to Natural Resources**

The widening of the road surface required to install the turning lane into the Sunrise Road may necessitate the removal of approximately 30-50 trees. All trees to be removed would be less than 16” dbh.

Approximately 12 small (less than 8” dbh) alders would be removed from the forest understory in the area between the Sunrise Road and SR 410. One large western red cedar (approximately 30” dbh) may require removal to install the retaining wall in the lower edge of the fill where the turning radius would be increased.

A maximum of 0.3 acre of road shoulder and forest would be impacted by constructing the road to the additional width necessary for the turning lane using standard length and widths of turning lanes. Design options would be investigated by the National Park Service to minimize these distances. At the same time, approximately 0.14 acre of pavement would be removed and the area restored to natural conditions by reducing the area presently covered by the wide bench at the intersection.

**Conclusion.** Widening the turning radius of the Sunrise Road and installing a turning lane at the intersection would create a maximum of 0.3 acre of ground disturbance and require the removal of approximately 30-50 trees less than 16” dbh. These losses would be offset by the removal of 0.14 acre of pavement and the subsequent restoration of this area to natural conditions.

**Impacts to Cultural Resources**

Proposed reconfiguration of the Sunrise Road intersection is anticipated to have no adverse effect on cultural resources. All construction would occur within previously disturbed areas. The stone "Mather Memorial Parkway" sign at the intersection has been determined an object contributing to the significance of the National Historic Landmark district. The sign would be relocated a few feet away from the edge of the road as part of the proposed reconfiguration of the intersection. The wooden portion of the sign (made in the 1970s) would be replaced. Although the sign would be affected by relocation and replacement of its inscription, the overall setting and historic association of the sign would remain intact.

**Conclusion.** Implementation of this alternative would result in no adverse effect to cultural resources.

**Impacts on Visitor Use and Park Operations**

Widening the turning radius of the Sunrise Road would provide motorists a safer approach to the intersection. The removal of the alder underbrush would enable drivers approaching
the intersection to see the road junction from much further down the Sunrise Road. This should help prevent the vehicle skidding that frequently occurs at this location.

Providing a stacking lane for left-turning traffic would reduce the number of conflicting vehicle movements and would improve the safety characteristics of the intersection. Moreover, the additional width of SR 410 at the intersection would make it easier for a large vehicle coming from the Sunrise Road to make the right-hand turn southbound onto SR 410 without entering its northbound lane and into oncoming traffic.

Removing the Mather Memorial Parkway sign from the intersection and establishing signs at each portal of the parkway would reduce visitor confusion regarding the intersection and would remove a roadside obstacle.

Conclusion. Proposed improvements at the Sunrise Road intersection would enhance motorist safety by providing a safer approach to the intersection and improved traffic flow.

ALTERNATIVE B - NO ACTION (EXISTING CONDITIONS)

Impacts to Natural Resources

There would be no additional impacts on natural resources under the no action alternative. However, safety concerns may in the future require that tree removal take place so that drivers could see the intersection from further away as they approach it from the Sunrise Road.

Conclusion. There would be no additional impacts on natural resources under the no action alternative.

Impacts to Cultural Resources

There would be no effect to cultural resources under the no action alternative.

Impacts on Visitor Use and Park Operations

The intersection would remain as it currently exists; no safety improvements would be made.

STATE ROUTE 123 INTERSECTION

ALTERNATIVE A - REDESIGN AND RECONSTRUCT INTERSECTION (PREFERRED)

Impacts to Natural Resources

Redesign of the SR 123 intersection would result in no additional impacts on natural resources since all work would be confined to the existing road prism and previously disturbed areas.

Conclusion. Redesign of the SR 123 intersection would result in no additional impacts on natural resources.

Impacts to Cultural Resources

Proposed reconfiguration of the SR 123 intersection is anticipated to have no effect on cultural resources. All construction would occur within previously disturbed areas.

Conclusion. Proposed reconfiguration of the SR 123 intersection is expected to have no effect on identified cultural resources.
IMPACTS ON VISITOR USE AND PARK OPERATIONS

Redesign of the SR 123 intersection would help clarify traffic patterns and improve safety at this location. It would also provide a designated parking area, particularly for winter visitors.

Conclusion. Redesign of the SR 123 intersection would benefit travelers and park visitors through enhanced traffic flow and improved parking at this location.

ALTERNATIVE B - NO ACTION

Impacts to Natural Resources

There would be no additional impacts to natural resources under the no action alternative.

Impacts to Cultural Resources

There would be no effect to cultural resources under the no action alternative.

Impacts on Visitor Use and Park Operations

The intersection would remain as it currently exists; no attempt would be made to delineate traffic patterns and enhance safety at this location.

Conclusion. Under the no action alternative inadequate parking and safety concerns would persist at the SR 123 intersection.

TIPSOO LAKE

ALTERNATIVE A - IMPROVE PARKING AND REDUCE RESOURCE IMPACTS (PREFERRED)

Impacts to Natural Resources

Placing a barrier along the road edge would channel visitors to use designated trailheads, eliminating or substantially reducing the social trails leading down to Lower Tipsoo Lake. This would allow for successful revegetation of the existing social trails between the road and the lake. The new roadside parking area and redesign of the existing parking lot would help concentrate visitor use, reducing impacts on the surrounding subalpine vegetation. Much of the area to be occupied by the new roadside parking area has been previously disturbed; a maximum of 0.1 acre would be impacted by this construction. Construction of barrier walls and elimination of informal parking along the road shoulder would help channel visitor use and reduce the erosion and subsequent siltation of the meadow and lake that now occurs from use of the road shoulder for parking.

Conclusion. Proposed site improvements would reduce impacts on the surrounding subalpine vegetation by channeling visitor use along maintained trails and allowing for successful revegetation of existing social trails. It would also help curtail the erosion and subsequent siltation of the meadow and lake that now occurs due to informal roadside parking.

Impacts to Cultural Resources

The proposal to improve/pave parking areas and construct rock parapet walls to control visitor access to the lakes has the potential to affect archeological site 45-PI-406. As
described under Alternative C for the overall road reconstruction project, test excavations of the site have been completed and it is recommended eligible for the National Register. The National Park Service would provide archeological monitoring during construction to ensure avoidance of significant portions of the site. The design of the parapet walls would be compatible with the rustic architectural style of rock walls throughout the park.

**Conclusion.** No adverse effect to cultural resources would be expected in consideration of archeological monitoring during construction, and sensitive/compatible design measures.

### Impacts to Visitors and Park Operations

Development of additional parking would eliminate the safety concerns associated with parking along the road shoulder. Although the wall that would be constructed would serve as a barrier, it would be aesthetically pleasing and would be compatible with other rock walls within Mount Rainier National Park.

Visitors would have to travel a short distance further to reach the lake, particularly if they parked in the upper end of the parking area. However, visitor safety would be increased by encouraging the use of designated trails, particularly in the area near the outlet of Tipsoo Lake when snow covers the stream.

Park staff would have a much easier task ensuring that the subalpine vegetation is not trampled and that visitors remain on designated trails. However, additional care would be necessary during snow removal operations to ensure that the stone walls are not damaged by heavy equipment.

**Conclusion.** Safety concerns associated with roadside parking would be alleviated and visitor safety and resource protection would be enhanced by channeling use along designated trails.

### ALTERNATIVE B - NO ACTION

#### Impacts to Natural Resources

Visitors would continue to trample the meadows between Lower Tipsoo Lake and SR 410. It would continue to be difficult if not impossible to rehabilitate and revegetate the numerous social trails that lead down to the lake. In addition, soil erosion occurring adjacent to the roadway and the resulting siltation of the meadow and lake below the road would continue.

**Conclusion.** Trampling of subalpine vegetation and soil compaction would continue, as would soil erosion and siltation of the meadow and Lower Tipsoo Lake.

#### Impacts to Cultural Resources

As described under Alternative A for the overall road reconstruction project, the no-action alternative would result in continued erosion and disturbance of site 45-PI-406 as a consequence of social trail traffic. The National Park Service would decide on appropriate measures to preserve or mitigate this National Register-eligible site.

**Conclusion.** Under the no action alternative, the Tipsoo Lake site (45-PI-406) would be affected by continuing social trail traffic and erosion.

#### Impacts to Visitors and Park Operations

No additional impacts would occur to park visitors. Park staff would continue to have difficulty in controlling the proliferation of
Conclusion. Safety concerns would still persist as would the proliferation of social trails between Lower Tipsoo Lake and SR 410.

TRAFFIC MANAGEMENT OPTIONS

Methodology

An economic impact study (FHWA 1997) was prepared for the National Park Service to assess the impacts that traffic management options would have on businesses in gateway communities along the SR 410 corridor. An economic baseline was established through interviewing 41 businesses within the communities of Greenwater, Cliffdell, Goose Prairie, and Naches, as well as the Crystal Mountain Resort and operations at Sunrise Visitor Center in the park. Business owners were asked to provide current financial data regarding their estimated annual total sales, and estimated tourist-related sales during the visitor season (June through October). Historical traffic data was used to estimate the future traffic patterns during Phase I construction. The estimated sales for each community, and estimated reductions in traffic based on the proposed traffic management options were used to estimate loss in sales in each community, under each construction option (Appendix F).

ALTERNATIVE A - NO ACTION

Impacts to Park Visitors, Motorists, and Local Communities

Continuing the current course of action would not have an adverse affect on surrounding businesses, concessions within the park, or recreation activities, since there would be no delays or disruption of normal traffic flows. Routine repairs such as pavement restriping and patching, crack repairs, and hazard tree removal are expected and would cause minimal delays that are part of normal roadway maintenance. However, continued deterioration of the roadway could necessitate unexpected emergency road closures, which may result in loss of sales to surrounding gateway communities.

Conclusion. No adverse economic impacts to businesses along or near SR 410 would occur unless continued deterioration of the roadway forces unexpected emergency road closures.

ALTERNATIVE B - PAVEMENT OVERLAY OF EXISTING ROAD SURFACE

Impacts to Park Visitors, Motorists, and Local Communities

Actions proposed in this alternative are intended to remedy roadway surface and drainage issues. Milling and recycling of pavement, and materials transport and distribution associated with resurfacing may cause traffic delays, resulting in minor inconveniences to park and commuter traffic. Park visitors using or planning to use SR 410 may choose an alternative route to the park, depending on the location and timing of construction information that is provided. It is not anticipated that commuters would change their route due to minor delays, therefore, impacts to surrounding businesses are thought to be moderate and short term.

Conclusion. Economic impacts to businesses along or near SR 410 resulting from actions proposed in this alternative would be moderate and short term.
ALTERNATIVE C - RESURFACE, RESTORE, AND REHABILITATE EXISTING ROAD SURFACE (PREFERRED) AND D - RECONSTRUCT ROAD TO A 26-28 FOOT TOPWIDTH

Actions Common to Alternatives C and D

Actions proposed in Alternatives C and D call for the same phasing schedules and propose the same closure options, therefore effects to the socioeconomic environment would be the same under both alternatives. Phasing and road closures proposed in Alternatives C and D would result in approximately four to five years of road construction.

Actions Common to Options A, B-1, B-2, and C

Actions proposed in Phase I for Options A, B-1, and C call for total road closure from Cayuse Pass to Chinook Pass in October of 1997. Fall closure would occur sometime at or after closure of the Sunrise Visitor Center, leaving access available on SR 410 from SR 123 until the northern entrance of the park closes. Under all options, the Mather Memorial Parkway would be open to two-way traffic on Memorial Day, Fourth of July, and Labor Day weekends.

Approximately 10-25 full-time workers from the project vicinity would be hired for construction over the duration of Phase I. Workers would likely be from areas outside the Enumclaw and Yakima areas. The contractor would bring approximately 5-10 workers to the job, and the remaining workers (e.g., flaggers, truck drivers, etc.) would probably come from the Enumclaw area. While these additional jobs may provide some short-term economic benefits in sales tax and sales receipts from food, gas, and lodging to local communities, no significant impact to the local job market is expected.

Construction materials such as rock fill and borrow material for the project would come from a site on USFS land. Minor amounts of other material, such as concrete, sterile topsoil, and native stone would be purchased from local commercial sources by the contractor and result in modest, short-term economic benefits to local economies, and a negligible amount of economic benefits to the regional economy.

Option A

This option requires the least overall time to complete Phase I. Although the accelerated schedule would prevent a third year of road closures in the visitor season, total closure in year 2 would reduce through traffic during the visitor season by approximately 92%, and would consequently result in the greatest economic impacts to businesses surrounding the park. Significant economic losses could occur at the concessioner services at Sunrise within the park which could lose up to 37% of annual sales, and the communities of Goose Prairie and Cliffdell-Nile which could each lose up to 22%. Traffic management options in years 1 and 3 of this option would result in modest reductions in traffic and loss of sales compared to year 2. The total loss in sales to businesses along SR 410 over the duration of Phase I is estimated to be $2,207,124.

Commuters intending to travel eastbound over the pass could choose a number of alternate routes depending on the timing and extent of closure information received. If commuters obtain information prior to departure, they would have the option of traveling alternate routes around or through the park. If travelers were unaware of closures until they arrived at or near the proposed construction, they would have the option of traveling southbound on SR 410 within the park to U.S. Highway 12 via SR 123. It is difficult to predict which alternate route a commuter may likely choose. Therefore, it is unknown what impacts
rerouted traffic may have on concessioner services within the park, or businesses along alternative routes surrounding the park.

Recreationists intending to travel eastbound over Chinook Pass to recreation lands east of Mount Rainier in year 2 would most likely choose another recreation area due to road closures restricting through access to areas just east of Chinook Pass. They may choose to remain west of the pass, placing demands for recreation lands within the park or on USFS and Weyerhauser lands north and west of the park. The impacts associated with any increase in recreation activities could translate into an increased demand for services for the communities of Greenwater and Enumclaw, and a decrease in business activities east of the pass.

Commuters and park visitors intending to travel westbound via SR 410 from interior areas of the state could access the park or areas west of it via U.S. Highway 12 west, or SR 123 north to SR 706 west, or proceed north to SR 410 via SR 123, bypassing proposed construction zones. The communities and businesses along U.S. Highway 12 may experience an increase in demands for services as a result of rerouted traffic. It is difficult to predict what alternate route a commuter may likely choose. Therefore, it is unknown what impacts rerouted traffic may have on concessioner services in the park or businesses in communities such as Greenwater and Enumclaw.

Overall, this alternative has the least impact on traffic over the duration of the project. However, intense work and complete closures during year 2 could cause up to a 36% decrease in annual sales of some businesses within the park and east of the pass, and could result in significant long-term impacts to businesses that survive on a year-by-year basis and rely on a steady, seasonal flow of traffic for their economic viability.

Option B-1

Weekday road closures proposed under this option would impact park visitors and through traffic, but not to the extent of Option A. Loss in sales to the business sector of these communities would be lower in year 2 under this alternative than Option A, but higher in year 3. Overall, total loss in tourist-related sales along the corridor over the duration of the project under this option would be $2,159,387 compared to $2,207,124 in Option A.

Detour choices would be similar to those mentioned in Option A, however, the volume of detoured traffic would be lower in construction year 2. Actions proposed in year 3 of this option are identical to year 2 and would result in similar impacts.

Option B-2

Actions proposed in this option are estimated to have the least economic impact to businesses over the duration of Phase I. As in Option B-1, full closures of the roadway would occur Monday through Thursday when traffic volumes are considerably lower than on weekend days. However, spring weekday closures from April to July, as opposed to a total spring closure proposed in Option B-1, would not impact businesses in construction year 1 and would pose less of an economic impact in year 2 by allowing more traffic east and west of the pass. Although the traffic management schedule under this option would necessitate more work and result in a higher loss of seasonal and annual sales to businesses in year 3 than Option B-1, sales losses are minimized yearly by distributing construction work over a longer time period and avoiding total closures in the visitor season. The biggest loss in sales revenue for a business under this option would be experienced by the Sunrise - Mount Rainier concessions operation, which would lose approximately $70,500, or 19% of
total sales in years 2 and 3. Under this option, total loss of sales for businesses along the study corridor over the duration of Phase I is estimated to be $1,780,330.

Option C

Work shift strategies suggested in years 2 and 3 of this option would have significant impacts on morning through traffic, but have the least impacts on afternoon traffic. Overall, this option would have the greatest impact on daily and yearly traffic volumes over the duration of the project, impacting more than half the traffic both west and east of the pass in years 2 and 3. Impacts to morning traffic would be greatest on through traffic east of the pass, however, loss of tourist-related sales during this period would be significant on both sides of the pass.

Park visitors originating east of the pass would be inconvenienced if they choose to enter the park via SR 410. However, opening of the pass in the afternoon would allow park visitor traffic the option of exiting the park eastbound via SR 410 in the afternoon.

Although park visitors would still be able to access the park from the northern entrance, morning through traffic traveling eastbound to the northern entrance of the park would be forced to choose another route. Impacts to businesses within and outside the park would depend on the timing and extent of closure information that travelers receive beforehand. If travelers obtain information prior to departure, they would have the option of traveling alternate routes around or through the park. Detour choices and impacts associated with eastbound commuter traffic are the same as described in Option A, however, only morning and early afternoon through traffic would be affected.

Tour bus traffic would be impacted if mitigative measures are not taken to reduce conflicts associated with morning closures. Although only a small percentage of vehicles in the park are considered tour buses, the number of passengers on tour buses is high. Disruption of normal tour bus schedules on SR 410 could cause significant impacts to businesses that rely on regular stops they make on the way to the park.

Overall, short-term impacts to traffic volumes and total sales loss to businesses would be greatest under this option. Total loss in sales to businesses under this option is estimated at $2,572,170, with the greatest losses occurring at Sunrise - Mount Rainier concessions, and businesses east of the pass.

Conclusion. Of the four options proposed in Alternatives C and D, Option B-2 would result in the least overall economic impact to businesses over the duration of Phase I, because full closure of the project roadway would occur Mondays through Thursdays when traffic volumes are considerably lower than on weekend days. Option B-1 consists of the same weekday closure schedule as B-2, except that total closure of the project roadway early (May-June) and late (October-December) in the visitor season would result in lower traffic volumes and greater economic impacts to local businesses.

Option C would restrict morning traffic through total pass closure, but open the project roadway to afternoon traffic. This traffic management schedule would result in the greatest economic impact through loss in sales to local businesses along and near SR 410 over the duration of Phase I. Option A would result in the highest loss in sales in one year (1998) when the project roadway would be completely closed during the visitor season. Option A could significantly impact local businesses along and near SR 410 that survive on a year-by-year basis and rely on a steady, seasonal flow of traffic for their economic viability.
PHASE II

Actions proposed in Phase II call for total road closures (up to one month) from the north park entrance to Cayuse Pass in the fall of 1999. Total closure of SR 410 within the proposed construction zone would significantly impact both park and through traffic in the fall, particularly traffic east of the pass. However, closures would occur in shoulder seasons or when the pass is normally closed and traffic volumes are significantly lower. Overall, yearly impacts to surrounding businesses are considered short-term and moderate.

Two-hour closures proposed in subsequent years of Phase II could have minimal to moderate impacts on traffic, depending on location and timing of closure information, and the commuter tolerances regarding construction delays. Impacts to surrounding businesses would be moderate.

**Conclusion.** Total closures would occur early (May-June) and late (October-December) in the visitor season when traffic volumes are significantly lower or when the pass is normally closed. Overall, yearly impacts to surrounding businesses are considered short term and moderate. Two-hour closures proposed in subsequent years of Phase II could have minimal to moderate impacts on traffic. Impacts to surrounding businesses would be short term and moderate.

PHASE III

Road closures proposed in Phase III could result in significant impacts to traffic volumes, but would occur in early spring when traffic volumes are not at peak levels. Impacts to businesses would, therefore, be short term and moderate.

Traffic delays associated with Phase III may cause minor inconveniences to commuters during the visitor season. It is not anticipated that a majority of commuters would choose an alternative route to avoid temporary closures. Impacts to businesses along the SR 410 corridor would be considered short term and moderate.

**Conclusion.** Road closures would occur in early spring and late fall when traffic volumes are not at peak levels. Impacts to businesses would be short term and moderate. Traffic delays may cause minor inconveniences to commuters during the visitor season. It is not anticipated that a majority of commuters would change their route to avoid temporary closures. Impacts to businesses along the SR 410 corridor would be considered short term and moderate.

CUMULATIVE IMPACTS

Cumulative impacts address the incremental impacts on the environment resulting from adding the proposed action to other past, present, and reasonably foreseeable future actions (CEQ Sec. 1508.7). For the proposed reconstruction of SR 410 within Mount Rainier National Park, an attempt has been made to confine resource impacts to previously disturbed areas to the extent possible. Since the area of new disturbance would be small (less than 2 acres) and would result in only a slight widening of the road corridor (generally within 10 feet of the existing area of disturbance on either side of the road), no adverse or long-term cumulative impacts on the environment are anticipated. Nor would the project result in a loss of botanical or faunal diversity.

On a regional level, actions contained in the proposal would result in a negligible loss of wildlife habitat. Despite the recent loss of 38 acres of suitable marbled murrelet and northern spotted owl habitat along the SR 410 corridor on the adjacent Mount Baker-Snoqualmie
National Forest, the cumulative effect of losing an additional 1.8 acres of potential habitat along SR 410 within Mount Rainier National Park is expected to be insignificant given the abundance of undisturbed habitat in proximity to the project site (there is approximately 22,000 acres of suitable marbled murrelet habitat and 100,000 acres of potential spotted owl habitat within the park) and the fact that habitat losses would be confined to a linear segment on either side of a road corridor where human disturbance is prevalent.

The cumulative effect of in-park sources of pollution on regional air quality would be insignificant since these sources are of a temporary and localized nature. Likewise, cumulative effects on water quality are expected to be minor. Although the project would result in a loss of 0.1 acre of wetlands, acre-for-acre compensation would result in no net loss of wetland acreage.

Despite road improvements along the entire length of the Mather Memorial Parkway in recent years, the parkway continues to exhibit many of its original design characteristics as a rustic and scenic byway, allowing visitors the opportunity to view the relatively unaltered natural scenery along the corridor. However, the pleasure-driving qualities of the road have been compromised in part by its inclusion within the larger intra-state highway system. This has resulted in increased traffic volumes and speeds by non-visitors traveling across the entire length of the parkway including the 11.6 miles within Mount Rainier National Park.

Current project efforts to retain as much of the historic design characteristics of SR 410 as possible will further highlight the NPS role and responsibility of preserving the road as an integral component of the park's National Historic Landmark district. Because of modifications affecting SR 410 outside the park in efforts to safely accommodate greater traffic volumes traveling at higher speeds, the segment within the park will perhaps gain increasing significance as an historical remnant recalling the original design intent for the Mather Memorial Parkway (a leisurely, scenic byway designed in the rustic style to harmonize with the natural landscape). As historic rock retaining walls and other distinguishing features are replaced along SR 410 outside the park, and are substituted by simulated stone or other non-historic materials, historic fabric retained along the road segment within the park will also provide added significance contributing to the road's historic feeling and association.

Past construction work along sections of SR 410 nearby the section proposed for construction have had moderate, short-term economic effects to local businesses by restricting normal traffic flows, thereby affecting tourist-related expenditures at businesses near or along the route. In addition, recent flooding in late 1995 and early 1996 forced temporary closure of SR 123 within the park and U.S. Highway 12 outside the park, causing additional restrictions of normal traffic flows, and consequently a loss in sales to businesses near or along these corridors. It is not anticipated that commuters would discontinue using an accessible route because of past closures. However, past, present and future road construction could have cumulative adverse effects on businesses along construction routes that have come to depend on seasonal and yearly traffic patterns for their economic viability.
APPENDIX A. SUMMARY OF PUBLIC COMMENTS RECEIVED ON 1990 ENVIRONMENTAL ASSESSMENT: RECONSTRUCT WASHINGTON STATE ROUTE 410, MOUNT RAINIER NATIONAL PARK

Interagency planning efforts for the reconstruction of SR 410 began in the mid-1980s. A draft environmental assessment was prepared by the National Park Service in consultation with the Federal Highway Administration, Washington State Department of Transportation, and the U.S. Forest Service and released for public review in July 1990. Two meetings were held locally to solicit public comments; one in the community of Naches on August 1, and another in Enumclaw on August 2, 1990. The 30-day comment period ended on August 17, 1990. During this period 142 responses were received from individuals; one from the U.S. Forest Service (Naches Ranger District, Wenatchee National Forest); one from a forest management group (White River Forest Management Committee); and nine from conservation organizations (The Mountaineers, Friends of the Earth, North Cascades Conservation Council, Mount Rainier National Park Associates, Washington Native Plant Society, Public Land Users Society, Tahoma Audubon Society, Sierra Club - Cascade Chapter, National Parks and Conservation Association). Major concerns are identified below and are grouped by topic; the number of commenters addressing similar issues appears in parentheses.

PRIMARY CONCERNS:

GENERAL:

Save all trees; don’t cut trees (89)
Don’t widen road corridor; accomplish all work within existing cleared area (64)
Do not design for a "highspeed" highway; reduce speed (58)
Keep vegetation close to road; do not create a large cleared area; maintain tunnel effect of tree canopy (32)
Keep roads in good repair; repave/repair current road (31)
Bend or change the funding rules to include the park without widening the road (28)
Reduce the speed limit (21)
Stop cutting of old trees (17)
Protect the meadow (lake) (13)
Find other methods of getting people into or around the park; build or use alternative highway around park (13)
Minimize size of cuts and raw scars; don’t make new cuts; oppose cutting that requires use of exposed gabions (9)
Make logged trees available for firewood; don’t take trees from park; chip and scatter cut trees (8)
Sloping shoulders not essential (4)
In favor of guardrails (4)
Do not let the west side look like the east side of SR 410 (3)
Disruption of visitor traffic should be held to a minimum (3)
Don’t permit commercial vehicles to use park highway (3)
Opposed to guardrails; reduce speed (3)
Don’t channelize streams (2)
Disruption of park resources beyond present area justifies EIS; scope of work requires EIS (2)
Provide hiker/biker lanes on shoulder; same for all park roads (2)
EA does not meet NEPA or laws directing NPS to protect natural values (2)
Public should have an opportunity to review and comment after site-specific design has been completed (2)
NPS should avoid another "test of wills" (Olympic NP) (1)
Place more shoulder reflectors (1)
Clear undergrowth for 30-40’ each side to protect wildlife (deer) (1)
Don’t use chainsaws in park (1)
Spend money (11 million) to repair SR 12 & Mowich or Westside Road (1)
Work should be confined to a strip of 3-4 miles maximum; complete project in 1 year (1)
No action needed for Sunrise Road intersection (1)
Undertake a floodplain survey (1)
Limit visitor entry based on road capacity (1)
Opposed to use of native material for construction (1)
Utilize natural rock retaining walls instead of cutting into opposing bank (1)
Finding of No Significant Impact is incorrect (1)
Provide economic analysis (1)
EA vague and non-specific about which agency makes the decisions (1)
Include rejected alternatives to get full range as required by NEPA (1)
Display full range of alternatives (1)
Include closing date and address for public comments to EA (1)

SAFETY-RELATED:

How many accidents resulted from not meeting standards? Safety does not justify proposal (11)
Given the higher speeds possible on improved road, accidents will increase (4)
Make turnouts, viewpoints and wide spots large enough so visitors may enter/exit vehicles safely (1)
Explore more alternatives for Sunrise Road intersection; current proposal will cause extended backups for left turns (1)
Safety issue is ridiculous (1)
Provide parking for cross-country skiers (1)
Discourage long-term parking (in excess of 15 minutes) to prevent congestion; identify parking as "view point etc."; identify opportunity for long-term parking at Tipsoo Lake (1)
Restrict speed when loose rock present to prevent damage to other vehicles (1)
Connect trails near upper end of Tipsoo wall and trail to Dewey Lake with primary pedestrian access identified in Alternative A sketch via a trail which parallels the wall on the lake side, thereby eliminating a potential safety hazard of visitors walking along the road (1)

SUBJECT-SPECIFIC:

Against the proposal/alternative (18)
Failed to justify need for bridge replacement (6)
Supportive of proposed alternative (6)
Replace deteriorating bridges unobtrusively (4)
Build new Sunrise Road intersection without cutting 30" cedar (4)
Remove Department of Transportation sand piles/equipment shed (4)
Operate asphalt batch plant so it does not degrade air or water quality/place batch plant outside of park (4)
Sign Mather Memorial Parkway (MMP) at each end (3)
Assure that signing of project doesn't adversely affect businesses (2)
EA must say that Superintendent of Mount Rainier has final say on removal or disturbance of trees and other natural resources (3)
Use stop light on bridges (2)
Perform night work to avoid delays for visitors/businesses (2)
EA should address road requirements for large recreational vehicles; these vehicles would be precluded from park if they were commercial (2)
Don't understand why concrete Jersey barrier concept was rejected (1)
Provide new alternative for replacing Deadwood Creek bridge with details (1)
Not appropriate to produce environmental reviews for segments of MMP. An EIS is needed for full length (1)
EA cites the Nisqually-Paradise road as most heavily traveled park road yet its standards are quite different from MMP (24' not 28' surface width and more restrictive cut zones) (1)
Paving of Tipsoo Lake parking lot and pull off will cause oil, grease, and antifreeze to travel into lake. Need to mitigate (1)
Clearly state the environmental impacts of stabilizing roadway at milepost 64.43; potential for major impact is great (1)
Park hazard tree standards should apply under all alternatives (1)
Walls at Tipsoo will interfere with motorists' enjoyment of meadow flowers (1)
Better/more parking at Tipsoo/Entrance Arch (1)
Covering 1/2 of tree root should not be the standard for cutting of tree; this standard makes tree death 100% certain (1)
Select Alternative B for Deadwood Creek bridge as it will be the least disruptive to the environment (1)
Do not include a trail to Tipsoo Lake (1)
Believe that a net loss of wetlands will occur (1)
Permit additional access points through upper end of wall at Tipsoo Lake (1)
Consider a third lesser-impact alternative for Sunrise Road intersection that does not excavate side hill or remove deciduous brush (1)
Do not widen road for bikes but use 2-3' shoulder for bicycles (1)
Call for spotted owls in construction area/review spotted owl considerations w/USFWS (2)
Keep road open year-round to Cayuse Pass (1)
It would be inconvenient if construction started after we retire in a couple of years (1)
Project not exempt from Corps of Engineers 404 permit process (1)
Don't cut or disturb "my" vine maple or the slanting cedar at milepost 60 (1)

UNRELATED COMMENTS:
Reopen the West Side Road (2)
Don't effect fishing access on American River or close campgrounds (1)
Don't restrict hunting along parkway (1)
Change park name to Tahoma (1)
Concerned regarding USFS timber cutting along north boundary and lack of NPS funds for operation (1)
Ski area expansion (White Pass and Crystal) are concern (1)
Concerned that a "squeeze play" is on (1)
Suggest all highway engineers be dismissed from park staff (1)
Plow road to Mather wye in winter and provide Snow Park (1)
What agency has the interpretive center? (1)
Will this affect my land approximately 25 miles east of Chinook? (1)
Cars do hit trees at one point just north of Dalles Camp, north of park (1)

LIST OF COMMENT ORIGIN BY CITY:

WASHINGTON STATE:

Auburn 3  Seabeck 1
Ashford 1  Seattle 33
Bellevue 6  Spokane 1
Bothell 2  Steilacoom 2
Battleground 1  Sumner 3
Bremerton 1  Tacoma 18
Carbonado 1  Tieton 1
Chattaroy 1  Tumwater 1
Eatonville 3  Wenatchee 1
Edmonds 2  Winslow 1
Enumclaw 4  Wapato 1
Federal Way 3  Yakima 1
Greenwater 1
Home 1
Issaquah 6
Kennewick 2
Kent 1
Lynnwood 3
Mazama 1
Mercer Island 2
Milton 1
Mountlake Terrace 1
Naches 2
Normandy Park 1
Olalla 1
Olympia 3
Packwood 1
Port Angeles 1
Puyallup 4
Redmond 1
Renton 2
Roy 1

OTHER AREAS:

Concord, CA 1
Fairview Park, OH 1
Hilliard, OR 1
Pepper Pike, OH 1
Gresham, OR 1
Portland, OR 1
Tigard, OR 2
Washington, D.C. 1

(15 telephone information requests related to EA received during comment period; 1 telephone comment incorporated in information above.)
APPENDIX B. BIOLOGICAL ASSESSMENT AND CONSULTATION LETTERS FROM U.S. FISH AND WILDLIFE SERVICE

BIOLOGICAL ASSESSMENT

for the Proposed Reconstruction of State Route 410 (Mather Memorial Parkway) in Mount Rainier National Park, Washington

PROJECT DESCRIPTION

The National Park Service (NPS), in cooperation with the Federal Highway Administration, proposes to resurface, restore, and rehabilitate the 11.6 miles of State Route 410 (SR 410) within the boundary of Mount Rainier National Park. The proposed action is part of a larger effort by the Washington State Department of Transportation to reconstruct approximately 53 miles of the parkway from Enumclaw to Naches, Washington. The work is necessary to correct structural and design deficiencies in the road. These deficiencies include drainage problems, surface slumps, soft spots, pavement warping and cracking, narrow shoulders, deteriorating and ineffective guardrail, few paved turnouts, and overly-steep, unprotected side slopes adjacent to the roadway.

Reconstruction of SR 410 within Mount Rainier is scheduled to begin in October 1997 and is expected to be completed by the fall of 2001. The project would be broken into a minimum of three phases, each taking approximately one to two construction seasons to complete: Phase I - Chinook Pass to Cayuse Pass (1997-1999); Phase II - Cayuse Pass to Deadwood Creek bridge (1999-2000); and Phase III - Deadwood Creek bridge to the north park entrance (2000-2001). A complete description of the proposal can be found in the National Park Service's 1997 Environmental Assessment: Reconstruct Washington State Route 410 (Mather Memorial Parkway), Mount Rainier National Park, Washington (attached).

BACKGROUND

The Mather Memorial Parkway consists of a 53-mile-long section of SR 410. It begins at milepost 47.7 in the Mount Baker-Snoqualmie National Forest, and ends at milepost 100.5 in the Wenatchee National Forest. The parkway provides access to recreational areas in the Mount Baker-Snoqualmie National Forest, Mount Rainier National Park, and the Wenatchee National Forest. It also provides an important cross-state link between the east and west sides of the Cascade Mountain Range.

The 11.6-mile section of SR 410 within Mount Rainier extends from the northeastern corner of the park to Chinook Pass along its eastern boundary. At the northeast edge of the park, the road generally follows the floor of the White River Valley through a stand of old-growth conifers. From there to the south, the road gradually ascends the valley and remains beside the river for the first two miles (mileposts 57.6-59.6; elevation, 2,700 feet). Continuing south, the road ascends more steeply up the
Among the mountain slopes on the eastern side of the valley to Cayuse Pass at the top of the watershed (milepost 65.5; elevation, 4,694 feet). From Cayuse Pass, the road turns east and makes several switchbacks up very steep slopes to Chinook Pass (milepost 69.2; elevation, 5,432 feet) at the park’s eastern boundary. The road traverses three broad vegetation types (lowland forest, intermediate forest, and subalpine parkland) between the north park boundary and Chinook Pass. The legal description of the area is T17N R10E S04, 09, 10, 15, 22, 27, 33, 34, and T16N R10E S03, 10, 14, 15, 22, 23.

The section of SR 410 between Cayuse Pass (the intersection of SR 123) and Chinook Pass is closed for approximately five to six months each year between mid-November and mid-May due to heavy snow accumulations and avalanche danger. The lower section of the road between Cayuse Pass and the park’s northern boundary is closed for approximately four to five months between December and April. Closure dates are highly variable depending upon snowfall and avalanche activity.

Reconstruction of a 9.9-mile section of SR 410 extending from the western boundary of the Mount Baker-Snoqualmie National Forest (milepost 47.7) to the northern boundary of Mount Rainier National Park (milepost 57.6) was completed by the Federal Highway Administration in the fall of 1996. Approximately 31.3 miles of the roadway to the east of Mount Rainier has been reconstructed by the Washington State Department of Transportation between 1986 and 1993.

AFFECTED SPECIES

Section 7 of the Endangered Species Act, as amended, prohibits federal agencies such as the National Park Service from implementing any action that is likely to jeopardize the continued existence of a federally protected (i.e., endangered, threatened) species. Furthermore, the act requires that the National Park Service consult with the U.S. Fish and Wildlife Service (USFWS) on any action it authorizes, funds, or executes that could potentially affect a protected species or its designated critical habitat.

Based on recent information obtained from the USFWS's North Pacific Coast Ecoregion, Western Washington Office (FWS Ref: 1-3-97-SP-346 [X-Ref: 1-3-96-SP-319], received May 12, 1997), four listed wildlife species have been identified as occurring within the project vicinity. Listed avian species include the marbled murrelet (Brachyramphus marmoratus marmoratus) and northern spotted owl (Strix occidentalis caurina), both of which are classified as threatened. In addition, the National Park Service reports that the bald eagle (Haliaeetus leucocephalus), listed as threatened, and the American peregrine falcon (Falco peregrinus anatum), listed as endangered, also may occur within the project vicinity. Listed mammals include the gray wolf (Canis lupus), classified as endangered in the state of Washington, and the grizzly bear (Ursos arctos), listed as threatened in the conterminous U.S. No species proposed for listing or critical habitat (designated or proposed) has been identified within the project area although critical habitat for the northern spotted owl occurs nearby in a portion of T17N R10E S04 on U.S. Forest Service land.
Marbled Murrelet and Northern Spotted Owl

During the spring and summer of 1994 and 1995, surveys for marbled murrelets were conducted within Mount Rainier National Park at six sites along SR 410 (32 stations were surveyed in 1994, and 24 stations in 1995). Surveys followed Pacific Seabird Group protocol (Pacific Seabird Group 1994). Although suitable nesting habitat for the murrelet generally exists along the road corridor below 4,000 feet (between mileposts 57.6 and 63.35 [areas to be affected primarily by Phase III construction]), surveys did not detect the presence of marbled murrelets within the project area.

Northern spotted owls are known to occur along the SR 410 corridor throughout the year. Along the portion of SR 410 within Mount Rainier National Park, spotted owl habitat generally occurs below 5,000 feet, between mileposts 57.6 and 66.68. This section of road would be affected primarily by Phase II and III construction.

To determine occupancy of the project area by spotted owls, surveys were conducted within a 1.8-mile radius of the SR 410 corridor during June and July of 1994 and 1995. Surveys were conducted according to USFWS approved protocol. A total of 64 survey stations were sampled in 1994, and 65 in 1995. Stations ranged in elevation from 2,800 to 5,200 feet. Approximately 8,200 acres of potential spotted owl habitat was surveyed, representing about 90% of the potential owl habitat surrounding SR 410. (Steepness of the terrain prevented all of the potential habitat from being surveyed.)

In 1994, six spotted owls (5 adults [1 pair and 3 individuals] and 1 juvenile) were detected along the SR 410 corridor at elevations ranging from 3,700 to 4,600 feet. In 1995, only two adult spotted owls were detected along SR 410. It is unknown whether observations represent duplicate sightings or distinct individuals since no owls have been banded in the park. Although spotted owls were known to reproduce in the park in 1994 (5 juveniles were detected, including one in the SR 410 area), no nesting activity or juvenile spotted owls were detected within Mount Rainier in 1995. Two owls were detected along the road corridor in unrelated sightings in 1996. During the 1997 nesting season, visits are planned to locations along SR 410 where spotted owls have been observed in the past in an attempt to relocate these owls and determine nesting status. A copy of the 1994 and 1995 raw survey data for northern spotted owls and marbled murrelets is attached along with a progress report summarizing the survey results.

It is the opinion of the National Park Service that the proposed project is not likely to adversely affect the marbled murrelet or northern spotted owl, nor result in the destruction or adverse modification of critical habitat for the following reasons:

1. No murrelets were detected during the two years that surveys were conducted along SR 410 within Mount Rainier National Park (1994 and 1995) and the Mount Baker-Snoqualmie National Forest (1992 and 1993).

2. The project area is 48 miles (at its closest distance) from a marine environment, and on the edge of the murrelets' known home range. Although murrelets are known to use old-growth forests for nesting purposes and have been recorded up to 50 miles inland (Ralph et al. 1995), the distance from suitable foraging and roosting habitat makes murrelet occupancy of the project area unlikely.
The National Park Service has selected a road design that minimizes impacts on natural resources, including retention of the largest trees in the stand and minimal encroachment on the forest community. Guardrail and guardwall would be used to minimize habitat losses throughout the project area. Loss of potential murrelet habitat would not exceed 0.9 acre, whereas loss of potential spotted owl habitat would not exceed 1.8 acres. Habitat removal would generally be confined to a linear segment on either side of the road within 10 feet of the existing area of disturbance, along a road corridor where human disturbance is frequent. (Total habitat losses for Phase I, II, and III construction are approximately 0.61 acre, 0.48 acre, and 0.69 acre, respectively.) Because habitat losses would occur adjacent to a road, the increase in forest edge is not expected to significantly alter the interior forest, increase the potential for blowdowns to occur, or adversely affect populations of prey species. Nor is it expected to encourage predation of murrelet nest sites by corvids or other avian predators, increase the vulnerability of spotted owls to great horned owl (*Bubo virginianus*) predation, or encourage encroachment of spotted owl competitors such as the barred owl (*Strix varia*).

Although 27 trees (each > 24 in. diameter at breast height [dbh]) are slated for removal along the road corridor between mileposts 57.6 and 66.68 (below 5,000 feet elevation), few of these trees meet the requirements for potential murrelet nest trees (e.g., >32 in. dbh; availability of suitable nest platforms; high canopy closure and low exposure) (Ralph et al. 1995). Nor do they possess characteristics typically associated with spotted owl nest trees (broken tops, naturally occurring cavities), roost sites (relatively dense vegetation with high canopy closure), or foraging areas (high canopy closure and complex structure) (U.S. Department of the Interior 1992). All of the 27 trees to be removed are located within four miles of the park’s northern boundary and would be cut during Phase III construction.

Despite the recent loss of 38 acres of suitable marbled murrelet and spotted owl habitat along the SR 410 corridor on the adjacent Mount Baker-Snoqualmie National Forest, the cumulative effect of losing an additional 1.8 acres of potential habitat along SR 410 within Mount Rainier National Park is expected to be insignificant given the reasons mentioned under # 3 above and the abundance of undisturbed habitat in proximity to the project site (there is approximately 22,000 acres of suitable marbled murrelet habitat and 100,000 acres of potential spotted owl habitat within the park).

No take of marbled murrelets or spotted owls is anticipated since road reconstruction is not expected to result in the direct or indirect mortality of either species and habitat losses would be relatively insignificant.

There would be no loss of critical habitat for either species since critical habitat for the marbled murrelet and northern spotted owl has not been designated within Mount Rainier National Park.

**Reasonable and Prudent Measures Proposed**

In an attempt to save as many potential nest trees as possible, each tree slated for removal would be evaluated individually by a NPS landscape architect and the park ecologist and park botanist. In fill areas, tree wells (small rock retaining structures) would be created near the base of trees where necessary to protect the root zone from damage. Care would be taken to ensure
that at least half of the root zone of any tree near the toe of a fill slope remain at the existing grade. Felled trees would remain on site unless determined by the National Park Service to be suitable for use as construction materials (e.g., repair of historic structures; use as footlogs). Tree butts would be obscured from view or blasted onsite to simulate blowdown conditions. An effort would be made to protect snags, wherever possible.

(2) To reduce the effects of habitat loss, construction activities would be planned and implemented in a way that facilitates restoration of native plant communities in disturbed areas. A roadside rehabilitation plan would be formulated to guide restoration efforts. Restoration activities would be accomplished within one year after construction is completed.

(3) It is possible that construction activities (e.g., noise, dust, increased human presence) could adversely affect individual spotted owls or marbled murrelets if they were found nesting and rearing young in the immediate vicinity of the project area. To help minimize the potential for disturbance during the nesting season, all blasting would occur during spring (before June 1) and late summer (after August 15), to the extent possible. Blasting would be limited to no earlier than two hours after sunrise and no later than two hours before sunset (generally between 8:00 a.m. and 6:00 p.m.).

If nest sites were discovered after construction activities began, work would be halted in that particular area until the young birds were fully fledged. The National Park Service also would consult with the Fish and Wildlife Service to determine further mitigation measures such as the need to conduct additional pre-construction surveys in those areas to be affected by Phase II (1999-2000) and Phase III (2000-2001) construction (Phase I construction would occur largely outside the range of suitable marbled murrelet and spotted owl habitat [the lowest elevation within this construction phase is at Cayuse Pass at 4,694 feet]).

Bald Eagle and American Peregrine Falcon

Bald eagles and peregrine falcons are seasonal migrants within the project area and neither species is known to roost or nest along the SR 410 corridor. The National Park Service has determined that the proposed project would have no effect on the bald eagle or peregrine falcon. This determination is based on limited accounts of the above species within the project vicinity and a lack of actions that would result in long-term adverse effects on habitat or prey.

Grizzly Bear and Gray Wolf

Mount Rainier National Park contains areas large enough to provide suitable grizzly bear spring and fall foraging habitat, but the amount of secluded habitat away from human influence is limited. There have been no confirmed tracks or sightings of bears with physical identifying characteristics of grizzlies (e.g., humpback, dished face, and long claws) since the park’s establishment in 1899. However, during June 1993, animal tracks were confirmed as those made by two grizzlies west of the park on private Champion International Timber Company land (Braaten, pers. comm.).
Although suitable wolf habitat exists within Mount Rainier, there have been no confirmed records of wolves inhabiting the park within the last 50 years. In the past, the gray wolf was a component of the Cascade Mountains and historically was documented in the park, including the White River drainage, by early park rangers and climbers. Sporadic sightings of possible wolves have occurred over the years by the public and park employees, but none have been confirmed by biologists.

The National Park Service has determined that reconstruction of SR 410 within Mount Rainier National Park would have no effect on the grizzly bear or gray wolf based on (1) the lack of either animal’s confirmed presence in the project area, (2) the small amount of habitat that would be lost or disturbed, (3) the relatively large amount of undisturbed habitat nearby, (4) no anticipated adverse effects on prey populations, and (5) the project’s location along an existing highway corridor where human disturbance is frequent.

LITERATURE CITED


Memorandum

May 7, 1997

To: Natural Resource Specialist, National Park Service, Denver Service Center, Denver, Colorado
(Attention: Elizabeth S. Bellantoni)

From: Supervisor, North Pacific Coast Ecoregion, Western Washington Office, Lacey, Washington

Subject: Mather Memorial Parkway, Mt. Rainier, Pierce County, Species List Update
FWS Ref: 1-3-97-SP-346, X-Ref: 1-3-96-SP-319

This is in response to your letter dated April 8, 1997, and received in this office on April 17. You have requested an updated list of Federally listed and proposed threatened and endangered species, candidate species and species of concern (Attachment A) that may be present within the area of the proposed above referenced project. This list reflects changes to the candidate species list published February 28, 1996, in the Federal Register (Vol. 61 No. 40, 7596) and the addition of “species of concern” prepared by the U.S. Fish and Wildlife Service’s (Service) Western Washington Office. The list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act of 1973, as amended (Act). It is identical to the species list provided by the Service on June 20, 1996, reference number 1-3-97-SP-319. We have also enclosed a copy of the requirements for National Park Service (NPS) compliance under the Act (Attachment B).

Should the Biological Assessment (BA) indicate and you determine that a listed species is likely to be affected (adversely or beneficially) by a project, the NPS should request section 7 consultation through this office. If the BA indicates that a proposed action is "not likely to adversely affect" a listed species, the NPS should request Service concurrence with that determination through the informal consultation process. Even if the BA shows a "no effect" situation, we would appreciate receiving a copy for our information.

Candidate species are those species for which the Service has sufficient information to support a proposal for listing as threatened or endangered under the Act. Species of concern are those species whose conservation standing is of concern to the Service, but for which further status information
is still needed. Conservation measures for species of concern and candidate species are voluntary, but recommended. Protection provided to these species now may preclude possible listing in the future.

Please be advised that Federal and State regulations may require permits in areas where wetlands are identified. You should contact the Seattle District of the U.S. Army Corps of Engineers for Federal permit requirements and the Washington State Department of Ecology for State permit requirements.

In addition, there may be other Federally listed species that may occur in the vicinity of your project which are under the jurisdiction of the National Marine Fisheries Service (NMFS). Please contact NMFS at (503) 230-5400 to request a species list.

Your interest in endangered species is appreciated. If you have additional questions regarding your responsibilities under the Act, please contact Chandra Madrona at (360) 753-7762 or John Grettenberger at (360) 763-6044 of this office.

John Engbring

for

David C. Frederick

cm/jkp
Attachments
SE/NPS/1-3-97-SP-346/Pierce
c: WDFW, Region 4
   WNHP, Olympia
LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CANDIDATE SPECIES AND SPECIES OF CONCERN WHICH MAY OCCUR WITHIN THE VICINITY OF THE PROPOSED MATHER MEMORIAL PARKWAY PROJECT ON MT. RAINIER, IN PIERCE COUNTY, WASHINGTON (T17N R10E S04,09,10,15,22,27,33,34 / T16N R10E S03,10,14,22,23)

FWS REF: 1-3-97-SP-346

LISTED

Gray wolf (*Canis lupus*) may occur in the vicinity of the project.

Grizzly bear (*Ursus arctos = U.a. horribilis*) - may occur in the vicinity of the project.

Marbled murrelet (*Brachyramphus marmoratus marmoratus*) - murrelets may occur in the vicinity of the project.

Northern spotted owl (*Strix occidentalis caurina*) - there are 5 spotted owl site centers located within the project vicinity at T17N R10E S02,04,15,27,32.

PROPOSED

None

DESIGNATED

Critical habitat for the northern spotted owl has been designated in the vicinity of the project in a portion of T17N R10E S04.

CANDIDATES

The following candidate species may occur in the vicinity of the project:

Bull trout (*Salvelinus confluentus*)
ATTACHMENT A (CONTINUED)

SPECIES OF CONCERN

The following species of concern may occur in the vicinity of the project:

California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
North American lynx (*Felis lynx canadensis*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus borealis*)
Pacific fisher (*Martes pennanti pacifica*)
Pacific lamprey (*Lampetra tridentata*)
Pacific western big-eared bat (*Corynorhinus (=Plecotus) townsendii townsendii*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
*Castilleja crypiantha* (obscure Indian paintbrush)
## APPENDIX C. TOTAL COST FOR PHASE I CONSTRUCTION
(CAYUSE PASS TO CHINOOK PASS)

<table>
<thead>
<tr>
<th></th>
<th>OPTION A</th>
<th>OPTION B-1</th>
<th>OPTION B-2 (Preferred)</th>
<th>OPTION C</th>
</tr>
</thead>
<tbody>
<tr>
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<td>$ 211,715</td>
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<td>$ 379,550</td>
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<td>$ 50,000</td>
<td>$ 50,000</td>
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<td>$ 613,916</td>
<td>$ 613,916</td>
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<td>$ 592,073</td>
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<td>Contractor Incentives</td>
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<td>$ 176,000</td>
<td>$ 176,000</td>
<td>$ 176,000</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$ 7,936,338</strong></td>
<td><strong>$ 8,218,985</strong></td>
<td><strong>$ 8,314,713</strong></td>
<td><strong>$ 8,941,643</strong></td>
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APPENDIX D. STATEMENT OF FINDINGS FOR EXECUTIVE ORDER 11990
(PROTECTION OF WETLANDS)

for the Proposed Reconstruction of State Route 410 (Mather Memorial Parkway)
in Mount Rainier National Park, Washington

PURPOSE AND NEED FOR ACTION

The National Park Service (NPS), in cooperation with the Federal Highway Administration, proposes to resurface, restore, and rehabilitate the 11.6 miles of State Route 410 (SR 410) within the boundary of Mount Rainier National Park. The proposed action is part of a larger effort by the Washington State Department of Transportation to reconstruct approximately 53 miles of the parkway from Enumclaw to Naches, Washington. The work is necessary to correct structural and design deficiencies in the road. These deficiencies include drainage problems, surface slumps, soft spots, pavement warping and cracking, narrow shoulders, deteriorating and ineffective guardrail, few paved turnouts, and overly-steep, unprotected side slopes adjacent to the roadway.

Beginning at the north entrance of the park (milepost 57.6), the road generally follows the valley floor through a stand of old-growth conifers. In this area, the road has a favorable alignment and a posted speed limit of 50 mph. However, the driving surface is rough and too narrow for the volume of traffic using it. This portion of the road is in need of rehabilitation and spot safety improvements.

As the road begins ascending Cayuse Pass, the alignment is still favorable and the speed limit remains 50 mph, but the road becomes more of a challenge for motorists. Extended tangents combined with curves in mountainous terrain pose a safety hazard. In this area the road surface is rough and narrow and needs to be replaced. Additional width is also needed to safely accommodate the current (as well as anticipated future) traffic volume and vehicle mix.

Between Cayuse Pass (milepost 65.5) and Chinook Pass (milepost 69.2), the road provides even greater challenges to motorists because it climbs a steep grade through a series of switchbacks. This section of the road was constructed with stone masonry retaining walls that are in excellent to poor condition, with some walls no longer considered safe. The existing road varies in width from 24 to 26 feet and has minimal ditches. The irregular and narrow alignment in this area poses additional hazards for motorists.

State Route 410 was originally constructed without the benefit of a geometric alignment. This was done intentionally to achieve a better fit of the road to the local topography. However, current advances in design, survey tools, and construction equipment make it possible to convert the original irregular road layout to a precision geometric alignment with little affect on existing road character. This change would help improve the driveability of the road and facilitate construction efforts.

Reconstruction of SR 410 within Mount Rainier National Park is scheduled to begin in October 1997 and is expected to be completed by the fall of 2001. The project would be broken into a minimum of three phases, each taking approximately one to two full seasons to complete: Phase I - Chinook Pass to
Cayuse Pass (1997-1999); Phase II - Cayuse Pass to Deadwood Creek bridge (1999-2000); and Phase III - Deadwood Creek bridge to the north park entrance (2000-2001).

WETLANDS WITHIN THE PROJECT AREA

Based on field observations and information appearing on National Wetlands Inventory maps (FWS 1987), several wetlands occur along the SR 410 corridor in the vicinity of Tipsoo Lake (milepost 68.8). These wetlands are classified as palustrine emergent, semipermanently flooded, and palustrine open water, permanently flooded. Forested wetlands also occur along the lower two miles of the road (mileposts 57.6-59.6) near the northern park entrance. Some of these wetlands were created incidentally by highway construction and receive hydrologic support from culverts and roadside ditches.

THE PROPOSAL'S IMPACT ON WETLANDS

Executive Order 11990 (Protection of Wetlands) requires all federal agencies to enhance and restore wetland values, to avoid development in wetlands when practicable alternatives exist, and to mitigate adverse impacts if a wetland will be occupied or modified. NPS Management Policies (1988) and the Protection of Wetlands Guideline (1977) reiterate the importance of safeguarding wetlands and provide agency-specific guidance for complying with Executive Order 11990. This document, prepared as part of that compliance procedure, describes the anticipated adverse impacts on wetland functions and values resulting from reconstruction of SR 410 within Mount Rainier National Park.

Construction along SR 410 would generally be limited to the previously disturbed road corridor. Guardrail and guardwall would be used throughout the project area in an effort to minimize wetland impacts. The road would generally be reconstructed to a paved topwidth of 26 feet with 11-foot travel lanes and 2-foot paved shoulders.

One small palustrine wetland located on the south side of the road at milepost 67.84 (approximately 0.5 mile west of the Tipsoo Lake parking lot) would be affected by the placement of fill material during Phase I construction. This 0.51 acre wetland lies on a bench at the toe of an existing fill slope, roughly 10-15 feet below the road surface, and is hydraulically charged by water seeping through the fill. The proposed extension of the fill slope would reduce the size of this wetland by a maximum of 0.1 acre due to the placement of approximately 340 cubic yards of class I riprap, two feet in depth. (The extent of the wetland and the limits of the proposed fill are shown on the attached drawing.)

Although the design has yet to be finalized for Phase III construction, work along the lower section of the road would generally be limited to the existing road prism. In compliance with the NPS Protection of Wetlands Guideline, this project would adhere to the policy of "no-net-loss" of wetland acreage and functions on NPS lands, and strive to achieve the broader goal of net gain of wetland acreage and functions by avoiding wetland impacts and restoring wetlands that have been degraded or lost due to human activities. As the design for Phase III construction proceeds, and if wetland impacts appear unavoidable, this Statement of Findings will be amended to address the extent of the anticipated
wetland impacts, the alternatives considered to avoid or minimize these impacts, and the compensation proposed to offset losses of wetland acreage and functions.

ALTERNATIVES CONSIDERED TO AVOID WETLAND IMPACTS

A range of reasonable alternatives was considered to avoid or minimize impacts to the wetland located at milepost 67.84. Alternatives considered to gain the needed road width in this area were to (1) extend the road prism into the cut slope on the north side of the road, (2) extend the road prism into the fill slope on the south side of the road, or (3) install approximately 700 feet of guardwall/retaining wall along the south side of the road above the fill slope.

The avoidance alternative of widening the road by moving into the existing, vegetated, cut slope on the north side of the road was not preferred due to the effort required to re-establish vegetation on steep cut slopes. Widening into the cut slope would have meant disturbing the existing healed slopes and creating new scars that would have been much larger than existing ones and could have been problematic to stabilize and revegetate. The minimization alternative of constructing a fill side wall on the south side of the road, to allow road widening, but not impact the wetland was evaluated but not preferred. Construction of a guardwall/retaining wall in this area would be very expensive and would create an extensive new intrusion on the landscape, resulting in unacceptable impacts on scenic quality and road character. It would also be difficult to avoid trampling vegetation and compacting soil along the edge of the wetland while the wall was under construction.

The preferred alternative, based upon an evaluation of the overall environmental and aesthetic impacts, as well as safety and efficiency of the road design, is to fill over a limited area of the existing wetland. Extending the fill slope on the south side of the road was chosen as the least impacting alternative for the following reasons: (1) since the bench is fairly flat in this area, the resulting fill slope would be nearly the same height as the existing bench; (2) the new fill slope could be constructed on a flatter slope so that it could be easily revegetated; and (3) creating a new fill slope would be the least costly solution and would not introduce any new visual intrusions on the landscape.

ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

Expansion of the fill slope at milepost 67.84 would result in the direct loss of 0.1 acre of palustrine wetland. However, because perforated pipe would be installed beneath the class I riprap, no adverse effects on wetland hydrology are anticipated since water flow through the wetland would remain unimpeded. Nor is the addition of fill material expected to adversely affect wetland functions (e.g., ground water recharge, erosion and sediment control, habitat diversity).
COMPENSATION FOR WETLAND IMPACTS

To compensate for lost acreage and values resulting from the wetland fill at milepost 67.84, approximately 0.1 acre of in-kind mitigation would be accomplished at Lower Tipsoo Lake. Although details of the proposed enhancement project are still being worked out, park staff are exploring the possibility of replacing all or a portion of the turnpiking that surrounds the lake with a raised, accessible trail to help reestablish natural drainage patterns currently hindered by the turnpiking. Additional enhancement efforts may also include removing introduced fish from the lake. Details of the proposed enhancement project would be further refined once the area is free of snow and site visits can be made by park resource personnel later this summer.

CONCLUSION

Care was taken throughout the design process to avoid or minimize development in wetlands wherever possible. However, given site constraints, environmental and aesthetic impacts, and safety and efficiency of the road design, there is no practicable alternative to filling 0.1 acre of palustrine wetland at milepost 67.84. To compensate for this lost wetland acreage, approximately 0.1 acre of in-kind mitigation would be accomplished at Lower Tipsoo Lake. This action would result in no net loss of palustrine wetlands within the drainage or park and would comply with the NPS policy of acre-for-acre compensation for actions that result in wetland degradation or loss. Consequently, the National Park Service finds the proposed action in compliance with Executive Order 11990.

REFERENCES


May 8, 1997

Mr. William J. Briggs, Superintendent
Mount Rainier National Park
Tahoma Woods, Star Route
Ashford, Washington 98304

In future correspondence refer to:
Log: 032697-01-NPS
Re: Rehabilitate & Reconstruct S.R. 410

Dear Mr. Briggs:

Thank you for your letter to the Washington State Office of Archaeology and Historic Preservation (OAHP) regarding the above referenced action. From the documentation, I understand that the National Park Service (NPS) proposes to conduct rehabilitation work on 11.6 miles of S.R. 410 (Mather Memorial Parkway) within the boundaries of Mount Rainier National Park. The road is a contributing element to the National Historic Landmark (NHL) district within the Park.

In response, OAHP staff, including Acting State Historic Preservation Officer David Hansen, Restoration Designer Stephen Mathison, and myself have carefully reviewed the documentation associated with this action. The issues relating to cultural resources are certainly complex and the Park is to be commended for the sensitive and deliberate approach taken in designing the roadway. As a result of our review, I concur with your determination that this action will have no adverse effect on the status of the Parkway as a contributing element of the NHL district. This concurrence is based upon the recognition of the somewhat unusual nature of the resource itself (a linear feature several miles in length with variations in character) and the recognition that overall, the roadway will retain the feeling and association as a historic resource. Furthermore, in concurring with the no adverse effect determination, I understand that the rehabilitation/reconstruction project will be executed in accord with the plans submitted to OAHP accompanying your letter and that monitoring of project work at the Tipsoo Lake archaeological site will be carried out under supervision of qualified cultural resource personnel. If project plans change significantly from those we have reviewed, please contact OAHP for further consultation.
In closing, on behalf of OAHP I want to commend you and your staff, particularly Craig Strong, for the extra effort devoted to protecting this resource. Our staff recognizes the complexities that were overcome and the cooperation that has resulted from this planning effort. We look forward to working with you as the project unfolds. Should you have any questions, please feel free to contact me at (360) 753-9116.

Sincerely,

[Signature]
Gregory Griffith
Comprehensive Planning Specialist

cc:  Craig Strong
     Stephanie Toothman

GAG
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<thead>
<tr>
<th>Community</th>
<th>Total Annual Sales ($)</th>
<th>Loss in Sales Dollars under Option A (%)</th>
<th>Loss in Sales Dollars under Option B-1 (%)</th>
<th>Loss in Sales Dollars under Option B-2 (%)</th>
<th>Loss in Sales Dollars under Option C (%)</th>
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<td>Crystal Mountain</td>
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<td>Sunrise - Mount Rainier</td>
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<td>138.000</td>
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<td>163.500</td>
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<td>Cliffeid - Nile</td>
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<td>2,207.124</td>
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APPENDIX F. ESTIMATED LOSS IN DOLLARS AND PERCENT OF SALES PER COMMUNITY FOR 1997-1999 UNDER TRAFFIC MANAGEMENT OPTIONS DURING PHASE I CONSTRUCTION BETWEEN CAYUSE AND CHINOOK PASSES.

Loss in Sales Dollars under Option A (%) 1997: 29,551 (1.6); 2012, 2013: 180,258 (9.6); 2014: 88,652 (4.7); 2015: 298,461
Loss in Sales Dollars under Option B-1 (%) 1997: 138,888 (7.4); 1998: 138,888 (7.4); 1999: 277,775
Loss in Sales Dollars under Option B-2 (%) 1997: 159,573 (8.5); 1998: 159,573 (8.5); 1999: 348,697
Loss in Sales Dollars under Option C (%) 1997: 159,573 (8.5); 1998: 159,573 (8.5); 1999: 348,697
REFERENCES

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POTTS, MERLIN K., AND RUSSEL F. GRATER

RICE, DAVID G.

SULLIVAN, GREGG M.
PREPARERS AND CONSULTANTS

PREPARERS

Liz Bellantoni, Natural Resource Specialist, Denver Service Center
Laurie Domler, Community Planner, Denver Service Center
Pete Field, Highway Engineer, Federal Highway Administration, Vancouver, WA
Harold Gibbs, Landscape Architect, Denver Service Center
Jim Hammett, former Natural Resource Specialist, Denver Service Center
Mary Ryan, Visual Information Technician, Denver Service Center
Robert Todd, Cartographer, Denver Service Center
Steve Whissen, Historian, Denver Service Center

LIST OF PERSONS AND AGENCIES CONSULTED

Tom Bennett, Civil Engineering Technician, Federal Highway Administration, Vancouver, WA
Bill Briggle, Superintendent, Mount Rainier National Park
Kerry Cook, Geotechnical Engineer, Federal Highway Administration, Vancouver, WA
Kelly Donahue, Landscape Architect, Mount Rainier National Park
Nancy Dunkle, Revegetation Specialist, Denver Service Center
Mike Edgerly, Project Manager, Federal Highway Administration, Vancouver, WA
Dick Engle, Facilities Management Specialist, Columbia Cascades Support Office
Elmer Hernandez, Transportation Planner, Denver Service Center
Marty Hogan, Landscape Architect, Mount Rainier National Park
Fahmi Ismail, Structural Engineer, Federal Highway Administration, Vancouver, WA
Vicky Jacobson, Park Historical Architect, Mount Rainier National Park
Al Killian, Geotechnical Engineer, Federal Highway Administration, Vancouver, WA
Rich Lechleitner, Biologist, Mount Rainier National Park
Art Lemke, Environmental Specialist, Federal Highway Administration, Vancouver, WA
Jerry Lorenz, Project Manager, Denver Service Center
Gina Rochefort, Natural Resource Specialist, Mount Rainier National Park
Craig Strong, Cultural Resources Specialist, Mount Rainier National Park
Greg Sullivan, Archeologist, Mount Rainier National Park
Jim Thomson, Archeologist, Columbia Cascades Support Office
U.S. Fish and Wildlife Service, Ecological Services, Olympia, Washington
Eric Walkinshaw, Chief of Planning, Mount Rainier National Park
Washington State Office of Archeology and Historic Preservation, Olympia, Washington
As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS D-306, May 1997