Redwood
National Park

National Park Service
US Department of the

Redwood National Park and Green Diamond Resource Company Rights-of-Way Exchange Environmental Assessment

Redwood National Park
Humboldt County, California
September 2008

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Introduction

Redwood National Park was established by Congress in 1968 [Act of October 2, 1968, Public Law 90-545, 82 Stat. 931] and expanded in 1978 [Act of March 27, 1978, P. L. 95-250, 92 Stat. 163]. The park was created through a Congressional taking of private lands, with the majority of private lands owned by a succession of timber companies that had operated in the region since the late 1800s. The 48,000-acre expansion area was located primarily in the Redwood Creek watershed in Humboldt County, California. Today, Redwood National Park is managed jointly with the three state parks located within the national park's legislated boundary as Redwood National and State Parks (RNSP).

The three largest timber companies operating in the park expansion area in 1978 were Arcata Redwood Company, Simpson Timber Company, and Louisiana-Pacific Corporation. Since that time, Simpson Timber Company acquired the property of the other companies and reorganized as Green Diamond Resource Company (GDRCo), a single company that operates in Del Norte, Humboldt, and Trinity counties including areas adjacent to the park (Figure 1).

The combined effect of large storms, unregulated logging practices and logging roads that were constructed prior to park expansion significantly impacted the land and streams in the Redwood Creek watershed within the park. The expansion legislation directed the National Park Service (NPS) to implement a watershed restoration program to rehabilitate park lands damaged by historic logging and reduce sedimentation from existing logging roads. The NPS is systematically removing poorly constructed roads that have damaged streams and hillslopes, or that have the potential to damage streams and hillslopes. The NPS uses parts of the former logging road network for access to subwatersheds in Redwood Creek for watershed restoration, other resource management activities including fire management, and administrative access for research and maintenance of visitor facilities such as trails and backcountry camps.

GDRCo conducts timber operations under the California Forest Practice Act [Public Resources Code Division 4, Chapter 8, §§4511–4628]. Timber operations require roads for access to and removal of timber harvested. The current Forest Practice Act and other state and federal laws require timber operations including construction and use of access roads to be conducted in a manner that protects resources including water quality, rare and endangered species, and significant cultural resources. GDRCo is required to prepare a state timber harvest plan (THP) for each timber operation. GDRCo also manages its lands subject to a federally-approved Habitat Conservation Plan (HCP) to evaluate potential effects from timber operations on the northern spotted owl, a federally listed threatened species (Simpson 1992). In addition, GDRCo lands are managed under a federally-approved Aquatic Habitat Conservation Plan (AHCP) for six aquatic species (USFWS/NMFS 2006). The HCPs include mitigation measures and terms and conditions for operations to avoid or reduce adverse effects on federally listed threatened and endangered species and lands within this project area.

The 1978 expansion legislation directed the NPS to work with a variety of entities to prevent erosion on private lands in areas upstream of the park to protect the downstream park resources from potential

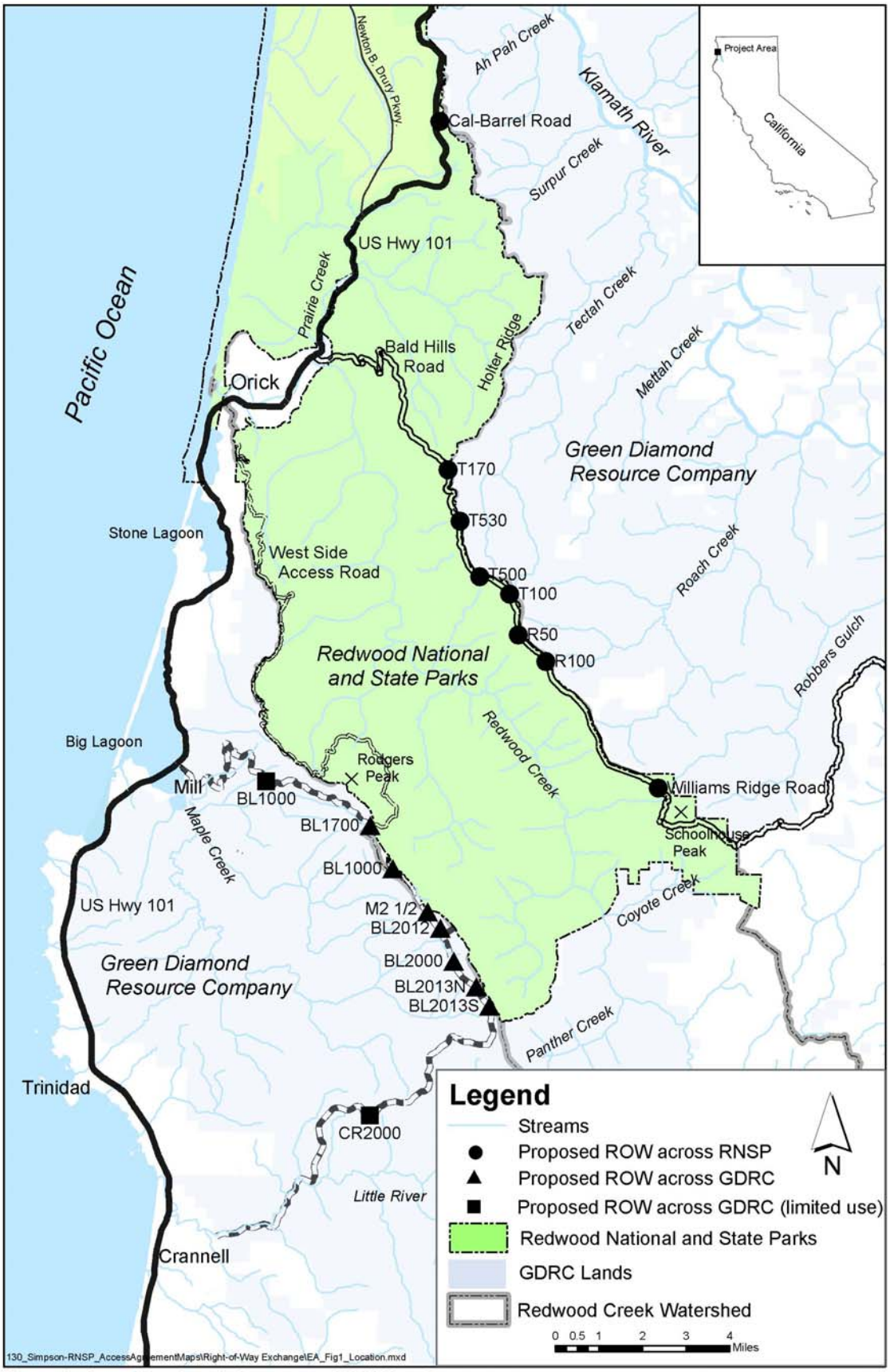

Figure 1. Location of roads in proposed ROW exchange.

impacts associated with timber harvest activities. Cooperative efforts between the NPS and private landowners in Redwood Creek started in the mid-1980s and expanded in the 1990s. NPS and private landowners, including GDRCo, have entered into a series of Memoranda of Understanding (MOUs) since 1995 for cooperative erosion control and erosion prevention work upstream of the park as part of an overall program to reduce the adverse effects of logging roads on park resources and to improve water quality and aquatic habitat throughout the watershed.

Purpose and Need for Action

The NPS proposes to convey permanent rights-of-ways (ROWs) to GDRCo for use of about 1.2 miles of existing roads across lands in Redwood National Park in exchange for conveyance of permanent ROWs for NPS use of about 22 miles of existing roads owned by GDRCo on lands adjacent to the park. Of the 22 miles of GDRCo roads used by the NPS, 5.8 miles would be used for routine park management operations and would receive regular NPS use. The other 16.1 miles of GDRCo roads would be used only occasionally, as needed, for direct transport of large earthmoving equipment and personnel from U.S. Highway 101 into the park. GDRCo would use the 1.2 miles of park roads on a regular basis for access to manage its timberlands. Regular use of these roads by GDRCo would not lead to indirect effects on the park, or in watersheds in which GDRCo operates, other than those indirect effects on natural resources that are described in this environmental assessment, in the final environmental impact statements for the GDRCo HCP/AHCP, or in THPs required for timber harvest.

The NPS and GDRCo have allowed the reciprocal use of certain roads through special use permits or general agreements since 1983. Neither special use permits nor general agreements are adequate instruments because of the perpetual need of both parties for use of the roads for management of resources. The conveyance of 1.2 miles of ROWs to GDRCo would not result in any changes in GDRCo's timber harvest program, and the conveyance of 22 miles of ROWs to the NPS would not result in any changes in Redwood National Park's operations.

The purpose of the ROW exchange is to provide the shortest route to lands owned by each party using existing roads, thereby avoiding construction of new road systems. Construction of new roads would result in additional adverse effects to natural and cultural resources and in increased travel, construction and maintenance costs to both the NPS and GDRCo.

Background

When the park was created and expanded, logging roads that had been formerly used in timber harvest operations were included within the legislated park boundary. After the park was expanded, the NPS made a series of minor boundary adjustments to allow more efficient management of park resources and to meet statutory requirements in the expansion legislation. However, the access needs of both the park and GDRCo were not fully resolved with the boundary adjustments.

On the west side of the Redwood Creek watershed, GDRCo's BL1000 and BL2000 roads (the former M-Line) were initially included within the western boundary of the expanded park (Figure 2). Because these are mainline (two-lane, rock-surfaced, all-season) roads that connected private timberlands lands to U.S. Highway 101, the park boundary was adjusted administratively in the early 1980s to return the BL1000 and BL2000 roads to private ownership. The boundary adjustment also returned to private ownership the short sections of intersecting roads (BL1700, M2½, BL2012, BL2013N, and BL2013S) that provide access to areas in the southernmost region of the park. This adjustment limited NPS access to park lands on the west side of Redwood Creek to the southernmost end of the West Side Access Road (WSA Road) which is located on park lands.

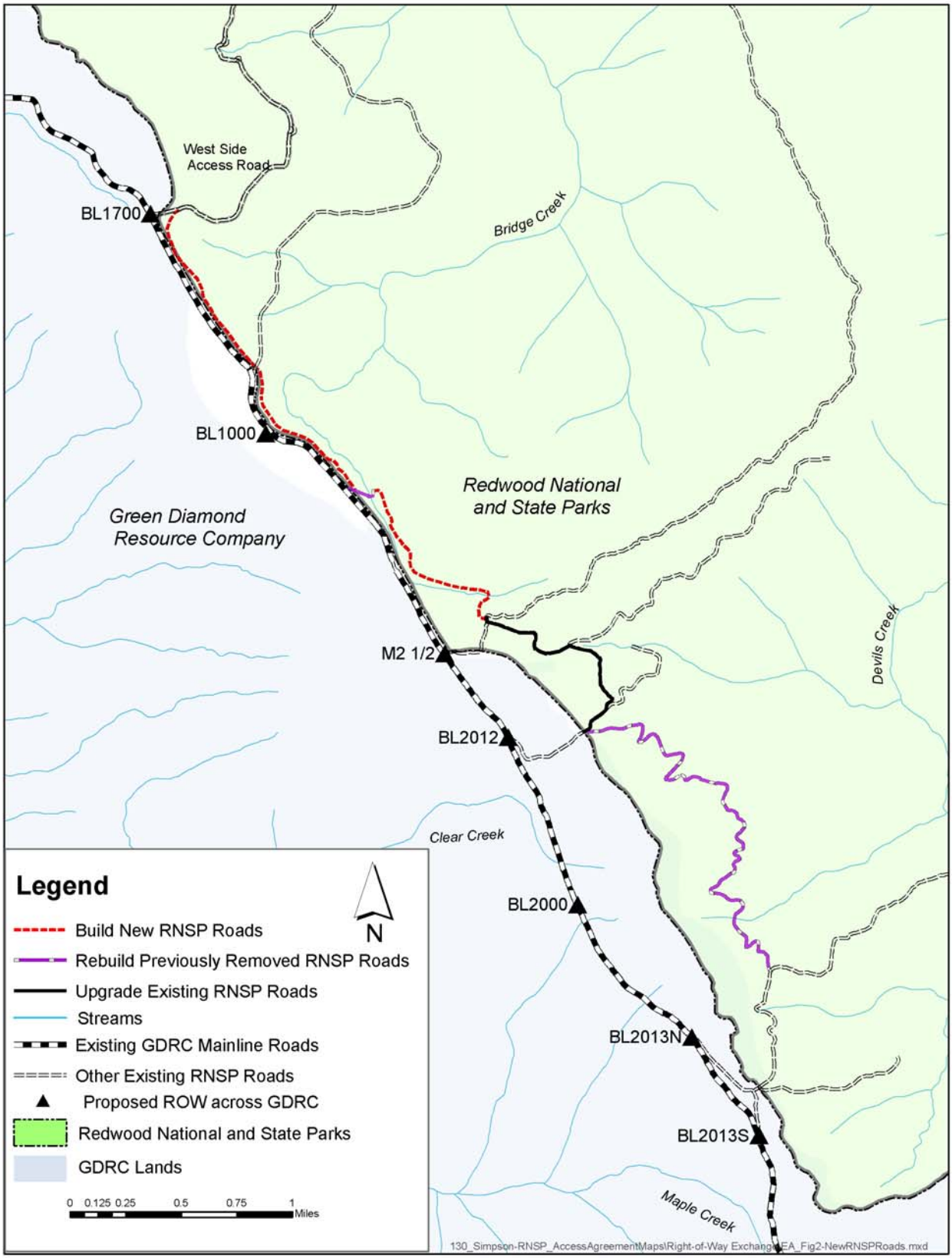

Figure 2. Redwood National and State Parks alternate access route.

On the east side of Redwood Creek, the park boundary severed GDRCo's access to its road system in the Klamath River watershed. The park boundary was established east of the Bald Hills Road to prevent hydrologic and visual impacts on park resources and the visitor experience from timber operations occurring on adjacent private lands. The Bald Hills Road is a public road that crosses NPS lands, and is owned and maintained by Humboldt County. Its use includes public travel to and from points east of U.S. Highway 101 into the Klamath River, Redwood Creek and Trinity River watersheds, park administrative and visitor use, and commercial use such as log hauling associated with timber harvest activities (NPS 1981a). The expansion legislation provided for the continued use of Bald Hills Road through the newly expanded park at "existing levels, and extent of access and use" [P.L. 95-250, 92 Stat. 164], including commercial timber operations. The NPS does not anticipate any change in the future use of the Bald Hills Road, and recognizes that a significant percentage of the traffic using this road is unrelated to the park (USDI 2000).

The park boundary is generally less than 300 feet east of the Bald Hills Road, creating a narrow strip of park land between the Bald Hills Road and GDRCo lands farther east. This strip of land is crossed by seven roads that connect the Bald Hills Road to GDRCo's road network in the Klamath River watershed (Figure 3). Six of the seven roads are narrow, rock-surfaced, all-season roads through second-growth forest. They range in length from 45-490 feet, averaging about 250 feet in length. The seventh road is Williams Ridge Road and is the longest at 3,170 feet (0.6-mile). It is a one-lane, rock-surfaced, all-season road that crosses park land through grasslands.

Construction of the Highway 101 Bypass around Prairie Creek Redwoods State Park authorized in the 1978 park expansion also reduced access to private lands in the Klamath River watershed on the east side of Holter Ridge north of the Bald Hills (Figure 4). Highway construction obliterated a portion of Cal-Barrel Road originally owned by Simpson Timber Company, GDRCo's predecessor in interest. A 1,580-foot-long segment of Cal-Barrel Road now on park lands is needed by the NPS, GDRCo, and the owners of a small residential parcel for access to lands east of the highway.

A reciprocal road use agreement between the NPS and GDRCo has provided temporary relief to these access issues. The agreement allows the NPS to use seven GDRCo roads (22 miles) to access park lands on the west side of the Redwood Creek watershed via the WSA Road. The agreement also allows GDRCo to use eight NPS roads (1.2 miles) to access its lands in the Klamath River watershed via the Bald Hills Road.

In addition to the proposed ROWs that would be exchanged, GDRCo currently has seven deeded ROWs totaling about 2.9 miles in length within Redwood National Park. A fee simple ROW on Robbers Gulch Road (a.k.a. Skookum Prairie Road) (Figure 3) originally deeded by the landowner to Weyerhaeuser Company in 1963 was later acquired by Simpson Timber Company as successor in interest. Use of this road was reserved to Simpson in the final settlements compensating private landowners for the Congressional taking of lands for the 1978 park expansion. The total length of Robbers Gulch Road across park lands is about one mile. Six ROWs were also granted to Simpson Timber Company, GDRCo's predecessor in interest, following completion of the Highway 101 Bypass when Simpson's access was severed by highway construction (Figure 5). These ROWs cross park lands on the east side of the Bypass and total about 1.9 miles.

The roads in the proposed ROW exchange are the same roads covered by the current reciprocal road use agreement. They are single and double lane, rock-surfaced, all-season roads. In the proposed exchange, GDRCo's use of park roads would be limited to the existing road corridor, and park roads would not be widened or paved. GDRCo would be responsible for the routine maintenance and repair of all roads included in the exchange, including maintenance and repair of the rocked road surfaces, drainage systems and structures, grading, and vegetation management. Vegetation management within these park corridors would be limited to the removal of overhanging tree limbs that interfere with vehicle passage.

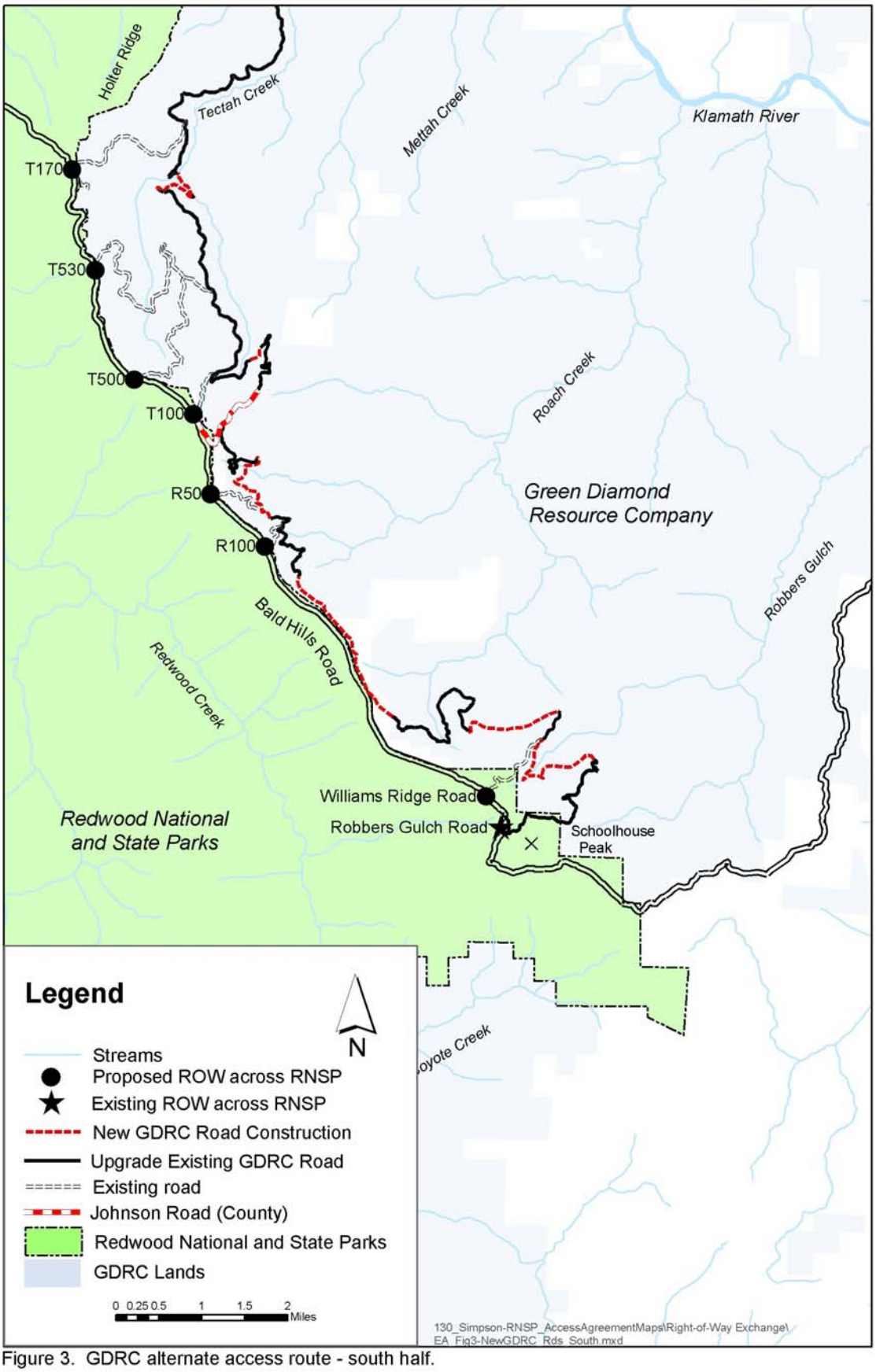

Figure 3. GDRC alternate access route - south half.

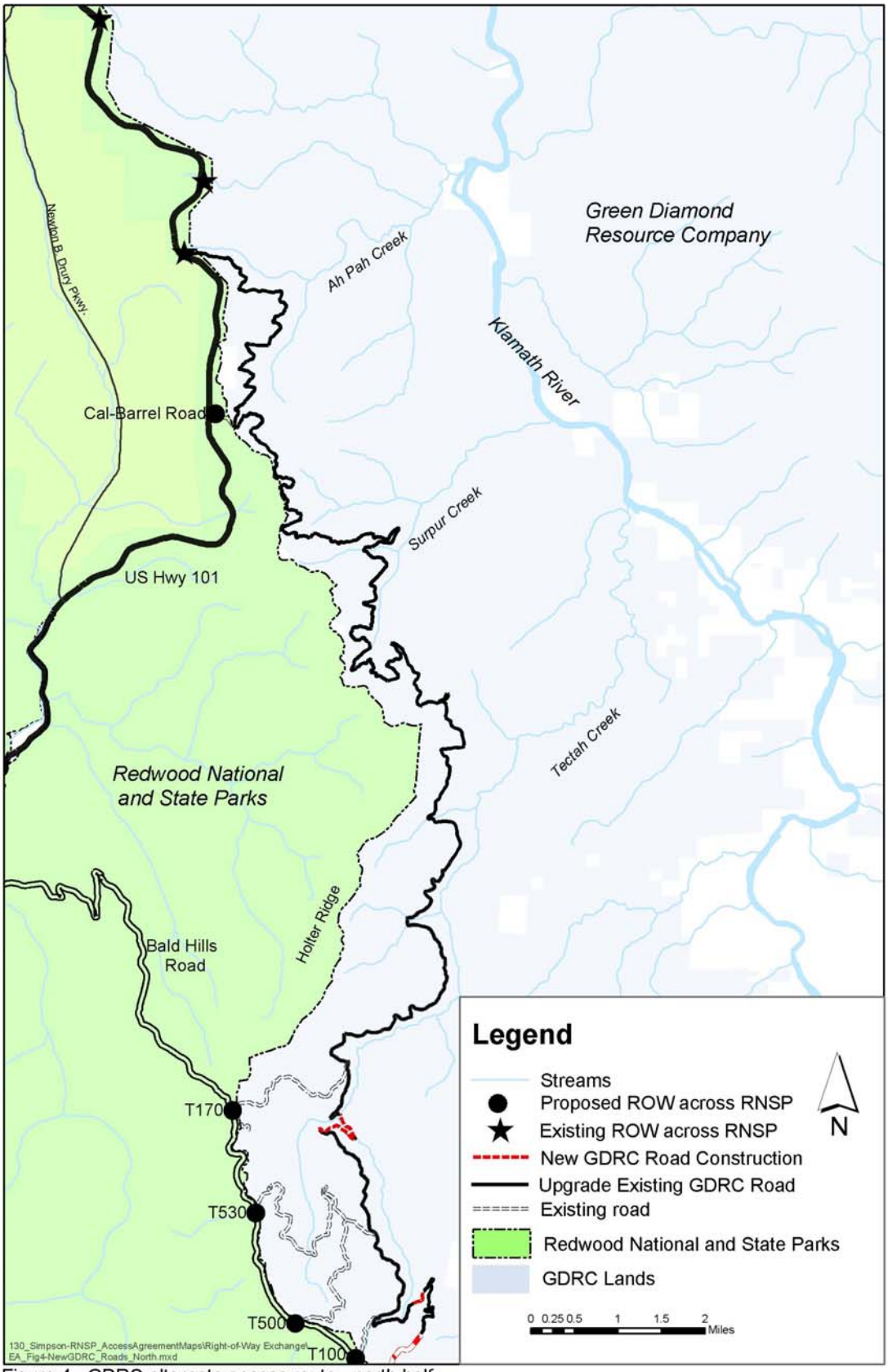

Figure 4. GDRC alternate access route - north half.

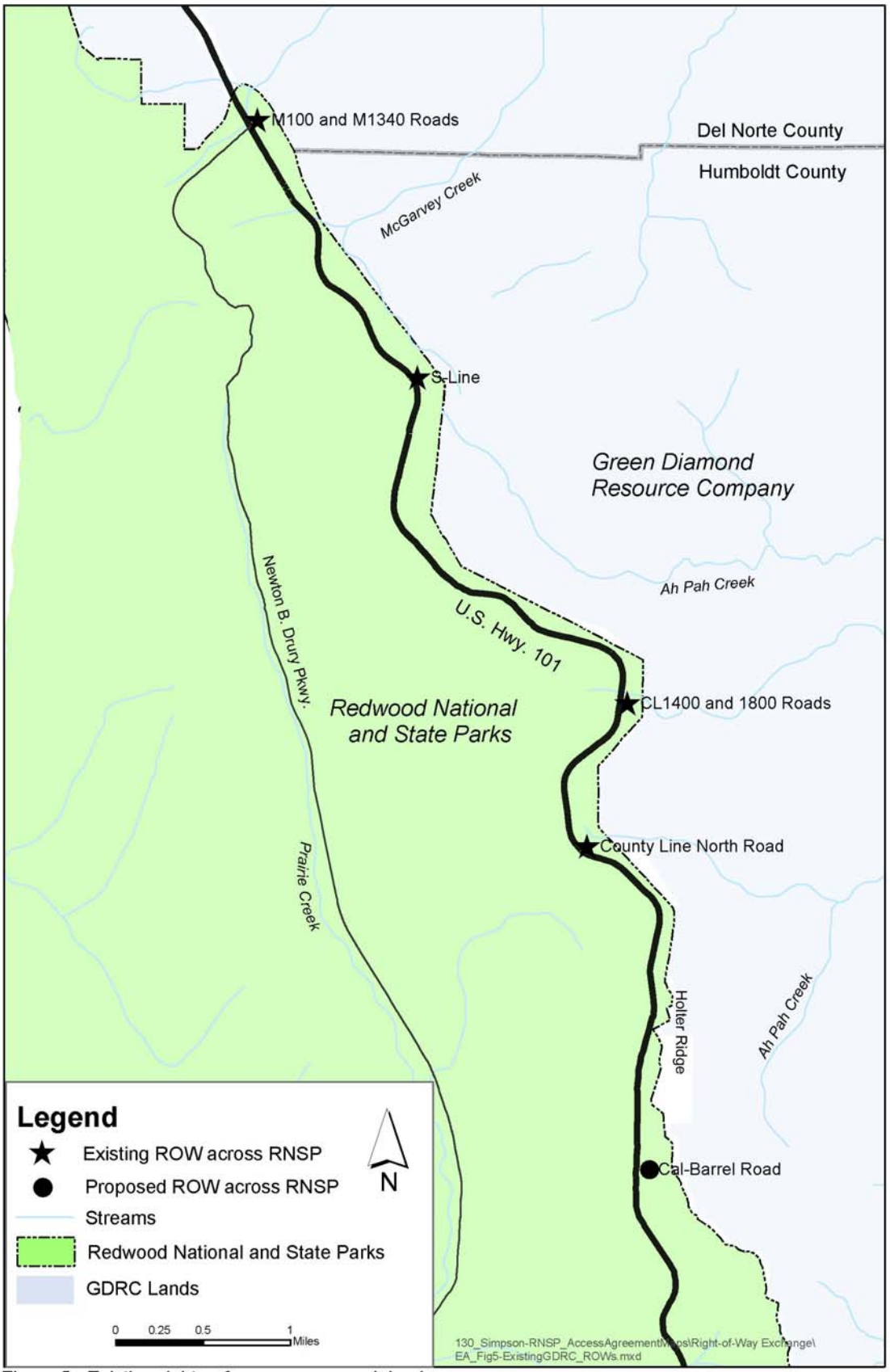

Figure 5. Existing rights-of-ways across park lands.

The NPS and GDRCo roads considered in the ROW exchange are summarized in the Tables 1-3 below.

Table 1. NPS roads in proposed ROW exchange – regular GDRCo use (lengths are approximate)

Road Name	Length, feet	Length, mile	Township/Range/Section
Cal-Barrel	1,580	0.30	T12N R2E Sec 31
T170	290	0.05	T10N R2E Sec 07
T530	490	0.09	T10N R2E Sec 20
T500	280	0.05	T10N R2E Sec 29
T100	180	0.03	T10N R2E Sec 28
R50	45	0.01	T10N R2E Sec 33
R100	210	0.04	T09N R2E Sec 03
Williams Ridge	3,170	0.60	T09N R2E Sec 24
Total Length	**6,245**	**1.17**	

Table 2. GDRCo roads in proposed ROW exchange – regular NPS use (lengths are approximate)

Road Name	Length, feet	Length, mile	Township/Range/Section
BL1700	530	0.1	T9N R1E Sec 24
BL1000/BL2000 (BL1700-BL2013S)	25,880	4.9	T9N R1E Sec 24,25,36 T9N R2E Sec 31 T8N R2E Sec 6,7,8,17
M 2½	120	0.02	T9N R2E Sec 31
BL2012	1,585	0.30	T8N R2E Sec 6
BL2013N	1,600	0.30	T8N R2E Sec 8
BL2013S	1,070	0.20	T8N R2E Sec 8,17
Total Length	**30,785**	**5.82**	

Table 3. GDRCo roads in proposed ROW exchange – occasional NPS use (lengths are approximate)

Road Name	Length, feet	Length, mile	Township/Range/Section
BL1000 (U.S. Hwy 101 - BL1700)	30,650	5.8	T9N R1E Sec 15,16,17,18,19 T9N R1E Sec 20,22,23,24
BL2000 (BL2013S - CR2000)	3,730	0.7	T8N R2E Sec 17
CR2000 (BL2000 - Crannell)	50,700	9.6	T8N R2E Sec 17,18,19,30 T8N R1E Sec 25,26,34,35 T7N R1E Sec 3,8,9,10
Total Length	**85,080**	**16.1**	

Relevant Laws, Policies, Guidelines, Plans, and Agreements

Authorities for Exchange—The Act of August 8, 1953 (P.L. 83-230, 67 Stat. 496), authorizes the acquisition of "rights-of-way as necessary to construct, improve, and maintain roads within the authorized boundaries of any area of the … National Park System … and also the acquisition of land and interests in land adjacent to such rights-of-way… to provide adequate protection of natural features … or when the acquisition of adjacent residual tracts … would be in the public interest."

As cited above, P.L. 83-230 allows for the acquisition of interests, specifically ROWs, over adjacent lands outside the authorized park boundary as well as within the boundary. Under the Acts of October 2, 1968 (PL 90-545, 82 Stat. 931) and March 27, 1978 (PL 95-250, 92 Stat. 163) establishing and expanding the park, the Secretary acquired lands and roads within the park boundary as authorized by that legislation.

The ROWs to be acquired by the NPS from GDRCo are outside the park boundary and are not subject to park regulation. The interests outside the park boundary that would be acquired by the NPS as a result of the exchange would only be those expressly stated in the conveyance deed. The only interests in park lands that would be acquired by GDRCo would be limited to those stipulated in the right-of-way deed to GDRCo. The underlying park land within the park boundary would remain in Federal ownership (fee title) and would be subject to park regulation consistent with the scope of access rights deeded to GDRCo.

NEPA/CEQA—The NPS is required to assess the potential effects of its actions under the implementing regulations of the National Environmental Policy Act (NEPA). This environmental assessment complies with all applicable NPS policies and guidelines for implementing NEPA. The exchange of ROWs for use of roads on federal or private lands does not require a state permit and is not subject to the California Environmental Quality Act (CEQA), although GDRCo timber harvest planning and operations are subject to CEQA. THPs or other operational permits required by state laws will be prepared or acquired by GDRCo pursuant to the requirements of CEQA as applicable. The THP process substitutes for environmental impact reports required under CEQA (PRC §21080.5).

NPS Management Policies—The NPS is obligated by law to regulate use of the parks in such manner as to leave them in an unimpaired condition (Management Policies 1.4.3, NPS 2006). NPS Management Policies expand upon the legal and regulatory requirements and direct the NPS to manage the resources of parks and maintain them in an unimpaired condition (Management Policies 4–Introduction). The NPS is also directed to work cooperatively with neighboring landowners to anticipate, avoid, and resolve potential conflicts that may significantly affect park programs, resources, and values (Management Policies 1.6.)

Activities that take place outside park boundaries and that are not managed by the Service can profoundly affect the NPS' ability to protect natural resources inside the parks. NPS management policies provide for some park uses that are unrelated to public enjoyment, such as use of park roads by GDRCo, if such uses are not prohibited by law or regulation. The NPS will allow such uses only that are (1) appropriate to the purpose for which the park was established, and (2) can be sustained without causing unacceptable impacts (Management Policies 8.1.1).

NPS management policies relating to determination of impairment and unacceptable impacts are discussed in the Environmental Consequences under applicable policies.

Park General Management Plan—The NPS prepared a General Management Plan (GMP) accompanied by a Final Environmental Impact Statement (FEIS) in 1999 to guide management of the park for 15-20 years (USDI 1999). The Record of Decision (ROD) signed in April 2000 summarizes the management decisions of the NPS described in the FEIS (USDI 2000a). The GMP directs the NPS to actively participate in land use decisions for activities such as logging adjacent to the parks to minimize adverse effects on park resources and values and to cooperate with the timber industry to accomplish long-range resource management planning and reduce threats to park resources. The ROD describes cooperative erosion control efforts outside of the park as a major resource management program. In relation to the Bald Hills Road, the GMP states the NPS will "depend on Del Norte and Humboldt Counties to manage and maintain county roads within the parks that provide access to nonpark lands that serve the general public in addition to RNSP visitors."

Management strategies for land protection in the GMP include acquisition of the minimum interest in lands necessary to meet management strategies under management zoning; use of the most practical and cost-effective method of acquisition to protect RNSP resources and values, including less-than-fee options and cooperation with landowners; and acquisition of interests in lands necessary to achieve RNSP purposes and minimize adverse impacts on RNSP resources that are the result of human activity outside the parks (USDI 2000b).

Current Agreements—RNSP and GDRCo signed an agreement (No. G848504003) in August 2003 that granted each other the right to a well-defined access for motor vehicles over certain roads on RNSP and GDRCo lands. The agreement was a temporary solution to a long-standing problem arising from the legislative taking of certain fee lands owned by GDRCo's predecessor in interest.

A second agreement signed in March 2005 expands the reciprocal use of roads. Under that agreement, the use of roads off the Bald Hills Road that cross park lands is limited to specific existing roads. Park use of GDRCo roads ensures complete access to park lands on the west side of Redwood Creek. The current agreement expires in about two years.

Public Involvement

The NPS sent scoping letters to 51 federal, state, and local officials, agencies, organizations, and individuals and to seven American Indian governments in October 2006 soliciting comments on the proposed ROW exchange (Appendix A). The NPS received no responses to these letters. Two organizations were informed of the proposal via electronic mail and responded that they had no substantive concerns on the scoping proposal.

The opportunity for public review and comment on the environmental assessment will be announced via news releases sent to local newspapers of record and other local media. The environmental assessment will also be sent to local libraries and will be available on the park website. Copies of the environmental assessment will be sent to the list of recipients in Appendix B, with letters announcing the availability of the document sent to recipients of the scoping letter who did not comment on the scoping proposal.

Cultural Resource Consultations—The National Historic Preservation Act of 1966 requires federal agencies to consult with the state historic preservation officer (SHPO) if an undertaking has the potential to affect properties listed or eligible for listing on the National Register of Historic Places. The NPS is consulting with the California SHPO regarding this proposed agreement as well.

Prior consultation has occurred between the NPS and California SHPO regarding two access points addressed in the proposed action. Correspondence between NPS and the California SHPO dated October 2003 sought concurrence with preliminary findings and recommendations for providing GDRCo access points at the T530 and the T500 road intersections with Bald Hills Road and at Rodgers Peak. The SHPO concurred with this determination in November 2003 provisioned on conditions outlined by the NPS for protection of archeological site CA-HUM-669 (SHPO Project No NPS031008).

In addition, letters of consultation were sent to the Yurok Tribe, Hoopa Valley Tribe, Resighini Rancheria, Big Lagoon Rancheria, Trinidad Rancheria, Elk Valley Rancheria, and Smith River Rancheria in October 2006. No comments were received.

Regulatory Agency Consultations

Federal Endangered Species—The NPS met with U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) staff in Arcata, California on September 20, 2006. Both the USFWS and NMFS agreed that the proposed exchange of rights-of-way on existing roads does not have the potential to directly affect any species listed or proposed for listing under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1521 *et seq*.). Further, timber harvest is occurring and will occur regardless of whether the NPS grants rights-of-way to GDRCo, so that timber harvest is neither interdependent upon nor interrelated to the proposed NPS action.

The USFWS further agreed in the September 20, 2006 meeting that indirect effects, i.e. those reasonably expected to occur and that are later in time (timber harvest), on northern spotted owls from the proposed ROW exchange have been adequately evaluated and considered in the Simpson Timber Company HCP

for the Northern Spotted Owl (Simpson 1992) and the accompanying Environmental Assessment (USFWS 1992) and that incidental take associated with timber harvest was previously authorized by the USFWS.

NMFS agreed that consultation on the proposed ROW exchange is not warranted because while there may be indirect effects on coho salmon or other listed fish from future timber harvest outside the project area, timber harvest is neither interdependent upon nor interrelated to the proposed exchange of rights-of-way and effects on listed fish are addressed by the GDRCo Aquatic Habitat Conservation Plan and accompanying Environmental Impact Statement (USFWS/NMFS 2006).

The NPS has completed consultations with both the USFWS and NMFS for effects on listed species from use and maintenance of park roads. Therefore, the NPS will not consult separately on the proposed action under Section 7 of the ESA.

State Consultations and THP Review—GDRCo conducts timber harvest operations under state Forest Practice Rules (FPRs) that regulate timber harvest activities. GDRCo is also subject to state environmental laws, regulations and policies for protection of water quality, fish and wildlife (including state-listed endangered species) and cultural resources. The FPRs require that GDRCo prepare THPs for approval by the California Department of Forestry and Fire Protection (CDF). Use of pesticides on timberlands is regulated by the California Department of Pesticide Regulation and is monitored by the North Coast Regional Water Quality Control Board (NCRWQCB) in regulatory proceedings separate from timber harvest regulation.

The CDF is the state agency responsible for approval of THPs submitted for private lands in California. Other state agencies, including the Department of Fish and Game (CDFG), the NCRWQCB and the California Geological Survey (CGS) are members of the official interdisciplinary review team. County, state and federal park representatives can be included when the proposed action can affect values on public lands. The review process is comprised of an initial office review during which time the plan is either filed or returned. If filed, a pre-harvest field inspection may be scheduled depending on the complexity of the THP. A second office review occurs after the pre-harvest inspection. During this final review, recommendations developed by the interdisciplinary team during the pre-harvest inspection are considered. The THP is either approved or denied during this second office review. A plan approved against the objection of any review team member can be challenged through a non-concurrence process.

NPS geologists have reviewed THPs submitted for the Redwood Creek watershed since the mid-1970s. They participate in the pre-harvest inspection to evaluate proposed activities in relationship to observed ground conditions in the field. The goal of NPS review is to prevent avoidable erosion and sedimentation associated with roads and harvest activities adjacent to streams to protect the resources in the park downstream of proposed timber harvests.

The NPS also reviews THPs submitted for areas along the park boundary where edge effects from adjacent timber harvest activities might affect park resources. The FPRs provide for the establishment of Special Treatment Areas (STAs) at locations that contain significant resource features, such as state or national parks. STAs are generally a 200-foot-wide zone established along the property line and on the property being harvested. Timber harvest operations must consider the objectives for which the STA is being established. A multidisciplinary NPS team reviews these THPs for potential impacts to park resources, including wildlife, vegetation and streams. Cooperative relationships established with private landowners generally allow this review to occur with the forester who prepares the THP before it is finalized and submitted to CDF.

THPs are reviewed by the California Department of Fish and Game (CDFG) for potential effects on plants and animals listed under the California Endangered Species Act and other sensitive species. CDFG

and GDRCo are exploring a transition to a long-term Sensitive Plant Conservation Program (SPCP) for all GDRCo lands in northern California. The SPCP includes plant protection measures that would apply to all THPs filed and approved by CDF after July 1, 2005. This program includes appropriate floristic surveys for all sensitive plant species that have the potential for key habitat and/or general geographic location on GDRCo California ownership, monitoring, and a combination of impact avoidance and risk minimization. Sensitive plants are defined as a species, subspecies, or variety of native plant that is federally or State listed, or meets the criteria for listing as rare, threatened, or endangered species pursuant to Section 1580 of the CEQA Guidelines. The final phase is being developed with a goal to adopt a long-term, cost-efficient, ownership-wide conservation strategy for sensitive plants that incorporates appropriate surveys, monitoring, and a combination of measures to avoid impacts and minimize risk.

Appendix C contains a list of sensitive wildlife species for which GDRCo conducts surveys on its lands.

Alternatives

This environmental assessment describes a no action alternative (Alternative 1) and two action alternatives: Alternative 2: Exchange of Rights-of-way (Proposed Action, Environmentally Preferred Alternative), and Alternative 3: Construct Roads.

Alternative 1: No Action—The no action alternative is required under NPS guidelines for complying with NEPA and is used to compare the existing conditions with other alternatives. No action means either a continuation of existing management practices or "no project". For this project, no action means continuing renewal of the general agreement for reciprocal use of roads for resource management and administration by the NPS and for timber operations and resource management by GDRCo.

Under the no action alternative, both the NPS and GDRCo would continue to use each other's roads for access to respective NPS and GDRCo lands under a reciprocal road use agreement. The most recent agreement allows the NPS to use approximately 22 miles (5.8 miles regular use/16.1 miles occasional use) of GDRCo roads and GDRCo to use approximately 1.2 miles (5,844 feet) of NPS roads with regular use (Figure 2). The road agreement contains road use guidelines and restrictions for each party and will expire in less than three years.

All of these roads were constructed for access to timber operations and have been used more or less continually for approximately 50 years. The roads are either one-lane roads with turn-outs to allow large vehicles to pass, or two-lane roads. The road surfaces are rocked to allow for use in all seasons, which generally means during wet weather. Proper surface drainage and erosion protection are provided to protect the beneficial uses of water.

Although a no action alternative is being considered as required under NEPA, continued use of a general agreement for use of roads is not considered to be a long-term solution for either the NPS or GDRCo because of the perpetual needs of each party for access to their respective lands. The purpose and need for the project is to provide a long-term solution for access to each party's respective lands.

Alternative 2: Exchange of Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—Under the Proposed Action, the NPS would grant a ROW to GDRCo for use of 1.2 miles of park roads for access to GDRCo lands immediately adjacent to the park. In exchange, GDRCo would grant a ROW to the NPS for use of 22 miles of GDRCo roads for access to park lands. Granted ROWs would be transferable to GDRCo's future successors. Right-of-way deed restrictions would limit GDRCo use of NPS roads to the management of industrial timberlands, require road maintenance, and limit modification to NPS roads. For example, dust abatement, grading and graveling of the road surface would be permitted, road use would be limited to the existing road corridor, no widening or modification to the road surface would be permitted other than what would be required for road maintenance and

repair, and vegetation management would be limited to manual or mechanized removal of brush and low tree limbs that interfere with safe vehicle access. ROW deed restrictions would limit NPS use of GDRCo roads to administrative use.

All other aspects of this alternative are similar to the no action alternative. GDRCo would continue to operate under applicable state and federal rules and regulations pertaining to commercial timber harvest in California.

Alternative 3: Construct Roads —Under Alternative 3, the NPS and GDRCo would terminate the general agreement for use of roads owned by the other party. The NPS would construct a new road system to access park lands on the west side of the Redwood Creek watershed south of Rodgers Peak. GDRCo would construct a new road system to access its lands in the Klamath River watershed.

The NPS would construct a six mile long road system to provide access to the southwest area of the park (Figure 2). Of this total length, the NPS would build 2.5 miles of new roads, upgrade 1.0 mile of existing roads, and rebuild 2.6 miles of roads previously removed under the park watershed restoration program. New road construction would be parallel to GDRCo's BL1000 and BL2000 roads. Roads to be rebuilt include the M-2-2 Road in the headwaters of Devils Creek (removed in 1985) and the M-3 Road in the headwaters of Bridge Creek (removed in 1987). Roads in the park would utilize a 36-foot-wide corridor. About 23 stream crossings would be built (ten in headwaters of Devils Creek and 13 in headwaters of Bridge Creek). More than 125,000 cubic yards of soil would be excavated. About 25 acres of second-growth forest would be cleared to build the new road system.

GDRCo would construct a new all-weather road system about 40 miles long to access its lands on the south side of the Klamath River watershed (Figures 3 and 4). This new road system would be used in lieu of the 1.2 miles of road, in eight existing segments, that cross park lands and connect GDRCo's lands to the Bald Hills Road and U.S. Highway 101. Of the 40 miles, GDRCo would build about 6 miles of new all-season roads and would upgrade about 34 miles of existing roads to mainline road standards. This new road system would include about 144 stream crossings and require nearly 380,000 cubic yards of earthmoving. About 45 acres of second-growth forest would be cleared for new road construction within a 60-foot-wide corridor and about 80 acres cleared in a 20-foot-wide corridor to upgrade other roads.

Actions Common to All Alternatives - – Under the no action alternative and the two action alternatives, GDRCo would continue to access, harvest and manage its lands in accordance with company objectives, the California Forest Practices Act and other applicable rules and regulations. Potential impacts from GDRCo operations would be mitigated by methods prescribed in the rules, by site-specific measures incorporated into THPs, and by the recommendations of the multi-agency, inter-disciplinary review team process. All provisions and requirements of approved HCPs and Incidental Take Permits for federally-listed terrestrial and aquatic species would be implemented.

Environmentally Preferred Alternative—The environmentally preferred alternative is the one that best meets the criteria identified in Section 101 of (NEPA) as outlined below.

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural and natural aspects of our national heritage.
- Enhance the quality of renewable resources.

The NPS has determined that Alternative 2: Exchange of Rights-of-Way (the Proposed Action) is the environmentally preferred alternative. Use of existing roads under Alternative 2 would avoid construction of new roads within park boundaries to access areas on the west side of Redwood Creek that require legislatively-directed rehabilitation of abandoned logging roads, and that are needed for research, fire suppression, and maintenance of horse and hiking trails and equestrian camps used by visitors to enjoy the park.

The no action alternative (Alternative 1) does not have direct impacts to resources as defined by NEPA but it is inconsistent with laws and guidelines applicable to NPS management of units of the national park system and with the RNSP General Management Plan. The purpose of the project is to provide a long-term agreement for use and maintenance of the roads for efficient management of park resources and to reduce potential cumulative effects that would result from construction of new or additional roads. The no action alternative is not the environmentally preferred alternative because it does not provide the long-term management stability needed for the NPS to fulfill its trustee responsibilities for protection of the park for future generations as outlined in the park expansion legislation.

Alternative 3 (Construct Roads) is not the environmentally preferred alternative because construction of new roads or re-opening of previously removed roads within the park would disturb 25 acres of soils and vegetation and require construction of 23 stream crossings. Construction of 2.5 miles, upgrading of 1 mile, and reopening of 2.6 miles of road would create the potential for erosion associated with roads and stream crossings. Although these 25 acres have already been disturbed by the original logging, the NPS completed some restoration work for the original roads and the forest has been regrowing for over 25 years. Road-related erosion and sedimentation is identified in the 1978 park expansion legislation and the GMP as a threat to the aquatic and riparian resources of Redwood Creek. Major storms have the potential to erode existing abandoned and unmaintained logging roads, causing catastrophic resource degradation in the parks. Even though new roads would be constructed and maintained to current standards, constructing additional roads within the national park would not meet the long-term trustee responsibilities of the NPS and would further degrade park lands rather than reducing the existing level of degradation.

Alternatives Eliminated from Further Consideration—The NPS analyzed several options for providing GDRCo with access to their land across short stretches of park land on the east side of Bald Hills Road. The NPS determined that these options either do not meet the purpose and need for the project or that the NPS does not currently have the authority to pursue these options.

- Purchase of Land by GDRCo—There is no legislative authority for the NPS to sell or directly transfer an interest in real property to a private entity in this situation.

- Exchange of Federal easements for GDRCo fee land—This alternative would involve the expansion of the boundary of RNSP to include fee land to be conveyed by GDRCo. The fee land offered by GDRCo in exchange is a ten-acre tract, and is not part of the roadway system across GDRCo lands. Because of the relatively small area involved, the boundary adjustment and acquisition could be done administratively rather than legislatively. This alternative does not address the need for NPS to cross GDRCo lands to access park lands.

- Exchange of Perpetual Easements with a Park Boundary Adjustment —This alternative addresses RNSP and GDRCo access needs, but would require a highly unusual boundary adjustment that would include long, finger-like Federal park corridors over GDRCo land. Such a boundary adjustment is unacceptable to both NPS and GDRCo.

Affected Environment

Setting and Access

The project area includes existing roads along the east and west sides of the Redwood Creek watershed. Most of the roads are located on ridgetop areas and have been in use for over 50 years.

On the east side of the watershed, the short roads that cross park lands are spur roads off the Bald Hills Road. The Bald Hills Road is a public road owned and maintained by Humboldt County. The short spurs are the final length of GDRCo's rocked, all-season roads that connect their transportation system to the Bald Hills Road. These roads are gated and closed to public access.

The park roads along the Bald Hills Road for which NPS would grant GDRCo a ROW are located approximately seven miles southeast of the town of Orick. They are located on the Holter Ridge and Bald Hills 7.5' USGS quadrangles in township/range/sections (TRS) listed in Table 1. These areas drain into the headwaters of Tectah Creek, Roach Creek, and Robbers Gulch (Tully Creek), all tributaries of the Klamath River.

Cal-Barrel Road is located farther north along Holter Ridge. It connects GDRCo lands located to the east with the Highway 101 Bypass to the west. Cal-Barrel Road is located about eight miles northeast of the town of Orick and on the Ah Pah Ridge 7.5' USGS quadrangle in the TRS listed in Table 1. This road drains into the headwaters of an unnamed tributary of Prairie Creek, which is tributary to Redwood Creek. Cal-Barrel Road is gated and closed to public access with the exception of a small privately owned parcel that adjoins NPS and GDRCo lands along Holter Ridge.

On the west side of the Redwood Creek watershed, the roads for which GDRCo would grant NPS a ROW are one- and two-lane, rock-surfaced, all-season roads. GDRCo roads that would receive regular NPS use are located on the Panther Creek, and Rodgers Peak 7.5' USGS quadrangles in TRS listed in Table 2. NPS access to these roads would be from the WSA Road, which lies entirely on NPS lands. The road is gated and closed to general public use, and is the primary park administrative access route to the west side of Redwood Creek. GDRCo roads that would receive occasional NPS use are located on the Crannell, Panther Creek, and Rodgers Peak 7.5' USGS quadrangles in TRS listed in Table 3. NPS access to these roads would generally be from U.S. Highway 101 between Crannell/Little River and Big Lagoon. Nearly all of these roads drain into Maple Creek or Little River.

Climate and Weather

The Pacific Ocean is a moderating influence on the climate of the project area. The region has wet, mild winters and relatively dry summers with frequent coastal fog. Most rain falls between November and March, although it can rain any time. Annual rainfall averages 70 inches at the town of Orick and can exceed 80 inches in the inland areas near Schoolhouse Peak. Winter storms from the Pacific Ocean bring intense rainfall over several hours or days, particularly warmer storms from lower latitudes. These storms may cause both small streams and larger rivers to flood. Snow accumulates relatively frequently at elevations above 1,800 feet but does not persist even at higher elevations in the park.

Temperatures vary only slightly from summer to winter along the coast, and generally average about 60°F. Temperatures fluctuate more in the inland areas. Mean daytime temperatures at Prairie Creek Redwoods State Park, five miles north of Orick, are 47°F in January and 59°F in June. Temperatures below freezing or above 90°F occur in the interior areas away from the moderating influence of the coast.

Winds come from the northwest or south-southwest and are generally light. Intense winter storms may be accompanied by damaging winds. Occasionally in the fall, a warm dry wind from the east produces a rapid drying effect, intensifying the fire hazard in the normally moist redwood forests. The fire hazard in the dry inland areas is much greater than along the coast.

Fog is a dominant climatic feature, generally occurring daily in the summer and not infrequently during the rest of the year. Fog occurs mostly within a few miles of the coast. Fog may extend inland in the river valleys where it commonly dissipates as the day gets warmer. The Bald Hills and the ridge on the west side of Redwood Creek are generally free of fog because of the elevation and distance from the coast.

Air Quality

Redwood National Park has been designated as a Class I airshed pursuant to Part C of the Clean Air Act, as amended (42 U.S.C. 7401 et al.). State park lands within RNSP are classified as Class II airsheds, with some areas being considered for reclassification to Class I. Class I and Class II designations are given to areas where air quality is cleaner than the national ambient air quality standards. Class I areas have the most stringent regulations for the protection of air quality, permitting the lowest increments of air quality degradation, whereas Class II status allows moderate deterioration that might accompany well-planned growth.

The parks are assigned to the North Coast Air Basin by the California Air Resources Board, which is under the jurisdiction of the North Coast Unified Air Quality Management District. A particle monitor in the parks measures fine particle mass (matter less than 2.5 micrometers in diameter), sulfates, nitrates, and aerosol elemental composition. An ozone and meteorological monitoring site operated in the parks between 1987 and 1995. Other monitoring stations are in Crescent City and Eureka.

Air quality in RNSP is considered good to excellent because of the low population, scarcity of pollutant sources, and prevailing westerly ocean winds. All federal standards are consistently achieved, including those for ozone, carbon monoxide, particulate matter, nitrogen dioxide, sulfur dioxide, and lead. The most significant air pollutant in the parks is PM_{10} (particulate matter less than ten micrometers in diameter), which is primarily from widespread non-industrial burning, the industrial burning of timber harvest slash piles, and smoke drift from occasional large wildfires inland. In the past, total suspended particulates exceeded air quality standards, but improved technology, better use of materials, and fewer sawmills (and especially their tepee burners) in the region have resulted in a reduction in suspended particulates. An industrial site along Humboldt Bay (50 miles south of the park) is the most serious point source of pollution. Local vistas are often impaired by fog, rain, low clouds, salt spray haze, and natural forest haze inversion.

Topography, Geology, and Soils

Topography—The NPS roads considered in the ROW exchange are generally along the ridges on the east side of the watershed on rolling terrain with steeper slopes on either side of the ridge. Slope steepness ranges from 0-40 percent, and elevations above sea level range from 2,000-2,400 feet along the Bald Hills Road and about 1,600 feet at Cal-Barrel Road.

The GDRCo roads considered in the ROW exchange are generally along or just below the ridges on the west side of the watershed. Slope steepness ranges from 0-50 percent with steeper slopes on either side of the ridge. The elevation of the BL1000 and BL2000 roads on the west side of the watershed is about 2,000 feet above sea level.

Geology—The project area is underlain by the Franciscan assemblage of the Late Jurassic to Early Cretaceous age (about 100 to 150 million years old) and alluvial sedimentary deposits of the late Tertiary and Quaternary age (Cashman et al. 1995). These deposits were carried eastward on the oceanic plate, accreted to the North American continent, and eventually uplifted to form the Coast Range. Subsequent folding and faulting contributed to the formation of different bedrock types and their distribution in the Redwood Creek watershed. The Grogan Fault, which the mainstem of Redwood Creek follows over most of its length, separates schist and sandstone bedrock units in the watershed.

On the east side of Redwood Creek, the project area is underlain by the Coherent Unit of Lacks Creek and the Incoherent Unit of Coyote Creek. The primary rock types in both units are massive sandstone, interbedded sandstone, and mudstone. Only the incoherent unit contains chert and greenstone along with sandstone and mudstone. The geomorphic expression of the two units is markedly different. The coherent unit with its relatively resistant sandstone supports steep slopes and narrow v-shaped stream valleys. In contrast, the incoherent unit with its relatively softer sandstone supports a subdued, rolling landscape with less deeply incised streams. Sharp ridge crests are generally found on ridgetop areas underlain by the coherent unit in contrast to the broad flat ridge crests found in the incoherent unit.

On the west side of the Redwood Creek watershed, the project area is underlain by the Schist of Redwood Creek. It is composed of metagraywacke, fine-grained schist, and minor laminated to massive greenstone. Its texture, composition, and degree of deformation can vary significantly depending on hillslope position. The geomorphic expression of the schist unit is variable, but slopes underlain by schist usually have gently convex profiles ranging from 20-40 percent and averaging about 25 percent. Ridgetop areas have rather broad, flat ridge crests.

Soils—The Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service) recently completed a soil survey for the park (USDA 2007). The Dolason soil series (480) is the most common soil found in the project area along the eastern ridgetops in Redwood Creek (USDA 2007). These soils are deep (59-77 inches), gravelly clay loam inceptisols derived from sandstone parent material. The soils are present on 9-30 percent slopes, are well drained, and have a moderate surface erosion hazard rating due to low rock content (USDA 2007).

The Trailhead soil series (560) is the most common soil found in the project area on the western ridgetops in Redwood Creek (USDA 2007). These soils are deep (55-74 inches), silty clay loam ultisols derived from schist parent material. The soils occupy 0-30 percent slopes, are well drained, and have a moderate surface erosion hazard rating due to low rock content (USDA 2007).

Roads and Erosion—Roads and their associated impacts to aquatic and riparian resources and water quality were central to discussions leading to the expansion of Redwood National Park (Janda et al. 1975). There are more than 1,200 miles of roads on private lands in the Redwood Creek watershed upstream of the park. Studies in the Redwood Creek watershed have confirmed the relationship between roads, sedimentation, and degraded water quality. The Redwood Creek Watershed Analysis (RNSP 1997), the sediment TMDL for Redwood Creek (USEPA 1998), and the North Coast Watershed Assessment for Redwood Creek (NCWAP 2005) all identify sedimentation from roads, especially logging roads, as the primary nonpoint source pollutant in the watershed. A sediment budget for Redwood Creek identified erosion from roads as the largest controllable source of sediment in the watershed (USEPA 1998).

Erosion from roads occurs through surface and landslide erosion. Surface erosion occurs through sheet wash, rill, and gully erosion when surface runoff concentrates on a road surface or when a culvert plugs or otherwise fails. The extent of surface erosion is influenced by soil type, slope gradient, vegetative cover, degree of ground disturbance, and rainfall intensity and duration. Landslide erosion occurs when roads are built on steep wet slopes, and when too much fill material is sidecast along the road edge. Landslide erosion can also occur when a stream diverts from its natural channel and streamflow is diverted onto an unchanneled hillslope. The erosional process begins with deep gully erosion that leads to landslide erosion. The amount of eroded sediment delivered to a stream depends on the distance to the nearest stream, and the amount and condition of the vegetation between the stream channel and the road.

Hydrology and Water Quality

Most of the roads considered in the ROW exchange are located at or near the ridgetops that separate the Klamath River, Redwood Creek, Maple Creek, and Little River watersheds. Where streams exist in this upland setting, drainage areas are small (less than 20 acres), and channels are narrow (one to six feet wide) and poorly defined with few exposed instream gravels. Stream gradients are variable (less than five percent to greater than 15 percent), and stream flow is ephemeral (rain dependent) or intermittent (seasonal). In contrast, the mainstem channels of tributary streams located farther downslope are larger streams that support salmonid species. These channels have frequent pools, moderate to high amounts of large woody debris and accumulated gravels, and perennial (year-round) stream flow. Stream channels located in mid-slope areas can have any combination of the channel characteristics described above, but are generally steeper gradient, intermittent streams. Streams with drainage areas smaller than about one square mile (640 acres) are commonly dry during summer months (Janda et al. 1975).

Hydrology—Regular stream discharge measurements have been taken on Redwood Creek in Orick since 1953. Peak annual flows ranged from a low of 2,300 cubic feet per second (cfs) in February 2001 to the highest flow on record of 50,500 cfs in December 1964. Between 1953 and the present, there have been five years with a peak annual flow at or near 50,000 cfs, and three years with flows at or around 40,000 cfs. The most recent flow above 40,000 cfs occurred on January 1, 1997 (40,300 cfs). The 100-year flood for Redwood Creek is estimated to be 65,280 cfs (USGS 1993).

Except for Cal-Barrel Road, the NPS roads that are being considered in the ROW exchange drain into the Klamath River watershed via major tributary streams. From north to south, these Klamath River tributaries include Tectah Creek, Roach Creek and Robbers Gulch (a Tully Creek tributary).

Cal-Barrel Road, located farther north along Holter Ridge, drains west into the park and into an unnamed tributary of Prairie Creek, which is the largest Redwood Creek tributary in the watershed.

There are no streams associated with most of the NPS roads on the east side of the Bald Hills Road and Cal-Barrel Road because of their very short length and ridgetop locations. The T100 Road is the closest NPS road to a stream, located about 1,400 feet from where Tectah Creek becomes a perennial stream. Williams Ridge Road, the longest NPS road considered in the ROW exchange, crosses one small ephemeral stream that has a drainage area of less than five acres. Based on topographic maps, the crossing is located nearly 1,200 feet from where Robbers Gulch becomes an intermittent stream, and nearly 4,000 feet from where it becomes a perennial stream.

Most of the main GDRCo roads considered in the ROW exchange (i.e., those that would receive routine NPS use) drain into Maple Creek via tributary streams. The Maple Creek tributaries include Clear Creek and several unnamed headwater streams. A portion of the BL1000 Road spills over to the Redwood Creek side of the ridge and drains into Bridge Creek and the park.

The combined length of the BL1000 and BL2000 roads along the ridgeline that separates Redwood Creek and Maple Creek is about 3.4 miles. Of this total, the northern part of the BL1000 Road parallels Bridge Creek for about one mile. The road does not cross Bridge Creek but surface runoff from the road enters this Redwood Creek tributary via shoulder drains or culverted cross-drains. Bridge Creek is a perennial stream. The BL1000 Road is located 300 feet to 800 feet from Bridge Creek's mainstem channel and, on average, is about 450 feet away. Continuing south along the ridge, the BL1000 and BL2000 roads cross one intermittent reach of Clear Creek and two intermittent reaches of unnamed Maple Creek tributaries. Both of these roads are well maintained, rock-surfaced, all-season haul roads.

Other GDRCo roads considered in the ROW exchange that would receive occasional NPS use provide direct highway access for heavy equipment transported into and out of the park. These roads include the BL1000 Road from U.S. Highway 101 to the BL1700, and the CR2000 Road from the BL2013S Road to

Crannell. Leaving the coast, the BL1000 climbs the hillslope crossing Maple Creek tributaries including Diamond Creek, Pitcher Creek, and several unnamed streams. The CR2000 Roads descends from the ridgeline crossing the headwaters of Maple Creek and lower portions of Little River. The BL1000 crosses one perennial reach of Diamond Creek and the CR2000 crosses two perennial reaches of Little River. These roads are well maintained, rock-surfaced, all-season haul roads that use modern bridges to cross these perennial streams.

Water Quality (*Sediment)*—The Klamath River, Redwood Creek, Maple Creek, and Little River are the major streams in the vicinity for which beneficial uses have been established. The 1994 Water Quality Control Plan for the North Coast Region states that "Beneficial uses of the waters of the state that may be protected against water quality degradation include, but are not necessarily limited to, domestic, municipal, agricultural and industrial supply; power generation, recreation, aesthetic enjoyment, navigation; and preservation and enhancement of fish, wildlife and other aquatic resources or preserves."

The collective potential beneficial uses for the Klamath River, Redwood Creek, Maple Creek, and Little River, include municipal, domestic and agricultural supply; navigation; groundwater recharge; freshwater replenishment; water contact and non-water contact recreation; commercial and sport fishing; warm and cold freshwater habitat; wildlife habitat; rare threatened or endangered species habitat; migration, spawning, reproduction, and/or early development of aquatic organisms; and water quality enhancement.

The Environmental Protection Agency (EPA) pursuant to Section 303(d) of the Clean Water Act has listed the Klamath River and Redwood Creek as "impaired" water bodies. The 303(d) list was developed in response to Section 303(d)(1)(A) of the Clean Water Act, which requires that "Each State shall identify those waters within its boundaries for which effluent limitations . . . are not stringent enough to implement any water quality standard applicable to such waters." The Clean Water Act also requires states to establish a priority ranking for waters on the 303(d) list of impaired waters and establish total maximum daily loads (TMDLs) for such waters. A total maximum daily load is defined as "the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" such that the capacity of the waterbody to assimilate pollutant loadings is not exceeded.

The EPA lists the Klamath River as having impaired water quality due to high water temperatures and high nutrient loads, and is currently considering listing it for excessive sediment. These impairments are associated with numerous past and present activities, both natural and anthropogenic, including agricultural water diversion, water impoundments, road building, silviculture, highway construction, gravel mining, landsliding, flooding, development, and point source pollution. The EPA has not established a TMDL for the Klamath River impairment factors.

Redwood Creek was first identified as having impaired water quality due to excessive sediment in California's 1996 303(d) list submittal by the NCRWQCB. Redwood Creek was also listed in 2002 for temperature impairment.

The EPA adopted a sediment TMDL for the Redwood Creek watershed on December 30, 1998 (USEPA 1998). Following the adoption, the NCRWQCB developed a Water Quality Attainment Strategy and Implementation Plan (Plan) to achieve water quality objectives in the sediment TMDL for Redwood Creek. Although the Plan was never adopted by the State Water Resources Control Board, the NPS has applied many of the objectives from the Plan through voluntary efforts in THP reviews and erosion control/prevention projects on park and private lands.

The TMDL identified ten sources of sediment delivery for the Redwood Creek watershed. Two sources of naturally occurring sediment delivery are earthflows and block slides. The other eight are controllable to some extent through management practices: 1) erosion associated with roads, skid trails, and landings;

2) gully erosion; 3) bare ground erosion associated with human activities; 4) stream bank erosion associated with human activities; 5) road related tributary landslides; 6) harvest related tributary landslides; 7) mainstem landslides, many of which are natural, but their occurrence may be controllable to varying degrees, and; 8) debris torrents.

Through the TMDL process and analyses, the level of sedimentation in Redwood Creek watershed was judged to exceed the existing narrative water quality objectives necessary to protect beneficial uses of the watershed, particularly the cold water fishery. Accelerated erosion from land use practices, especially logging roads, and other causes is impacting the migration, spawning, reproduction, and early development of cold water anadromous fish including coho salmon, Chinook salmon and steelhead trout.

Redwood Creek load allocations were developed based on the source analysis of the various erosional processes found in the watershed. Hillslope targets address preventable erosion through improved land management practices, especially related to roads. There are no point-source load allocations for Redwood Creek.

The impacts that led to the listing of Redwood Creek as sediment impaired are the combined effects of past and current land use and large winter storms. Aggradation in the mainstem of Redwood Creek and the tributaries is reversing. The Redwood Creek Watershed Analysis (RNSP 1997) indicated that 60-80 percent of flood-related instream sediment deposits are flushed out of tributary watersheds within ten years, in contrast to the mainstem where stored sediment can reside for three or more decades. The lowermost reaches of Redwood Creek are still impacted by excessive stored sediment.

Water Quality (Temperature)—Redwood Creek and the Klamath River are listed as impaired for high summertime stream water temperatures under Section 303(d) of the Clean Water Act. Past timber harvest, removal of riparian vegetation, streamside landsliding, and channel aggradation have been recognized as contributing to higher stream temperatures.

High summertime stream temperatures in Redwood Creek and the Klamath River watersheds reflect, in part, poor riparian conditions along the mainstem channels and tributary channels, which produce cold water. In the case of Redwood Creek, poor riparian conditions is a lingering cumulative effect from past land use. In 1948, 86 percent of the length of riparian zone along Redwood Creek was dominated by old-growth conifers (Urner and Madej 1998). By 1978, about 80 percent of the old-growth conifer forests in Redwood Creek (Best 1995) and more than 80 percent of the riparian areas along Redwood Creek (Bundros et al. 2003) had been harvested. By 1997, nearly 60 percent of the riparian area along Redwood Creek had become hardwood-dominated (Bundros et al. 2003).

Forest practice rules that recognized the importance of retaining some streamside trees for the protection of aquatic habitat and water quality were not adopted until 1983 (CDF 1983) after much of the Redwood Creek and Klamath River watersheds had already been harvested. Landmark studies of cumulative watershed effects (U.C. Committee 2001) and the California Forest Practice Rules (Ligon et al. 1999) led to significant advances in forest practice rules in 2001 (CDF 2001) that improved stream and riparian forest protection in water quality impaired watersheds.

Current FPRs recognize the importance of riparian conifers for the improvement and protection of water quality and aquatic habitat. They also recognize that some watersheds that support listed salmonid species, such as Redwood Creek, have threatened or impaired values (sediment and temperature) that require additional protection measures (CDF 2006). The rules, therefore, place importance on the restoration and maintenance of the beneficial uses of water and habitat of salmonid species.

Smaller streams, such as Prairie Creek, Maple Creek and Little River, are closer to the coast and are generally cooler than larger streams that extend inland because the temperatures along the coast are

cooler, especially with summer coastal fog. Tributaries immediately below the ridgetop areas on either side of Redwood Creek are generally cooler than the mainstem channels of the Klamath River and Redwood Creek that originate inland where summer temperatures are higher, there is no fog, and the Klamath River channels are sometimes too wide to be shaded by riparian canopies.

Floodplains and Wetlands

Floodplains—Streams in the project area are typically small and steep and do not have well-developed floodplains because valley confinement and steep slopes prevent development of floodplains. However, there are floodplains near the mouths of the Klamath River and Redwood Creek and along perennial streams in areas that are less steep. Floodplains in the Redwood Creek watershed are discontinuous and best developed in the flatter downstream portion of the river, from McArthur Creek north to the national park boundary. Upstream of the park boundary, the floodplain is poorly developed because of the high gradient in the steep-sided, narrow valley.

Wetlands—Wetlands are defined by the National Park Service as any area classified as wetland habitat according to the USFWS's *Classification of Wetlands and Deepwater Habitats of the United States.* Wetlands types under this classification are referred to as "Cowardin wetlands" after the author of the classification report. According to this definition, a wetland has at least one of three attributes: undrained hydric soils, predominantly hydrophytic vegetation, or, if the substrate is nonsoil, the area is saturated with water or covered with shallow water at some time during the growing season of each year. The U.S. Army Corps of Engineers definition generally requires evidence of all three attributes.

Hydric soils are soils formed in a wet environment. Hydrophytic vegetation is defined as vegetation typically found in wet areas rather than on upland or dry sites. The growing season is defined as the frost-free period. In Humboldt County, the growing season is considered to be March-October by the NRCS and year-round by the U.S. Army Corps of Engineers.

Because the project area is located at the top of watersheds, wetlands in the area are generally riparian zones along perennial streams downstream of the roads. Two primary types of Cowardin wetlands are depicted on the U.S. Fish and Wildlife 1987 National Wetlands Inventory (NWI) maps of the project area. These types are classified by the persistence of the stream, the substrate, and the duration of inundation (seasonal flooding regime), as well as the position in the drainage.

The upper reaches of the streams in the project area are mapped as R4SBC (Riverine, Intermittent, Streambed, Seasonally Flooded) or R3UBH (Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded). These riverine wetlands are present where the steep topography prevents the development of a floodplain. In the lower reaches of the watershed, the subdrainages coalesce to form a perennial stream, which allows the development of a floodplain and streamside vegetation that is dependent on permanent running water. The riparian zones along the perennial streams are classified as PFO1C (Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded). Palustrine wetlands are dominated by trees, shrubs, and emergent plants. The primary wetland functions and values associated with the naturally occurring wetlands in the project area are fish and wildlife habitat. The palustrine wetlands along perennial streams also function as filters for sediment and to attenuate floods by reducing the velocity of flood waters. A small impoundment constructed by one of the former timber companies for fire protection (PUBHh—palustrine, unconsolidated bottom, permanently flooded, impoundment) is present just downslope off the WSA Road in the headwaters of Bridge Creek.

Wetlands occasionally develop where road drainage structures are not properly maintained, allowing water to stand in non-functioning ditches or behind plugged culverts or failed stream crossings. These artificial wetlands form when ground water is intercepted by undercutting the slopes with heavy equipment during construction and emerges into road ditches and onto road and skid road surfaces. Road fills immediately upstream of road-stream intersections often possess wetland characteristics when the

accumulated sediment becomes saturated by stream flows. With proper drainage of roads or when the original topography is restored, these wetlands disappear. These wetlands are generally found on abandoned logging roads in the park and do not possess significant functions and values. The primary value of these artificial wetlands is breeding habitat for amphibians. The average size of these artificial wetlands is estimated at about 100 square feet on NPS lands. Roads and associated drainage structures on GDRCo lands receive more regular and intensive maintenance under the FPRs, and wetlands that form along unmaintained or failing roads are uncommon.

Vegetation

Most of the lands in and near the project area were logged extensively beginning in the 1950s. Logging on what are now park lands ceased when the lands were acquired for the park in 1978, resulting in a matrix of old growth and second-growth forests. Timber production has continued on GDRCo lands, which now contain primarily second and third growth forest stands. GDRCo has even-aged stands of Douglas-fir and redwood trees averaging 30-45 years in age. Understory vegetation varies but includes common species such as huckleberry, salmonberry, salal, rhododendron, and swordfern. The dominant age class is approximately 30-40 years. A residual age class of Douglas-fir and redwood trees, estimated at over 90 years of age, are sparsely scattered throughout the GDRCo lands. Park land second-growth forests are typically dominated by Douglas-fir. Redwood sprouting is typically common, with hemlock, and grand-fir lesser associates in the tree overstory. The forest understory includes common plant species such as salmonberry, huckleberry, blackberry, maidenhair fern, sword fern, wild iris, Oregon grape, wild parsnip, wild celery, coltsfoot, and rhododendron. The dominant tree age class in park land second-growth averages 35-55 years. A residual age class of redwood and Douglas-fir trees over 200 years old are sparsely scattered throughout park land second-growth. The second-growth forests on park lands have never been thinned since timber harvest.

Hardwood tree species typically encountered in second-growth forests vary by location. Within the park, hardwoods on the east side of Redwood Creek typically include tanoak stands, scattered chinquapin, and madrone. On the moister west side of Redwood Creek, red alder or big-leaf maples tend to be the dominant hardwood. Hardwood trees are typically culled from GDRCo lands to allow for maximum development of coniferous tree species, except as mandated to preserve overstory in habitat retention areas or along streams. To meet this requirement, numerous mature hardwoods have been retained throughout the GDRCo lands. In the park, mature hardwood trees can also be found scattered within the second-growth forest.

Riparian zones along perennial streams typically consist of an overstory of mainly red alder and conifers of various age classes and sizes, with huckleberry, salmonberry, thimbleberry, willow, blackberry, sword fern, Oregon-grape, and/or salal dominating the understory. In a few upland locations, riparian zones are dominated by coniferous species.

Along logging roads, plants from adjacent areas quickly colonize uncompacted fill along the sides of a road and colonize cutbanks more slowly. The vegetation types are generally the same as those in the adjacent forest although the percentage distributions of species may differ between what is in the adjacent lands and what is on the road fill. Along cutbanks, the age of the vegetation is generally younger than the road. Where roads cut through more rocky soils or expose bedrock, vegetation is generally sparse or completely lacking.

Within project areas in the park and the vicinity of the project area, the dominant vegetation types are old growth forest, second-growth forest, and grassland/oak woodland vegetation. At Williams Ridge Road, the vegetation is dominated by perennial grassland species that are a mix of naturalized exotic and native herbaceous flora including California oatgrass, tall oatgrass, blue wildrye, soft chess, California brome, dogtail, sorrel, mountain dandelion, and lupines. Invasive exotic plant species include Himalaya blackberry, tansy ragwort, and Harding grass, especially along the road edge. Oregon white oak

woodlands occur within or near several riparian areas along Williams Ridge Road. Oregon white oak dominates the canopy, while other hardwoods such as black oak, tanoak, bay laurel, and madrone are present to a lesser degree. Herbaceous flora under the oak stands are similar to adjacent grassland flora, and a more pronounced shrub layer is present with gooseberry, coyote bush, and wild rose common. Douglas-fir commonly 'seeds in' from nearby forested areas of Robbers Gulch and has become established along the Williams Ridge Road corridor.

From the R100 to the T170 road, the dominant vegetation type is second-growth forest dominated by Douglas-fir, with redwood and tanoak occurring to a lesser degree. These stands were regenerated by aerial seeding after harvest of the old growth forests, which were dominated by large redwood trees. The aerial seeding without follow-up thinning treatments resulted in forests in this area that average 40 years in age and are dominated by small-diameter Douglas-fir in extremely high densities. The understory is bereft of vegetation due to near 100 percent canopy closure in the overstory. Along some of the road corridors, a break in the canopy has provided conditions favorable to shrub or herbaceous vegetation. Species typically encountered in these isolated areas include huckleberry, rhododendron, Oregon grape, and conifer or hardwood seedlings/saplings.

At the T170 road near the Bald Hills Road, remnant old growth redwood forest remains and is dominated by primarily redwood and Douglas-fir, with tanoak, hemlock, and grand-fir occupying mid-canopy positions. A dense understory shrub layer of rhododendron, huckleberry, and Oregon grape occurs with a few herbaceous species scattered on the forest floor.

At Cal-Barrel Road, the forest vegetation is second-growth forest comprised primarily of Douglas-fir and redwood in the overstory, with hemlock, tanoak, and alder as codominants. This area has a well-developed understory that includes huckleberry, salmonberry, thimbleberry, and salal.

In the vicinity of the WSA Road, GDRCo management for timber production has resulted in multiple age classes of forests, from recent clearcuts to trees averaging 55 years in age. A residual age class of Douglas-fir and redwood trees can be found sparsely scattered throughout the GDRCo lands. There are occasional isolated large trees estimated at more than 120 years of age in this part of the project area. The forests here are dominated by Douglas-fir and redwood, with hardwood a lesser stand component. Red alder provides some canopy cover along streamsides, where the understory can be dense in shrubs such as salmonberry, huckleberry, and rhododendron.

Fish and Wildlife

Fish identified or reported in Redwood Creek include the Humboldt sucker (*Catostomus humboldtianus*), threespine stickleback (*Gasterosteus aculeatus*), coastrange sculpin (*Cottus aleuticus*), Pacific lamprey (*Lampetra tridentata*), and pink salmon (*Oncorhynchus gorbuscha*). Three other species of anadromous salmon and trout (fish that spend most of their life cycle in the ocean and return to freshwater to spawn) that occupy the streams in the project area are discussed below under *Threatened and Endangered Species.* Eulachon (*Thaleichthys pacificus*) have not been seen in Redwood Creek since the early 1980s but they persist in the Klamath River.

Perennial streams in the project area are inhabited by resident rainbow trout (*Oncorhynchus mykiss*) which are the same species as steelhead trout but are non-anadromous. Coastal cutthroat trout occupy the same habitats as the anadromous salmonids that are listed as threatened species. Coastal cutthroat trout are native to northwestern California, inhabiting most coastal streams north of the Eel River. Some coastal cutthroat trout that occupy streams in the project area are anadromous but this species is not currently listed or proposed, or a candidate species for listing, as threatened or endangered. Adult anadromous cutthroat return to freshwater in late autumn and early winter and spawn in small streams between February and May. Cutthroat trout are often found in the summer in the Redwood Creek

estuary. RNSP fisheries staff suspect that a few resident, non-migratory populations of cutthroat trout inhabit the tributaries of Redwood Creek.

The moist cool coastal environment of old-growth forest and riparian zones favor salamanders and frogs over lizards and snakes, which are more common in the drier vegetation types and warmer sites that are more common in the project area. Pacific giant salamanders (*Dicamptodon tenebrosus*), newts (*Taricha* spp.) and painted salamanders (*Ensatina eschscholtzii*) are found throughout the Redwood Creek watershed. Foothill yellow-legged frogs *(Rana boylii)* are recorded from upper Redwood Creek. Tailed frogs *(Ascaphus truei)* and northern red-legged frogs (*Rana aurora*) occur throughout the watershed. Alligator lizards *(Gerrhonotus coeruleus)*, California red-sided garter snakes *(Thamnophis sirtalis infernalis),* and coast garter snakes *(Thamnophis elegans terrestris)* are found in the project area which is drier and has greater temperature extremes than unlogged old growth forest.

Tracts of old growth forest that border the project area are now protected in the park but the majority of the project area within the park has been logged. The youngest logged areas in the park are approaching 40 years of regrowth. Wildlife species diversity is low in some of these logged areas that were never thinned following replanting because the trees are too small and densely packed, and there is little understory or canopy diversity. Animal species diversity is lower in the upland younger-aged redwood forest community in comparison to other plant communities (such as riparian forests) because of lower plant diversity and less structural complexity in the canopy of unmanaged second-growth forests. GDRCo lands have all been previously logged but the standard silvicultural treatment of replanting and thinning has produced better wildlife habitat than is found on some unmanaged second-growth forests in the park.

Bird species commonly observed in park second-growth forests including the project area along Holter Ridge and the West Side Access Road include band-tailed pigeons; California and mountain quail; northern flickers; kinglets; Steller's jays; ruffed and blue grouse; northern sawwhet, barred, great horned and western screech owls; and American robins. Along the Bald Hills Road, commonly observed birds include a variety of sparrows, dark-eyed juncos, western bluebirds, western meadowlarks, common ravens and raptors.

Black bear and black-tailed deer are the most common large mammals in the project area. Managed timberlands surrounding the park provide excellent habitat for bear and deer, and intensive logging in what is now the park resulted in an increase in bear and deer numbers. Use of second-growth forests by deer and black bear has declined relative to when these areas were first cut.

Roosevelt elk herds are seen in the Bald Hills prairies and in recently logged areas where new plant growth creates a preferred browse source. The California Department of Fish and Game allows limited special elk hunts on GDRCo lands adjacent to the park within the project area.

Other mammals likely to occupy the project area include mountain lions, bobcats, coyotes, grey foxes, long-tailed weasels, raccoons, skunks, chipmunks, ground squirrels, wood rats, flying squirrels, voles, brush rabbits, bats, and shrews but no surveys have been done for these species in the project area.

Sensitive, Threatened and Endangered Plants—There are no federally or state listed proposed, threatened or endangered plants in the park or on GDRCo lands that would be affected by the proposed action. GDRCo conducts surveys for sensitive plants, defined as species, subspecies, or variety of native plant that is federally or State listed, or meets the criteria for listing as rare, threatened, or endangered species pursuant to Section 1580 of the CEQA Guidelines. Intensity of surveys depends on the quality of habitat present.

Plants that might occur in the project area in the park and that are ranked by California Native Plant Society (CNPS) as sensitive due to limited distribution or limited numbers are listed in Table 4**.** The common names and rankings given here are from the on-line edition of the CNPS *Inventory of Rare and Endangered Plants* (7th edition, 2006). The rankings incorporate the CNPS Listing and a modifier from 1-3 indicating the degree of threat to a plant, with a higher number indicating a more serious threat. Threat code 1 indicates a plant that is seriously endangered in California (over 80 percent of occurrences threatened / high degree and immediacy of threat). Threat Code 2 indicates "fairly endangered in California (20-80 percent occurrences threatened)", and Threat Code 3 is used for plants that are not very endangered in California (fewer than 20 percent of occurrences threatened or no current threats known.) These Threat Code guidelines represent a starting point in the assessment of threat level. Other factors, such as habitat vulnerability and specificity, distribution, and condition of occurrences, are also considered in setting the Threat Code. List 1B plants are rare throughout their range, generally endemic to California, and have a high vulnerability because of limited range or vulnerable habitat, low numbers of individuals per population, or limited numbers of populations. All 1B plants are eligible for state listing under the California State Endangered Species Act or for full protection under the state Native Plant Protection Act. List 2 plants would all appear as List 1B plants except that they are common beyond the boundaries of California. List 4 plants are on the "watch list" and have limited distributions, but their vulnerability or susceptibility to threat is currently low.

Table 4—Sensitive Plants Listed by CNPS

Common/Scientific Name		Habitat Type	CNPS Rank
California globe mallow	*Illiamna latibracteata*	coniferous forest	1B.2
Running pine	*Lycopodium clavatum*	coniferous forest	2.3
Bog club-moss	*Lycopodiella inundata*	coniferous forest	2.2
Indian pipe	*Monotropa uniflora*	coniferous forest	2.2
seacoast ragwort	*Senecio bolanderi* var. *bolanderi*	coniferous forest (banks)	2.2
Small ground-cone	*Boschniakia hookeri*	coniferous forest	2.3
Heart-leafed twayblade	*Listera cordata*	coniferous forest	4.2
Purple onion grass	*Melica spectabilis*	dry coniferous forest	4.3
woodnymph	*Moneses uniflora*	coniferous forest	4.3
White-flowered rein orchid	*Piperia candida*	lower coniferous forest	4.3
California pinefoot	*Pityopus californicus*	coniferous forest	4.2
Nodding semaphoregrass	*Pleuropogon refractus*	open coastal forest	4.2
Trailing black currant	*Ribes laxiflorum*	coniferous forest	4.3
Slender false lupine	*Thermopsis gracilis* var. *gracilis*	coniferous forest	4.3

Sensitive, Threatened and Endangered Fish and Wildlife

Federally or state listed animals, or their suitable habitat, that occur on either GDRCo or park lands in the project area or that might be affected by the project include steelhead, coho salmon, Chinook salmon, northern spotted owls, marbled murrelets, and bald eagles. The fisher is a federal candidate for listing. Coastal cutthroat trout were described previously in the Fish and Wildlife section; they are neither currently listed nor a candidate species but occupy the same areas as the listed fish. Appendix C contains a list of wildlife identified as sensitive by either state or federal wildlife agencies for which GDRCo conducts surveys prior to timber operations.

Threatened and Endangered Fish—Anadromous fish spend most of their life cycle in the ocean and return to freshwater to spawn. Different stocks of fish of the same species may migrate into freshwater at different seasons and at different ages. These stocks are commonly referred to by the season when they migrate into freshwater, e.g., summer and winter steelhead or spring-run and fall-run Chinook. The term "evolutionarily significant unit" (ESU) is used to identify the species of anadromous salmonid, the

geographic range and streams in which they occur, and, in some cases, the season when they return to freshwater to spawn.

Three ESUs federally listed as threatened occur in Redwood Creek and some of its major tributaries: the Southern Oregon/Northern California Coasts (SONCC) coho salmon (*Oncorhynchus kisutch*), the California Coastal (CC) Chinook salmon (*O. tshawytscha*) and Northern California (NC) steelhead trout (*O. mykiss*). The coho salmon in the Klamath River are the same ESU as the Redwood Creek fish. Steelhead, coho salmon and Chinook salmon occur in perennial streams on GDRCo lands downslope of the project area.

All coho salmon in streams downslope of the project area are SONCC and are listed as threatened. The steelhead and Chinook occurring in the Klamath River and its tributaries are not listed, and there is no designated critical habitat for these species in the Klamath and its tributaries.

Critical habitat is defined in Section 3(5)A of the Endangered Species Act as "…the specific areas within the geographical area occupied by the species… on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection". In designating critical habitat, NMFS considers habitat elements and conditions required for all life stages of the species. In addition, NMFS also focuses on the known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation.

The Klamath River, Redwood Creek, and its tributaries downstream of the project area contain designated critical habitat for SONCC. Redwood Creek and its tributaries that are accessible to any life stage of SONCC, NC steelhead, and CC Chinook are designated critical habitat for these three ESUs.

The numbers of anadromous fish are governed by conditions in both freshwater and marine environments. Three factors have the greatest potential to affect the quality and quantity of freshwater habitat: water temperature, fine sediment, and habitat complexity or cover. Good freshwater habitat for anadromous fish contains complex habitat with both wood and rock, spawning gravels with low levels of fine sediment, water temperatures rarely more than 60°F, shade cover, and a well-developed riparian zone.

The key fish habitat problems in Redwood Creek and its tributaries associated with sedimentation appear to be pool quality, gravel quality, and changes in channel structure that contribute to elevated temperatures. Salmonids require gravels free from excessive fine sediment to lay their eggs and for the eggs to develop into free-swimming fish. They also require deep pools for the young fish to feed and grow while protected from predators. Flood flows in Redwood Creek mobilize sediment eroded into the stream from upslope areas. Sediment fills in pools and smothers eggs. Flood flows also scour the streambed, destroying spawning redds (fish nests dug into the gravels in the streambed into which eggs are laid) and killing eggs, or burying eggs under sediment.

Anadromous fish populations in Redwood Creek have diminished substantially over the past 45 years. In 1965, CDFG roughly estimated the spawning escapement of 5,000 Chinook, 2,000 coho, and 10,000 winter steelhead. Although channel deepening and pool development have begun to increase in all but the lower few miles of Redwood Creek following the intensive logging prior to the enactment of the state FPRs, the mainstem lacks an adequate pool-riffle structure and cover. Coarse sediment deposited in the mainstem allows a large proportion of summer base flows to infiltrate and flow subsurface, thereby limiting surface water available to fish and causing increased surface temperatures.

The overall condition of streams within GDRCo lands appears to be improving from damage due to outdated logging practices because of increased protection measures required by regulations, and from

maintenance of and improvements to drainage and erosion control structures and self-imposed protection measures implemented by GDRCo. The condition of streams on park lands is also improving, based on studies conducted in 2004-05 comparing stream health with studies conducted in 1974-75 immediately after logging.

California Coastal Chinook Salmon—Chinook salmon are the largest salmonids occurring in the rivers and streams in the region. Chinook spawn primarily in the larger streams in the park, including Redwood Creek and the Klamath River. In the streams downslope of the project area, only the Coastal California Chinook salmon occupying Redwood Creek and its tributaries are federally listed as threatened.

Winter-run Chinook constitute the main Chinook runs in RNSP streams. These fish begin their upstream migration around November, if access through the Redwood Creek estuary is possible, and have spawned and died by January. Adult spring-run Chinook in Redwood Creek were observed in only one season since 1981, when the park began summer steelhead surveys, but are not typically considered to use the Redwood Creek watershed. Chinook salmon spawning in the RNSP tributaries may be able to surmount some barriers that impede the smaller coho salmon. Chinook typically return from the ocean to rivers, larger streams, and larger tributaries to spawn between November and early January. In spring, Chinook salmon fry (early life stage that develops from the egg) migrate downstream to rear in the Redwood Creek estuary before entering the ocean. Recent studies have found fish larger than fry entering the estuary, indicating that the stream environment also provides important areas for rearing and growth of Chinook, as well as for the other anadromous salmonids. Chinook salmon usually return to freshwater after three to four years in the ocean, although two-year-old male spawners are commonly observed.

The low numbers of returning adult Chinook are probably related in part to the conditions in the Redwood Creek estuary. Flood events and gravel instability (bedload movement) during the winter spawning season affect the production of juvenile Chinook. Winter spawning/carcass counts in RNSP continue to indicate low numbers of returning salmon.

Critical habitat for California Coastal Chinook salmon was re-designated on January 2, 2006. Potentially suitable habitat for these fish in RNSP occurs in the Redwood Creek watershed and includes all stream and estuarine reaches accessible to the species. Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of the species.

Southern Oregon/Northern California Coast Coho Salmon—Coho or silver salmon are smaller than the Chinook, and spawn in the Klamath River, Redwood Creek, and some of the smaller tributaries of these creeks.

Coho salmon have a simple (relative to other anadromous Pacific salmon) three-year life cycle. Adult coho return to freshwater between November and early February to spawn. Adult coho typically run upstream to spawn from late October to early March depending on access through the sandberm at the mouth of the Redwood Creek estuary. Recent data suggest that the peak of the spawning run begin in late November. After hatching, juvenile coho salmon generally spend one full year rearing in freshwater before entering the ocean. Downstream migration of coho to the ocean from upstream Redwood Creek rearing areas has been documented between March and June. Survey data from RNSP indicate that these young salmon (smolts and young-of-the-year) presently move directly into the ocean, spending a minimal amount of time in the Redwood Creek estuary. Adult migration through the Redwood Creek estuary is dependent on the mouth being open to the ocean. The conditions at the mouth depend on a combination of wave action on the sand berm, the volume of water in the estuary, and the flow of water in the stream.

Coho use a variety of spawning sites but characteristically enter small coastal creeks or tributary headwaters of larger rivers to spawn. The tiny fry occupy shallow stream edges next to pools but move into deeper water as they grow. Coho salmon juveniles remain in the streams for one year before

migrating to the ocean, typically between March and May. Most coho salmon return to freshwater after two years in the ocean. Optimal rearing habitat for juveniles is pools deeper than 3.5 feet that contain logs, large tree roots, or boulders in heavily shaded sections of the streams.

The total adult coho population in the Redwood Creek system once numbered more than 2,000. Most of the coho occurred in the Prairie Creek drainage and probably originated from the Prairie Creek Fish Hatchery (D. Anderson, RNSP, field notes). Since the closure of the hatchery in 1992, numbers of coho are probably much lower. There are historic reports of "good" numbers of coho in the middle to upper reaches of Redwood Creek in the 1950s. However, since 2000, only six young of year coho captured in 2007 have been recorded in the CDFG monitoring station in the upper watershed.

Coho salmon in the Redwood Creek watershed occur in the mainstem and the larger low gradient tributaries. General stream surveys were conducted in the watershed in 1980 and 1981 to describe and characterize the salmonid rearing habitat and distribution of juvenile salmonids. Migration barriers were identified during these surveys. No coho were found during these early electrofishing surveys above the barriers. However, subsequent surveys in the 1990s have detected coho in streams that did not have coho in 1980-81. Whether these barriers still exist, have changed to allow fish passage, or new barriers have been created is unknown. Based on these data, RNSP fish biologists assume that coho occupy 26 miles of stream within the Lower Redwood Creek watershed. Structurally complex streams containing stones, logs, brush, and aquatic macrophytes support larger numbers of rearing coho juveniles than do streams that lack these structural features.

NMFS has designated critical habitat for the Southern Oregon/Northern California Coast coho ESU between Cape Blanco, Oregon and Punta Gorda, California. The critical habitat unit is all stream and estuarine reaches accessible to the species and includes water, substrate, and the adjacent riparian zone. Stream reaches accessible to coho salmon within the parks are designated critical habitat. Critical habitat includes all waterways, substrate, and adjacent riparian zones of estuarine and riverine sections accessible to coho salmon. Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of coho. The adjacent riparian zone is the area that provides shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. Habitat quality in this zone is related to the quality of riparian areas, upland areas, and inaccessible or headwater or intermittent streams that provide key habitat elements, such as large woody debris and gravel, that are crucial for coho in downstream reaches. Thus, the width of the riparian zone included as critical habitat is variable depending upon consideration of these factors.

There are no sections of streams within the parks that are inaccessible to coho because of specific dams identified in the NMFS proposal or because of longstanding, naturally impassible barriers such as natural waterfalls in existence for at least several hundred years.

Northern California Steelhead Trout—Northern California steelhead trout are found in Redwood Creek and in most small order, high gradient tributaries to Redwood Creek. They are able to leap above barriers that might impede coho salmon. Whether logjams are barriers to movement depends upon stream dynamics such as the size of the logjam and the stream discharge as well as the timing and duration of the steelhead migration. These events change from year to year.

The life history of the steelhead varies more than that of any other anadromous fish regarding the length of time spent at sea, the length of time spent in freshwater, and the times of emigration from and immigration to freshwater. Steelhead spawn in cool, clear, well-oxygenated streams with suitable depth, current velocity and gravel size. Intermittent streams are often used by steelhead for spawning with most of the fry produced emigrating to perennial streams soon after hatching. Streams on GDRCo lands downslope of the project area contain steelhead but this ESU is not listed as threatened.

Steelhead are the last of the salmonid species to return to freshwater in the annual cycle, generally between January and April. Steelhead juveniles rear in the streams for one to four years before their migration to the ocean. They then reside in marine waters for typically two or three years before returning to freshwater to spawn. Unlike other Pacific salmon, steelhead are capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying. Most of the multiple spawners are females, provided there are no barriers to migration and adequate amounts of water are left in the stream during the dry summer months.

Steelhead can be divided into two reproductive types, based on their state of sexual maturity at the time of river entry and the duration of their spawning migration. These two types are termed "stream maturing" and “ocean maturing.” Stream-maturing steelhead enter freshwater in a sexually immature condition and require several months to mature, after which they spawn. Stream-maturing steelhead are also known as summer steelhead. Ocean maturing (or winter) steelhead enter freshwater in a mature state and spawn shortly after river entry. Summer steelhead return to a river or stream from spring to early fall and remain in deep pools until spawning occurs. The long freshwater holding time renders the adult steelhead especially vulnerable to predation and habitat changes.

Redwood Creek has both summer and winter runs of steelhead. Survey data indicate a continuous decline of summer steelhead since surveys began in 1981. Forty-four adult fish is the highest total number observed during summer surveys of portions of the mainstem of Redwood Creek. No adult fish were seen in 1989 and few fish were seen in the mid-1990s. No other streams within the parks in the Redwood Creek watershed have been surveyed because these streams do not have large enough pools to support adult fish during the warm summer months.

Winter-run steelhead numbers are higher than summer steelhead numbers. Juvenile winter-run steelhead are the most common and widely distributed fish in the Redwood Creek watershed. During sampling efforts in the summers of 1980 and 1981, steelhead trout occurred in 57 of the 111 tributaries surveyed (Anderson 1988, Brown 1988). In recent years, winter stream surveys have been conducted on several park streams, including the mainstem of Redwood Creek (flows permitting) and Bridge Creek. In the winter of 2000-2001, ten live winter steelhead were observed in Redwood Creek (Holden 2002).

NMFS designated critical habitat in January 2006 for the distinct population segment of NC Steelhead between Redwood Creek, California and Russian River, California. The project area includes designated critical habitat for NC steelhead, which is essentially identical to the critical habitat for CC Chinook and SONCC coho previously described.

Sensitive, Threatened and Endangered Wildlife—Wildlife habitat in the project area is fragmented due to previous even-aged management practices and wildfires on both GDRCo and NPS lands. On GDRCo lands, habitat patches are governed by state regulations specifying size and distribution of even-aged regeneration harvests. Currently stream protection zones connect wildlife habitats within GDRCo lands, with wildlife corridors extending to upslope areas and ridgetops. GDRCo lands are developing a greater diversity of vegetation types and habitats, and wider wildlife protection zones due to current practices adopted under the GDRCo HCP for northern spotted owls.

Species that have suitable habitat or are found in the vicinity of the project, although not necessarily on the roads for which rights-of-way would be exchanged, which have been identified as sensitive by the CDFG but which are not listed as threatened or endangered either by the State of California or federally include southern torrent salamanders *(Rhyacotriton variegatus)*, tailed frogs, and Pacific giant salamanders.

GDRCo conducts surveys for Del Norte salamanders *(Plethodon elongatus)*, southern torrent salamanders, and tailed frogs, all of which occur in suitable habitat scattered throughout GDRCo lands.

Del Norte salamanders are largely restricted to talus habitats. Southern torrent salamanders are associated with cold, well shaded perennial streams, springs, headwater seeps, waterfalls, and moss covered rock rubble with flowing water in humid coastal coniferous forests at elevations up to 3,900 feet (Welsh 1990). This species has been found in gravelly, headwater streams or springs in GDRCo lands. In northwestern California, southern torrent salamanders have been linked to old growth habitats. In northern California and southern Oregon, Welsh (1990) found significantly more salamanders in mature and old growth forests than in young stands, but structure rather than age alone was believed to be important.

Tailed frogs are found in perennial streams with clear water and dense vegetation primarily in mature and old growth coniferous forests. The frogs seem to be absent from clearcut areas or managed young forests, although they have been observed in young, naturally regenerated forests (Welsh 1990).

GDRCo also conducts surveys for several birds considered sensitive by the CDFG including species protected under the Migratory Bird Treaty Act. Harvest operations retain snags and wildlife trees to provide current and future nesting habitat for sensitive bird species.

Northern Spotted Owl *(Strix occidentalis caurina)*—Northern spotted owls are forest-dwelling birds that nest primarily in old growth forests in RNSP. In other areas outside the park including GDRCo lands, spotted owls are known to nest in second-growth forest if trees providing suitable nest sites are available. In general, suitable northern spotted owl nesting and foraging habitat consists of dense closed-canopied forest stands dominated by large conifers, with associated large snags and large down logs. Suitable habitat within the project area includes a minor amount of old growth, second-growth 40 years old or older, and second-growth forest with moderate to high density old growth residuals regardless of the age of the second-growth understory.

Bald Eagle *(Haliaeetus leuocephalus)*—Essential components of bald eagle breeding habitat include forested habitats with trees with large limbs to provide suitable nest-building sites, nearby bodies of water inhabited by medium to large fish, and minimal human disturbance during the nesting period. Winter habitats of bald eagles are less closely associated with water than summer habitats. Wintering bald eagles require suitable food supplies, including carrion, and roosting sites. Eagles generally prefer to roost in trees that are taller or that are more open in structure than trees in the surrounding stand. Specific characteristics of forest stands and roost trees vary considerably among regions. No bald eagle nests are known to exist within the project area on either GDRCo or park lands. The nearest known bald eagle nest to the park is in the lower reaches of Ah Pah Creek on GDRCo lands in Humboldt County about 3.8 miles northeast of the Cal-Barrel Road.

Marbled Murrelet *(Brachyramphus marmoratus)*—Marbled murrelets (federally and state listed as threatened) are sea birds that nest in coastal old growth forest along the west coast of North America. The largest population of marbled murrelets in Oregon and California is found in RNSP. Marbled murrelet nests have been confirmed in lower Redwood Creek. The marbled murrelet is not known to occur in areas or habitats adjacent to roads affected by the proposed action. GDRCo lands within the project area contain primarily 0-80 year old second-growth. Second-growth stands regenerated after clearcutting without residual old growth trees do not provide suitable nesting habitat for marbled murrelets.

Fisher *(Martes pennanti)*—Fishers are medium size carnivores in the weasel family that live in forested areas. The fisher is a federal candidate species for listing as threatened. Suitable habitat for the fisher has generally been described as dense forested stands comprised primarily of large diameter trees and snags, which provide suitable denning and resting structures. Habitat structure for fisher denning, resting, and foraging is present in residual old growth in the park adjacent to the project area. It is expected that fishers have the potential to use the project area for denning, resting, or foraging wherever suitable structures occur. Forest carnivore surveys on park lands within the project area detected a fisher within approximately one-half mile of the T170 access road. Other surveys also have detected fishers in forested

habitat on both sides of the Redwood Creek drainage, suggesting that fishers probably occur quite commonly within the project area. Fishers are known to occur on GDRCo lands where specific studies of fishers have been conducted.

Cultural Resources

Redwood National and State Parks contain a significant set of cultural resources including archeological sites, historic structures, cultural landscapes, resources of ethnographic significance, and museum objects.

Archeological Resources—The majority of archeological sites in the parks are prehistoric. Sites are recorded throughout the parks, along the coast, inland and especially in the Bald Hills of the Redwood Creek basin. These sites range from temporary and seasonal camps to trail use sites to villages and sacred places, representing no less than a 4,500-year continuous record of habitation extending to after European contact at about 1850 by at least three different Native American groups and their ancestors. There are five prehistoric archeological sites located within or immediately adjacent to proposed access points in this EA. All of these are located along the Bald Hills Road. These sites include CA-HUM-443, CA-HUM- 452, CA-HUM- 480, CA-HUM-525, and CA-HUM-669. The sites consist of light density lithic scatters and areas of prehistoric settlement. All of these sites are listed on the National Register of Historic Places (NRHP) as part of the Bald Hills Archeological District.

Historic archeology in Redwood National and State Parks consists of the remains of Euroamerican settlement and activities beginning in the late 1800s. Types of historical resources that can be found include evidence of historic settlements, ranching, logging, mining, and recreation.

There is one known historic archeological site (CA-HUM-709H) in the project vicinity that consists of a trash deposit associated with early 20th century logging. Although no formal determination of eligibility to the NRHP has been completed for this site, it contains artifacts that contribute to knowledge of logging history in Humboldt County and therefore may be eligible for listing on the NRHP under criterion D.

Ethnographic Resources—The project area lies within the ancestral lands of the Yurok and Chilula people. Letters of consultation were sent to Yurok Tribe, Hoopa Valley Tribe, Resighini Rancheria, Big Lagoon Rancheria, Trinidad Rancheria, Elk Valley Rancheria, and Smith River Rancheria in October 2006.

Fish, game, and acorns were particularly significant foods for the local Native Americans. In addition to villages of wooden plank houses and sweathouses, there were also numerous temporary summer camps and specialized use areas throughout the region. An extensive trade and travel network also existed. At the time of contact, the Yurok lived along the coast and the Chilula along Redwood Creek. The Chilula, whose territory included park lands in the Redwood Creek basin, were almost decimated after contact; most of those who remained were relocated to the Hoopa Reservation to the east of the parks.

Today, the Tolowa, the Yurok, and Chilula have ancestral ties to the parks. Resources of ethnographic significance to these American Indians in the project area include a wide variety of plant and animal resources, but most particularly important are redwood, tan oak, berries, hazel, elk, and deer.

Historic Structures—The historic structures in the project area consist of the roads themselves. Many of these roads in the project are or are near historic age (i.e., 50 years or older). The Bald Hills Road is probably one of the oldest roads the project area and is considered a contributing element to the National Register eligible Lyons Ranches Rural Historic District. None of the other roads have been evaluated for eligibility to the NRHP.

Cultural Landscapes—A portion of the project area includes the Lyons Ranches Rural Historic District that represents 100 years of settlement and ranching by one family in the Bald Hills. This cultural

landscape district was found eligible for listing on the NRHP in 2005. It is comprised of barns, cabins, outbuildings, roads, fences, water related features, small-scale elements, and open space related to the ranching activities that took place in the Bald Hills area of the park. The Lyons family was the first to bring sheep into northern Humboldt County. Some of the proposed access points are located along the Bald Hills Road, which is a contributing element to the National Register district.

Visitor Use and Experience, and Visual Quality

Total visitation to the national park in 2005 was reported as 394,144 visits and 383,780 in 2006, with each visit representing 13 hours. Lady Bird Johnson Grove, Holter Ridge Bike Trail, Redwood Creek Overlook, Tall Trees Grove trailhead access, and Dolason Trailhead are the primary visitor use facilities available to visitors driving along the Bald Hills Road. Using electric eye counts of vehicles at selected parking areas in 2006, the NPS recorded 50,586 visits to Lady Bird Johnson Grove; 42,644 visits to the Redwood Creek Trailhead; and 9,766 visits to the Lost Man Creek trailhead and picnic area.

Active, recent, and regrown timber harvest operations are commonly seen along highways and back roads throughout northwestern California, especially in Humboldt County where private timberlands are common. Bald Hills Road provides vistas of the past clearcuts in Redwood Creek in what is now park. Park forests that regenerated without thinning are dense thickets of undersized Douglas-fir with little undergrowth and low visual quality. RNSP conducted thinning projects on several acres that have improved the visual quality as undergrowth returns.

The first few miles of the Bald Hills Road through the park is a winding road with grades approaching 20 percent; it is not recommended for trailers or large RVs. The posted speed limit is 25 miles per hour. The west end of the road as it descends to Redwood Creek must be driven at a substantially lower speed to successfully and safely negotiate the sharp steep corners. The volume of logging truck traffic that visitors encounter on the Bald Hills Road depends on whether active logging operations are being conducted. Timber operations are more likely to occur during the dry summer months when park visitation is highest. After ascending the steep hill to the ridgeline, the Bald Hills Road passes through intact old growth redwood forest before reaching portions of the park that have been logged. On the ridgeline, Bald Hills Road is less winding and steep but it becomes a gravel road and remains narrow with occasional blind corners. As the road continues east, it passes from the coniferous forest into the oak woodlands and grasslands for which the Bald Hills are named. The open grasslands feature long-distance views of the Pacific Ocean and the Klamath mountains, with wildflower displays in the spring.

Park Operations

The NPS uses GDRCo roads to access park lands for ongoing implementation of programs including watershed restoration, vegetation management, fire management, review of proposed THPs, erosion control on private lands, and park road maintenance.

The Watershed Restoration Program at Redwood National and State Parks is composed of a core of staff geologists who plan and implement the physical component of the restoration efforts on park lands (NPS 1981b). Support is provided from various disciplines of the Resource Management and Science Division, including the Fish and Wildlife, Vegetation Management, Cultural Resources, and GIS branches. Supporting research includes studies of erosion and sedimentation, vegetation, fisheries, wildlife, soils, hydrology, fire effects and cultural resources. Park maintenance staff and labor support crew in the Roads and Trails Branch of the Maintenance Division and administrative staff provide additional support.

The RNSP Vegetation Management Branch is planning restoration work in second-growth forests to shorten the time needed for these areas to develop characteristics and functions normally found in old growth forests. Nearly 36,000 acres of the 48,000 acres acquired in the 1978 park expansion had been previously harvested with no subsequent forest management. Second-growth management is expected to occur in selected areas of the park.

The NPS lands adjacent to GDRCo lands, including the lands on the west side of Redwood Creek, are included in the coniferous forest fire management unit described in the 2004 RNSP Fire Management Plan. All wildfires in these areas will be suppressed and there are no planned prescribed fire or fuel reduction projects, at this time. Some park roads will be retained for access by fire equipment and personnel.

Park road maintenance crews maintain roads within the parks at various levels. On visitor use roads, maintenance levels are high, with periodic grading, and ditch and culvert cleaning, repair and maintenance. On abandoned logging roads scheduled for removal, maintenance is less regular, and focused mainly on erosion prevention and safety rather than on driver comfort and convenience. Road maintenance costs are approximately $1,700 per mile for brushing, ditch cleaning, and culvert maintenance.

Park staff use GDRCo roads throughout the Redwood Creek watershed. Park staff use GDRCo roads when reviewing proposed THPs in areas immediately adjacent to and upstream of the park. Park staff also use GDRCo roads during the planning, implementation, and monitoring phases of erosion control/prevention projects. The NPS and GDRCo have cooperated on erosion control work on GDRCo lands since 1996. Over 30 miles of GDRCo roads have been decommissioned and two miles upgraded through cooperative projects. Many more miles of road have been decommissioned or upgraded through implemented THPs.

Park operations related to visitor education and interpretation of park resources were described above in the visitor use and experience section.

Socioeconomic Considerations

Roads are a common thread in the socioeconomic fabric of northwestern California. Roads facilitate the movement of people who live, work and recreate in the area, and resources that are extracted and processed locally. The Bald Hills Road serves multiple commercial and recreational interests, and is a transportation link for residents in outlying areas of Humboldt County. It is a county-owned and maintained road that connects U.S. Highway 101 to Weitchpec and other inland areas in the Klamath and Trinity River watersheds. The Bald Hills Road provides access for park visitors who explore the forests, grassland prairies and oak woodlands along the Bald Hills in the national park, and gain access to the hiking trails in Redwood Creek. Driving the road through the old growth redwood forest is a recreational activity in itself. The Bald Hills Road also receives commercial use dating from the mid-1900s when there were several mills operating between the towns of Orick and Klamath. It is a major haul route for timber harvested from the Klamath River and Redwood Creek watersheds. The direct link to U.S. Highway 101 facilitates this and other commercial uses.

In the 1950s, the town of Orick supported several timber mills and many of the services for the growing community were tied to the timber industry. The creation and expansion of the Redwood National Park in 1968 and 1978, the harvest of most of the old growth trees, and the enactment of legislation protecting water quality and endangered species contributed to the decline of the logging industry as the principal source of income for the town. California Redwood Company, a GDRCo subsidiary, operates the last remaining mill in Orick.

A sport fishery in Redwood Creek also once provided a valuable source of revenue to the local Orick economy (Van Kirk 1994). However, recreational fishing is no longer as popular because fish populations have declined and fishing regulations have become more restrictive with zero bag limits (Cannata et al. 2006).

RNSP and local businesses provide opportunities for eco-tourism in the Orick area, including kayaking on the lagoons and the ocean, bird-watching, and horseback rides in the forest. The NPS recorded about 394,000 visitors to the national park in 2005 and 384,000 in 2006.

GDRCo is the largest private landowner in both Humboldt and Del Norte Counties. GDRCo is a privately owned corporation that has been in business for over 100 years under various business names but always under substantially the same ownership.

In California, GDRCo commercially harvests approximately 200 million board feet of conifer volume annually from fee timberland holdings of approximately 438,000 acres. Most harvested redwood is transported to GDRCo's subsidiary company, California Redwood Company, which manages the mill operations in Arcata, Orick and Korbel. Much of the non-redwood timber is sold on the open market and shipped to points north and south. All of the roads considered in the ROW exchange, in combination with U.S. Highway 101, State Highway 36, State Highway 96, State Highway 169, State Highway 197, State Highway 199, State Highway 299, USFS Route #1, and the Bald Hills Road, form the major transportation network for trees harvested from GDRCo California timberlands.

Environmental Consequences

Methodology—Impacts on a particular resource are predicted based on impacts observed and measured from similar projects, relevant scientific research and publications, and best professional judgment of park specialists and GDRCo personnel familiar with the resources. Impact analyses based on best professional judgment of park resource managers were derived from their analyses of effects of past watershed restoration actions within and outside of RNSP, including past monitoring; discussions with knowledgeable local and regional foresters, forest ecologists, geologists, hydrologists, geomorphologists, wildlife and fish biologists, archeologists, and watershed restoration specialists; and reports and studies prepared by academic, industry, and government agency personnel on the effects of watershed restoration in the Redwood Creek watershed and other watersheds in the region and in areas that have been logged.

Impact analyses for privately owned timberlands adjacent to the park were based on THPs prepared by GDRCo Registered Professional Foresters and approved by CDF.

Impact Definitions—Impacts are analyzed according to the type of impact (beneficial or adverse), the timing and duration of impact (short-term, long-term, one-time, occasional, repeated) and the severity or intensity of impact (no effect, negligible, minor, moderate, or major). These factors are also considered in the context of the geographic location of the park and the region.

Context—The context of a park action includes consideration of the effects on resources in the project area, and on similar resources within the parks, the local area surrounding the parks, and the region.

The geographic context of an impact includes consideration of the project area, the parks as a whole, and local and regional conditions.

Timing and Duration—The timing of an impact is also part of its context. For example, removing brush and trees along a road in October does not affect nesting birds but brushing the same road in June would affect any birds that might be nesting in the vegetation.

The duration of an impact considers whether an effect would happen immediately, the length of time over which an impact occurs, and how long it would be noticeable. Duration is defined as short-term or long-term, although the duration of an effect is related to the resource affected. In general, long-term effects would be those that are repeated over at least several years or that would not be immediately noticeable.

Short-term effects on annual vegetation would generally be on the order of a year or less, because a year includes one complete growing season. In the context of resources such as soils or plant communities, or for long-lived plants such as redwood trees, or for geological processes such as flooding, long-term refers to effects on the order of decades to centuries.

Type—The type of impact describes whether an action would benefit or harm a resource. A beneficial effect improves the condition of a resource, protects it from damage or loss, or favors the persistence of a resource. A harmful or adverse effect is one that worsens the condition of a resource, damages or degrades a resource, leads to the loss of the resource, alters it irretrievably in an undesirable way or changes its essential character so that the resource no longer possesses integrity or its defining characteristic. Adverse effects are unfavorable to the conservation and preservation of the resource.

Intensity—Intensity, degree, or severity of an impact refers to how much of an effect an action has on a resource and is described as negligible, minor, moderate, or major. Major effects are considered significant. Determining intensity relies on understanding the range of natural variation of a resource. If an action has no effect on a resource, or if the effect is barely noticeable or measurable, the effect is considered negligible. Negligible effects are those that are unnoticeable, undetectable, or result in no change to a resource, or that affect so few individuals that the effect cannot be distinguished from the natural variability for a resource. Significant effects are always noticeable and result in a permanent change to a resource over a large area.

Levels of change between negligible and significant are described as minor or moderate. Minor changes to a resource are detectable but there is no long-term or permanent alteration of the resource and the changes are within the range of natural variability. Minor effects are generally noticeable but result in only a slight change to a resource or occur in a small area, and do not change its function.

Moderate effects are always noticeable, and result in some change to the resource or its function, and occur in several areas. If an action changes the resource completely or a change is irreversible, the effect is considered significant or major. Actions are more likely to result in a gradient of change rather than a distinct level of change, so that some effects may be judged “minor to moderate” to indicate that portions of a resource in different locations might be affected slightly differently by the same action. For natural resources that are distributed discontinuously across a landscape or where individual elements of a resource are not exactly equivalent to other individuals or pieces of the same resource, a range of effects from a single action is likely.

The intensity of an impact also includes consideration of how widespread or local the area of impact would be, the amount of a resource that might be affected, or the number of times an effect would occur. If an action affects all of a resource within the parks, that impact would be considered major or significant.

Intensity of effects on wildlife is determined based on the number of individuals affected in relation to the total population in the project area, the park, the region, and the range of the species. If only a few individuals of a plant or animal are affected, the impact would be considered negligible. If an action affects more than a few individuals but the effects are within the natural level of variability for a population or a resource, the effect is considered minor. If an action affects many or all individuals and causes changes to populations that are greater than the natural level of variability, the effect is considered moderate.

For sensitive wildlife and plants, there are two sets of definitions for intensity. One set of definitions is used in this EA based on the NEPA regulations (40 CFR 1500, *et seq.)* and the NPS guidelines for implementing NEPA. The USFWS uses a second set of definitions to accompany its determinations of effect based on its regulations for implementing the Endangered Species Act. Negligible effects on listed

species for the purpose of this EA are defined as those that are unnoticeable or that the USFWS has determined to have "no effect." The USFWS has defined a "no effect" determination as the "appropriate conclusion when the action agency determines its proposed action will not affect listed species or critical habitat." USFWS defines impacts that result in a determination of "may affect but not likely to adversely affect" as "discountable or insignificant"; these effects are defined in this EA as minor. Adverse effects occur if impacts are not discountable, insignificant or beneficial. Impacts that are determined to be adverse but can be lessened or minimized, even though incidental take may still result, are considered moderate. An effect that is determined by the USFWS to result in jeopardy to a listed species is defined as major or significant.

Applicable Laws, Regulations, and Policies

Water Quality—The primary responsibility for water quality protection and enhancement in California has been delegated to the California Water Resource Control Board. In northern California, the North Coast Regional Water Quality Control Board (NCRWQCB) is responsible for adopting and implementing the Water Quality Control Plan for the North Coast Region. The plan specifies objectives, requirements, and implementation plans to protect the beneficial uses of water in the north coast area, including the parks. Water quality objectives in the plan do not allow any degradation of surface or groundwater or permit any alteration of natural conditions. The plan also specifies the maximum contaminant levels for point (discharge from a discrete point) and nonpoint (dispersed runoff) sources.

The Redwood Creek TMDL is a specific plan to improve the impaired water quality of Redwood Creek. Both the TMDL and the appropriate implementation measures are incorporated into the State Water Quality Management Plan.

The NCRWQCB has indicated that the NPS is not required to obtain a Stormwater General Permit for general maintenance of existing roads.

Endangered Species Act Section 7 Consultations—Section 7 of the Endangered Species Act of 1973, as amended (19 U.S.C. 1536 (c)), requires that federal agencies consult with the USFWS and NMFS if agency actions have the potential to affect species listed or proposed for listing under the Endangered Species Act or designated critical habitat. The NPS, USFWS, and NMFS agreed that use of existing roads under either the no action alternative or the proposed action would not directly affect any listed or proposed threatened or endangered species.

Migratory Bird Treaty Act—The Migratory Bird Treaty Act (MBTA) protects migratory birds including hawks and songbirds. Several species protected under the MBTA nest in and around the project area. Seasonal restrictions on noise and habitat disturbance to protect nesting birds would be required under Alternative 3 (Construct Roads). GDRCo surveys for birds identified by the State of California as species of special concern include most birds protected under the MBTA. The NPS avoids impacts to birds protected under the MBTA by managing vegetation suitable for nesting outside the primary nesting season for most migratory birds (May 1 through July 31).

Cultural Resource Consultations—The National Historic Preservation Act of 1966 requires federal agencies to consult with state historic preservation officer (SHPO) if an undertaking would have the potential to affect properties listed or eligible for listing on the National Register of Historic Places. The NPS is also required to consult with affected American Indian tribes.

Non-Impairment of Park Resources and Values—The NPS is required by law to manage park resources and values in such a way as to leave them unimpaired, unless a particular law directly and specifically provides otherwise. NPS management policies require that environmental documents disclose whether an action has the potential to impair park resources or values. Impairment is defined (Management Policies 1.4.5, NPS 2006) as an impact that, in the professional judgment of the responsible NPS manager, would

harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts. An impact is less likely to constitute impairment if it is an unavoidable result, which cannot reasonably be mitigated, of an action necessary to preserve or restore the integrity of park resources and values. An impact would be more likely to constitute impairment if it affects a resource or value whose conservation is necessary to fulfill specific purposes identified in the park's establishing legislation, or which are key to the natural or cultural integrity of the park or the opportunities to enjoy the park, or which are identified in the park's general management plan as being of significance.

NPS Management Policies also require that NPS managers determine whether impacts that might result from an action are unacceptable. Unacceptable impacts are those that fall short of impairment but are not acceptable in a park's particular environment (Management Policies 1.4.7.1, NPS 2006). Unacceptable impacts are those, individually or cumulatively, that would among other things

- be inconsistent with a park's purposes or values;
- impede the attainment of a park's desired future conditions for natural or cultural resources; or
- unreasonably interfere with a park's program's or activities or an appropriate use.

Analyses and findings for non-impairment of resources or values follow the analyses of potential effects for each park natural and cultural resource impact topic. Analyses and findings for unacceptable impacts follow the analyses of potential effects for each impact topic.

Timber Harvest Operations—GDRCo conducts timber operations under the regulations for implementing the California Forest Practice Act [Public Resources Code Division 4, Chapter 8, §§4511–4628.]

Environmental Consequences Common to All Alternatives— Under the no action alternative and the two action alternatives, GDRCo would continue to access, harvest, and manage their timberlands in accordance with company objectives, the California Forest Practices Act, its implementing FPRs, and other applicable rules and regulations for protection of air quality, water quality, sensitive species, and cultural resources. Potential impacts would be mitigated by methods prescribed in the rules, by site-specific measures incorporated into the THP, and by the recommendations of the multi-agency inter-disciplinary review team.

Effects of GDRCo operations are not covered in this EA because there will be no GDRCo timber harvest operations within the national park and the effects of GDRCo operations and mitigating measures are fully described in THPs prepared for private lands as required under state law. While GDRCo operations on private lands are not subject to environmental review as part of the proposed action or alternatives considered in this environmental assessment, their operations are considered under cumulative effects as reasonably foreseeable future actions.

Effects of NPS use of GDRCo roads over which NPS would have occasional use is not evaluated in this EA because NPS use of these roads would be very infrequent. The need to use of these roads would arise from a specific project. For example, if a park road is scheduled for removal under the watershed restoration program, GDRCo roads would be used to transport large, earthmoving equipment into and out of the park from U.S. Highway 101. The effects of NPS use of GDRCo roads are adequately addressed in GDRCo THPs and the HCP/AHCP.

Effects on Air Quality

In general, air quality in RNSP and the surrounding area meets or exceeds standards set by the EPA because the prevailing winds come from the northwest across the ocean where there are no emission or pollutant sources. Air quality returns quickly to very good to excellent after vehicles and equipment

cease operating or stirring up dust. The amount of time for regional air quality to return to pre-disturbance condition depends on the prevailing winds and the movement of air masses but air stagnation or long-term inversions that cause extended periods of poor air quality are rare.

Alternative 1: No Action—Under this alternative, roads would be maintained under GDRCo or NPS schedules and maintenance standards. Road maintenance and use of administrative roads for GDRCo operations and maintenance, and NPS fire management and other natural resource management projects would create dust and produce vehicle emissions. The volume of dust produced by vehicles using roads would be greater when the roads are dry, which is generally from June through October. Adverse effects on air quality from dust and vehicle emissions would be localized, occasional, repeated, and short-term. The overall effect on air quality under the no action alternative from vehicle emissions and dust generated by routine road maintenance activities would be adverse, short-term and negligible.

Alternative 2: Exchange Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—Effects on air quality under the proposed action would be the same as under Alternative 1, because the same roads would be used and maintained at the same levels as current use and maintenance. The overall effect on air quality under the proposed action from vehicle emissions and dust generated by routine road maintenance activities would be adverse, short-term and negligible.

Alternative 3: Construct Roads—Under this alternative, dust would be generated during earthmoving for construction or rebuilding of roads. Road construction is estimated to take several months, during which dust would be generated. The effects on air quality from vehicle emissions would be slightly greater than under Alternative 1 or 2 because vehicles would have to travel farther, producing more dust, and running longer, producing more emissions. The overall adverse effect on air quality in the parks would be greater under Alternative 3 because the roads would be constructed or rebuilt in the park but the greatest increase in dust and vehicle emissions would be temporary during construction. The long-term effect on air quality and air quality related values in the park under Alternative 3 from use of an additional six miles of roads in the park compared to slightly more than one mile in the park under no action and the proposed action would be adverse, repeated occasionally over the long-term, and negligible.

Cumulative Effects on Air Quality—Construction and use of 40 miles of newly constructed and upgraded roads on GDRCo lands for harvest operations under the Alternative 3 would result in more dust and vehicle emissions than would use of the existing 1.2 miles of road across park lands. These effects would be adverse, short-term but repeated occasionally during the long-term, and negligible.

Cumulative effects on air quality in the parks result from dust from soil disturbance and emissions from vehicles and gas-powered tools associated with maintenance of park roads and trails, watershed restoration, second-growth management, preparation of roads and fire lines and other fire management activities, timber harvest on adjacent lands, and vehicle emissions from public roads and highways, smoke from wildfires, prescribed fires including broadcast burning to reduce logging debris, wood stoves in adjacent communities, and vehicle emissions on area highways and in adjacent communities. Adverse effects from smoke from prescribed fire and wildfires would have the greatest potential for moderate adverse effects but smoke is temporary for the duration of the fire. These effects on air quality are adverse, localized to widespread, temporary but repeated, and negligible to moderate. No long-term cumulative adverse effects on air quality or air quality related values in the parks are anticipated for the foreseeable future because the regional prevailing winds are from the northwest across the Pacific Ocean where there are no sources of air pollution.

Conclusions—Effects on air quality under all alternatives would result primarily from dust generated by road maintenance and vehicle emissions. Dust produced by use of the roads during GDRCo timber operations would be mitigated by applying dust abatement treatments if low visibility creates a driving hazard. The adverse effects on air quality would be localized at work sites. Dust would temporarily

reduce air quality in the immediate vicinity of the roads being used but greater volumes of dust are generated by use of the unpaved sections of the Bald Hills Road, West Side Access Road, and other unpaved roads through the park. Therefore, the adverse effect on air quality and air quality-related values in the park would be negligible to minor under all alternatives. The cumulative effects on air quality under any of the alternatives would be negligible, because the primary sources of air pollution in the project area are vehicle emissions on highways and smoke from fires, and state air quality standards in the project area are rarely violated by either source.

Non-Impairment of Air Quality and Air-Quality Related Values in the Park—Air quality would be affected by emissions from park and GDRCo vehicles and from dust from use and maintenance of roads. Vehicle emissions are regulated under California air quality standards. Vehicles must meet emission standards to be licensed and registered. Adverse effects on air quality from vehicle emissions are repeated over the long-term and negligible. Adverse effects on air quality from dust from road use and maintenance would be mitigated by applying dust abatement treatments to roads if driving conditions become hazardous and cannot be otherwise mitigated through signing or radio communication. Dust would be localized along road corridors, temporary while the roads are in use, short-term during the dry season, repeated, and negligible to minor. Air quality in the park would be adversely affected by use of the rights-of-way by GDRCo vehicles but only short segments of roads would be used at any given time, and the overall effect in air quality would be negligible. Construction of a new road in the park under Alternative 3 would produce greater quantities of dust from earthmoving during road construction but the long-term adverse effects on air quality that would result from use of the road would be negligible because of vehicle emission standards, low traffic volumes, and dust mitigation measures outlined above.

The adverse impacts to air quality and air-quality related values in the park under any of the alternatives are limited to dust from vehicles using unpaved roads during the dry season. These are negligible impacts and are therefore acceptable impacts.

There would be no long-term effect on visibility or other air quality related values in the park from use of the ROWs, and therefore, air quality and air quality related values in the park would not be impaired under any alternative.

Effects on Geological Resources, Soils and Topography
Geological Resources—There are no significant geological resources that would be affected under any of the alternatives including the no action alternative. Effects on geological resources are indirect effects related to effects on soils and topography, which are a result of the geology of the region. The purpose of the proposed action is to use existing roads to avoid new effects on soils and topography from construction of new roads. Many of the past logging and road construction practices that severely altered topography or that resulted in loss of topsoil and soil productivity are prohibited by current FPRs under which GDRCo operates. Under current regulations, impacts on geologic features would generally be avoided by moving the road to the most stable location or through engineering designs to provide long-term stability.

Soils and Topography—Under all alternatives, there would be minor disturbance to soils on road surfaces within road corridors from maintenance. There would be no new effects on topography from the use of existing roads under either the no action alternative or the proposed action. There is some earthmoving for road construction associated with timber harvest on GDRCo lands outside the project area but substantial alterations to topography are prohibited under current regulations.

Alternative 1: No Action—There would be no new disturbance to soils or topography from use of existing roads under the no action alternative. The potential for erosion from roads is largely a function of the area of exposed mineral soil. Use of existing roads would avoid new disturbance to soils and

alterations to topography from compaction, grading, erosion, and loss of top soil and organic matter associated with road construction.

There would be short-term effects on previously disturbed soils within the existing road corridors from use and maintenance of the roads. On-going disturbance from use and maintenance of existing roads would result in minor erosion within the existing road corridor. Erosion would be minimized by maintenance of road surfaces and drainage structures. Roads that are used year-round are surfaced with rock or gravel to allow use in wet weather and to reduce erosion.

Adverse effects associated with soil erosion on the road surface would continue in the long-term as long as the road is in use and would be negligible.

Alternative 2: Exchange Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—Effects on soils and topography under the proposed action are the same as those under the no action alternative because the same roads would be used under the proposed action as under the no action alternative.

Alternative 3: Construct Roads—Constructing or rebuilding six miles of roads on park lands would require grading, excavation, and other earthmoving activities affecting about 125,000 cubic yards of soils on about 23 acres previously disturbed by timber harvest. Approximately 380,000 cubic yards on about 127 acres would be disturbed for construction or rebuilding of 40 miles of roads on GDRCo lands.

New construction of 2.5 miles of road in the park would be constrained by topography, streams, and property lines. Thus, some of the new park roads might occupy steeper (greater than 50 percent) slopes than would be desirable, resulting in above-average-size cuts and fills for road bench construction. Road construction on GDRCo lands would be less constrained and would minimize the volume of cut and fill needed to create a level and stable bench.

Roads that are used year-round for park access and GDRCo timber operations would be surfaced with rock or gravel to allow use in wet weather and to reduce erosion. Erosion would be minimized by the proper placement of waterbars, by installing adequately sized drainage structures to move water off road surfaces and retain fill stability (including culverts sized to accommodate a 100-year flood event), and mulching newly exposed soils.

The overall effect on soils in the parks under this alternative would be adverse, long-term, and minor due to the previous disturbance of the soils from past logging and in comparison to widespread damage to soils from previous unregulated road construction and logging techniques. The overall effect on topography in the park would be adverse, long-term and minor compared to the widespread alteration of topography from earlier logging. Within the project area in the park where the road would be constructed under Alternative 3, the overall adverse effect on soils and topography would be moderate because of the alteration of the natural topography on which portions of the road would be constructed.

Cumulative Effects on Soils, Topography and Geological Resources—Cumulative effects on soils in the project area are primarily the result of past unregulated logging of old growth forest and the construction of truck roads, skid roads, and landings. Most unused sites such as skid roads and landings in both the park and GDRCo lands have revegetated but the soil productivity is reduced until the organic layer redevelops from the forest litter and microbial decomposition occurs. Current logging outside the park also affects soils and topography but the effects are minor compared to the significant adverse effects of the original logging practices.

The reuse of existing skid roads, in combination with the soil stabilization measures required under current FPRs, the proper waterbar placement prior to completion of operations, cable yarding and shovel

yarding, and the amount of residual vegetation and/or logging slash and debris retained after logging to reduce erosion and sediment production would minimize the amount of potential erosion within harvest areas.

GDRCo would construct seasonal and temporary truck roads to reduce skidding distances in ground-based yarding areas and to allow access for potential cable yarding. Temporary roads are decommissioned at the completion of use to ensure maintenance-free drainage and long-term stability.

Aside from the existing damage from prior logging, the greatest cumulative effects on park soils are associated with watershed restoration projects where former logging roads are removed and original topography restored to the greatest extent practical. In a typical watershed restoration project, thousands of cubic yards of soil are excavated from stream crossings and abandoned roads and the topography is reshaped to resemble the original topography, including the original stream channels. The most recent watershed restoration project in the park, begun in 2006 and continuing through 2010, is removing about 28 miles of road.

Consistent with the requirements of its AHCP, GDRCo would continue its road restoration efforts that upgrade and decommission roads across its ownership. Generally, roads located on stable slopes would be upgraded to modern-day standards that include single-lane roads with pullouts, properly sized culverts, and effective surface drainage. Roads built on unstable slopes would be decommissioned by excavating fill from stream crossings and steep slopes where road or landing failures could reach nearby streams.

Conclusions—The effects on soils and topography are the same under both the no action alternative and the proposed action. There would be no new effects on topography from use and maintenance of the existing roads. The roads off the Bald Hills are located on the ridgetop with negligible changes to the original topography from cut and fill. The overall effect on soils and topography under either the no action alternative or the proposed action would be long-term, localized within the road corridors, adverse, and negligible.

Effects on park soils and topography from building a new road system on the west side of the Redwood Creek watershed would be localized in areas previously disturbed by timber harvest and original road construction. These effects would be short-term during construction, short-term and repeated for maintenance operations, and negligible. The effects on park soils and topography would persist as long as the roads existed. The effect on soils and topography from construction of 2.5 miles of new roads using modern construction techniques and applying best management practices for erosion control would be negligible compared to the past significant alteration of soils and topography from original unregulated logging and road building throughout the Redwood Creek watershed (cumulative effects).

Non-Impairment of Topography, Soils, and Geological Resources in the Park—Topography and soils in the project area have been significantly altered, and in some locations impaired, by past timber harvest practices including road construction. Impairments to topography include gullying, mass wasting and erosion-related landslides, extreme cut and fill of slopes, and fill placed in stream channels. Impairments to soils include loss of top soil from erosion, burial of top soil, and soil creep that reorients soil profiles. The effects on geological resources are directly related to the effects on soils and topography, but there are no unique geological features within the park. The NPS has been implementing a legislatively-mandated watershed rehabilitation program since park expansion in 1978 to reduce the impairment to soils and topography created by past unregulated logging practices. State FPRs prohibit logging practices and road construction techniques used in the past that caused impairments to soils and severe alterations to topography.

Use and maintenance of existing roads rather than construction of new roads would avoid further impairment of park soils and topography. Therefore, the proposed action and the no action alternative

would not impair soils or topography. If 2.6 miles of previously removed roads are rebuilt under Alternative 3, the rebuilt roads would alter the previously restored topography on affected hillslopes and 23 stream crossings. Thus, Alternative 3 would not reduce the existing impairment to park soils and topography but reconstruction would not create new impairments to the same degree that resulted from the original widespread intensive logging and road construction techniques.

The level of impairment to topography and soils in the park is being reduced by watershed restoration treatments that reshape topography to resemble the original contours and that excavate buried topsoil layers and relocate them to their original position. The impairment to topography in some areas caused by road-related landslides cannot be reduced nor can the original topography be restored to pre-disturbance conditions. The impairment to park soils would be lessened over the very long term as soil development processes act to recreate soils and soil profiles are re-established.

Under the no action alternative and the proposed action, the impacts on geology, soils and topography from use and maintenance of the existing roads are acceptable, because

- the roads would be maintained at a standard to avoid new adverse effects on these resources or values;
- the roads have been determined by park geologists to have no potential for long-term adverse effects to these resources (provided they are adequately maintained) and therefore, are not subject to removal under the park watershed restoration program.

Under Alternative 3, the effects on geology, soils, and topography from re-opening park roads that were previously removed would be unacceptable because it would impede the attainment of the park's desired future condition for watersheds identified in the 2000 GMP. Constructing new roads on GDRCo land would have unacceptable impacts on park values because the NPS is actively engaged in a cooperative program with GDRCo, and other adjacent landowners, to reduce the adverse effects on park and regional watersheds from construction and use of roads.

Effects on Hydrology and Water Quality

Methodology for Assessing Hydrology and Water Quality Impacts—Water quality impacts are considered in the context of the watershed, and significant on-site and downstream cumulative effects on beneficial uses of water, as defined in the Water Quality Control Plan for the North Coast Region, adopted by the North Coast Regional Water Quality Control Board on December 9, 1993, and subsequently approved by the State Water Resources Control Board on August, 18, 1994.

Effects on hydrology and water quality in the park are considered in the context of the Redwood Creek TMDL and the condition of the watershed after the park was established and expanded. Instream numeric targets for sediment loads in Redwood Creek and its tributaries established through the TMDL process represent adequate stream habitat conditions for salmonid reproductive success. Instream targets are used to determine whether beneficial uses adversely affected by sedimentation are recovering over the long-term. Instream targets for the mainstem require a minimum of ten years of data collection to be able to determine trends and cannot be strictly applied to the tributaries.

Sediment impacts often occur long after the sediment enters the stream, and in locations far removed from the sediment loading site. It is technically infeasible to vary the TMDL between the tributaries and the mainstem to account for temporal and spatial variations in sediment loadings and impacts. Because of the difficulties of applying instream targets for the mainstem of Redwood Creek to the tributaries, the final TMDL established hillslope targets that are desired conditions for any given site in the watershed and achievable at any point in time.

The hillslope targets are based on scientific literature, available monitoring data for the Redwood Creek watershed and for sites within the parks, and on the best professional judgment of geologists and

hydrologists. The hillslope targets are expected to result in the reduction of erosion potential and future sediment delivery to streams to levels, which will allow recovery of instream habitat from sediment impacts over the coming decades. The hillslope targets in the Redwood Creek TMDL are believed by the EPA to describe the attributes of a well-functioning watershed, which supports both healthy aquatic habitat and ongoing road use and logging (USEPA 1998). Although there is no longer commercial logging in the park, roads in the project area will be retained for park management. Under the proposed action, 1,223 feet (0.2-mile) of these park roads would be retained specifically for GDRCo use.

Hillslope targets represent desired conditions for land management that are associated with properly functioning erosional processes and erosion rates that are not excessively accelerated by human influences. While the EPA expects recovery of sediment-impaired streams such as Redwood Creek to take many years, hillslope targets provide an immediately useful set of measures of whether land uses known to contribute much of the human-caused share of sediment loading to Redwood Creek are being modified in ways that will minimize future erosion and sediment delivery.

Cumulative impacts on water quality for GDRCo lands from timber operations, including roads, are based on the professional judgment of licensed geologists and registered professional foresters, followed by review and approval through the CDF timber harvest review process. THP review in Redwood Creek includes review by the NPS and state agencies such as CDF, CDFG, CGS, and the NCRWQCB.

Water quality impacts for GDRCo operations are based on the assumption that the projects that have taken place within the last ten years are the most important when evaluating cumulative adverse impacts. Impacts from GDRCo operations more than ten years ago are assumed to be less significant over time due to revegetation of harvested areas and the continuous upgrading and repair of roads.

Alternative 1: No Action—Under the no action alternative, GDRCo and the NPS would use existing rock-surfaced, all-season roads. There would be no direct adverse effects to hydrology or water quality in the park because the existing roads are located at the top of ridges and because the roads on park lands do not cross perennial or intermittent streams.

Under the no action alternative, short-term indirect adverse effects on water quality or hydrology would be minimized or avoided by using the existing roads rather than constructing new roads. GDRCo would inspect and maintain roads in accordance with the FPRs, and any deficiencies in existing stream crossings and drainage structures would be corrected or improved under applicable regulations.

There would be indirect beneficial effects on water quality in Redwood Creek and the lower reaches of tributaries with perennial flows because no new roads would be constructed, and therefore there would be no alteration of drainage patterns or new soil disturbance that would result in new erosion. These indirect benefits to water quality and hydrology in Redwood Creek would be negligible because of the direct adverse effects on water quality from sedimentation from on-going erosion from remaining abandoned roads elsewhere in the watershed.

Alternative 2: Exchange Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—The effects on hydrology and water quality under the Proposed Action would be the same as under the no action alternative: no adverse short-term or long-term direct adverse effects on water quality or hydrology; negligible short-term beneficial effects on water quality and hydrology; and negligible long-term beneficial effects on water quality or hydrology. The beneficial effects on water quality and hydrology are negligible because the roads to be used are high in drainages and do not cross any streams. The long-term beneficial effects on water quality and hydrology from using existing roads are primarily associated with cumulative effects of the entire road network in the Redwood Creek watershed, including use of adequately sized and maintained drainage structures, locating roads in geologically stable areas, decommissioning and upgrading roads on GDRCo and other private lands, and

removal of abandoned roads in the parks. Despite the improvement from current restoration efforts to the past condition of water quality and hydrology, benefits to water quality would be negligible because of on-going erosion from remaining abandoned roads in the park and on private lands.

Alternative 3: Construct Roads—Under this alternative, GDRCo would construct new roads and upgrade existing roads to connect its road system to public roads such as U.S. Highway 101. GDRCo would construct or upgrade about 40 miles of road to replace access served by eight existing road segments (1.2 miles altogether) that cross park lands. Constructing or upgrading these roads would require construction of 144 stream crossings.

Within the park, constructing or rebuilding six miles of road to provide access to the southwest portion of the park would have short-term adverse effects on water quality from construction of 10 stream crossings in Bridge Creek and 13 crossings in Devils Creek.

Construction of roads and stream crossings would have negligible long-term effects on hydrology because modern construction techniques for stream crossings retain the original drainage patterns with drainage structures that can accommodate 100-year storm events and because modern roads incorporate adequate drainage for road segments between stream crossings.

Construction of stream crossings would have short-term adverse effects on water quality for the first few rainy seasons following construction as stream channels adjust to any excavation required and small quantities of newly excavated sediment wash downstream. These temporary adverse effects on water quality result from increased turbidity due to erosion of newly-disturbed soils. The increase in erosion and associated turbidity would be negligible because of the distance between the newly constructed road and the perennial streams. If newly constructed roads cross any stream channels where there is a potential for eroded sediment to reach streams, adverse effects on water quality would be mitigated through best management practices to reduce erosion, including mulching and working during dry periods.

Construction of new roads within the park and rebuilding roads previously removed under the NPS watershed restoration program are inconsistent with management strategies outlined in the 1999 GMP for watershed restoration and with the establishing legislation for the park which directed the NPS to implement the watershed restoration program to reduce sedimentation associated with past land use practices for road construction. Even though new roads would be constructed to modern standards, such construction would be inconsistent with the restoration program intended to remove roads to reduce their adverse effects. On the west side of Redwood Creek, this would result in parallel road systems on park and GDRCo lands. Besides new road in the park, GDRCo would construct additional roads in the Klamath watershed.

Cumulative Effects on Hydrology and Water Quality—Redwood Creek has been designated as sediment-impaired under Section 303(d) of the Clean Water Act primarily because of past unregulated logging practices. The hydrology and water quality in the Klamath River have also been adversely affected by past unregulated logging practices, in addition to dams for hydroelectric power and irrigation, and by agricultural uses in northeastern California and southern Oregon. These latter factors are also linked to the listing of the Klamath River for temperature impairment under Section 303(d) of the Clean Water Act.

Watershed damage from logging practices was widespread throughout the north coast region of California prior to the enactment of the FPRs. Roads were constructed without regard to soil stability, slope steepness, or hydrologic effects. During heavy rains, erosion of old Humboldt crossings (stream crossings constructed by placing soil excavated from nearby slopes on logs laid parallel to the stream channel), streamside roads, and landings introduced large quantities of sediment into streams. After harvesting was completed in an area, truck roads, skid roads, and stream crossings were abandoned (no

longer used or maintained). Road abandonment in combination with continued upstream and upslope harvesting which removed significant ground cover resulted in accelerated erosion for many years. Over time, periodic high flows in steep gradient streams have moved much of the stored channel sediment out of the upper reaches of the watershed and into the Klamath River and Redwood Creek floodplains where gradients lessen.

Sediment yields were certainly higher in the past immediately following the logging that occurred 40-60 years ago. Most of the sediment from past unregulated logging has been transported outside of the project area due to the duration of time that has elapsed since impact. Within the park, sediment is being monitored as it moves down the mainstem of Redwood Creek. The upper reaches of the creek within the park are recovering from earlier forest practices and large storms.

Sediment inputs into Redwood Creek upstream of the park and in the Klamath River from current and future timber harvest operations would be minimized by practices that use existing truck roads and skid roads to the greatest extent practicable; upgrade existing stream crossings; establish wildlife or stream protection zones; fall timber away from streams; use temporary road construction techniques that minimize soil disturbance and alteration of the topography; and implement soil stabilization measures.

GDRCo would continue its road restoration efforts that upgrade and decommission roads across its ownership as it implements the prescriptions of its AHCP. Generally, roads located on stable slopes would be upgraded to modern-day standards that include single-lane roads with pullouts, properly sized culverts, and effective surface drainage. Roads built on unstable slopes would be decommissioned by excavation of fill from stream crossings and steep slopes where road or landing failures could reach nearby streams. In Redwood Creek, over 30 miles of GDRCo roads have been decommissioned through cooperative erosion control projects and many miles have been upgraded through completed THPs.

Herbicides registered for use in forestry might be used on GDRCo lands adjacent to the project area if needed to control competing vegetation following replanting or along roadsides to prevent vegetation from encroaching into the roadway. Operational practices have been developed to protect the beneficial uses of the waters of the State during and after herbicide applications. These practices have evolved into best management practices that, when fully implemented, are designed to provide maximum protection to the beneficial uses of water. (See descriptions of GDRCo herbicide management practices and likely effects in the FEIS for the AHCP (USFWS/NMFS 2006)). No significant cumulative adverse effects on water quality relating to chemical contamination are anticipated from herbicide application. Chemical inputs from past timber operations, such as equipment oil leaks, nutrient release from slash burning, and herbicide use almost certainly occurred in the past but no long-term impacts from this type of contamination are evident today. Compared to upstream nutrient loading to the Klamath River from agricultural practices, potential chemical input into the Klamath River from herbicide use and petroleum and chemical leaks on GDRCo lands downstream of the project would be negligible.

Temperature impairment of the Klamath River and Redwood Creek is the result of stream channel aggradation and widening during past large floods, and riparian canopy removal during timber harvest. Current FPRs emphasize retention of riparian trees. In general, streamside tree canopy cover on GDRCo land is high. In combination with current streamside protection zones and the recovering riparian areas, future GDRCo harvest operations are not expected to increase stream temperatures within the Redwood Creek or Klamath River watersheds.

Conclusions— The project area roads are located on ridges and are upslope of intermittent or perennial stream channels and would not affect hydrology of the project area. There would be negligible to minor surface erosion of fine sediment from the project area roads from use and maintenance that loosens dirt on the road surface. The quantities that would be delivered to streams would be negligible to minor because

of the distance between the roads and streams. Therefore, impacts to hydrology or water quality would be negligible from use of project area roads under either the no action or the proposed action.

There would be no direct effects on hydrology or water quality in Redwood Creek or the Klamath River under either the no action alternative or the proposed action because the existing roads occupy ridgetop locations and park roads do not cross intermittent or perennial streams. Direct adverse effects on water quality in Redwood Creek, the Klamath River, and some tributaries in the project area from sedimentation from past unregulated logging and road construction continue to occur. These are long-term effects that have been on-going since original timber harvest practices that began in the 1950s and continued through the enactment of the state FPRs and state regulations to implementing the federal Clean Water Act. Adverse effects of water quality (temperature, turbidity) range from negligible to significant depending on the reach of stream and the time of year, with good water quality in shaded tributaries during low flow periods to significant turbidity and mobilized sediment during flood flows.

Long-term indirect adverse effects to hydrology and water quality on GDRCo lands from sediment would be minimized by compliance with FPRs; by use of existing roads to minimize construction of new roads; by enforcement of the GDRCo road construction and maintenance program; by improvements to existing drainage and stream crossing structures; and by voluntarily striving to meet Redwood Creek TMDL hillslope targets. Long-term adverse effects on water quality and hydrology in the park would be lessened by replacement of old or failing culverts at stream crossings with larger culverts sized to accommodate 100-year storm events, and by removal of roads and restoration of original landforms through the Watershed Restoration Program. Removal or replacement of failing drainage structures and removal of abandoned roads would support voluntary efforts to meet Redwood Creek TMDL hillslope targets.

Construction of new roads and rebuilding previously removed roads in the park would have short-term adverse effects on water quality during the first few seasons following construction, and long-term adverse effects after the initial flush of newly excavated sediment. These effects are expected to be negligible because of modern construction techniques and maintenance of the new road. Construction of new roads within the park would not meet the Redwood Creek TMDL hillslope targets.

Over the very long-term, water quality in Redwood Creek and tributary streams is expected to improve if old roads are removed in and upstream of the park. Hydrological systems of park watersheds are also expected to improve over the long-term as stream crossings and topography are restored under the watershed restoration program.

Non-Impairment of Hydrology and Water Quality in the Park—Under the no action alternative and the proposed action, existing roads would be used and maintained. Use and maintenance of existing roads located near and on top of ridges would not affect hydrology and would result in negligible erosion of road surfaces and therefore negligible effects on water quality. All drainage structures would be maintained in functional condition. Watershed restoration that removes roads within the park would reduce potential road failures that contribute to erosion and sedimentation that eventually would reach Redwood Creek and cause adverse effects on water quality. Watershed restoration within the parks would restore original drainage patterns, and reduce the impairment to hydrology and water quality in park streams.

Thus, use and maintenance of existing roads would not contribute to the sediment impaired or temperature impaired condition of Redwood Creek, using the definition of impairment from Section 303 (d) of the Clean Water Act.

New roads constructed under Alternative 3 would increase the mileage of roads within and adjacent to the project area. Roads would be constructed to modern standards with adequate drainage structures and receive regular maintenance. The construction of 2.5 miles and rebuilding of 3.6 miles of additional

roads in the watershed and the potential for failure with resulting adverse effects on water quality would not create an impairment in the park especially in comparison to the existing impaired condition, but the existing impairment would not be reduced, and the hillslope targets of fewer roads established in the Redwood Creek TMDL to reduce the level of sediment impairment in Redwood Creek would not be met.

Under the no action alternative and the proposed action, the impacts on hydrology and water quality from use of the existing roads are considered acceptable, because

- the roads would be maintained at a standard to prevent adverse effects to these resources or values;
- the roads have been determined by park geologists to have no potential for long-term adverse effects to hydrology and water quality, and therefore, are not subject to removal under the park watershed restoration program.

Under Alternative 3, the effects on hydrology and water quality from re-opening park roads that were previously removed would be minor. Even though new roads would be constructed to modern standards, such construction would be inconsistent with the watershed restoration program intended to remove roads. Construction of new roads within the park and rebuilding roads previously removed by the park's watershed restoration program are inconsistent with management strategies outlined in the 1999 GMP for watershed restoration and with the establishing legislation for the park which directed the NPS to implement the watershed restoration program to reduce sedimentation associated with past land use practices of logging and road construction. Constructing new roads would impede the attainment of the park's desired future condition for hydrology as identified in the 2000 GMP. Constructing new roads on GDRCo land would also be unacceptable because the NPS is actively engaged in a cooperative program with GDRCo, and other adjacent landowners, to reduce the adverse effects on park and regional resources from construction and use of roads. Therefore, impacts on hydrology from construction or re-opening of roads would be an unacceptable impact.

Effects on Floodplains and Wetlands

Alternative 1: No Action—There would be no effect on floodplains from use or maintenance of existing roads covered in the proposed ROW exchange. The roads are located on ridges at the upper reaches of the watersheds and park roads do not cross intermittent or perennial streams. Occasional seeps or springs exposed along road cuts are small and possess limited wetland functions and values. Effects on wetlands from use or maintenance of roads under the no action alternative would be negligible.

Alternative 2: Exchange Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—The proposed action would have no effect on floodplains. The roads are located on ridges at the upper reaches of the watersheds and park roads do not cross intermittent or perennial streams. Occasional seeps or springs exposed along road cuts are small and possess limited wetland functions and values. Effects on wetlands from use or maintenance of the road would be negligible.

Alternative 3: Construct Roads—Construction of new roads or rebuilding previously removed roads would not adversely affect floodplains because roads would be located near the tops of ridges where floodplains do not form. Floodplains do not develop on the upper slopes that constitute the project area because these areas are high up in steep drainages. It is possible that seeps or springs could be exposed by constructing roads but these wet areas would possess limited wetland functions and values. Visible seeps or springs would be avoided during road layout if at all possible because these areas cause road fill to become saturated and can lead to road failure. Larger springs require drainage structures, which add to the cost of constructing and maintaining a road, and are therefore avoided if at all possible. Effects on small isolated wetlands from constructing roads would be negligible.

Riparian areas would be adversely affected by additional road construction or reconstruction. About 23 stream crossings would be built on park lands to construct, upgrade, or re-open the new six-mile road

system. Assuming that each crossing would be about 50 feet long and 80 feet wide, a total of 2.1 acres of riparian area would be affected to construct 23 crossings. This would be a minor adverse effect on individual riparian wetlands because the riparian wetlands are isolated from each other and riparian wetlands are common throughout the park.

Cumulative Effects on Floodplains and Wetlands—The floodplain of Redwood Creek both within what is now the park and upstream of the park boundary has been adversely affected by past timber harvest practices. Past logging practices resulted in erosion of large volumes of sediment (in excess of the already naturally high sediment volumes) that entered streams, resulting in channel aggradation that was exacerbated by the 1964 flood. Aggradation caused the floodplain to become shallower and wider, and caused streamside redwood trees to fall. The floodplain of the Klamath River did not experience a similar level of adverse effect from aggradation because of the larger size of the river channel relative to the sediment input volume. The flood control levees on lower Redwood Creek and the lower Klamath River continue to alter the functioning of the floodplains to minimize property damage and protect structures during floods that generally occur during intense winter storms. The floodplain of Redwood Creek is recovering as sediment input decreases under current logging regulations and as the large volumes of sediment from past logging and road construction are transported down the channel by high flow events.

The majority of wetlands in the Redwood Creek and Klamath River watersheds adjacent to the project area are riparian wetlands bordering the intermittent and perennial streams. These wetlands were significantly damaged by past logging and road building. Recovery of riparian wetlands is on-going through logging restrictions and the GDRCo AHCP prescriptions that protect streams and through the park's Watershed Restoration Program in which roads are removed, and the original landforms, hydrological patterns and stream functions restored.

Conclusions—There would be no direct effects on floodplains of either Redwood Creek or the Klamath River under either the no action alternative or the proposed action. There would be a long-term, indirect benefit to floodplains under either of these alternatives from maintenance of existing roads to prevent erosion but this benefit is negligible because of widespread damage to the floodplains from past land uses. The floodplain of Redwood Creek is gradually recovering from unregulated logging but the recovery is expected to take many decades as the volume of sediment moves downstream in flows capable of mobilizing large quantities of material. Under the road construction alternative, there would be no direct effects to floodplains because the roads to be constructed would be located near ridgetops where no floodplains have developed because of the location high in the drainage.

There would be no direct effects on riparian wetlands under either the no action alternative or the proposed action. There might be temporary direct adverse effects from replacement of improperly functioning culverts or improvements to drainage ditches in very small isolated wetlands that form from nonfunctioning drainage structures outside the project area but these adverse effects would restore proper drainage. The isolated wetlands have negligible values associated with natural wetlands.

Direct adverse effects on small areas of riparian wetlands would result from road construction at individual stream crossings under Alternative 3 from installation of culverts in intermittent streams in the headwaters of Bridge Creek and Devils Creek. The total area of riparian wetland affected by construction of the 23 stream crossings would be 2.1 acres of non-contiguous riparian wetlands that were previously affected by logging, road building, and road removal. Construction would take place when streams are dry so there would be no direct short-term adverse effects on wetland values from construction. The functions of riparian wetlands downslope of the project area would be protected by installation of drainage structures that retain the original drainage patterns to protect the riparian areas along streams. Therefore, there would be very minor effects on riparian wetlands under a road construction alternative.

Non-Impairment of Floodplains and Wetlands in the Park—There would be negligible direct or indirect adverse effects on floodplains or wetlands under either the proposed action or the no action alternative because the existing roads are on ridges high in the drainages above the floodplains of the Klamath River or Redwood Creek; none of the park roads cross intermittent or perennial streams in the project area with associated riparian wetlands; and because existing roads are maintained in a condition to ensure adequate drainage to protect natural wetland functions associated with riparian zones. The floodplain of Redwood Creek would remain impaired by past land uses that caused stream aggradation. Current management of GDRCo and NPS lands would continue to lessen the impairment through voluntary efforts to meet hillslope targets established in the Redwood Creek TMDL. Riparian wetlands in tributary streams and along the mainstem of Redwood Creek would continue to improve as the adverse effects of past land uses are lessened through the watershed restoration program and efforts to reduce erosion from roads. Therefore, floodplain and wetland values in the national park would not be impaired under the proposed action.

Under Alternative 3, new roads would be constructed and maintained to modern standards to prevent road and slope failures that adversely affect floodplains and wetlands by scouring or aggrading stream channels and removing riparian vegetation. The road to be constructed in the national park would be located high in the drainage, and would not affect the floodplain of Redwood Creek. About 2.1 acres of non-contiguous riparian wetlands that are common in the park and that were already disturbed by prior logging, road building, and road removal would be affected. Therefore, there would be no new impairment to floodplains or wetlands from construction of a new road but the impairment to the floodplain of Redwood Creek associated with the previous road network would not be lessened.

Under the no action alternative and the proposed action, the impacts on floodplains and riparian wetlands from use of the existing roads are considered acceptable, because

- new impacts to the Redwood Creek floodplain would be indirect and negligible because roads would be constructed to modern standards and are located high above the creek;
- riparian wetlands in the park would not be affected by use of existing roads, which are not located next to riparian corridors;
- the roads would be maintained at a high standard to prevent road failure and associated adverse effects to floodplains and riparian wetlands;
- the roads have been determined by park geologists to have no potential for long-term adverse effects to aquatic resources including floodplains and riparian wetlands and therefore, are not subject to removal under the park watershed restoration program.

Under Alternative 3, the effects on the Redwood Creek floodplain from re-opening park roads that were previously removed would be negligible and indirect. The effects on riparian wetlands from re-opening park roads would be direct and minor. Construction of new roads within the park for administrative access and rebuilding roads that were previously removed under the park's watershed restoration program are inconsistent with management strategies outlined in the 1999 GMP for watershed restoration, with the management zoning established in the 1999 GMP, and with the establishing legislation for the park which directed the NPS to implement the watershed restoration program to reduce sedimentation associated with past land use practices of logging and road construction. Constructing new roads would impede the attainment of the park's desired future condition for riparian wetlands as identified in the 2000 GMP. Constructing new roads on GDRCo land would also be unacceptable because the NPS is actively engaged in a cooperative program with GDRCo, and other adjacent landowners, to reduce the adverse effects on park and regional resources from construction and use of roads. Therefore, impacts on riparian wetlands from construction or re-opening of roads would be a long-term adverse impact that is determined to be unacceptable.

Effects on Vegetation
Effects on vegetation were analyzed by reviewing recent approved GDRCo THPs prepared by a licensed RPF and incorporating the conclusions, as well as analyses by park botanists and foresters, results of published studies and park data, and best professional judgment.

Alternative 1: No Action—Roadside vegetation would be removed along the edges of the existing disturbed road corridor for routine maintenance to keep roads open for vehicles. All vegetation along all roads in the project area has been previously disturbed for road construction or by logging and continuously disturbed for routine maintenance. No large mature trees would be removed for maintenance of existing roads. The effect on vegetation under the no action alternative would be repeated during annual or periodic maintenance and negligible.

Alternative 2: Exchange of Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—The effects on vegetation under the proposed action are the same as under the no action alternative, and result from removal of roadside vegetation for routine maintenance. All vegetation along all roads in the project area has been previously disturbed for road construction or by logging. No large mature trees would be removed for maintenance of existing roads. The effect on vegetation under the proposed action would be repeated during annual or periodic maintenance and negligible.

Alternative 3: Construct Roads—Approximately 25 acres of second-growth forest in the park would be removed for construction or rebuilding of five miles of road along ridges and in the upper watershed of the west side of Redwood Creek. On GDRCo lands, about 45 acres of second-growth forest would be cleared for new road construction in a 60-foot-wide corridor and about 80 acres cleared within a 20-foot-wide corridor when roads are built or upgraded.

All vegetation that would be removed for road construction in the park has already been disturbed by logging, and is primarily dense second-growth forest dominated by undersized Douglas-fir. Vegetation that would be cleared on GDRCo lands is also second-growth forest that has been continually managed for timber production.

Initially a larger area is cleared than the actual finished grade. If the road is constructed over rolling terrain or on steep slopes, a larger area would be cleared to allow for cut-and-fill needed to provide a level road bench. Vegetation would regrow along the road corridor outside of the traveled surface of the road within a few years.

Cumulative Effects on Vegetation—Reasonably foreseeable NPS projects that would affect vegetation within the parks include watershed restoration projects in which vegetation that has reestablished on abandoned logging roads is removed; management of second-growth forests through thinning of small-diameter trees (primarily Douglas-fir); fire management including reduction of hazardous fuels along roads, around historic structures, and in areas scheduled for prescribed fires; management of Bald Hills prairies and oak woodlands through prescribed fire; removal of invasive exotic plants; and removal of vegetation around structures and facilities including roads and trails. The majority of the vegetation managed under these projects has been previously disturbed by logging or ranching, or is common in the parks and routinely trimmed for maintenance of facilities or protection of structures from wildfire. Bald Hills vegetation management is directed at maintenance of vegetation communities that were originally maintained through a natural fire regime or are cultural landscapes that require active maintenance to retain the vegetation elements that contribute to the historic significance of the landscape.

Timber production is the principal land use within GDRCo ownership. The timberlands owned by GDRCo within the assessment areas will continue under intensive forest management. These activities will include timber harvesting, minor road construction and reconstruction, reforestation, stand improvement, and wildlife management, as well as a GDRCo watershed restoration projects throughout

the GDRCo ownership. Broadcast burning may occur on GDRCo lands for site preparation and fuel load reduction. Broadcast burning would not be initiated in areas established for stream or wildlife habitat protection.

GDRCo plans to conduct harvest operations on approximately 1,954 acres east of the Bald Hills in the Klamath drainage through the year 2016, with 282 acres selectively logged and 1,672 acres scheduled for clearcutting. Future harvesting projects are often contemplated or appear to be feasible based on assumed ground conditions, stand age and composition, and other variables. Given the changing market factors or biological conditions, other potential harvesting projects under consideration may become economically unjustified or infeasible. Until fieldwork begins, the location of the THP on the ground, its area layout including size and shape, the foreseeable impacts or potential associated mitigations and protection measures are unknown.

The timing or location of future timber harvests where on-the-ground field and layout work has not begun is not reasonably foreseeable due to the uncertainty that accompanies GDRCo's harvest planning process. This uncertainty is due to the interaction of a variety of factors including the constraints imposed by management of biological resources within the harvest area, the regulations governing timber harvesting in California, and fluctuations in wood products markets that are associated with a host of unpredictable economic factors.

Conclusions—Under all alternatives including no action, vegetation along the existing road corridors would be trimmed for periodic routine maintenance to provide a clear and safe roadway for vehicles. All vegetation along existing roads has been previously disturbed by road construction or logging. Under the road construction alternative, 25 acres in the park of second-growth forest would be removed to clear a 36-foot-wide corridor for the road. On GDRCo lands, 45 acres of second-growth forest would be removed to construct new roads in a 60-foot-wide corridor and 80 acres would be cleared in a 20-foot-wide corridor to upgrade roads. These impacts to vegetation are considered negligible because the vegetation is second-growth forest that is not high-quality wildlife habitat, and because second-growth forest on GDRCo lands is intended to be managed for timber values. There would be no effect on old growth forests or large mature trees under any of the alternatives including no action. Adverse effects from repeated routine maintenance of roadside vegetation would be negligible.

Non-Impairment of Park Vegetation—The impairment to park vegetation communities caused by logging prior to park establishment is lessening as forests regrow. Impairment to old growth forests caused by clearcutting can only be reduced through centuries of regrowth. The impairment to logged forests would be reduced more quickly by management of some logged forest stands to accelerate the recovery of old growth characteristics. Under the no action alternative and the proposed action, there would be no new disturbance to vegetation in the park from use and maintenance of existing roads. All vegetation along all roads covered under the ROW agreement has been previously disturbed by logging and road construction. Therefore, there would be no impairment to park vegetation resources from the no action alternative or the proposed action or from building a new road system under the road construction alternative. Under the road construction alternative, a road would be constructed through previously harvested second-growth forest similar to what would be thinned under the proposed second-growth forest management program, and, therefore, the effects on 25 acres of previously logged forests under Alternative 3 would not cause impairment to park vegetation resources.

Under all alternatives including no action, maintaining the existing road corridors through periodic removal of overgrown vegetation to provide a clear and safe roadway for vehicles and removal of 25 acres of second-growth forest in the park to construct new roads or re-open roads would be acceptable impacts on park vegetation resources and values.

Effects on Wildlife

Alternative 1: No Action—Effects on wildlife under the no action alternative are related to vehicles using the roads. Use and maintenance of existing roads would create temporary but repeated noise, and dust during dry periods. Maintenance would result in removal of roadside vegetation within the existing disturbed road corridor. Wildlife that inhabit the road corridor are small enough to take shelter in available vegetation, mobile enough to get away from the road corridor while vehicles pass by, or tolerant of road use and disturbance from passing vehicles. The effects on wildlife from noise from use and maintenance of roads, and from occasional removal of roadside vegetation for maintenance would be short-term, repeated, adverse and negligible.

Alternative 2: Exchange Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—Effects on wildlife under the proposed action are the same as under the no action alternative.

Alternative 3: Construct Roads—Under this alternative, 2.5 miles of new roads would be constructed and 3.6 miles would be rebuilt or upgraded on park lands, which would affect 25 acres of vegetation previously disturbed by logging. Under this alternative, six miles of new roads would be constructed and 34 miles would be upgraded on GDRCo lands, which would affect 45 acres of vegetation previously disturbed by logging to construct the new roads and 80 acres for upgrading existing roads.

Some wildlife species that occupy areas with newly constructed or upgraded roads would be disturbed by noise and would temporarily abandon the construction zone when people or equipment are present. Soil-dwelling organisms and some individuals of small sedentary species would be killed when soils and trees are removed for construction. Construction noise and the presence of equipment and people would attract some species such as ravens and jays that are tolerant of people and are opportunistic feeders that have learned to associate people with food. Wildlife that are less tolerant of people would move back into the area when people and equipment are no longer present. The loss of individuals of small, sedentary species from removal of vegetation and soil for road construction would not affect the overall population of these species within the parks. The effects on wildlife under the road construction alternative would be adverse, temporary for those animals that are less tolerant of humans and can move out of the area during construction but permanent for some individuals of small sedentary species, and negligible because none of the vegetation that would be removed is high quality wildlife habitat and none of the animals that would be killed during construction are considered sensitive species whose preservation is essential.

Cumulative Effects on Wildlife—The logging that occurred in the project area prior to park establishment and expansion had significant adverse effects on certain terrestrial and aquatic species of wildlife. Small less-mobile wildlife that occupy forest or riparian habitats were directly affected by logging. More mobile wildlife species were indirectly affected by widespread loss of forest habitat and damage to streams. Some species that suffered major population declines from loss of forest habitat due to logging throughout their range were listed as threatened under the federal or California endangered species acts; effects on these species are discussed under *Effects on Threatened and Endangered Species.* The effects on terrestrial wildlife from clearcut logging in what is now the park were localized on individual animals but widespread throughout timber harvest areas, and were generally adverse from loss of vegetation used for shelter and food over the short-term. Small, sedentary animals were more affected than more mobile animals such as birds and medium to large mammals because these animals could move out of an area when logging occurred. Nesting birds were adversely and directly affected by large clearcuts conducted during nesting season.

As forests reestablished, some species such as deer, elk, and black bears benefited from new browse that grew as large clearcuts revegetated. Populations of elk and bears probably increased as logged forests reestablished because of the increased availability of some types of food such as cambium layers on

young redwoods favored by bears and shrubs for elk browse. Overall adverse effects on populations of terrestrial wildlife in the project area were negligible to significant depending on the degree of mobility and whether a species favored old growth habitats or could survive in logged areas.

Cumulative effects on animals that are considered to depend on old growth forest habitat are covered under the threatened and endangered species section, because widespread loss of old growth habitat reduced populations of these species as habitat was lost to logging and development throughout the range of temperate coniferous forests. Aquatic species were directly affected where stream channels were blocked with Humboldt crossings and by sedimentation of streams from landslides and erosion from bare slopes and indirectly affected by loss of shade when the forest canopy was removed. The adverse effects of sedimentation on aquatic species continued after forest vegetation reestablished. Adverse effects on aquatic species following logging were more substantial than on terrestrial species because of major sediment deposition into streams and widespread loss of forest cover that caused higher stream temperatures. While some species of terrestrial wildlife could move out of a clearcut to find suitable unlogged habitat, aquatic species could not relocate to another stream. The overall initial effect on aquatic species was adverse, localized on individual animals but widespread over timber harvest areas, and moderate to major, with aquatic species populations in smaller streams subject to greater loss of individuals because the entire stream was damaged.

Timber operations on GDRCo lands would remove wildlife habitat in areas adjacent to the park. Small sedentary individuals would be killed by heavy equipment or displaced from loss of habitat. Individuals of more mobile species could move to another area during and following timber harvest while other individuals that benefit from increases in forage and seed production could migrate to the site when operations cease. Riparian corridors that are no-cut zones would continue to provide habitat and migration corridors for a wide variety of wildlife. Although some individuals of certain species could be killed or displaced, habitat would remain available outside harvest blocks for other individuals. Some individual wildlife living in harvest areas adjacent to the park would be able to move into the park. There would be no adverse effects to any population of any species in the park over the long-term from timber harvest adjacent to the park.

Habitat retention areas within harvest units would serve as core areas for development of habitat that accelerate re-colonization by species requiring vertical structure and/or multistory canopy conditions that would otherwise be lacking in the early stages of forest development. During the layout of harvest units, harvest areas are surveyed for unique habitat features including individual trees or clumps of trees that provide high quality nesting or roosting habitat, trees with exceptional mast production, seeps or springs, or rocky outcrops. When high quality habitat features are identified during plan layout, the features are marked for retention. The retention of snags and green wildlife trees, and no-cut zones along streams, would provide vertical forest structure that would benefit some wildlife species.

Varying stages of forest development provide for a variety of habitats on GDRCo lands. Following timber removal and cessation of heavy equipment operations that cause noise and disturbance to wildlife that is not tolerant of human presence and working equipment, some species of wildlife benefit from increased light to the forest floor, which results in increased browse and seed production within the first few years. Timber harvesting also increases quantities of large woody debris that is used as shelter for a wide variety of organisms.

Conclusions: There would be temporary adverse effects on wildlife from noise and vegetation disturbance within the road corridor for road maintenance under no action and the proposed action; these effects would be negligible because the roads are in regular use. Road construction under Alternative 3 would have adverse effects on wildlife from noise during construction, and would reduce the amount of habitat in the park by 25 acres and on adjacent GDRCo lands by 125 acres. The adverse effect of loss of habitat on wildlife populations would be negligible because there is sufficient adjacent land to sustain the

wildlife populations that are able to survive in logged forests. These effects would be significantly adverse for those individuals that are killed during road construction, moderate for those animals that are temporarily displaced, and negligible for the populations of any wildlife species in the parks.

Non-Impairment of Wildlife Resources in the Park - Use of existing roads under the no action alternative and the proposed action would have continued temporary adverse effects on some species of wildlife that are less tolerant of human presence and noise disturbance. The primary adverse effect on wildlife populations in the park resulted from the loss of habitat from the original logging that occurred over 40 years ago, prior to park establishment. Road construction would remove about 25 acres of park forest that has regrown following the original timber harvesting. Removal of 25 acres of second-growth would have a negligible effect on wildlife because there are approximately 50,000 acres of previously harvested forests in the park and much of this habitat is not high quality habitat. The continued use and maintenance of roads or the rebuilding, upgrading or new construction of roads would not have any new long-term adverse effects on park wildlife, and, therefore, wildlife resources in the park would not be impaired.

The repeated, short-term impacts on wildlife from use and maintenance of existing roads under the no action alternative and the proposed action would be negligible and have been determined to be acceptable. Under the road construction alternative, the impacts from noise, disturbance and loss of 25 acres of low-quality habitat from construction would be negligible, and therefore, have been determined to be acceptable.

Effects on Sensitive, Threatened and Endangered Species

Alternative 1: (No Action)—There would be no direct effects on federally or state-listed threatened or endangered plants or animals, or candidates for listing, from use and maintenance of existing roads through previously harvested second-growth forest in the park. Use and maintenance of the roads occurs within the existing disturbed corridor, with no new removal of trees. The project area does not contain perennial streams so there would be no direct effects on listed fish or other sensitive aquatic species. No large mature trees would be removed so there would be no effects on birds that prefer or require old growth forest habitat.

Alternative 2: Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—Effects on sensitive, threatened or endangered species under the proposed action would be the same as under the no action alternative.

Alternative 3: Construct Roads—Construction or rebuilding of roads through second-growth forests on park lands would have no direct effects on sensitive, threatened or endangered species. The area would be surveyed for sensitive plant species during the design phase. The design would attempt to avoid any sensitive plants encountered. If the plants cannot be avoided, they would be salvaged by park botanists and transplanted to a nearby location.

This project would not directly affect marbled murrelets because none of the roads that would be used, maintained or constructed are located in murrelet habitat. Adverse effects to northern spotted owls that would result from construction, upgrading or reopening 6 miles of road in the park would be avoided by constructing the road outside the noise restriction period or outside the breeding season (after September 15 and before February 1) within unsurveyed potentially suitable habitat. Because the USFWS does not require consultation under Section 7 of the Endangered Species Act for alternatives that are not the proposed action, the NPS has not determined the potential effects on northern spotted owls from removal of 25 acres of second-growth forest to construct a road under Alternative 3. Standard mitigation measures to minimize impacts on northern spotted owls from park projects include implementation of noise restriction periods and avoidance of habitat degradation or removal if possible. If spotted owl habitat

would be adversely affected, the NPS would consult with the USFWS on measures needed to reduce adverse effects, and would request incidental take if needed.

The stream protection measures incorporated into GDRCo THPs, including construction, use, and maintenance of roads, have been designed to protect the downstream beneficial uses of water, including fish habitat and fish. These methods would avoid or minimize indirect effects to listed fish and other sensitive aquatic species from constructing or upgrading roads under the road construction alternative.

Cumulative Effects on Sensitive, Threatened and Endangered Species

Cumulative Effects on Terrestrial Sensitive Wildlife—Northern spotted owls and marbled murrelets have been affected primarily by loss of old growth forest habitat due to commercial logging and residential, agricultural, commercial and industrial development associated with increasing human populations. Marbled murrelets are also adversely affected by marine oil or fuel spills associated with shipwrecks that affect marbled murrelet feeding habitat offshore as well as directly killing birds that come in contact with spilled oil. Cumulative effects on northern spotted owls would also result from continued loss of suitable second-growth forest (generally more than 40 years old) habitat and from increasing competition with barred owls, which are expanding their range and are considered to constitute the most imminent threat to the recovery and continued survival of northern spotted owl populations. These cumulative effects on northern spotted owls and marbled murrelets are widespread throughout the range of each species, adverse, long-term and significant, and have lead to the listing of these species as threatened.

Cumulative Effects on Terrestrial Sensitive Wildlife in the Park—Spotted owls and/or marbled murrelets that nest in the Lost Man Creek watershed near Holter Ridge Road would continue to be subject to noise disturbance from logging operations on GDRCo lands near the ridgetop. If CDFG and RNSP biologists determine from consultations during the THP review process that noise is a potential adverse effect, mitigation is required to reduce or avoid adverse effects from noise.

On-going park projects for which consultations with the USFWS have been completed and which have been determined that the projects may affect but are not likely to adversely affect northern spotted owls or marbled murrelets are management of exotic plants throughout RNSP, fire management throughout the parks, and management of Port-Orford-cedar in the northern part of the parks.

Park projects for which consultations with the USFWS have been completed but the project has not been implemented include development of visitor facilities at Freshwater Lagoon Spit and construction of trails proposed in the draft trail plan. The USFWS has concurred with the NPS determination that the Freshwater Lagoon Spit project may affect but is not likely to adversely affect northern spotted owls or marbled murrelets. The USFWS has authorized incidental take of northern spotted owls and marbled murrelets for construction of new trails proposed in the draft trail plan. Incidental take of marbled murrelets on several thousand acres is due to increased threat of corvid predation in picnic areas, along existing and proposed trails, and in developed state park campgrounds, with additional incidental take associated with noise disturbance during trail construction and a minor amount of acreage affected by habitat degradation.

On-going park projects for which incidental take of spotted owls, marbled murrelets, or both has been authorized include the Lost Man Creek watershed restoration project, routine annual and periodic maintenance of roads and facilities, culvert replacements in Lost Man Creek and Mill Creek watersheds, and helicopter use.

Proposed park projects for which consultations are underway and for which incidental take is expected to be requested in 2007 but the amount of take has not been determined include tree-clearing from 2005-6 winter storms and management of second-growth forests in the South Fork of Lost Man Creek.

Cumulative Effects on Sensitive Plants on GDRCo Lands—In consultation with CDFG, GDRCo will develop and implement a detailed conservation plan for sensitive plant species including *Sidalcea malachroides* (maple-leaved checkerbloom), *Lycopodium clavatum* (running pine), *Montia howellii* (Howell's montia), and *Mitella caulescens* (leafy-stemmed miterwort). No timber harvesting or road construction is permitted within 50 feet of any location supporting sensitive plants unless alternative mitigation measures developed through consultation with CDFG are implemented.

Cumulative Effects on Sensitive Wildlife on GDRCo Lands—The GDRCo conservation strategy for protecting northern spotted owls is based on a habitat conservation plan (HCP) that sets aside 13,200 acres of no harvest area, maintains a 20,000-acre special management area, and accelerates the regrowth of owl habitat (Simpson 1992). Under a proposed amendment to the northern spotted owl HCP, GDRCo would also initiate research on the interaction between the northern spotted owl and the barred owl (USFWS 2007). GDRCo has been authorized incidental take of northern spotted owls by USFWS under Section 10(a) of the Endangered Species Act.

Species that are protected in and along streams in harvest areas include salmonids and other fish, frogs, stream-dwelling salamanders, pond turtles, a variety of birds, and white-footed voles. Species such as purple martins and other cavity nesting birds, ospreys, and Pacific fishers, which use snags or deformed trees for nesting or denning habitat, are protected by the retention of all safe snags in THP areas and retention of deformed, green wildlife trees.

Suitable habitat for state or federally listed bird species such as peregrine falcons, bald eagles, ospreys, and goshawks would be surveyed to prevent disturbance during the breeding seasons as part of THP planning.

Cumulative Effects on Listed Fish—Salmonid stocks throughout the Pacific Northwest region are threatened by the cumulative impacts of livestock use, road construction, timber harvest, stream channelization, water diversions, hydroelectric development, over-fishing, and the influence of hatchery fish on both disease resistance and genetic fitness of native stocks (USDC 1997a and 1997b).

Though few scientific data are available for accurate estimates of past salmonid populations in Redwood Creek, the limited data available indicate that the anadromous fishery of Redwood Creek has experienced a substantial reduction during the last 30 years. Present populations of salmonid species are well below those reported in historical accounts. The earliest accounts circa 1890 reported Redwood Creek as having supported a substantial salmonid fishery (Van Kirk 1994).

Degraded stream and riparian habitats are major contributors to the decline in numbers of salmon and trout. The combined effects of timber harvest (i.e., removal of forest cover and riparian conifers, and construction of logging roads) and significant storms have deposited large amounts of sediment in Redwood Creek and degraded the habitat for fish. Sedimentation of the mainstem filled in deep pools, and major flood events caused significant channel adjustments including channel widening, aggradation, and bank erosion. The resultant widened streambed and shallow riffles provide little or no cover for fish. Sedimentation negatively affects egg survival and fry emergence, and fish food organisms, i.e. benthic invertebrate production. The Prairie Creek drainage in Prairie Creek Redwoods State Park has few adverse effects from logging but was adversely affected in 1989 by severe erosion during construction of the U.S. Highway 101 Redwood Park Bypass. Other factors contributing to and exacerbating population declines in the park and the region are natural events including severe floods, extended drought, poor ocean conditions, over-fishing, and the prolonged effects of past hatchery practices.

The Redwood Creek TMDL describes fish populations in Redwood Creek as "much reduced" compared to historic accounts. Habitat conditions are still degraded relative to pristine conditions but are showing signs of improvement. Although channel deepening and pool development have been observed in all but

the lower few miles of Redwood Creek, the mainstem generally lacks adequate pool-riffle structure, large woody debris for cover, and a healthy riparian area. Riparian areas lack mature conifers for large woody debris recruitment. Coarse sediment deposited in the mainstem allows a large proportion of the summer base flow to infiltrate and flow subsurface, thereby limiting the surface water available to fish and increasing surface water temperatures. Spawning habitat in Redwood Creek is slowly improving as gravels are cleaned of fine sediment. Tributary water temperatures are generally suitable for salmonids but suboptimal along much of the mainstem.

Cumulative Effects on Listed Fish in the Park—Other on-going and reasonably foreseeable projects for which the NPS has prepared biological assessments and completed consultations with NMFS for potential effects to listed fish species throughout the parks include annual and periodic road maintenance (NMFS biological opinion and letter of concurrence 151422SWR02AR6347, March 2003); previous Lost Man Creek watershed restoration projects (151422SRW01AR54:BW, July 2003); fire management (NMFS biological opinion and letter of concurrence (151422SWR04AR99149:BW, January 2005); and relocation of the RNSP maintenance facility (NMFS biological opinion 151422SWR2003AR8948:BAD, October 2005). The maintenance facility project is located outside the Redwood Creek watershed and will not have any effects on fish in the project area or in Redwood Creek.

The NPS requested incidental take for California Coastal Chinook salmon, Southern Oregon/Northern California Coasts coho salmon, and Northern California steelhead under the NPS biological assessment prepared in 2003 for the Annual and Periodic Road Maintenance program, and the 2006 addendum. NMFS authorized an unquantified amount of take based on miles of stream affected under a biological opinion and letter of concurrence 151422SWR02AR66347 issued in March 2003.

Future actions anticipated within the project area include road and trail maintenance downstream of the project area, fire suppression in case of wildfire but no planned fire management actions (fuel reduction, prescribed fire), and management of second-growth forests on less than 400 acres outside riparian and old growth areas. Of these projects, trail and road maintenance is likely to have negligible to minor short-term adverse effects on listed fish if culverts are replaced.

Using the guidelines outlined in the current and previous biological assessments and terms and conditions specified in associated biological opinions, cumulative adverse effects to anadromous fish or their habitat are expected to be minor and short-term. Long-term benefits to listed fish are expected from the reduction of threats associated with erosion and sedimentation of streams resulting from failure of untreated roads and stream crossings, and from restoration of drainage patterns and geomorphic processes under watershed restoration projects.

Routine road maintenance on all park roads would have negligible adverse effects on listed aquatic species from brushing and grading. Short-term adverse effects from increased erosion at stream crossings for replacement of culverts along main haul roads would be reduced by implementation of best management practices described in the NPS biological assessment for Annual and Periodic Road Maintenance, and the resulting biological opinion and letter of concurrence issued by NMFS in 2003 (file number 151422SWR02AR6347) with the 2006 addendum. There would continue to be long-term adverse effects on fish as untreated roads fail and sediment is delivered to streams. These adverse effects would range from minor to moderate depending on the volume of sediment delivered and the distance between the erosion site and stream.

Cumulative Effects on Listed Fish on GDRCo Lands—Coho, Chinook, and steelhead would not be directly affected by timber harvest on GDRCo lands within the project area. Protection provided by the FPRs and site-specific mitigations required for THPs would reduce effects on these species to less than significant, as required under CEQA and the California Endangered Species Act.

Scientific studies performed in Redwood Creek since the early-1970s document how watershed conditions from past timber harvest operations under previous regulatory and management regimes on lands within and adjacent to the project area adversely affected anadromous salmonid habitat. Studies also confirm that current watershed conditions have improved over past conditions. Given current FPRs, management practices, long-term strategies, and active restoration efforts, watershed improvement is expected to continue.

Fisheries and stream enhancement projects have been initiated in previous years and such activities are expected to continue. These include installing large woody debris structures in mainstem channels, replacing culverts on fish bearing streams with bridges, removing roads originally built in streamside areas, rocking roads near streams, upgrading existing roads, and removing unnecessary crossings on fish bearing streams. All these projects are designed and carried out to improve existing conditions or to mitigate potential adverse conditions.

GDRCo has a federally-approved AHCP for six aquatic species (USFWS/NMFS 2006). The AHCP includes required mitigation measures and terms and conditions for operations to avoid or reduce adverse effects on federally listed threatened and endangered species. The conservation strategy for protecting aquatic species includes, among other things, protective measures for unstable areas and streamside harvesting, and road improvement schedules for its entire ownership. The Final Environmental Impact Statement for the AHCP was approved and signed on June 12, 2007. The incidental take and enhancement of survival permits issued by the USFWS and NMFS under Section 10(a) of the Endangered Species Act became effective on July 1, 2007.

Conclusions—Use and maintenance of existing roads would cause occasional noise and disturbance within the existing road corridor. Road maintenance that has the potential to affect listed species would be conducted in compliance with terms and conditions or BMPs found in Biological Opinions issued by USFWS and NMFS to avoid or reduce adverse effects on listed wildlife or fish species, and their designated critical habitat.

Non-Impairment of Threatened and Endangered Species in the Park—Use and maintenance of existing roads under the proposed action, and the no action alternative, would cause short-term, occasional noise but this effect would not cause an impairment to threatened or endangered species in the park because the existing roads do not affect habitat for listed species.

Constructing, upgrading, or rebuilding roads in or outside the parks under Alternative 3 would occur in second-growth forest on previously logged lands. There would be no effects on marbled murrelets from construction in second-growth forest. Potential adverse effects on northern spotted owls from removal of 25 acres of second-growth forest in the park suitable for foraging would be minor because of the quantity of similar habitat throughout the park. None of the roads to be constructed would be near streams, except at stream crossings. Roads would be constructed using best management practices to avoid indirect effects to listed fish species in streams downslope of the project area. Therefore, none of the alternatives including the road construction alternative would impair threatened or endangered species in the park.

There would be no impacts to threatened terrestrial species from use and maintenance of existing roads through second growth forest under any of the alternatives. Indirect impacts on listed threatened fish species from culvert replacements on existing roads would be minimized through best management practices and terms and conditions in NMFS biological opinion for periodic and annual road maintenance (NMFS 2003). Roads to be constructed or re-opened under Alternative 3 would be located in second growth forest and would cross stream reaches that are not occupied by listed fish. Indirect impacts on listed fish from construction of new stream crossings would be minimized by best management practices and terms and conditions in biological opinions that would be required for such construction in the park,

or that have been issued to GDRCo through the planning process for the approved HCP/AHCP. These impacts would be negligible and have been determined to be acceptable.

Effects on Cultural Resources

Methodology for analyzing effects—Cultural Resources are defined as archeological resources, prehistoric or historic structures, cultural landscapes, traditional cultural properties, and museum objects. These resources are called "Historic Properties" when they are either listed in or are determined eligible for listing on the National Register of Historic Places under §106 of the National Historic Preservation Act (36 CFR 800, *Protection of Historic Properties*). Criteria for determining eligibility of listing such resources on the National Register include the following:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of significant persons in or past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded or may be likely to yield, information important in history or prehistory.

Potential impacts to historic properties either listed in or eligible to be listed in the National Register of Historic Places for this project were identified and evaluated in accordance with the Advisory Council on Historic Preservation's regulations implementing §106 of the National Historic Preservation Act (36 CFR 800, *Protection of Historic Properties*) by (1) determining the area of potential effects; (2) identifying resources present in the area of potential effects that are National Register listed or eligible; (3) applying the criteria of adverse effect to affected resources; and (4) considering ways to avoid, minimize or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of *no historic properties affected*, *adverse effect*, or *no adverse effect* must be made for historic properties. A determination of *no historic properties affected* means that either there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them (36 CFR 800.4(d)(1)). An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register, e.g. diminishing the integrity (or the extent to which a resource retains its historic appearance) of its location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternatives that would occur later in time, be farther removed in distance or be cumulative (36 CFR 800.5(a)(1)). A determination of *no adverse effect* means there is an effect, but the effect would not meet the criteria of an adverse effect, i.e. diminish the characteristics of the cultural resource that qualify it for inclusion in the National Register (36 CFR 800.5(b)).

Thus, the criteria for characterizing the severity or intensity of impacts to National Register listed or eligible archeological resources, prehistoric or historic structures, cultural landscapes, and traditional cultural properties are the §106 determinations of effect: *no historic properties affected*, *adverse effect*, or *no adverse effect*. A §106 determination of effect is included in the conclusion section for analysis of impacts to each National Register listed or eligible cultural resource.

Alternative 1: No Action—There are six known archeological resources in the project area. Five of these are prehistoric archeological sites and one is an early 20th century trash deposit associated with logging. The Bald Hills Road transects the Lyons Ranches Rural Historic District, and the Bald Hills Archeological District. Under the no action alternative, roads would continue to be maintained by occasional brushing, tree limbing, grading and graveling. Grading and graveling would be limited to the existing driving surface. No widening would be permitted.

Overall, the no action alternative would result in negligible adverse impacts to cultural resources. Under Section 106 of the National Historic Preservation Act, this activity will have no adverse affect to historic properties in the project area including CA-HUM-443, CA-HUM-452, CA-HUM-480, CA-HUM-525, CA-HUM-669, CA-HUM-709H, or the Lyons Ranches Historic District. A confidential report has been prepared under separate cover for review by the California SHPO that details these findings.

If GDRCo proposes maintenance activities on NPS land beyond grading or graveling of the existing driving surface; minor brushing; or tree limbing, NPS staff will review such proposed maintenance activities prior to implementation. If the projects have the potential to affect significant cultural resources (including but not limited to archeological sites, historic structures, cultural landscape features, or resources of ethnographic significance) or when proposed maintenance may have an adverse affect on cultural resources (i.e., historic properties), NPS will consult with the California SHPO in compliance with Section 106 NHPA and its implementing regulations 36 CFR 800.

Alternative 2: Exchange Rights-of-Ways (Proposed Action, Environmentally Preferred Alternative)— Impacts to cultural resources from the proposed action would be the same as for the no action alternative. Continued use and maintenance of existing access roads would result in negligible adverse impacts to cultural resources. Efforts to protect significant cultural resources (historic properties) would be the same as for the no action alternative.

Alternative 3: Construct Roads—No inventory for cultural resources has been conducted in areas where proposed roads would be constructed. Proposed road locations are in areas considered sensitive for archeological resources. Therefore, impacts to cultural resources under Alternative 3 could be adverse. Construction of new roads could result in major long-term adverse impacts to cultural resources. Any new construction on NPS land would require further consultation with Tribes and the California SHPO in compliance with Section 106 NHPA and its implementing regulations 36 CFR 800.

Cumulative Effects on Cultural Resources—Cultural resources throughout the remainder of the parks would be unaffected by the proposed action. Densely forested lands within the park and in GDRCo ownership that were harvested for timber are considered to have low cultural sensitivity for archeological resources, ethnographic resources or historical resources. Sensitive cultural areas are generally associated with ridges that served as trail routes, open prairies, oak woodlands, streams and especially the mouths of Redwood Creek and the Klamath River because these areas were more easily accessible by foot, boat, or horseback, and because the primary food sources such as acorns, shellfish, salmon, and elk were found in these areas.

Adverse effects on cultural resources in the park occurred with prior timber harvesting and ranching; construction of roads, industrial, commercial, and residential development; and agricultural development. Some of these developments that retained their original integrity have been determined eligible for listing on the National Register of Historic Places. Since Alternative 3 would result in new road construction in archeologically sensitive areas, this alternative could contribute to cumulative adverse effects on cultural resources.

Cultural resources on GDRCo land are addressed through a records check and survey prior to any CEQA-approved activity.

Conclusions—Under the terminology of Section 106 of the National Historic Preservation Act, no adverse affect to historic properties determined eligible for or listed on the National Register of Historic Places is expected from the proposed project

Non-Impairment of Cultural Resources in the Park—Existing roads traverse areas that have been affected by logging and original road building. Any prehistoric archeological sites within road corridors

or logged areas have been affected by ground disturbance. Use and maintenance of existing roads in existing disturbance corridors would not affect significant cultural resources. Therefore, no significant cultural resources would be impaired by the proposed action or under the no action alternative.

There would be no impacts to significant cultural resources from use or maintenance of existing roads under any of the alternatives, nor are impacts to cultural resources anticipated from construction or re-opening of any of the roads. Therefore, none of the alternatives would have unacceptable impacts on cultural resources.

Effects on Visitor Use and Experience, including Soundscapes and Visual Quality
There would be no effect on visitors from either park or GDRCo use of roads because these roads are not open to the public for private vehicle use.

Timber harvest is a common land use practice in the Pacific Northwest, and areas of active logging and timber of various age classes are readily visible from roads and highways. Roads providing access to the park and throughout the region are commonly used for the transportation of forest products including logs and lumber. Traffic levels associated with the logging industry depend on the level of timber harvest activity, the season and weather, and economic factors.

Public roads in the project area include U.S. Highway 101 and the Highway 101 Bypass along the southern and middle portions of the park, and Bald Hills Road. The Bald Hills Road provides access for park visitors to Lady Bird Johnson Grove, the Tall Trees Grove, scenic overlooks, and trails along the Bald Hills to natural and cultural features. The Highway 101 Bypass skirts the easternmost boundary of the park; there are no visitor facilities or access to park features from the Bypass.

State FPRs (14CCR 913.1(a)(6)) require that, "Special consideration for aesthetic enjoyment shall be given to selection of silviculture treatments and timber operations within 200 feet of the edge of the traveled surface of any permanent road maintained by the County, or the State." FPRs (14CCR 913.4 (a)) also require that timber harvest operations be compatible with the objective for which a special area, such as a national park, was established. These requirements are enforced through the THP review and approval process that considers the biological and visual effects of the proposed harvest operations.

Alternative 1: No Action—There would be no direct effect on park visitors under the no action alternative because the NPS and GDRCo roads considered in the ROW exchange would not be open to visitor use. Under the no action alternative, visitors using the Bald Hills Road would occasionally pass empty and loaded logging trucks, as well as through-traffic traveling from U.S. Highway 101 to Weitchpec and State Route 96. The effect on visitors from logging traffic on the Bald Hills Road would be short-term while they are driving or in one of the parking areas along the road, repeated over the long-term but on different drivers, and direct. Some visitors would not be affected by driving on a narrow winding road with logging truck traffic while other visitors might be bothered by sharing the road with large trucks. The rough unpaved sections along the ridgetop through the prairies and the steep sharp curves on the west end of the Bald Hills Road are more distressing for some drivers than encountering large logging trucks along the less-winding and more open sections of road between Williams Ridge and the T170 Road. The overall effect on visitors would be negligible because drivers must share all roads with large vehicles occasionally and are very likely to have encountered large commercial and RVs on narrow winding sections of U.S. Highway 101 in order to get to the Bald Hills Road.

Alternative 2: Exchange of Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—Effects on visitors and the visitor experience under the proposed action are the same as those under the no action alternative.

Alternative 3: Construct Roads—Roads that would be constructed or rebuilt under Alternative 3 would not affect visitors because the roads would not be open to public use. The effect on visitors from logging traffic on the Bald Hills Road would be the same as under the no action alternative or the proposed action.

Cumulative Effects on Visitor Use and Experience in the Park: Visitors would not be affected under any of the alternatives because the roads considered in the ROW exchange are closed to public use. The level of traffic is expected to be the same as it has since the 1978 park expansion. It will vary through time by the amount of timber harvest activity in the area, which is determined by economic factors outside the scope of the NPS or GDRCo.

The Bald Hills Road is the primary access route to the prairies and grasslands that are the focus of the park's prescribed fire program. Prescribed fires are generally conducted in September and October. During prescribed fire operations, the park posts traffic control to warn visitors of smoke along the road. Smoke from prescribed fires obscures visibility temporarily and reduces the long-distance views, which are one of the prime resource values of the Bald Hills. The effect on visual quality and viewsheds from smoke from prescribed fires is temporary, repeated annually, adverse and minor to moderate.

Areas of timber harvest will continue to be visible from public and park roads. The visual effects will be minimized by requirements in the FPRs.

Conclusions: There would be no effect on park visitors from GDRCo use of park roads under either the no action alternative or the proposed action because these roads are closed to visitor use. There would continue to be negligible to minor adverse effects on the soundscape in the vicinity of old growth forest along portions of the Bald Hills Road between Holter Ridge and Lady Bird Johnson Grove from logging truck traffic.

Non-Impairment of Visual Quality and Soundscapes in the Park: There would be no new effects on soundscapes under any of the alternatives. The current soundscape in the vicinity of the Bald Hills Road is affected by traffic on the public road but the effect is temporary as traffic passes. The soundscape of this portion of the park would not be impaired under any of the alternatives.

All existing roads that would be subject to the right-of-way exchange pass through previously logged areas that are considered to be of lower visual quality than the old growth forest in unlogged park lands. Roads that would be constructed would be located in or adjacent to second growth forest in the park in areas that are not open to visitor use. Noise from use of existing roads off the Bald Hills Road would be at the same duration and intensity of the noise generated by the same vehicles using the Bald Hills Road. Noise from use of other roads is generated in areas not open to park visitors or areas immediately adjacent to GDRCo lands on which timber harvest is permitted. These impacts on visual quality and the soundscape are judged to be acceptable.

Effects on Park Operations

Alternative 1: No Action—Under this alternative, park staff would continue to use the 22 miles of GDRCo roads to access portions of the west side of Redwood Creek. GDRCo would maintain the 1.2 miles of park roads that GDRCo uses to access their lands.

Alternative 2: Exchange of Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—Effects on park operations under the proposed action would be the same as under the no action alternative.

Alternative 3: Construct Roads—Under this alternative, there would be additional costs for road construction and maintenance, and travel time for park employees. NPS would assume maintenance responsibilities for the 1.2 miles of roads that GDRCo currently maintains.

Cumulative Effects on Park Operations—Costs associated with travel for resource management and maintenance operations on the west side of Redwood Creek would increase slightly because the new road system constructed in the park would be longer than the roads currently used. Costs associated with road maintenance would increase because GDRCo would no longer maintain the park roads for which ROWs would be exchanged.

Conclusions—There would be no adverse effects to park operations under the no action or proposed alternatives, because NPS would use GDRCo's existing roads, and no roads would be constructed, reconstructed or upgraded on park lands. There would be adverse effects on park operations if the NPS had to build a new road system to access park lands on the west side of Redwood Creek. The adverse effect could be minor to moderate and short-term to long-term depending on whether new funds became available for construction of the new road system. Increased maintenance costs would be a moderate long-term adverse effect as maintenance costs increase annually and repeat on a regular basis.

Socioeconomic Effects

Alternative 1: No Action–Under this alternative, GDRCo would continue to use and maintain 1.2 miles of existing roads that cross park lands under the general agreement allowing reciprocal road use, provided the general agreement is successively renewed in perpetuity. This alternative would not provide certainty and stability for planning for future operations and transportation costs for GDRCo. Long-term transportation costs would be lower for GDRCo under this alternative than under the road-construction alternative (Alternative 3) because the travel distance would be minimized.

Alternative 2: Exchange Rights-of-Way (Proposed Action, Environmentally Preferred Alternative)—A ROW across 1.2 miles of park lands would provide GDRCo certainty and stability in planning for future operations and transportation costs for transporting logs to market. The 1.2 miles of the eight road segments that would be included in the ROW are the shortest route between the GDRCo's operations in the uplands areas along Bald Hills and the Bald Hills Road for access to timber markets to the north and south of Orick along U.S. Highway 101. Long-term transportation costs would be the same as under the no action alternative.

Alternative 3: Construct Roads—Under this alternative, GDRCo would build a new all-season road system about 40 miles in length to access its lands on the south side of the Klamath River watershed (Figures 3 and 4). This new road system would parallel the Bald Hills Road and Holter Ridge and be used in lieu of the 1.2 miles of road that cross park lands and connect GDRCo's lands to the Highway 101 Bypass and Bald Hills Road. Of the 40 miles, GDRCo would build about six miles of new all-season roads and would upgrade about 34 miles of existing roads to mainline road standards.

The new road system would have less direct access to the Highway 101 Bypass and the Bald Hills Road than currently exists with use of roads that cross park lands. Johnson Road and Robbers Gulch Road would be the only direct access to the Bald Hills Road (Figure 3). The County Line Road would be the only direct access to the Highway 101 Bypass (Figure 4). The round-trip transportation distance for areas south of Cal-Barrel Road would increase at least 16 miles. The round-trip transportation distance for areas along the Bald Hills Road would increase, on average, by at least ten miles. Overall, transportation costs would be expected to be about 40 times higher for GDRCo to drive along 40 miles of new road compared to 1.2 mile of existing road.

Cumulative Effects—Under either the no action alternative or the proposed action, future timber markets in Hoopa or Willow Creek might develop with increasing population. These markets would be more financially feasible if GDRCo has continued access to the Bald Hills Road under both the no action and proposed action alternative for use of the existing short spur roads.

Maintenance costs under the Road Construction alternative would increase slightly because GDRCo would have an additional 40 miles of road to maintain. The frequency of maintenance for mainline roads would be greater than standard all-season or seasonal roads. Travel costs for all aspects of timberland management would increase because of the greater driving distance workers would have to travel.

Conclusions—There would be no adverse effects to GDRCo operations under the no action alternative unless a general agreement could not be renewed after the current agreement expires.

There would be no adverse effects on GDRCo operations under the proposed alternative, because NPS and GDRCo would continue using each other's roads in perpetuity. No new roads would be needed and transportation and maintenance costs would remain at current levels.

Under Alternative 3, there would be adverse effects on GDRCo's operations from reduced access to its lands and higher construction and maintenance costs. Construction of the new road system would be a one-time cost. Adverse effects associated with increased road construction would be minor to moderate and short-term because road construction is an expected business expense for commercial timberland management. Adverse economic effects associated with road maintenance would be minor and long-term, because the cost of maintaining new roads and the added frequency of road maintenance due to increased use would likely be small relative to GDRCo's entire road maintenance budget. These costs would be repeated over the long-term. The adverse effects from increased travel distance and time for all aspects of timberland management would be moderate and long-term. Transportation is a major part of managing commercial timberlands. Transportation costs are expected to increase and are repeated on a regular basis.

List of Preparers
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Greg Bundros, Geologist, Redwood National Park, Arcata, CA.
Aida Parkinson, Environmental Specialist, Redwood National Park, Orick, CA.

Consultation and Coordination
Gregory Gress, Chief, Lands Program Center, National Park Service, Pacific-West Region, Oakland, CA.
Keith Hamm, Wildlife Biologist, Green Diamond Resource Company, Korbel, CA.
Baker Holden, Fish Biologist, Redwood National Park, Orick, CA.
Eric Schallon, Registered Professional Forester, Green Diamond Resource Company, Korbel, CA.
Kristin Schmidt, Wildlife Biologist, Redwood National Park, Orick, CA.

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Appendix A – Scoping Letter

United States Department of the Interior
California Department of Parks and Recreation

Redwood National and State Parks
1111 Second Street
Crescent City, California 95531

L1425 (GDRC ROW)

October 18, 2006

Dear Interested Party:

The National Park Service (NPS) is preparing an environmental assessment (EA) on a proposal to grant deeded rights-of-way (ROWs) to Green Diamond Resource Company (GDRC) for use of certain existing roads in Redwood National Park in exchange for ROWs from GDRC for park use of certain existing GDRC roads. All roads are located in Humboldt County.

The NPS is seeking your comments to help us identify issues, concerns, or opportunities associated with this proposal. This letter describes the proposal, and the environmental review process.

What Is Proposed
The NPS proposes to convey deeded ROWs to GDRC for use of a total of 1.12 miles of road on portions of eight different, existing roads in Redwood National Park in exchange for deeded ROWs for NPS use of a total of 22.34 miles of road on portions of seven, different existing roads owned by GDRC (Figure 1).

Seven of the eight park roads connect the Bald Hills Road to existing GDRC roads in the Klamath River watershed. Bald Hills Road, a public road owned and maintained by Humboldt County, is located on the east side of Redwood Creek along the ridge separating the Redwood Creek and Klamath River watersheds. The eighth road, Cal-Barrel Road, connects U.S. Highway 101 with GDRC roads on the east side of Holter Ridge, which separates the Prairie Creek and Klamath River watersheds. These roads would be used by GDRC for commercial forest management operations.

In exchange for use of NPS roads, GDRC would grant deeded ROWs to the NPS for routine use of 5.54 miles of six existing roads located on the ridgeline that separates the Redwood Creek and Maple Creek watersheds. These roads provide the only vehicle access to the southwestern portion of the national park. They would be used by the NPS for on-going resource protection and management activities. GDRC also would grant ROWs to the NPS for limited use of 16.80 miles of additional roads across GDRC lands. These roads include the remaining portions of the BL1000 Road from U.S. Highway 101 at Big Lagoon to the BL1700 Road, and the BL2000 and CR2000 roads from the BL2013 Road to Crannell. Road use would be limited to the NPS and its

contractors for transport of large earthmoving equipment and trucks for road maintenance, watershed restoration, and fire management in the national park. All ROWs granted by GDRC would not provide for public use.

Why This Action Is Needed

The purpose of the ROWs exchange is to provide the shortest route to lands owned by each party using existing roads and to avoid constructing new roads that could result in adverse effects to natural and cultural resources, and in increased construction and maintenance costs to both the NPS and GDRC.

The NPS and GDRC have allowed for the reciprocal use of certain roads through a series of special use permits or general agreements since 1983. Neither special use permits nor general agreements are sufficient permitting instruments because of the perpetual need of both parties for use of specific roads for management of their respective resources.

How to Participate in the Process

We are currently conducting public scoping to identify issues and information needed to assess the environmental effects of the proposed action. Your early involvement in the process will help us to determine the environmental issues and alternatives to be addressed in the EA. The EA will be distributed to interested or affected persons, organizations, agencies, and tribes for review and comment. The NPS will make a final decision on the proposed action at the end of the review period after considering all comments.

Please send any issues or other pertinent information in writing by November 30, 2006 to Superintendent, Redwood National and State Parks, 1111 Second Street, Crescent City, California 95531. If you have further questions regarding this project, please contact Greg Bundros at 707-825-5145 or via e-mail at greg_bundros@nps.gov.

If you know anyone who might be interested in this project, please have them contact us. We appreciate your participation in this important project to minimize adverse effects on park resources while furthering cooperation with local landowners.

Sincerely,

Amy Caldwell
Acting Superintendent

Enclosure

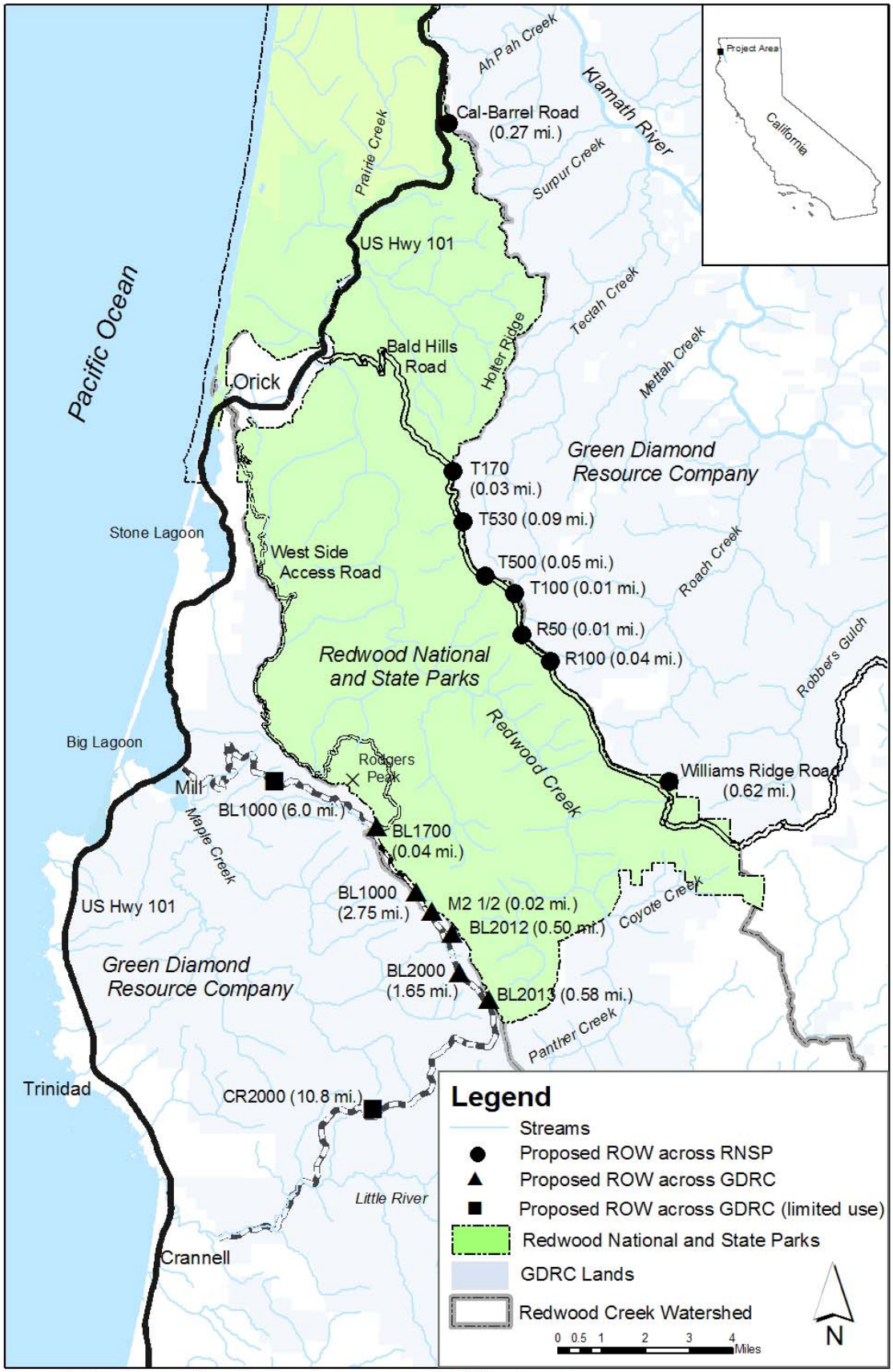

Figure 1. Location and length of roads in proposed ROW exchange.

Appendix B – Public Involvement

The following elected officials, tribes, agencies, interested parties, organizations, and businesses received this document in its entirety or a letter (denoted by an asterisk*) announcing that the document was available for review and comment.

Congressman Mike Thompson
State Senator Patricia Wiggins
State Senator Sam Aanestad
Assemblywoman Patty Berg
Del Norte County Board of Supervisors
Humboldt County Board of Supervisors

Big Lagoon Rancheria
Elk Valley Rancheria
Hoopa Valley Tribe
Resighini Rancheria
Smith River Rancheria
Tolowa Nation
Trinidad Rancheria
Yurok Tribe

Bureau of Land Management, Arcata Resource Area
California Department of Fish and Game
California Department of Forestry and Fire Protection
California State Historic Preservation Office
City of Arcata*
Humboldt County Department of Public Works
Humboldt State University, Department of Forestry
National Marine Fisheries Service, Arcata
North Coast Regional Water Quality Control Board
Orick Community Service District
Orick Chamber of Commerce
United States Fish and Wildlife Service, Arcata Fish and Wildlife Office
United States Forest Service, Six Rivers National Forest

California Coastal Conservancy
California Native Plant Society*
California Trout
Blue Ribbon Coalition
Friends of Del Norte*
Mattole Restoration Council*
National Parks Conservation Association
Northcoast Environmental Center
Pacific Coast Fish, Wildlife and Wetlands Restoration Association*
Redwood Community Action Agency*
Redwood Regional Watershed Center*
Save-The-Redwoods League

Sierra Club, North Group
Siskiyou Project*
Smith River Alliance
The Nature Conservancy
Western Lands Project

Del Norte County Public Library, Crescent City
Humboldt County Public Library, Eureka
Humboldt County Public Library, McKinleyville
Humboldt State University Library, Arcata

Arcata Eye Newspaper*
Crescent City Daily Triplicate*
Eureka Reporter*
Eureka Times-Standard*
McKinleyville Press*

Appendix C - Animals Surveyed by GDRCo for THPs

Fish

- Coastal cutthroat trout, *Oncorhynchus clarki*– CDFG California Species of Special Concern (CSC)
- Coho salmon, *Oncorhynchus kitsutch*–State Threatened (ST), Southern Oregon Northern California Coast ESU Federally Threatened (FT)
- Chinook salmon, *Oncorhynchus tshawytscha*–CSC, California Coastal ESU FT
- Steelhead trout, *Oncorhynchus mykiss irideus*–summer steelhead CSC, Northern California ESU FT

Amphibians

- Del Norte salamander, *Plethodon elongatus*–CSC
- Southern torrent salamander, *Rhyacotriton variegatus*–CSC
- Tailed frog, *Ascaphus truei*–CSC
- Northern red-legged frog, *Rana aurora*–CSC

Reptiles

- Western pond turtle, *Clemmys marmorata*–CSC

Birds

- Marbled murrelet, *Brachyramphus marmoratus*–State Endangered, FT, State Board of Forestry Sensitive Species (BOF)
- Great blue heron, *Ardea Herodias*–BOF
- Ruffed grouse, *Bonasa umbellus*–CSC
- Sharp-shinned hawk, *Accipiter striatus* (nesting)–CSC
- Cooper's hawk, *Accipiter cooperii* (nesting)–CSC
- Northern goshawk, *Accipiter gentilis* (nesting)–CSC, BOF
- Bald eagle, *Haliaeetus leuocephalus* (nesting & wintering)–State Fully Protected (SFP), BOF
- Golden eagle, *Aquila chrysaetos* (nesting and wintering)–CSC, SFP, BOF
- Osprey, *Pandion haliaetus* (nesting)–CSC, BOF
- Northern spotted owl, *Strix occidentalis caurina*–FT, BOF
- Purple martin, *Progne subis* (nesting)–CSC

Mammals

- Red tree vole, *Arborimus longicaudus* (north of the Klamath River)–CSC
- Red tree vole, *Arborimus pomo* (south of the Klamath River)–CSC
- Black bear, *Ursus americanus*–no agency status
- American (Humboldt) marten, *Martes americana humboldtensis*–CSC
- Pacific fisher, *Martes pennanti pacificus*–CSC, Federal candidate for listing