WILDLIFE BIOLOGICAL EVALUATION AND SPECIALIST REPORT FOR THE VILLAGE AT WOLF CREEK ACCESS PROJECT ENVIRONMENTAL IMPACT STATEMENT, RIO GRANDE NATIONAL FOREST, MINERAL COUNTY, COLORADO

Prepared for:

U.S. Forest Service
Rio Grande National Forest
Divide Ranger District
13308 West Highway 160
Del Norte, Colorado 81132

and

Western Ecological Resource
711 Walnut Street
Boulder, Colorado 80302

September, 2013

WILDLIFE BIOLOGICAL EVALUATION AND SPECIALIST REPORT FOR THE WOLF CREEK ACCESS ENVIRONMENTAL IMPACT STATEMENT, RIO GRANDE NATIONAL FOREST, MINERAL COUNTY, COLORADO

Prepared for:

U.S. Forest Service
Rio Grande National Forest
Divide Ranger District
13308 West Highway 160
Del Norte, Colorado 81132

And

Western Ecological Resource
711 Walnut Street
Boulder, Colorado 80302

Prepared by:

Jerald M. Powell, Certified Ecologist, Certified Wildlife Biologist
Wildlife Specialties LLC
PO Box 1231
Lyons, Colorado 80504

And

Richard W. Thompson, Certified Wildlife Biologist
Western Ecosystems, Inc.
905 West Coach Road
Boulder, Colorado 80302

Reviewed and Approved by:

_____/s/ Randy Ghormley__09/24/2013_____
Randy Ghormley, Date
Rio Grande National Forest Wildlife Biologist

_____ _ /s/ Barry Wiley 09/24/2013_____
Barry Wiley, Date
Rio Grande National Forest Fisheries Biologist

Table of Contents

WILDLIFE BIOLOGICAL EVALUATION i
AND SPECIALIST REPORT FOR i
THE Village at WOLF CREEK ACCESS Project i
ENVIRONMENTAL IMPACT STATEMENT, ... i
RIO GRANDE NATIONAL FOREST, ... i
MINERAL COUNTY, COLORADO i
1.0 INTRODUCTION 9
2.0 PROPOSED MANAGEMENT ACTION AND ALTERNATIVES 10
2.1 purpose and need 10
2.1.1 Alternative 1. No Action 11
2.1.2 Alternative 2. Land Exchange (Proposed Action) 11
2.1.3 Alternative 3. ANILCA Road ACCESS 12
3.0 DEVELOPMENT ASSUMPTIONS 12
3.1 Development Concepts for Action Alternatives 12
3.1.1 Alternative 2: Land Exchange 13
3.1.2 Alternative 3. ANILCA Road ACCESS 15
3.2 Project Design Criteria Common to All Action Alternatives 17
3.3 Mitigation Measures and Monitoring Requirements 18
3.3.1 Mitigation Measures 18
3.3.2 Monitoring Requirements 20
3.4 Identification of the Preferred Alternative 21
3.5 Projects and activities that are part of the environmental baseline 21
3.6 Reasonably Foreseeable Projects That May Contribute To Cumulative Effects 21
3.6.1 Ongoing Operations at Wolf Creek Ski Area 21
3.6.2 Saddle Brook 23
3.6.3 Big Reservoir Timber Salvage 24
3.6.4 Table Salvage Timber Sale 24
3.6.5 Pass Creek Yurt 24
3.6.6 Wolf Creek Pass Weather Station 24

3.6.7 Spruce Beetle Effects on Habitat 24
3.6.8 West Fork Fire Complex....25
3.6.9 Climate Change....26
3.6.10 Reasonably Foreseeable Future Actions under NEPA 26

4.0 DESCRIPTION OF THE ANALYSIS AREA 27
4.1 existing conditions 28
4.1.1 Disturbance Areas....28
4.1.2 Project site....29

5.0 R2 SENSITIVE SPECIES SURVEY INFORMATION 29

6.0 ENVIRONMENTAL BASELINE AND EFFECTS OF THE PROPOSED ACTION ON R2 SENSITIVE SPECIES EVALUATED 30
6.1 HOARY BAT, *Lasiurus cinereus*....36
6.2 American Marten, *Martes americana*....39
6.3 Northern Goshawk, *Accipiter gentilis*....43
6.4 AMERICAN peregrine falcon, *Falco peregrinus anatum* 47
6.5 White-tailed Ptarmigan, *Lagopus leucurus*....49
6.6 Boreal Owl, *Aegolius funereus* 50
6.7 Olive-sided Flycatcher, *Contopus cooperi* 55
6.8 Boreal Western Toad, *Bufo boreas boreas*....59
6.9 Northern Leopard Frog, *Rana pipiens* 62
6.10 Rio Grande Cutthroat Trout, *Oncorhynchus clarkii virginalis*....65
6.10.1 Life History and Background Information 65
6.10.2 Forest-Level Information....69
6.10.3 Project-Level Information....70
6.10.4 Project Effects....71
6.10.5 Project Consistency with Key Monitoring Questions and Strategies 74
6.10.6 Project Consistency with Forest Plan MIS Objectives 75
6.10.7 Rio Grande Cutthroat Trout Summary 76

7.0 R2 SENSITIVE SPECIES DETERMINATION SUMMARY 76

8.0 Management indicator species....77
8.1 Rocky Mountain Elk, *Cervus elaphus* 81
8.1.1 Life History and Background Information 81
8.1.2 Forest-Level Information....83
8.1.3 Project-Level Information....85
8.1.4 Project effects....87
8.1.5 Project Consistency with Key Monitoring Questions and....89
Strategies....89
8.1.6 Project Consistency with Forest Plan MIS Objectives 90
8.1.7 rocky mouintain elk summary 90
8.2 Mule Deer, *Odocoileus hemionus*....90
8.2.1 Life History and Background Information 91
8.2.2 Forest-Level Information....93
8.2.3 Project-Level Information....95

8.2.4 Project effects....96
8.2.5 Project Consistency with Key Monitoring Questions and....98
Strategies....98
8.2.6 Project Consistency with Forest Plan MIS Objectives....99
8.2.7 mule deer summary....99
8.3 Wilson's Warbler, *Wilsonia pusilla*....99
8.3.1 Life History and Background Information....99
8.3.2 Forest-Level Information....100
8.3.3 Project-Level Information....102
8.3.4 Project effects....103
8.3.5 Project Consistency with Key Monitoring Questions and....104
Strategies....104
8.3.6 Project Consistency with Forest Plan MIS Objectives....105
8.3.7 Wilson's warbler summary....106
8.4 Lincoln's Sparrow, *Melospiza lincolnii*....106
8.4.1 Life History and Background Information....106
8.4.2 Forest-Level Information....107
8.4.3 Project-Level Information....109
8.4.4 Project effects....109
8.4.5 Project Consistency with Key Monitoring Questions and....111
Strategies....111
8.4.6 Project Consistency with Forest Plan MIS Objectives....111
8.4.7 Lincoln's sparrow summary....111
8.5 Brown Creeper, *Certhia familiaris*....111
8.5.1 Life History and Background Information....112
8.5.2 Forest-Level Information....112
8.5.3 Project-Level Information....114
8.5.4 Project effects....115
8.5.5 Project Consistency with Key Monitoring Questions and....116
Strategies....116
8.5.6 Project Consistency with Forest Plan MIS Objectives....117
8.5.7 Brown creeper summary....118
8.6 Hermit Thrush, *Catharus guttatus*....118
8.6.1 Life History and Background Information....118
8.6.2 Forest-Level Information....119
8.6.3 Project-Level Information....120
8.6.4 Project effects....121
8.6.5 Project Consistency with Key Monitoring Questions and....122
Strategies....122
8.6.6 Project Consistency with Forest Plan MIS Objectives....123
8.6.7 Hermit thrush summary....123
8.7 Rio Grand Cutthroat Trout, *Oncorhynchus clarki virginalis*....123
8.8 Brook Trout, *Salvelinus fontinalis*....123
8.8.1 Life History and Background Information....124
8.8.2 Forest-Level Information....128
8.8.3 Project-Level Information....130

8.8.4 Project effects....131
8.8.5 Project Consistency with Key Monitoring Questions and....132
Strategies....132
8.8.6 Project Consistency with Forest Plan MIS Objectives....132
8.8.7 brook trout summary....132

9.0 RESIDENT AND NEOTROPICAL MIGRATORY LANDBIRDS....132
9.1 Summary of Effects of Alternatives on Migratory Birds....137

10.0 REFERENCES AND DATA SOURCES....141

11.0 FIGURES....163

12.0 APPENDICES....177
12.1 Project Design Criteria....177
12.2 Structure Class And Habitat Structural Stage....178
12.3 DETAILS OF DEVELOPMENT CONCEPTS....179

LIST OF TABLES

Table Page

Table 4-1. Vegetation Types and Acreage Within the 504.3-acre Village at Wolf Creek Project Site. 27

Table 4-2. Vegetation Types and Acreage Within the 504.3-acre Village at Wolf Creek Project Site by Alternative and Parcel. 27

Table 6-1. Region 2 Forest Service sensitive terrestrial and aquatic wildlife species for the Rio Grande National Forest. 31

Table 6-2. Alternative 2 Land Exchange Direct NFS Acreage Gain/Loss 34

Table 6-3. Alternative 2 and 3 Effects (Acres) by Habitat Type and Alternative and Development Concept[a]35

Table 7-1. Determination summary of Village at Wolf Creek Access EIS alternative effects on R2 sensitive animal species potentially present on the RGNF. 77

Table 8-1. Management Indicator Species for the Rio Grande National Forest. 78

Table 8-2. Acreage of Occupied and Potential Management Indicator Species (MIS) Habitat That Could Be Indirectly Affected by Alternatives 1-3 on NFS and Private Lands. 80

Table 9-1. FWS Birds of Conservation Concern for BCR 16 and the Anticipated Effect of the Proposed Action Upon Their Conservation Needs[a]. 134

Table 9-2. Species of the Southern Rocky Mountains Province and the Effect of Alternatives on PIF Priority Species [a]. 135

Table 9-3. Alternative 2 and 3 Effects (Acres) to PIF Species of the Southern Rocky Mountains Province by Habitat Type and Alternative and Development Concept[a]..... 136

Table 12.3-1 Development Assumptions – Alternative 2. Land Exchange 178

Table 12.3-2 Development Assumptions – Alternative 3. ANILCA Road Access 179

Table 12.3-3 General Details Common to Alternatives 2 and 3 – Moderate and Maximum Density Development Concepts..... 180

LIST OF FIGURES

Figure Page

Figure 1. Vicinity Map....163
Figure 2. Alternative 1. No Action....164
Figure 3. Parcels Owned by WCSA....165
Figure 4. Alternative 2. Land Exchange (Proposed Action)....166
Figure 5. Alternative 3. ANILCA Road Easement....167
Figure 6. Alternative 2. Land Exchange – Low Density Development Concept....168
Figure 7. Alternative 2. Land Exchange – Moderate Density Development Concept....169
Figure 8. Alternative 2. Land Exchange – Maximum Density Development Concept....170
Figure 9. At-Grade Intersection....171
Figure 10. Entry and Ski Area Access Roads....172
Figure 11. Alternative 3. ANILCA Road Easement – Low Density Development Concept....173
Figure 12. Alternative 3. ANILCA Road Easement – Moderate Density Development Concept....174
Figure 13. Alternative 3. ANILCA Road Easement – Maximum Density Development Concept....175

1.0 INTRODUCTION

United States Forest Service (USFS) Region 2 (R2) policy (Forest Service Manual [FSM] 2600 section 2670.22, 2011) provides direction on the review, actions, and programs authorized, funded, or implemented by the USFS relative to project effects on sensitive species. The Biological Evaluation (BE) is the means of conducting the review and documenting those findings, and to provide recommendations to minimize potential negative effects on sensitive species. This document contains the BE evaluating potential effects on USFS Region 2 sensitive fish and wildlife species resulting from the proposed Village at Wolf Creek Access Project. This BE will be filed under 2670 at the Forest Supervisor's Office. A separate plant BE (Western Ecological Resource 2012) has been prepared and is filed under 2670 at the Forest Supervisor's Office.

Furthermore, because of the need to address USFS Management Indicator Species (MIS) to meet NEPA and USFS requirements as part of the Proposed Action, that issue is also addressed in this Specialist Report.

This BE/Specialist Report is arranged in three chapters. The first chapter represents the Biological Evaluation (BE) evaluating potential effects on Region 2 sensitive plant and animal species and Federal candidate species resulting from the Proposed Action. USFS policy regarding BEs is stated in FS Manual 2672.4 as follows:

> "Biological Evaluation. Review all USFS planned, funded, executed, or permitted programs and activities for possible effects on sensitive species. The Biological Evaluation is the means of conducting the review and documenting the findings. Document the findings in the decision notice."

The second chapter represents the Management Indicator Species (MIS) Report addressing potential effects on all Rio Grande National Forest (RGNF) MIS resulting from the Proposed Action. The USFS (2006) identified MIS to provide a means to monitor selected actions on the Forest as required by regulation {36 CFR 219.19, 1982}. The Code of Federal Regulations {36 CFR 219.19 (a) (6)} states, "population trends of management indicator species will be monitored and relationships to habitat changes determined". The purpose of this chapter is to evaluate MIS that may be affected by the proposed project in light of known population trends with an overall objective of maintaining viable populations of all wildlife species across the Forest.

The third chapter represents the Migratory Bird Report addressing project consistency with migratory bird conservation. In 2008, the Forest Service Chief signed a Memorandum of Understanding (MOU) (#08-MU-1113-2400-264) with the U.S. Fish and Wildlife Service (FWS) to promote the conservation of migratory birds. This MOU was pursuant to Executive Order 131866, 66 Fed. Reg. 3853 (2001), Responsibilities of Federal Agencies to Protect Migratory Birds.

Forest Plan consistency related to Forest-wide ecological issues and species addressed in the BE, MIS, and Migratory Bird chapters of this report is considered to meet RGNF Forest Plan requirements.

This document is tiered to the RGNF Land and Resource Management Plan (Forest Plan) (USFS 1986 as amended 2003a) and incorporates by reference previous Village at Wolf Creek-related documents (i.e. Thompson 2005) contained in the USFS Village at Wolf Creek project file at the RGNF Supervisor's Office in Monte Vista, Colorado that are available for public review. The sections of those documents related to wildlife, along with this BE and the Forest Plan Consistency Analysis prepared for this project, constitute the technical documents that describe habitats and habitat use on and adjacent to the project site by the wildlife resources considered herein for the proposed Village at Wolf Creek Access project.

The above documents contain information on species status, distribution, and ecology derived from Colorado Natural Heritage Program (CNHP) data base maps and reports, Colorado Division of Parks and Wildlife (CPW) Wildlife Resource Information System and Natural Diversity Information System (NDIS) mapping, USFS database information, personal knowledge from Forest Service wildlife biologists, applicable scientific studies and reports, 2000-2011 field surveys by both Powell and Thompson, and other analyses cited herein. Collectively, the wildlife database used for the present analysis represents the best scientific information currently available.

In July 2010, the LMJV submitted a land exchange proposal to the RGNF. In addition to a land exchange, the LMJV requested that an easement across NFS lands be analyzed (citing the Forest Service's obligations to provide adequate access to the private inholding under ANILCA An Agreement to Initiate (ATI) was signed between RGNF Supervisor Dan Dallas and the LMJV in January 2011.

2.0 PROPOSED MANAGEMENT ACTION AND ALTERNATIVES

This section describes the alternatives that were developed to satisfy the purpose and need for the Federal action and to address the key issues identified throughout Chapter 1 of the Village at Wolf Creek Access Project EIS. Three alternatives are described: (1) the No Action Alternative; (2) the Proposed Action (Land Exchange); and (3) and Alaska National Interest Lands Conservation Act (ANILCA) Road Access Alternative. This section also identifies project design criteria common to all action alternatives, mitigation measures and monitoring requirements, potential development concepts for each Alternative, reasonably foreseeable projects that may contribute to cumulative effects, and comparison of alternatives summary. Although the development of the private property as the Village at Wolf Creek is a non-Federal action, it has the potential to cause cumulative impacts when assessed in combination with all Federal action alternatives. As such, the Village at Wolf Creek is a major consideration in the EIS.

2.1 PURPOSE AND NEED

The Purpose and Need for Action is to allow the non-Federal party to access its property as legally entitled, while minimizing environmental effects to natural resources within the project area. The legal entitlement is defined by ANILCA and Forest Service regulations as a right of access to non-Federal land within the boundaries of the NFS to secure to the owner the reasonable use and

enjoyment thereof. The non-Federal party has proposed a land exchange to satisfy their access needs in addition to their application for road access. The Forest Service is evaluating the land exchange as a means of meeting the legal requirement for access.

2.1.1 ALTERNATIVE 1. NO ACTION

Per the requirement of 40 CFR part 1502.14, a No Action Alternative has been included in the analysis to provide a baseline for comparing the effects of the Action Alternatives. By definition, the No Action Alternative represents a continuation of existing Federal and non-Federal land ownership patterns and existing management practices on these lands. Under the No Action Alternative, as illustrated by Figure 2, the Proponent has vehicular access via FSR 391 during those periods when this road is snow-free, generally mid-June through September. Under this alternative there would be no additional road access provided to the ±287.5-acre private inholding.

2.1.2 ALTERNATIVE 2. LAND EXCHANGE (PROPOSED ACTION)

The Proposed Action, as illustrated by Figure 4, is a land exchange between the Rio Grande NF and LMJV. This alternative assumes that LMJV would convey approximately ±177.8 acres of non-Federal lands to the Forest Service in exchange for approximately 204.4 acres of National Forest System (NFS) lands managed by the RGNF. The ±177.8 acres of the non-Federal exchange parcel to be conveyed to the United States encompasses the southern and western portions of the private inholding and the 204.4 acres of the Federal exchange parcel is located to the north, east and south of the private inholding. This exchange would create a private parcel of 323.4 acres, extending to Hwy 160, and therefore accommodate year-round vehicular access.

The existing Tranquility Road, which traverses a WCSA parking lot, would be extended east across NFS lands to provide access between any potential development on the private land parcel and WCSA, but would not accommodate access between Hwy 160 and the private property. Tranquility Road, however, would provide a route for emergency access.

2.1.2.1 Non-Federal Lands Proposed for Conveyance to the United States

- Township 37 North, Range 2 East, N.M.P.M., Mineral County, Colorado
- Sections 4, 5, 8 & 9: A portion of Tract 37

The non-Federal parcel is located in Mineral County east of the Continental Divide, immediately east of the WCSA and south of Hwy 160. Specifically, the parcel is approximately 18 miles southwest of South Fork and 24 miles northeast of Pagosa Springs (Figure 1). This exchange parcel is the southwestern portion of the ±287.5-acre private inholding and is surrounded by NFS lands on the south, west and a portion of the east side, and is located entirely within the WCSA Special Use Permit (SUP) boundary (Figure 4). In total, the non-Federal parcel encompasses ±177.8 acres of the ±287.5-acre private inholding. WCSA owns two parcels totaling ±9.84 acres (±9.01 acre Waterfall parcel and ±0.83 acre Tranquility parcel), which are bounded by the non-Federal parcel (Figure 3). Wolf Creek Ski Corporation has agreed to make these two small parcels available to LMJV for inclusion in the land exchange, and the acreage of these parcels is included in the acreage of the exchange parcel. Please note: the ±2.66 acres of ski area land encompassed by the *A-Way* trail parcel is not included in the land exchange.

2.1.2.2 Federal Lands Proposed for Conveyance to the Non-Federal Party

- Township 37 North, Range 2 East, N.M.P.M., Mineral County, Colorado

- Sections 3, 5, and 9: A portion thereof

The 204.4-acre irregularly-shaped Federal parcel is located north, east and south of that portion (119 acres) of the private inholding which is not proposed to be exchanged, and the northwestern portion is contiguous to Hwy 160.

2.1.3 ALTERNATIVE 3. ANILCA ROAD ACCESS

Alternative 3 is an access road across NFS lands between Hwy 160 on the north and the private inholding on the south (Figure 5). The road would be ±1,115 feet in length, be within a 100 foot corridor and have a total area of ±2.56 acres. Alternative 3 meets the Purpose of and Need for Action and fulfills the Forest Service's obligations under ANILCA, which is to provide adequate access to non-Federally owned land to secure to the owner the reasonable use and enjoyment thereof. The area of the private inholding included in this alternative is approximately ±288.3 acres. As with Alternative 2, the existing Tranquility Road would be extended east across NFS lands to provide access between the inholding and WCSA, but would not accommodate access between Hwy 160 and the inholding. Tranquility Road would also provide a route for emergency access.

3.0 DEVELOPMENT ASSUMPTIONS

For analytical purposes, the following assumptions as provided by the Proponent will be used to analyze the effects of the development concepts.

3.1 DEVELOPMENT CONCEPTS FOR ACTION ALTERNATIVES

The Forest Service has no authority to regulate the degree or density of development on private land and would therefore defer to Mineral County to regulate use and development of LMJV's private lands in the future. The Forest Service's legal obligation is to accommodate the private landowner with access considered to be adequate with respect to reasonable use and enjoyment of the property. However, there is not presently a PUD approved by Mineral County for any level of development of the private lands, and the level of any future development that may be approved by Mineral County is unknown. Therefore, a range of development concepts – from low to moderate to maximum – has been evaluated for each Action Alternative with the assumption that this range of development would likely encompass any potential development concept approved by Mineral County in the future.

The low density development concept has been designed to access future development of the private property to that which is permissible under current state law. Colorado Revised Statue (C.R.S.) Section 30-28-101(10)(b) provides an exemption from subdivision regulations, and the subsequent need for County review, for land which is divided into parcels of 35 acres or greater, with maximum development of one home (in addition to accessory dwelling units) on each lot. Commonly referred to as "use by right," this level of development is presently confirmed upon the land without further review or approval by Mineral County.

The moderate and maximum density development concepts would be subject to Mineral County Subdivision Regulations, as amended on June 10, 2002. These regulations require a Sketch Plan, Preliminary Plan and Final Plat, and provide the opportunity for public input at Public Hearings.

The low, moderate and maximum development concepts developed for the Land Exchange and ANILCA Road Access alternatives are described in the following sections.

3.1.1 ALTERNATIVE 2: LAND EXCHANGE

3.1.1.1 Low Density Development Concept

The low density development concept would accommodate a maximum development of nine 35-acre-plus lots on the ±323.9-acre property. Figure 6 illustrates the development area for the low density development concept. Please note, the ±323.9-acre development area includes ±119.5 acres of the private land not to be exchanged, plus the ±204.4 acres of the Federal parcel to be acquired by the exchange.

The nine lots could be accessed by a two-lane plowed road within a 60-foot corridor from Hwy 160 (per Mineral County Subdivision Regulations as amended June 10, 2002). For the purpose of analysis, it is assumed that the alignment for this road would be identical to the road alignment of the moderate and maximum density development concepts (Figures 7 & 8). The 26-foot wide road would have an at-grade intersection with Hwy 160, and there would be no requirement for acceleration/deceleration lanes. It is assumed that culverts would be used for stream crossings and there would be no road connecting the development to the ski area.

Under the low density development concept, it is assumed that water for the residences would be provided by wells. Each lot owner would be required to get a domestic well permit from the State, and a court approved augmentation plan would be required if homeowners plan to use well water for outdoor purposes. It should be noted that the existing water rights of the inholding are likely more than adequate to compensate for the water depletion for outdoor watering.

It is also assumed that each home would have a septic system and that electricity would be provided from adjacent power lines owned by the San Luis Valley Rural Electric Cooperative that provide electricity to the ski area. Furthermore, telephone, cable TV and fiber optics would likely be included in the road system.

3.1.1.2 Moderate Density Development Concept

Figure 7 illustrates the moderate density development concept which, should the proposed land exchange be approved, could potentially be constructed (contingent upon approval by Mineral County) on the ±323.9 acres of land following the land exchange. This development concept would have 497 units. These include one hotel with 71 units, four condominiums with 251 units, 10 townhomes with 120 units, 55 single family lots, and 49,500 ft^2 of commercial space. On-site infrastructure would include water storage and treatment facilities, a waste water treatment facility, and a natural gas distribution facility. Space would also be provided for a school.

The access road would extend south in a 100 foot corridor from Hwy 160 to connect with Village circulation roads, and there would be an at-grade intersection with Hwy 160 with accel/decel lanes (Figure 9). All stream crossings would be bridged except for a crossing of a tributary to North Pass Creek in the ROW of Hwy 160.

A ski area access road would extend west from the circulation road on the development parcel for ±1,689 linear feet in a 60 foot wide corridor to connect with Tranquility Road (Figure 10). This

road would not provide vehicular access between any future development and Hwy 160, but would function as an internal access route as well as for emergency access for potential future development. Tranquility Road currently extends ±1,778 linear feet to connect with Hwy 160. Any future upgrade to Tranquility Road would be at the discretion of the Forest Service and the ski area. Please note, ±1,593 feet of the ski area access road would be on NFS lands, including ±1,064 linear feet across the non-Federal property to be acquired by the Forest Service, and ±529 linear feet across existing NFS lands west of the existing non-Federal property boundary. All of the landscape of the proposed road alignment across the non-Federal exchange parcel and the existing Forest Service property is undeveloped except for the last 279 linear feet, which has been disturbed by the ski area parking lot.

The existing ±287.5-acre private inholding is subject to a Forest Service Scenic Easement (USFS, 1998) which regulates the height of buildings and other structures. The Scenic Easement would apply only to the ±119.5 acres of private land not included in the land exchange and would not apply to the ±204.4 acres of Federal land being acquired by the Proponent. Under the existing Scenic Easement, buildings and structures could be up to 48 feet in height (four stories). Mineral County Zoning Regulations as amended on April 10, 1996 state that the maximum building height for a PUD is 50 feet. Thus, structures outside the Scenic Easement on the Federal lands to be acquired by the Proponent could only exceed 50 feet with the consent of Mineral County.

Table 12.3-1 (in Section 12, Appendices) summarizes details on this development concept, and Table 12.3-3 provides details on power supply; water sources, storage and treatment; waste water treatment; bridges, roads and the Hwy 160 interchange; stormwater management; snow storage and removal; fire protection plan; emergency access; communications utilities; and other general details common to both the moderate and maximum development concepts.

The water storage requirement for the maximum density development concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. In addition, these facilities will likely be fenced for security purposes. Therefore, for the present analysis, the quantitative effects of the current water tank farm footprints are considered, recognizing that disturbance areas may increase somewhat, and the effects of the potentially larger, fenced, water tank farm sites are considered qualitatively as a worst case scenario.

3.1.1.3 Maximum Density Development Concept

Figure 8 illustrates the maximum density development concept which, should the proposed land exchange be approved, could potentially be constructed following approval by Mineral County on the ±323.9 acres of land following the land exchange. The development would likely be built in phases according to market, economic and logistical considerations. Full build-out of the development may occur over a period of 30 years or longer. This development concept would have 1,711 units. These include two hotels with 200 units, 16 condominiums with 821 units, 46 townhomes with 522 units, 138 single family lots, and 221,000 ft² of commercial space. On-site

infrastructure would include a water storage and treatment facility, a waste water treatment facility, and a natural gas distribution facility. Space would also be provided for a school.

The water storage requirement for the maximum density development concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. In addition, these facilities will likely be fenced for security purposes. Therefore, for the present analysis, the quantitative effects of the current water tank farm footprints are considered, recognizing that disturbance areas may increase somewhat, and the effects of the potentially larger, fenced, water tank farm sites are considered qualitatively as a worst case scenario.

The access road would extend south from Hwy 160 in a 100 foot corridor to connect with internal circulation roads associated with the development. The initial phase of the development would proceed with an at-grade intersection (Figure 9). There would be accel/decel lanes on Hwy 160 and all streams would be bridged except for a crossing of a tributary to North Pass Creek located in the ROW of Hwy 160. However, at some time in the future of the maximum build-out, and based on traffic counts, CDOT may require that a grade-separated interchange be constructed with Hwy 160. An analysis of the effects of constructing a grade-separated interchange would be completed in the future, when and if necessary.

A ski area access road for the maximum density concept and the scenic easement is the same as that described for the moderate density concept. See Tables 12.3-1 and 12.3-3 for additional development details.

3.1.2 ALTERNATIVE 3. ANILCA ROAD ACCESS

As with Alternative 2, low, medium and maximum density development concepts have been developed for the ANILCA Road Access alternative and have been used for the analysis of direct and indirect impacts disclosed in Chapter 4.

3.1.2.1 Low Density Development Concept

This concept assumes that the ±288.3-acre private land parcel would be partitioned into eight lots of 35 acres or greater in size, should Alternative 3 be approved. Figure 11 illustrates the private land that could potentially be developed under this alternative. Please note, ±9.01 acres of the ski area Waterfall parcel within the boundary of the non-Federal property would remain in ski area ownership and would not be available for future development by LMJV under this alternative, and the ±2.66-acre WCSA *A-Way* trail parcel is not included in any of the development concepts (Figure 3). The lots would be accessed by a two-lane plowed road within a 60-foot corridor extending south to the parcel in an alignment identical to that of the moderate and maximum density concepts for this alternative. Streams would be crossed using culverts. The 26 foot wide access road would have an at-grade intersection with Hwy 160 and there would be no requirement for acceleration/ deceleration lanes. The ski area access road would not be authorized.

It is assumed that water for the residences would be provided by wells. Each lot owner would be required to get a domestic well permit from the State, and a court approved augmentation plan would be required if homeowners plan to use well water for outdoor purposes. It should be noted that the existing water rights of the inholding are likely more than adequate to compensate for the water depletion for outdoor watering.

It is also assumed that each home would have a septic system and that electricity would be provided by the San Luis Valley Rural Electric Corporation from adjacent power lines that provide electricity to the ski area. Furthermore, telephone, cable TV and fiber optics would likely be included in the road system.

3.1.2.2 Moderate Density Development Concept

Figure 12 illustrates the concept for the moderate density development which, should the development be approved by Mineral County, could potentially be constructed on the existing ±288.3-acre private inholding. Please note, ±9.01 acres of the ski area Waterfall parcel within the boundary of the non-Federal property will remain in ski area ownership and not be available for development by LMJV under this alternative (Figure 3). This development concept would have approximately 523 units. They include one hotel with 71 units, four condominiums with 244 units, 13 townhomes with 168 units, 40 single family lots, and 49,500 ft² of commercial space. On-site infrastructure would include a water storage and treatment facility, a waste water treatment facility, and a natural gas distribution facility.

The water storage requirement for the maximum density development concepts would require the water tank farm area plus an additional area estimated at 4.0 acres for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. In addition, these facilities will likely be fenced for security purposes. Therefore, for the present analysis, the quantitative effects of the current water tank farm footprints are considered, recognizing that disturbance areas may increase somewhat, and the effects of the potentially larger, fenced, water tank farm sites are considered qualitatively as a worst case scenario.

A ±1,115 foot long access road would extend south from Hwy 160 across NFS lands in a 100 foot corridor. This road would have an at-grade intersection with Hwy 160 and there would be acceleration/deceleration lanes (Figure 9). All streams would be bridged except for a crossing of a tributary to North Pass Creek located in the ROW of Hwy 160. The development would be connected to the ski area by a ±529 foot long road across Forest Service property extending west to Tranquility Road (Figure 5). The first ±250 linear feet would be in an undeveloped landscape and the final ±279 linear feet would be across terrain disturbed by the ski area parking lot.

The Scenic Easement, as discussed in Section 3.1.1.2, would apply to the entire property under this alternative. See Tables 12.3-1 and 12.3-3 for additional development details.

3.1.2.3 Maximum Density Development Concept

Figure 13 illustrates the concept for the maximum density development which, should Alternative 3 be approved by Mineral County, could potentially be constructed on the existing ±288.3-acre private inholding. This development concept would have 1,981 units. These include three hotels with 403 units, 15 condominiums with 998 units, 42 townhomes with 504 units, 76 single family lots, and 221,000 ft² of commercial space. On-site infrastructure would include water storage and treatment facilities, a waste water treatment facility, and a natural gas distribution facility. Plans for the access road to Hwy 160 and the ski area access road are identical to those described for the moderate density development concept for Alternative 3.

The water storage requirement for the maximum density development concepts would require the water tank farm area plus an additional area estimated at 4.0 acres for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. In addition, these facilities will likely be fenced for security purposes. Therefore, for the present analysis, the quantitative effects of the current water tank farm footprints are considered, recognizing that disturbance areas may increase somewhat, and the effects of the potentially larger, fenced, water tank farm sites are considered qualitatively as a worst case scenario.

The maximum density development concept would likely be built in phases, according to market, economic and logistical considerations. The initial phase of development would have an at-grade intersection. However, at some time in the future of the maximum build-out, and based on traffic counts, CDOT may require a grade-separated interchange with Hwy 160. An analysis of the effects of a grade-separated interchange would be completed in the future, when and if it becomes necessary.

See Tables 12.3-1 and 12.3-3 for additional development details.

3.2 PROJECT DESIGN CRITERIA COMMON TO ALL ACTION ALTERNATIVES

The USFS uses many measures to reduce or prevent negative impacts to the environment in the planning and implementation of management activities. The application of these measures begins at the planning and design phase of a project. Project Design Criteria (PDC) are required to make Alternatives 2 and 3 consistent with Forest Plan standards and guidelines for anticipated alternative effects on NFS lands. To ensure consideration in the impact assessments for each alternative, these PDC have been incorporated into each alternative described in this chapter. The standards and guidelines in the Forest Plan are incorporated as design criteria common to both Action Alternatives. Rating of these PDC to determine effectiveness is presented in Appendix 11.1. Other mitigation measures may be incorporated during the implementation of the project.

3.3 MITIGATION MEASURES AND MONITORING REQUIREMENTS

3.3.1 MITIGATION MEASURES

Mitigation practices and associated effectiveness for the proposed project (Federal action) are described below. Mitigation measures for the private property are largely controlled through a variety of permits (state, Federal and Mineral County) required prior to development.

1. All construction vehicle movement would be restricted to the access road and utility corridors, designated access, contractor-acquired access, or public roads. No widening or upgrading of existing roads would be undertaken in the area of construction and operation other than the selected alternative. This mitigation is needed to avoid increased sediment transfer and non-permitted widening of corridors. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

2. Traffic control measures such as signs, flagmen, and construction area markings would be required on the Highway 160 entrance to the selected alternative. In addition, highway intersection designs required by CDOT (including, but not limited to, signage, reduction of height of embankments, removal of tree, acceleration/deceleration lanes) would be required. This mitigation is needed to avoid public and worker safety conflicts. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

3. Access road and utility corridor design features (e.g. bridging) would be placed to minimize disturbance to sensitive features such as riparian areas, wetlands, and water courses. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

4. Prior to construction, all supervisory construction personnel would be instructed on the protection of ecological resources, including mitigation measures required by Federal, state, and local agencies, and cultural resources, if encountered during subsurface excavations. To assist in this effort, the construction contractor would address (a) Federal and state laws regarding antiquities, plants and wildlife, including collection and removal; and (b) the importance of these resources and the purpose and necessity of protecting them. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

5. All construction and maintenance activities for the selected alternative would be conducted in a manner that would minimize disturbance to vegetation, soils, drainage channels, and intermittent or perennial streambanks in accordance with the NFS annual maintenance plan, and all state, county, and local requirements including Clean Water Act (CWA) compliance. Construction activities would follow Best Management Practices (BMPs) for the construction of the entire length of the selected access road/utility corridors. BMPs would be utilized in the proposed project, where applicable to alternatives, to prevent stormwater discharge impacts per National Pollutant Discharge Elimination System (NPDES) requirements. The following BMPs for NPDES compliance for sediment and erosion control are to be maintained and upgraded as needed to minimize the entrainment of soils from the proposed project area into the stormwater

discharges. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

- Maintain vegetative cover to the extent possible in exposed soil areas during construction activities.

- Minimize exposure of bare soil areas to precipitation following any new construction or other ground disturbing activities for selected Alternative. This can be accomplished by slope protection, flow diversions, and/or soil stabilization (mulching, matting, geotextiles, check dams, slope breakers, culvert placement as designed).

- Slow down stormwater runoff flowing across the selected alternative by grading and berms, and provide drainage pathways for runoff.

- Remove sediment from stormwater before it is discharged through implementation of the above-described controls. Use straw wattles and silt fencing.

- Stabilize all slopes.

- Minimize run-on of precipitation to the facility by maintaining berms and surface flow diversions.

- In addition, all construction activities would include dust-control measures. All existing roads would be left in a condition equal to or better than their condition prior to the construction of access road/utility corridors, in accordance with USFS directives.

6. Mitigation (conservation) measures developed during the consultation process under Section 7 of the Endangered Species Act (ESA) as specified in the Biological Opinion of the FWS would be implemented. The effectiveness for these conservation measures is uncertain and will need to be monitored by the FWS, CPW, and the USFS.

7. The access road(s) and utility corridors will be designed to minimize overall impacts, including ground disturbance and visual impacts. Effectiveness for this mitigation measure would be expected to almost always result in a significant reduction in impacts, and has been found to be effective on the adjacent Tranquility Road construction.

8. Access road and utility corridor construction would be required to minimize potential conflicts with winter recreation activities. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

9. Road fill, road base material, and all organic material used for rehabilitation would be certified weed-free. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

10. Visual mitigation within the Scenic Integrity Objectives (SIO), including, but not limited to, revegetation of grasses, trees, and shrubs in appropriate locations to break up the rock walls

and structures of parking areas. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

11. If selected, Tranquility Road use under Alternatives 2 and 3 would require mitigation measures for safety including traffic separation of roads/parking lots, signs, traffic control, speed limits, delivery restrictions, and assurance of unimpeded public access across the private property. Effectiveness for this mitigation measure would be expected to often reduce impacts significantly and is commonly applied.

12. A conservation measure would be required to preclude the take of active nest trees of migratory birds along the selected road and utility corridor ROWs and structures (e.g, hotels, condominiums, etc.) to be consistent with the Migratory Bird Treaty Act and Executive Order 13186. No clearing and grubbing of vegetation would be allowed between March 14 and July 15 to protect active nests.

3.3.2 MONITORING REQUIREMENTS

Monitoring requirements for the project include the following. The Proponent will be responsible for ensuring these are completed to the satisfaction of appropriate agencies:

1. Monitoring of traffic levels during peak traffic periods on Hwy 160 and during peak ski days at WCSA (documented as highest skier days in March and December in 2011-2012 season) during permit administration.

2. Monitoring of adherence to the Amended Scenic Easement and scenic mitigation measures. The USFS has a responsibility to insure that the selected access road alternative meets scenic requirements. Monitoring will occur during design and construction.

3. Monitoring of winter/summer use of FSR 391 to determine how many vehicles are utilizing the road during permit administration.

4. Monitoring of user conflicts on Tranquility Road. Since Tranquility Road will be utilized for parking for Ski Area operations, the USFS will monitor operations on Tranquility Road during peak ski days at the Ski Area (documented as highest skier days in March and December in 2011-2912 season) during permit administration.

5. Monitoring the effectiveness of conservation measures to protect lynx in conjunction with the FWS and CPW.

6. Monitoring of mitigation measure success. The USFS would evaluate site-specific mitigation measures during and after access road/utility corridor construction. The USFS also utilizes annual Monitoring and Evaluation Reports to evaluate if (USFS 2003c) “the management of the Forest is meeting goals, desired conditions, standards and guidelines, and prescriptive allocations (per 36 CFR 219.12).”

7. The Proponent will coordinate with the USFS to monitor the water quality of stream channels below the Village. Monitoring results will be made available to the Forest Service for

inclusion in their annual monitoring report and to the State Water Quality Control Division.

3.4 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The preferred alternative is the alternative that the agency believes would best fulfill its statutory mission, considering environmental, economic, technical, and other factors. At this time, all alternatives have equal standing with the responsible official. Alternatives may be modified or a new alternative developed in response to public comments on the Draft EIS.

3.5 PROJECTS AND ACTIVITIES THAT ARE PART OF THE ENVIRONMENTAL BASELINE

Recent and ongoing projects and activities that are part of the environmental baseline include, but are not limited to, ongoing operation of WCSA, Hwy 160 ROW and cut/fill slopes, existing and permitted yurts (2.0 miles east and 3.5 miles southeast of Alberta Lake), Hwy 160 and WCSA explosives work for avalanche control, CDOT's Wolf Creek Pass Weather Station and Highway 160 maintenance facility, and historic hazardous material spills monitoring

3.6 REASONABLY FORESEEABLE PROJECTS THAT MAY CONTRIBUTE TO CUMULATIVE EFFECTS

For all species other than Federally listed threatened and endangered species, consideration of projects that contribute to cumulative effects is based upon the following NEPA definition:

> "Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. [40 CFR §1508.7]

However, other reasonably foreseeable future actions should only be included in the cumulative impact analysis when their impact zones overlap areas occupied by resources affected by the Proposed Action (CEQ 1997, EPA 1999). Potential, reasonably foreseeable future actions are considered below.

Please refer to Section 2.0 and 3.0 for a discussion on the Village at Wolf Creek.

3.6.1 ONGOING OPERATIONS AT WOLF CREEK SKI AREA

The private land parcel is located within the 1,581-acre WCSA SUP boundary on NFS lands managed by the RGNF along the east side of the Continental Divide. Almost all of WCSA's operations are conducted on NFS lands within its SUP area. The ski area owns ±12.5 acres of private lands (limited to skiing activities) along the A-way ski trail and the Waterfall ski terrain. Also, portions of the Alberta chairlift and surrounding ski trails are within the ±287.5-acre private inholding.

Wolf Creek Ski Area serves as a day and regional, destination use ski area. Locals from surrounding southwestern Colorado communities, including Pagosa Springs, South Fork, Del Norte, Alamosa, Durango, and Monte Vista, represent typical day visitors. Regional destination skiers (e.g., Colorado's Front Range and Central Mountains [including Summit and Eagle counties] and northern New Mexico) tend to make overnight or weekend trips, particularly when winter storms are forecasted. It is also common for regional destination skiers to take multiple day tours through southwest Colorado, including a day at WCSA with their visit to other regional ski areas in the vicinity of Silverton, Durango, and Telluride. Finally, out-of-state skiers from Texas and Oklahoma (which in many cases requires only a one day drive) often spend multiple days at WCSA. The ski area is winter-season, day use resort with no overnight facilities. Lodging for overnight guests is primarily provided in nearby Pagosa Springs, South Fork, Del Norte, Alamosa, and Monte Vista. These are not considered "ski towns," but offer affordable lodging options and different experiences for WCSA's destination guests.

The ski season at WCSA typically extends from November through early April (approximately 145 days), with peak times being holiday periods and spring break. However, it is not uncommon for WCSA to receive high early season snowfall which allows it to open some or all of its terrain with natural snow well in advance of other Rocky Mountain resorts, which attracts a devoted early season following. Because WCSA does not have a large population base nearby to draw regular visitation, it does a large amount of its business during weekends, storm events, and holiday periods. Visitors to the towns that provide lodging during the ski season are important contributors to the economy in those communities. WCSA averages approximately 188,000 annual skier visits, from a high of 222,000 visits in the 2006/07 season, down to 114,000 in the 1999/00 season, depending on many variables, such as weather and economic trends.

The ski area operates five chairlifts, a surface lift, and a beginner conveyor lift across 91 traditional trails, and numerous unmaintained chutes and glades. Its roughly 1,200 acres of skiable terrain is composed of "traditional" developed trails, lift-served glades/tree skiing, and hike-to terrain (steeps, chutes, and trees) accessible off of Alberta Peak, Knife Ridge Chutes, and Horseshoe Bowl. The ski area currently operates several facilities in the base area, and an on-mountain guest service facility. These facilities provide skier support services as well as restaurant service and seating. Day skier parking is provided directly adjacent to the base area. The ski area uses explosives and other means for avalanche control within the 1,581-acre SUP boundary, generally in steep alpine areas along the Continental Divide.

Based on many factors – including capacity of the lift and trail network – WCSA's comfortable daily capacity has been calculated at approximately 3,590 guests. Peak visitation days at WCSA – for example, during the holidays – exceed 5,000 skiers. Mid-week attendance typically numbers in the hundreds. Average weekend visitation throughout the winter (excluding holidays and Spring Break) is typically in the range of 1,500 to 1,800 skiers. It is important to acknowledge that large snow events greatly influence WCSA's daily visitation throughout the season.

Due to its high elevation (between 10,300 to 11,900 feet) and location along the Continental Divide, WCSA has earned the reputation as the snowiest ski area in Colorado, receiving an average annual snowfall of 465 inches (39 ft.). Because of WCSA's abundant natural snowfall, the ski area does not rely on snowmaking to provide coverage, which is rare within the ski industry. The distribution of terrain and typically low trail densities at WCSA enable guests to commonly

discover great conditions and untracked snow days after a storm. WCSA is the last remaining family-owned and operated ski area in Colorado. The ski area prides itself in offering a distinct skiing/riding experience – a laid-back, friendly atmosphere that supports, and is complemented by, diverse terrain and abundant natural snowfall. Other attributes that define WCSA's reputation are short lift lines, low trail densities, and an unpretentious atmosphere. Although it is known for its undeveloped terrain (glades, steeps, and chutes) that are accessible from both its lift network and by hiking, there is also a sufficient quantity of traditional, developed, groomed terrain available for lower ability level skiers and riders.

Summer activities at WCSA are limited to general facility maintenance, with no operations open to the public, other than access to restrooms for passing motorists and access to surrounding hiking trails. WCSA has no current plans to provide any structured or organized summer activities in the foreseeable future. The Forest Service maintains the SUP area as a non-motorized use area.

3.6.2 SADDLE BROOK

Saddle Brook is a proposed residential community on a 75-acre property (formerly Riverwalk Resort and Spa) located approximately 12.0 miles east of WCSA (approx. milepost 180) along the South Fork of the Rio Grande River, on the south side of Hwy 160, opposite Goodnight's Lonesome Dove RV& Cabins and Moon Valley Resort, in Mineral County. It is also located within the eastern end of the WCPLL (Fig. 4-3). Proposed development consists of 11 separate, two-story buildings containing 166 condominium/townhome units and a small inn with 16 rooms. A commercial area is proposed near Hwy 160 (ERO Resources 2004). All proposed development would occur within 10 of the approximately 43 acres on the north side of the river. The remainder of the property (33 acres north of the river and 32 acres south of the river) would be left as undeveloped meadows, lakes, river, riparian forest, and wetlands and retained as designated and de facto open space. Additional herbaceous and willow-dominated wetlands would be created along the river as part of the proposed development. The development would be accessed from a single entrance off Hwy 160. With the exception of an earthen berm separating the proposed residential/ commercial development from the Highway corridor, no development has taken place. While full build-out of the Saddle Brook project was expected to be completed by ca. 2010 (ERO Resources 2004), the project has not yet initiated any construction and it is unknown if and when the project may begin development. Construction activities associated with the widening of Hwy 160 (USFWS 2003a) occurred adjacent to the property. Saddle Brook was previously considered during section 7 consultation (USFWS 2003, ERO Resources 2004; and as part of the 2005 environmental baseline for the prior Village at Wolf Creek development proposal [Thompson 2005]).

TranSystems (2003) estimated Saddle Brook trip generation at full build-out using standard trip generation methods (e.g., ITE 2003) and the assumption that the commercial parcel would be developed to the highest density approved by the County (a 90-room hotel, ERO Resources 2004). A total of 1,520 AADT would be generated at full build-out, including residents, guests, services, hotel employees, and other associated traffic. This estimate is based on conservative traffic estimates that use an average number of approximately six daily trips per unit per day, even though this would be a destination/vacation resort where many residents would stay put or may be expected to take a single day trip to a specific destination (ERO Resources 2004). Saddle Brook trip generation rates may be slightly higher than comparable Village at Wolf Creek rates as a result

of less on-site and adjacent retail/commercial support facilities at Saddle Brook and the resort's closer proximity to South Fork where such services would be available. Many of the Saddle Brook units would also be second homes occupied for only short periods of the year.

3.6.3 BIG RESERVOIR TIMBER SALVAGE

This project (aka Big Meadows II Campground Hazard Tree and Salvage) is located approximately three miles north of the Village at Wolf Creek project site. The project involves the removal of approximately 500 standing dead, weakened, and blown down trees from a 32.4-acre area within and around the Big Meadows Campground. Vegetation is spruce-fir and aspen. The NEPA associated with this project was approved in 2008 and the sale's current termination date is July, 2012.

3.6.4 TABLE SALVAGE TIMBER SALE

This project is located approximately seven miles north of the Village at Wolf Creek project site. The project involves 195 acres of spruce beetle salvage and is currently on-going. Vegetation is spruce-fir. The NEPA associated with this project was approved (under a Categorical Exclusion) in 2004.

3.6.5 PASS CREEK YURT

The Pass Creek Yurt is an existing, USFS permitted, user fee lodging facility for non-motorized winter recreation located approximately 5.5 miles up FSR 391 (Pass Creek Rd.) from Hwy 160, whose intersection with Hwy 160 is approximately five miles east of WCSA. A parking area near the Hwy 160 intersection is kept plowed in winter. The yurt is on a trail approximately one mile off the road, approximately one mile due east of Alberta Park Reservoir.

3.6.6 WOLF CREEK PASS WEATHER STATION

An automated weather station is maintained by CDOT on the top of Wolf Creek Pass, approximately 0.33 mile west of the Continental Divide and approximately 0.5 mi. south of Hwy 160. The USFS requires special use authorization and permitting for the proposed weather station.

3.6.7 SPRUCE BEETLE EFFECTS ON HABITAT

A close relative of the mountain pine beetle (*Dendroctonus ponderosae*), the spruce beetle *(D. rufipennis)* can reach outbreak levels in mature spruce forests and, under the right conditions, kill large numbers of trees. In Colorado and neighboring states, these conditions are created when high winds cause extensive windthrow in spruce forests, providing ideal host material for the development of outbreaks (Ciesla 2010). Large numbers of beetles can develop under the bark of windthrown trees and subsequent generations attack and kill standing live trees in the surrounding area that can result in nearly 100% overstory mortality. In most cases, spruce beetle requires two years to mature and reproduce. Where spruce stands are accessible for management operations, removal of windthrown trees can be an effective method to prevent the buildup of large spruce beetle populations that could spread to standing trees. After the mountain pine beetle, the spruce beetle was Colorado's second most damaging forest pest in 2010 (Ciesla 2010).

Since 1996, spruce beetle has affected 1.2 million acres of high-elevation Engelmann spruce forests in Colorado and Wyoming (Ciesla 2010, USFS 2011). In 2011, the spruce beetle outbreak expanded in forests in the San Juan Mountains and upper Rio Grande Basin, where the outbreak was first detected in 2003 (Ciesla 2010, USFS 2011). While most of the mature spruce trees in the Weminuche Wilderness have been killed, new attacks were detected in high-mountain areas outside the wilderness, from the town of South Fork south to Wolf Creek Pass. Beetle populations are rapidly expanding in some areas causing entire drainages to be infested in the course of one year (USFS 2011). In some cases nearly every mature spruce has been killed in multiple drainages, from the creek bottoms all the way up to the high elevation krummholz. Only younger spruce stands, which have developed in areas where disturbance have occurred in the past, have survived the current outbreak. Where spruce stands are accessible for management operations, removal of windthrown trees can be an effective method to prevent the buildup of large spruce beetle populations that could spread to standing trees.

Spruce bark beetles are presently at epidemic levels in some areas around the project area (Ciesla 2010) and 2011 aerial surveys recorded spruce beetle activity in the southern part of the Village at Wolf Creek project area (USFS 2011). Forests in the vicinity of the project area are approximately 90% spruce and 10% fir, so a majority of local forest stands could be affected. Forest stands in the project area have been buffered somewhat by the active removal of trees within the ski area boundary, but beetles continue to spread (T. Malecek, USFS, pers. comm., Mar. 21, 2012). There is a high probability that most spruce trees over five inches dbh in the project area will be lost to spruce beetles within the next few years (K. Self, USFS, pers. comm., Mar. 12, 2012).

Within spruce-dominated forests, spruce beetle mortality will likely alter structural forest stand conditions, which may influence lynx prey species abundance and lynx habitat use. These changes would likely occur in a patchy pattern, with some dead standing trees potentially remaining standing for decades, while others would fall more rapidly (Jones and Ghormley 2010). Trees would be expected to fall within the next 10-100 years (Ghormley 2004), with many falling between 20-40 years (M. Tooley, USFS, pers. comm. with R. Ghormley, USFS, Jones and Ghormley 2010). Canopy cover would be reduced. Reduced overstory coverage generally leads to faster understory regeneration. Through time, a patchy distribution of large amounts of deadfall, dead standing, and newly regenerating trees and shrubs would likely occur across the landscape. For this analysis, spruce beetle effects are considered an ongoing part of the environmental baseline.

Forest Service Aerial Health Data for 2005 (when the beetle epidemic first started near the project area) through 2012 (the most recent data available) were downloaded from the R2 Forest Health intranet-web page. Data for all pathogens other than spruce bark beetle (code 11009 in DCA1 field) were deleted. Each year's data were merged into one shapefile, intersected with the RGNF boundary, and then dissolved to prevent double-counting of acres of impacts.

3.6.8 WEST FORK FIRE COMPLEX

On June 5, 2013 a lightning strike in the San Juan Mountains of southwest Colorado started what became the West Fork Fire Complex. The fire started on the San Juan National Forest, west of the Continental Divide, but eventually developed into three separate fires, two of which (the West

Fork and Papoose Fires) burned primarily on the RGNF, east of the Divide. The fire was essentially out on July 16, 2013. The entire fire burned a total of 109,615 acres on the SJNF and RGNF. The burned area quantitatively considered in this report is only that portion of the fire contained within the RGNF. The final West Fork Fire Complex burn severity data were obtained by Rea Orthner, Western Ecological Resource (WER), from ILS on July 25, 2013 and provided to Wildlife Specialties LLC on September 11, 2013. Burn severity data, based on soil reflectance, were in four classes: unburned/ underburned, low burned, moderate burned and high burned. For this analysis, based on field verification of mapped burn severity (R. Ghormley, USFS, pers. comm., September 10, 2013), all habitat mapped as moderate or high burn intensity is in an "unsuitable" condition for some species. Habitat in burn areas classified as unburned/underburned and low burn were verified to be unaffected or very lightly influenced by the fire and were determined suitable for use by wildlife. To quantify the amount of different habitat structural stages impacted by the West Fork Fire, burn severity data were intersected with R2 vegetation mapping for the RGNF in ArcGIS. Lastly, to ensure no double counting of acres of habitat impacted by both the West Fork fire and beetle kill, the intersected R2vegetation data and the burn severity data were intersected with the beetle kill data; the resulting intersect fire intensity and habitat data were calculated for the overlap and the resulting acres were subtracted from the total burn data. The effects of the West Fork Fire on sensitive wildlife includes only those species whose analysis area overlaps the fire and may therefore be subject to magnified effects in relationship to the both the fire and the proposed project.

3.6.9 CLIMATE CHANGE

Climate change is reducing the snow pack in western North American mountains (Knowles et al. 2006) and is shifting the distribution of boreal forest northward (IPCC 2007, Sturm et al. 2001) and up mountain slopes (Danby and Hik 2007, IPCC 2007). Various development concepts associated with Alternatives 2 and 3 would be completed by Years 2020 and 2043, possibly before any measureable climate change effects predicted by Gonzales et al. (2007) that could be discerned from background variation would be realized in montane and subalpine habitats.

3.6.10 REASONABLY FORESEEABLE FUTURE ACTIONS UNDER NEPA

3.6.10.1 WCSA Draft MDP

The WCSA submitted a Draft MDP to the Rio Grande NF in 2012 that outlines the ski area's vision and future planned projects, activities, and operations on NFS lands. The Rio Grande NF has not accepted the Draft MDP at this time, but following acceptance, planned projects identified in the Draft MDP will require site-specific analysis and approval prior to implementation. As of the publication of this DEIS, there is no timeline for the Rio Grande NF's acceptance of the WCSA MDP, nor future site-specific NEPA analysis of individual projects.

3.6.10.2 Other State and Private Future Actions

With one exception, there are no other State or private future actions identified by the USFS or other parties that warrant consideration as "reasonably foreseeable" for the species considered in detail herein. County planning personnel were contacted and requested to identify projects that

met "reasonably foreseeable" criteria for the action areas considered herein. With the exception of the Creede Airpark, no such projects were identified (D. Johnson, WER, pers. comms. with Leslie Cahill, County Administrator, Mineral County, CO, Mar. 27, 2012; Cindy Schultz, Planning Manager, Archuleta County, CO, Mar. 30, 2012; Rose Vanderpool, Planning Department, Rio Grande County, CO, Mar. 27, 2012; R. Thompson, pers. comm. with Suzanne Benton, County Administrator, Rio Grande County, CO and Leslie Cahill, County Administrator, Mineral County, CO, Apr. 3, 2012).

The Creede Airpark is a 50-acre private parcel located south of Town off Highway 149, contiguous with the existing Creede Airport, and just outside the town limits in Mineral County. The Master Plat for this project, involving commercial retail, storage, etc., was recently approved. This project is located in a commercial/ residential area associated with the broad, open (treeless) Trout Creek valley bottom.

4.0 DESCRIPTION OF THE ANALYSIS AREA

The Village at Wolf Creek Access project site is located at the base of WCSA, near the top east side of Wolf Creek Pass and the Continental Divide. NFS lands affected by the Federal Action occur between approximately 10,400 and 10,600 feet, while private VWC lands occur between approximately 10,320 and 10,880 feet. The analysis area is on the east slope of the Rocky Mountains with all streams draining into the Rio Grande basin.

Vegetation types, which are also the habitat types used in this analysis, within the Village at Wolf Creek Access project site and the acreage of each type are shown in Table 4-1. Table 4-2 provides an estimate of each of the habitat types present within the project area by alternative and parcel.

Table 4-1. Vegetation Types and Acreage Within the 504.3-acre Village at Wolf Creek Project Site.

Vegetation Type	Acres	Percentage
Spruce-Fir Forest	370.9	73.6
Volcanic Tuff Barrenlands	7.8	1.6
Riparian/Wetland	78.2	15.5
Aquatic Habitat	1.4	0.3
Meadow	26.5	5.3
Clearing	9.9	2.0
Disturbed/Barren	9.5	1.9
Total Acres	**504.3**	**100.0**

Source: Western Ecological Resource August, 2012 (DEIS Table 3.6-1).
Village at Wolf Creek Project Area is the 504.3-acre area that includes the Federal exchange parcel (204.4 ac.), the non-Federal exchange parcel (177.8 ac.), and the private land inholding (287.5 ac. under Alt. 1; 119.3 ac. under Alt. 2). Note: parcel acreages do not sum to 504.3 ac. because of parcel overlap, small inholdings, and rounding error. For a general understanding, under Alt. 2, the approx. sum of the 204.4 ac. Fed. Parcel, the 177.8 non-Fed. Parcel, and the 119.3 non-Fed. Parcel that is to be retained, is 501.5 ac.

Table 4-2. Vegetation Types and Acreage Within the 504.3-acre Village at Wolf Creek Project Site by Alternative and Parcel.

Vegetation Type	Alternative 1 No Action	Alternative 2 Land Exchange	Alternative 3 ANILCA Access

	Private Parcel	Acquired Federal Parcel	Non-Federal Parcel		Private Parcel
			Traded to FS	Retained	
Spruce-Fir Forest	192.1	175.0	106.3	89.1	192.9
Volcanic Tuff Barrenlands	0.0	7.8	0.0	0.00	0.0
Riparian/Wetland	64.5	11.7	52.1	14.4	64.8
Aquatic Habitat	0.2	1.1	0.0	0.2	0.2
Meadow	21.1	3.0	15.3	8.0	20.7
Clearing	7.5	1.1	2.8	6.0	7.5
Disturbed/Barren	2.1	4.8	1.1	1.7	2.1
Total Acres	**287.5**	**204.4**	**177.8**	**119.3**	**288.3**
Total Acres	**287.5**	**501.5**			**288.3**
Source: Western Ecological Resource, August, 2012 (DEIS Table 3.6-2).					

4.1 EXISTING CONDITIONS

The analysis area for the resources considered herein includes all areas to be affected directly, indirectly, or cumulatively, and not merely the immediate area involved in the Federal Action (CEQ 1997, USFWS and NMFS 1998, EPA 1999). To more appropriately evaluate potential project effects of varying scale on species with wide variation in home range size, the analysis area is considered at different scales, depending on the species and issue involved, as described below.

4.1.1 DISTURBANCE AREAS

Disturbance areas are the immediate areas of physical habitat modifications (i.e., habitat conversion). For impact assessment to resources on NFS lands considered herein, disturbance areas considered include those on NFS land, where Federal Action impacts from Alternatives 2 and 3 roads and utility corridors would occur, and those on NFS land contiguous with and surrounding the private land parcel, where VWC development impacts could extend.

4.1.1.1 Proposed Disturbance Areas on National Forest System Lands

Under the No Action Alternative, there would be no new authorized physical impacts to NFS lands. FSR 391 maintenance frequency might be increased, but it is an existing unpaved road. Structure Class and Habitat Structural Stage (HSS – see Appendix 11.2 for HSS definitions) are related habitat classification systems forming the basis for the R2Veg database used to classify and evaluate wildlife habitats across NFS lands, including those on the RGNF.

The analysis area associated with Alternative 2, the Proposed Action, access road and utility corridor extends between the northwest corner of the private parcel and Hwy 160 across NFS lands. The dominant habitat type of this area is subalpine fir-Engelmann spruce forest (4A&B), dominated by spruce, with steep (1:1), bouldery, fill slopes associated with the highway, and a willow-graminoid wetland meadow. The forest is the distal, northeastern portion of a 23.97 acre spruce with a high density of standing and down coarse-woody debris (CWD) patch that is

surrounded on the south, west, and north by ski area parking lots, a forested wetland, Hwy 160, and a large (13.1 acre) scrub-shrub wetland to the east. The meadow is part of the patchy, native meadow matrix common in this area and supports a stand of planeleaf willow (*Salix planifolia*) averaging 3-4 feet tall. Sedges (*Carex* spp.) and cornhusk lily (*Veratrum tenuipetalum*) dominate the surrounding meadow, with tufted hairgrass (*Deschampsia caespitosa*) in upland areas. A mountain willow (*S. monticola*) dominated wetland supported by an intermittent stream emerging from a culvert under the highway, extends to the toe slope of the highway fill. Additional characterization of these wetlands is provided in the wetlands section of the DEIS. The widening and extension of the existing Tranquility Road would affect an 16.22 acre spruce-fir (*Picea engelmannii-Abies bifolia*; scientific plant nomenclature after Weber and Whittmann [2001]) stand predominantly located on the private parcel, a 1960s-70s era clearcut, and recently disturbed, nonvegetated, access road fill slope/snow storage area. This disturbance corridor overlaps a portion of the Ski Area's present access road and its Tranquility Road and Parking lots.

The analysis area associated with Alternative 3's ANILCA access road and utility corridor extends between the northwest corner of the private parcel and Hwy 160 across NFS lands. The dominant habitat type of this area is subalpine fir-Engelmann spruce forest (4A&B), dominated by spruce, with steep (1:1), bouldery, fill slopes associated with the highway, and a willow-graminoid wetland meadow. The forest is the distal, northeastern portion of a 23.97 acre spruce with a high density of standing and down coarse-woody debris (CWD)patch that is surrounded on the south, west, and north by ski area parking lots, a forested wetland, Hwy 160, and a large (13.1 acre) scrub-shrub wetland to the east. The meadow is part of the patchy, native meadow matrix common in this area and supports a stand of planeleaf willow (*Salix planifolia*) averaging 3-4 feet tall. Sedges (*Carex* spp.) and cornhusk lily (*Veratrum tenuipetalum*) dominate the surrounding meadow, with tufted hairgrass (*Deschampsia caespitosa*) in upland areas. A mountain willow (*S. monticola*) dominated wetland supported by an intermittent stream emerging from a culvert under the highway, extends to the toe slope of the highway fill. Additional characterization of these wetlands is provided in the wetlands section of the EIS.

4.1.1.2 Proposed Disturbance Areas on Private Wolf Creek Village Lands

Please refer to Section 2.0 and 3.0 for a discussion of potential disturbance associated with the Village at Wolf Creek.

4.1.2 PROJECT SITE

For the purposes of this analysis, the project site is restricted to the Federal exchange parcel considered for transfer to private ownership and the private parcel. This area includes the proposed disturbance areas on NFS and private Village at Wolf Creek land that could be affected by Alternatives 2 and 3.

5.0 R2 SENSITIVE SPECIES SURVEY INFORMATION

Region Two (R2) has designated "sensitive species" (USFS, last updated May 24, 2013), representing species declining in number or occurrence or whose habitat is declining, either of which could lead to Federal listing if action is not taken to reverse the trend, and species whose

habitat or population is stable but limited. From the current R2 list (USFS 2013), a subset of sensitive animal species was determined to be present or potentially affected by management decisions on the RGNF (R. Ghormley, USFS, pers. comm., March 21, 2011) after an analysis of all sensitive species overall. All R2 sensitive animal species on the RGNF list associated with the Proposed Action are considered in this document. Table 1 includes current sensitive species and MIS found within the RGNF. Complete lists by Region and Forests/Grassland can be found in the District files.

The senior author has reviewed the R2 sensitive species list (USFS 2013) and is familiar with local habitats and plant distributions within the Village at Wolf Creek Access project site based on field surveys conducted by Thompson on September 25-27, 2000, February 28-March 2, March 18-21, April 6-8, 2001, July 30-August 1, 2002, and May 28, July 8, 9, 23, 2004, and by Powell on July 13–19 and 20–21, 2009, July 8, 2011, and September 22–23, 2011. USFS personnel conducted additional field surveys on October 31 and November 1, 2004 and April 1, 2005. Surveys were conducted to (1) develop an ecological understanding of the resources present on and adjacent to the project site, (2) identify and characterize habitat types and Structure Classes present relative to the habitat affinities of species considered in this document, and (3) search for evidence of the R2 species considered herein.

Information on species status, distribution, and ecology was derived from Armstrong et al. (2011), Hammerson (1999), Kingery (1998), the CPW website, Birds of North America online, FS Species Conservation Assessments, USFS analyses, the Colorado Natural Heritage Program (CNHP) data base, USFS Ranger District information, Natural Diversity Information Source (NDIS) data for Mineral County, 2000–2011 field surveys of the project site by both authors, personal communications with USFS (R. Ghormley, D. Gomez, and B. Wiley) and CPW (T. Jackson, E. Odell and J. Nehring), and field surveys associated with other projects in the Wolf Creek Pass area conducted by Thompson since 1984.

6.0 ENVIRONMENTAL BASELINE AND EFFECTS OF THE PROPOSED ACTION ON R2 SENSITIVE SPECIES EVALUATED

Potential impacts to federally listed wildlife species are addressed in the 2012 Biological Assessment (BA, Thompson 2012). A detailed discussion of lynx and southwestern willow flycatcher ecology in relation to the Village at Wolf Creek Access project is included in the 2012 BA (Thompson 2012) and is available through the Forest Supervisor's Office. Species which are candidates for listing under the ESA are treated as Forest Service Sensitive Species according to Forest Service R2 policy and thus will be addressed within this BE.

Based on (1) biological surveys of the project site and similar surrounding habitats, (2) habitat suitability on and around the area, (3) records of sensitive species from the area of influence, and (4) species' habitat affinities, R2 wildlife species that are known or expected to occur, are potentially present in or adjacent to the project site, or warrant discussion, include three mammals, six avian, two amphibians, and one fish species (Table 6-1), discussed below. Alternatives 1, 2 and 3 would have **no impact** on any other R2 animal species known to occur on the RGNF because their habitats are not found within the NFS portion of the affected project site, they have no affinities to project site habitats, they have distributional ranges excluding the project site, and activities on NFS

lands related to the proposed alternatives would not affect the species. No further discussion of species noted as excluded in Table 6-1 will occur.

Table 6-1. Region 2 Forest Service sensitive terrestrial and aquatic wildlife species for the Rio Grande National Forest.

Common Name	Species	Habitat	Species Excluded	Reason for Exclusion
Mammals				
Fringed myotis	*Myotis thysanodes pahasapensis*	Coniferous woodlands and shrublands below 2,290 m (7,500 ft). rocky outcroppings in mid-elevation ponderosa pine, pinyon/juniper, oak, & mixed conifer woodlands, grasslands, deserts, & shrublands; Baca, El Paso, Huerfano, Las Animas, Otero, & Pueblo counties.	Yes	Suitable habitat does not exist within or near the project site.
Hoary Bat	*Lasiurus cinereus*	Generally a solitary species. In Colorado, the species is frequently detected in ponderosa pine forests where large deciduous trees are lacking. Can occur in any appropriate treed habitat.	No	Not excluded. Potentially suitable habitat exists within the project site.
Townsend's big-eared bat	*Corynorhinus townsendii*	Semidesert shrublands, pinyon-juniper woodlands and open montane forests below 2,900 m (9,500 ft). Requires caves or abandoned mines for roost sites during all seasons and stages of its life cycle, and its distribution is strongly correlated with the availability of these features.	Yes	Suitable habitat does not exist within or near the project site.
Gunnison's prairie dog (FC[1])	*Cynomys gunnisoni*	Sage brush ecosystem.	Yes	Suitable habitat does not exist within or near the project site.
American marten	*Martes americana*	Subalpine spruce-fir and lodgepole pine forests, alpine tundra and occasionally montane forests.	No	Not excluded. Known to exist within the project site.
River otter	*Lontra canadensis*	Relatively large rivers at low to moderate elevations; need ice-	Yes	Suitable habitat does not exist within the project site.

Table 6-1. Region 2 Forest Service sensitive terrestrial and aquatic wildlife species for the Rio Grande National Forest.

Common Name	Species	Habitat	Species Excluded	Reason for Exclusion
		free stretches of river in winter.		
Rocky Mountain bighorn sheep	*Ovis canadensis canadensis*	Bighorns typically occur in steep, high mountain terrain. In Colorado, they prefer habitat dominated by grass, low shrubs, rock cover and areas near open escape.	Yes	Suitable habitat does not exist within the project site.
Birds				
Bald eagle	*Haliaeetus leucocephalus*	Nest in mature cottonwoods or pines near water.	Yes	Project site does not contain suitable habitat.
Northern harrier	*Circus cyaneus*	Spring & fall migrant in western valleys mountain parks, and eastern plains in CO inhabiting grasslands, agricultural areas, marshes & tundra in fall; 3,500-13,000 ft.	Yes	Project site does not contain suitable habitat.
Northern goshawk	*Accipter gentilis*	Predominantly uses ponderosa pine, but will also use Douglas fir, various pines and aspens.	No	Not excluded. Surveys conducted within the project site in 2009 did not reveal the presence of this species. However, because of their large territory size they could use the project site while foraging.
Ferruginous hawk	*Buteo regalis*	Vast expanses of ungrazed or lightly grazed grassland and shrubland with varied topography, including hills, ridges and valleys.	Yes	Project site does not contain suitable habitat.
American peregrine falcon	*Falco peregrinus anatum*	Nests on foothill and mountain cliffs from 1,368—2,736 m (4,500 ft - > 9,000 ft); 50% of all nests sites near piñon-juniper.	No	Not excluded. Project site could occasionally be used for foraging.
White-tailed ptarmigan	*Lagopus leucurus*	Alpine, but may go as low 2,400 m (8,000 ft) along streams lined by willows or alders.	No	Not excluded. Potentially suitable winter habitat exists within the project site.
Mountain plover	*Charadrius montanus*	Grazed shortgrass prairie and fallow plowed agricultural fields.	Yes	Suitable habitat does not occur within or near the project site.
Yellow-billed	*Coccyzus*	Old-growth riparian	Yes	Suitable habitat does not occur within

Table 6-1. Region 2 Forest Service sensitive terrestrial and aquatic wildlife species for the Rio Grande National Forest.

Common Name	Species	Habitat	Species Excluded	Reason for Exclusion
cuckoo	*americanus* (FC)	woodlands with dense understories.		or near the project site.
Flammulated owl	*Otus flammeolus*	Depend on cavities for nesting, open forests for catching insects, and brush or dense foliage for roosting at altitudes between 1,830 – 3,048 m (6,000 – 10,000 ft).	Yes	Suitable habitat is not present within or near the project site.
Western burrowing owl	*Athene cunicularia*	Use burrows created by small mammals in grasslands, shrublands and deserts.	Yes	Suitable habitat is not present within or near the project site.
Boreal owl	*Aegolius funereus*	Mature to old-age spruce-fir above 2,745 m (9,000 ft), after nesting may wander to open pinon-juniper and ponderosa pine.	No	Not excluded. Surveys conducted in 2005 located one nesting pair northwest of Alberta Park Reservoir. Potentially use the project site while foraging.
Black swift	*Cypseloides niger*	Nests behind or close to waterfalls and wet cliffs.	Yes	Suitable habitat does not exist within or near the project site.
Lewis's woodpecker	*Melanerpes lewis*	Open pine forests, burnt-over areas with abundant snags and stumps, riparian and rural cottonwoods, and pinon-juniper woodlands.	Yes	Suitable habitat is not present within or near the project site.
Olive-sided flycatcher	*Contopus cooperi*	Boreal forests between 2,135 – 3,350 m (7,000 – 11,000 ft).	No	Not excluded. Suitable habitat exists and detections have occurred within the project site.
Loggerhead shrike	*Lanius ludovicianus*	Shortgrass prairie.	Yes	Suitable habitat is not present within or near the project site.
Brewer's sparrow	*Spizella breweri*	Sagebrush and other shrubs species with similar stand characteristics including greasewood, hopsage, and saltbush.	Yes	Suitable habitat does not exist within or near the project site.
Amphibians				
Boreal (western) toad	*Anaxyrus boreas boreas*	Damp areas near marshes, wet meadows, streams, beaver ponds, glacial kettle ponds, and lakes interspersed in subalpine forest. Beaver ponds with	No	Not excluded. Potentially suitable habitat present within the project site. Surveys conducted in support of the 2006 EIS and again in 2009-2011 did not result in detection.

Table 6-1. Region 2 Forest Service sensitive terrestrial and aquatic wildlife species for the Rio Grande National Forest.				
Common Name	Species	Habitat	Species Excluded	Reason for Exclusion
		emergent vegetation are the one key habitat component necessary for breeding.		
Northern leopard frog	*Rana pipiens*	Wet meadows and the banks and shallows of marshes, ponds, glacial kettle ponds, beaver ponds, lakes, reservoirs, streams, and irrigation ditches.	No	Not excluded. Potentially suitable habitat present within the project site.
Fishes				
Rio Grande chub	*Gila Pandora*	Lower elevation drainages of the Rio Grande Basin in south-central Colorado.	Yes	Suitable habitat does not exist within or near the project site.
Rio Grande sucker	*Catostomus plebeius*	No populations are known from the South Fork Rio Grande drainage. containing the project site	Yes	Suitable habitat does not exist within or near the project site.
Rio Grande cutthroat trout (FC)	*Onchorhynchus clarki virginalis*	Clear, cold water, naturally-fluctuating flows, low levels of fine sediment in channel bottoms, well-distributed pools, stable stream banks, and abundant stream cover.	No	Not excluded. Potentially suitable habitat present within the project site. Surveys conducted in support of the 2006 EIS and in 2009 did not result in detection. Alberta Reservoir is maintained by the CPW as a Rio Grande cutthroat trout fishery.
[1]FC = Federal Candidate				

Based on the habitat affinities for species in Table 6-1 which are included in this analysis, two dominant habitat types, high elevation riparian (HSS 2) and mixed conifer/spruce-fir (HSS 4B-C), would be impacted under Alternatives 2 and 3. No other habitat types which exist within the project site are considered essential to any R2 sensitive wildlife species for the RGNF. Table 6-2 provides the direct impact, the gain/loss of these habitat types to the Forest Service, which would occur under Alternative 2. Table 6-3 provides the acres of indirect impacts to high elevation riparian and mixed conifer/spruce-fir habitat by the Low, Moderate and Maximum Density Development Concepts for Alternatives 2 and 3, the net gain/loss of these habitat types to NFS lands, and total amounts of these habitat types impacted.

Table 6-2. Alternative 2 Land Exchange Direct NFS Acreage Gain/Loss			
	Non-Federal Exchange Parcel	Federal Exchange Parcel	Gain/Loss of NFS Lands

Table 6-2. Alternative 2 Land Exchange Direct NFS Acreage Gain/Loss			
Riparian/Wetland	52.1	12	+40.1
High Altitude Riparian [a,b]	8.7	5.5	+3.2
Spruce-Fir Forest [c]	47.1	170.7	-123.6
Aquatic Habitat	0	1.1	-1.1
Meadow	15.3	2.7	+12.6
Clearing	2.8	1.1	+1.7

[a] High Altitude Riparian is a subset of riparian/wetland.
[b] Habitat Structural Stage (HSS) 2S (scrub-shrub) wetland.
[c] HSS 4B&C

Table 6-3. Alternative 2 and 3 Effects (Acres) by Habitat Type and Alternative and Development Concept[a]

Habitat Type	Alternative & Development Concept	Federal Parcel Traded	Private Parcel Traded	Net Gain/Loss of Habitat to NFS Lands	Private Parcel Not Traded[b]	Total
High Elevation Riparian[c]	Alternative 2 – Land Exchange Low Density	0.31	0	-0.31	0.16	0.47
	Alternative 2 – Land Exchange Moderate Development	0.66	0	-0.66	0.20	0.86
	Alternative 2 – Land Exchange Max Density[d]	0.66	0	-0.66	0.32	0.98
	Alternative 3 – ANILCA Low Density	0.30[d]	0	-0.30	0.60	0.90
	Alternative 3 – ANILCA Moderate Development	0.30	0	-0.30	0.38	0.68
	Alternative 3 – ANILCA Max Density	0.65	0	-0.65	0.62	1.27
Mixed Conifer And Spruce/Fir[e]	Alternative 2 – Land Exchange Low Density	23.94	0	-23.94	5.60	29.54
	Alternative 2 – Land Exchange	28.23	0.76	-27.47	32.96	61.95

Table 6-3. Alternative 2 and 3 Effects (Acres) by Habitat Type and Alternative and Development Concept[a]						
Habitat Type	Alternative & Development Concept	Federal Parcel Traded	Private Parcel Traded	Net Gain/Loss of Habitat to NFS Lands	Private Parcel Not Traded[b]	Total
	Moderate Development					
	Alternative 2 – Land Exchange Max Density	85.18	0.76	-84.42	49.00	134.94
	Alternative 3 – ANILCA Low Density	1.93[d]	0	-1.93	23.18	25.11
	Alternative 3 – ANILCA Moderate Development	4.01	0	-4.01	34.81	38.82
	Alternative 3 – ANILCA Max Density	4.10	0	-4.10	65.12	69.22

[a] All impacts combined.
[b] Indirect effects associated with development of the private parcel. Under Alternative 3 there is no differentiation of private parcel traded and not traded. Thus, impacts are combined for each of the private parcels identified under Alternative 2 as traded and not traded. This results in a value of zero in the column identified as private parcel traded.
[c] Scrub-shrub and forested wetland vegetation types used in the analysis. Herbaceous wetlands were not used as they do not represent suitable habitat.
[d] Impacts associated with the access road.
[e] Spruce-fir forest habitat structural stage of 4 used in the analysis.

6.1 HOARY BAT, *Lasiurus cinereus*

The hoary bat is a solitary, wide-ranging tree dwelling species that never seems abundant in one area (Armstrong et al. 2011). Armstrong et al. (2011) reported that in Colorado the species is frequently captured in ponderosa pine forests, but the species probably occurs throughout Colorado in suitable habitat up to 10,000 feet in elevation (Armstrong et al. 2011). Roost sites are in tree foliage 9–16 feet (3-5 m) above ground often associated with the edges of clearings. Roost sites have dense foliage above and open foliage for flying below.

Hoary bats arrive in Colorado in April and are gone by November. Breeding occurs September through November. Delayed fertilization occurs with actual birth occurring between mid-May and early July (NatureServe 2012). Young are able to fly at four weeks.

The diet if comprised of beetles, moths, wasps, and even smaller bats, all of which are taken on the wing.

The distribution of the species is poorly understood and no forest-level specific information is available. Because of the lack of information on this species, and the presence of potential roost sites, it is possible that hoary bats could occur within spruce-fir forests within the project site.

Because of the lack of knowledge on territory size, etc. the analysis area for the hoary bat is confined to the project site.

Alternative 1 would have no direct or indirect adverse effects on hoary bats because no habitat modification would be authorized on NFS lands. Reasonably foreseeable projects near the Village at Wolf Creek Access project site are limited to the WCSA MDP. Cumulative effects to spruce-fir habitat within the analysis area are limited to historic logging which removed late successional spruce-fir; the construction of Hwy 160 and its associated ROW and cut/fill; and FSR 391. Secondary impacts associated with an increase in recreation on adjacent NFS lands are expected to be minor and discountable because of this species' nomadic and wide-ranging nature and that the surrounding areas are near the published altitudinal limit.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the loss of approximately 69 acres (Table 6-2) of potentially useable hoary bat foraging and roosting habitat. The loss of 69 acres is insignificant and discountable when compared to the amount of suitable habitat that is available within the RGNF. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner; thus, there would be no impact to hoary bats from the land exchange itself.

Alternative 2 – Land Exchange Low Density Development: A total of approximately 29.54 acres of mixed conifer and spruce-fir forest would be indirectly impacted under this concept, of which 23.94 acres are on NFS lands (Table 6-3). Timber removal could impact individuals roosting within the project site. The loss of the habitat and any secondary impacts likely would not cause a significant impact to hoary bats. Cumulative effects are the same as for Alternative 1. The determination for the Alternative 2 – Land Exchange Low Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 2 – Land Exchange Moderate Density Development: A total of approximately 61.95 acres of mixed conifer and spruce-fir forest would be indirectly impacted under this concept, of which 28.23 acres are on NFS lands (Table 6-3). Timber removal could impact individuals roosting within the project site. The loss of the habitat and any secondary impacts likely would not cause a significant impact to hoary bats. Cumulative effects are the same as for Alternative 1. The determination for the Alternative 2 – Land Exchange Moderate Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 2 – Land Exchange Maximum Density Development: A total of approximately 134.94 acres of mixed conifer and spruce-fir forest would be indirectly impacted under this concept, of which 85.18 acres are on NFS lands (Table 6-3). Timber removal could impact individuals

roosting within the project site. The loss of the habitat and any secondary impacts likely would not cause a significant impact to hoary bats. The water storage requirement for the Maximum Density Development Concept would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss. Cumulative effects are the same as for Alternative 1. The determination for the Alternative 2 – Land Exchange Maximum Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 3 ANILCA Road Access Low, Medium and Maximum Density Development: Alternative 3 would directly result in minor effects to potential hoary bat habitat as a result of the access road, Tranquility Road ski area access, and Hwy 160 interchange converting 1.93, 4.01 and 4.10 acres of habitat of NFS lands per the three development concepts (Table 6-3). Indirect effects to mixed conifer and spruce-fir habitats associated with Alternative 3 would result in the conversion of a total of 25.11, 38.82, and 69.22 acres per the three development concepts. The water tank farm sites for the Moderate Density Development Concept would likely accommodate the water storage requirements for this concept. The water storage requirement for the Maximum Density Development Concept would require the water tank farm area plus an additional area estimated at 4.0 acres for Alternative 3. The additional area for the water storage would likely be located in the general area of the water tank farm. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss. Cumulative effects are the same as for Alternative 1. As a result of the loss of at least potential foraging habitat, the determination for the Alternative 3 – ANILCA Road Access development concepts is that they **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Other reasonably foreseeable projects considered in this analysis would contribute no additional cumulative effects to this species because impact zones associated with those projects do not extend to potential habitat for this species directly and indirectly affected by the proposed Federal Action on NFS land. Because of possible adverse effects to hoary bats, Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Alternative 1 would have no direct or indirect adverse effects on hoary bats because no habitat modification would be authorized. Alternatives 2 and 3 would result in direct and indirect effects to potential hoary bat foraging and roosting habitats as a result of road and utility corridor construction though mature spruce stands on NFS land. Because of the large size of hoary bat territories, the spatial loss of potential habitat within the project site is expected to not be significant and the direct, indirect, and cumulative effects of Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

6.2 AMERICAN MARTEN, *Martes americana*

Considered apparently secure in Colorado, marten occur throughout Alaska, Canada and the lower 48 states except for the Midwest and the South. Martens are boreal weasels closely associated with mature and late-successional subalpine (spruce-fir) forest, Douglas-fir, lodgepole pine, and high elevation riparian forests. Seasonal distribution also extends upward into the alpine and down into lodgepole pine forests and coniferous riparian corridors (Armstrong 1972, Towry 1984, Armstrong et al. 2011, Buskirk and Ruggiero 1994). They prefer late-successional or mixed-age stands with over 30%, and preferably 40-60%, canopy cover. Complex physical habitat structure, particularly on the forest floor, provides three important microhabitat functions: access to subnivian space for foraging and resting, escape cover, and thermal protection (Buskirk and Ruggiero 1994). Such structure might be in the form of logs, rock piles/outcrops, stumps, windthrown trees, slash, boulder fields, and squirrel middens.

Martens generally avoid habitats lacking overhead cover, including large clearcuts, burns, and meadows (Buskirk and Ruggiero 1994). Excluding marten use of talus (Streeter and Braun 1968) and alpine boulder fields (Thompson unpubl. data), openings in the range of 100-300 m wide are the largest that martens are known to cross (Koehler and Hornocker 1977, Buskirk 1983). Marten also avoided traveling >23 m from forest edges in Colorado (Robinson 1953).

Marten primarily eat red-backed voles, other voles (*Microtus* spp. and *Phenacomys intermedius*), pine and ground squirrels (*Spermophilus* spp.), and other small mammals, but will opportunistically eat insects, birds, fruits, and nuts (Armstrong et al. 2011, Buskirk and Ruggiero 1994). Martens are mainly crepuscular and nocturnal, are active year-round, and may forage on the ground or in trees, except during periods of severe winter weather. They may exhibit diurnal behavior in the summer when diurnal ground squirrels are an important prey source. Their movements respond to prey availability, but they do not exhibit seasonal or altitudinal migrations (Towry 1984).

Martens are generally solitary except during the breeding season. They mate during July to early September (Armstrong et al. 2011) and give birth from mid-March to late April (Strickland et al. 1982). Natal and maternal dens are located in large snags and down coarse woody debris (CWD), squirrel nests and middens, and burrows, which are most common in late-successional forests (Towry 1984, Buskirk and Ruggiero 1994). Marten populations can fluctuate widely because of variations in reproductive success, resident mortality, and large numbers of highly mobile transients (Armstrong et al. 2011).

Home range size varies widely among reported studies, due to sex, geographic area, prey abundance, and habitat characteristics, including type and degree of forest fragmentation. Home ranges are larger for males (Strickland et al. 1982), larger in areas of reduced prey availability or abundance (Thompson and Colgan 1987), and larger in more fragmented landscapes (Thompson and Colgan 1987, Soutiere 1979). Male home range may overlap that of several females. In Wyoming, the closest study area to Colorado in which marten home ranges were measured, males averaged 494-791 acres and females 198 acres (Clark et al. 1989, Clark and Campbell 1997).

Marten are generally tolerant of human disturbance but are vulnerable to habitat loss or modification (NatureServe 2012d, Ruggiero et. al 1994). Timber harvest that reduces canopy

cover and removes structure from the forest floor and over-harvest are the greatest threats to marten (NatureServe 2012d).

In 1994-1995 winter sampling using bait stations showed that marten are common on the RGNF, with detections occurring at 47 of 50 bait stations and/or noted while snow tracking in the area (USDAFS 2003). A total of 57 site detections of marten are currently known on or near the Forest, the majority of which occur on the Divide Ranger District. Marten were detected on and surrounding the project site during field surveys, but they are certainly more common than what the track indices indicated (Thompson 2005). They use conifer habitats on NFS and private lands for foraging and travel and may use suitable structure on these lands for denning. Based on habitats, structural conditions, and land uses present, it is unlikely that marten would den in the insular spruce-fir stand (on NFS land) surrounded by Hwy 160, the ski area parking lots, and clearcuts because of small patch size, surrounding unsuitable habitat, and chronic disturbances. While denning would be unlikely in these stands, it is used for occasional foraging as part of a larger home range and it could be used for landscape connectivity over Wolf Creek Pass without requiring animals to cross Hwy 160. Mature spruce forest on the Federal and non-Federal exchange parcels and the private land not traded, contiguous with large tracts of similar forest, represents effective foraging, travel, and denning habitat, although denning might not occur on the project site.

The marten analysis area for this project includes all areas within the estimated home range of 494 acres, assuming that the project site is the center of a home range. A point was created in ArcGIS within the approximate center of the project site on the non-Federal exchange parcel in spruce-fir habitat to represent the center of a home range. This was then buffered by 2,624 feet (800 m) to create an area of 496 acres. This area was then examined to determine what impacts currently exist within the buffered area and to determine if reasonably foreseeable impacts are expected to occur within the buffer. All direct, indirect, and cumulative impacts to suitable habitat within this area were analyzed. It is possible, based on the distribution of spruce-fir habitat within the project site, that up to two home ranges could exist within the project site if one each was centered at the extreme northeastern and southwestern corners of the project site.

Alternative 1 would have no direct or indirect adverse effects on martens because no habitat modification would be authorized on NFS lands. Reasonably foreseeable projects near the Village at Wolf Creek Access project site are limited to the WCSA MDP. If assuming that the home range of a marten is located in the center of the project site, then no impacts associated with the MDP would occur within the marten analysis area. Cumulative effects to spruce-fir habitat within the analysis area (assuming the center of a home range was within the center of the project site) are limited to historic logging which removed old-growth spruce-fir; the construction of Hwy 160 and its associated ROW and cut/fill; and FSR 391. If the center of a home range is in the southwest corner of the non-Federal exchange parcel, impacts associated with the MDP are expected to be minor and discountable since little spruce-fir habitat conversion (no new trails and minimal ski lift tower footings) would occur. Additionally, much of this area has been impacted by historic logging which removed large areas of marten habitat, some of which has regenerated but much of it has not. Cumulative effects to spruce-fir habitat within the analysis area are limited to historic logging which removed late-successional spruce-fir; WCSA ski runs, lodge, lift lines, and parking lots; FSR 391; and current thinning of beetle killed trees. These cumulative effects, regardless of where the center of a home range would be located, have all resulted in the removal of potential

nesting and foraging habitat; the amount of loss is unknown. Secondary impacts associated with an increase in recreation on adjacent NFS lands are expected to be minor and discountable because martens are not shy and can adjust to humans if suitable habitat is present.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the loss of 123.6 acres (Table 6-2) of potentially useable martin foraging habitat. The loss of 123.6 acres represents 25% of a home range, which is insignificant and discountable when compared to the amount of suitable habitat that is available within the RGNF. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to martens from the land exchange itself.

Alternative 2 – Land Exchange Low Density Development: A total of approximately 29.54 acres of mixed conifer and spruce-fir forest would be indirectly impacted under this development concept, of which 23.94 acres are on NFS lands (Table 6-3). Though this number is small in relation to a male's home range size (4.8% of a 494 acre home range) the increase in forest openings could decrease the efficacy of the home range and result in the need for an increase in home range size. This would be accompanied by an increase in energy expenditure required to meet the life history requirements of the impacted individual and could lead to an increase in intra-species competition. Secondary impacts associated with this development concept include the possibility of being chased or killed by dogs and a marked increase in the chance of being hit by cars in an area where automobiles previously were not present. The addition of both cats and dogs could cause a decrease or localized loss of marten prey, further impacting martens. The loss of the habitat alone likely would not cause a significant impact to martens, but with the addition of these other factors martens could be displaced from the immediately impacted area. Cumulative effects are the same as for Alternative 1. The determination for the Alternative 2 – Land Exchange Low Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 2 – Land Exchange Moderate Density Development: A total of approximately 61.95 acres of mixed conifer and spruce-fir forest would be indirectly impacted under this development concept, of which 28.23 acres are on NFS lands (Table 6-3). Though 28.23 acres is small in relation to a male's home range size (5.7% of a 494 acre home range) the increase in forest openings could decrease the efficacy of the home range and result in the need for an increase in home range size. This would be accompanied with an increase in energy expenditure required to meet the life history requirements of the impacted individual and could lead to an increase in intra-species competition. Impacts to vegetation types could increase by 0.22 acres; depending on if the finalized design and siting of water tank facilities extend disturbances outside of the current water tank farm footprints. This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. Secondary impacts associated with this development concept include the possibility of being chased or killed by dogs and a marked increase in the chance of being hit by cars in an area where automobiles previously were not present. The addition of both cats and dogs could cause a decrease or localized loss of marten prey, further impacting martens. The loss of the

habitat alone likely would not cause a significant impact to martens, but with the addition of these other factors martens could be displaced from the project site. Cumulative effects are the same as for Alternative 1. The determination for the Alternative 2 – Land Exchange Moderate Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 2 – Land Exchange Maximum Density Development: A total of approximately 134.94 acres of mixed conifer and spruce-fir forest would be indirectly impacted under this concept, of which 85.18 acres are on NFS lands (Table 6-3). The approximate 85.18 acres of impact represents greater than one-quarter (17.2%) of a 494 acre home range. The resulting increase in forest openings, which are avoided by martens; a decrease in available prey through habitat loss and predation by cats and dogs; the greatly increased chance of harassment by humans and pets; and the increased risk of direct mortality by automobiles, all would lead to the localized extirpation of martens from the project site; they would, however, likely remain within surrounding forests and could use part of the project site. The water storage requirement for the Maximum Density Development Concept would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2. The additional area for the water storage would likely be located in the general area of the water tank farm. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. Cumulative effects are the same as for Alternative 1. The determination for the Alternative 2 – Land Exchange Maximum Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 3 ANILCA Road Access Low, Medium and Maximum Density Development: Alternative 3 would directly result in minor, adverse, displacement and reduced habitat effectiveness effects to potential marten habitat as a result of the access road, Tranquility Road ski area access, and Hwy 160 interchange, converting 1.93, 4.01 and 4.10 acres of habitat of NFS lands per the three development concepts (Table 6-3). Indirect effects to mixed conifer and spruce-fir habitats associated with Alternative 3 would result in the conversion of a total of 25.11, 38.82, and 69.22 acres per the three development concepts. The water tank farm sites for the Moderate Density Development Concept would likely accommodate the water storage requirements for this concept. The water storage requirement for the Maximum Density Development Concept would require the water tank farm area plus an additional area estimated at 4.0 acres for Alternative 3. The additional area for the water storage would likely be located in the general area of the water tank farm. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. The loss of habitat under Alternative 3 ranges from 5-14% of spruce-fir habitat within a marten home range. Cumulative effects are the same as for Alternative 1. As a result of the loss of at least potential foraging habitat, the determination for the Alternative 3 – ANILCA Road Access development concepts is that it **may impact individuals, but is not likely to result in a loss of**

viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide.

Other reasonably foreseeable projects considered in this analysis would contribute no additional cumulative effects to this species because impact zones associated with those projects do not extend to potential habitat for this species directly and indirectly affected by the proposed Federal Action on NFS land. Because of likely adverse effects to martens, Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Alternative 1 would have no direct or indirect adverse effects on marten because no habitat modification would be authorized. Alternatives 2 and 3 would result in direct and indirect effects to potential marten foraging and travel habitats as a result of road and utility corridor construction though mature spruce stands on NFS land. Because of habitat loss, fragmentation and perforation effects, and human activities associated with VWC development, marten habitat effectiveness (i.e., foraging, travel, and denning habitat) would be adversely affected on private and NFS lands adjacent to the non-Federal exchange parcel and the private land not exchanged. This relatively large habitat block likely overlaps the boundaries of several territories. Some of these territories likely extend beyond the non-Federal exchange parcel onto contiguous, similar and higher quality NFS lands. Because of the relatively large size of marten territories, the spatial loss of this occupied habitat patch and the displacement of resident animals on the project site would result in locally increased territory competition and a reconfiguration of existing territories in a relatively large surrounding area. This territorial flux would extend over the buildout period of the private development. It is unlikely that activities extending from the project site onto the Forest would directly affect any den site or result in habitat modifications that would affect the prey base for this species. The creation of defensible space from wildfires around residences should not extend onto the Forest. Stray cats would extend onto the Forest and would compete with marten for small mammals and birds. It is unknown to what extent stray cats would contribute to, or adversely affect, the local prey base, but they would not benefit it. Increased vehicular use on Hwy 160, directly attributable to the private development, would increase road-kill probabilities, as marten are susceptible to highway mortality. These cumulative effects extending onto the Forest are considered insignificant and discountable. Increased traffic volume on Hwy 160 over Wolf Creek Pass resulting from the Saddle Brook development could incrementally increase road-kill probabilities for those marten that have home ranges overlapping NFS lands on VWC project site. Some spruce-fir habitats in highway intersection upgrade areas could represent potential foraging and travel habitat within the home range of martens, although the effectiveness of that habitat has been degraded by existing highway use and maintenance. Nevertheless, the removal of additional forest along the highway edge would extend the zone of highway influence into adjacent stands, further reducing foraging effectiveness, fragmenting habitat, and increasing across-highway distances that could increase road-kill probabilities and reduce habitat permeability. Regarding American marten, direct, indirect, and cumulative effects of Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

6.3 NORTHERN GOSHAWK, *Accipiter gentilis*

The Northern goshawk is an interior forest habitat generalist, using a variety of forest types, forest ages, structural conditions, and successional stages. The principal forest types occupied by the goshawk are ponderosa pine, aspen, mixed-conifer and spruce-fir between 7,500 and 11,300 feet amsl. Goshawks nest in mature to old-growth aspen and mixed aspen and coniferous forests with a depauperate understory on gently sloping north or east aspects near the bottom of stream courses (Shuster 1980, Andrews and Righter 1992). Nests are typically composed of a branch and twig platform 2-4 feet in diameter, located in a fork along the main trunk, two-thirds to three-quarters of the way up the tree. Nests may be reused in subsequent years. In a review of the scientific literature, Finch (1992) found nest sites may be revisited from year to year and are generally within 1/4 mile of water. Fledgling areas contain a mix of large trees with a canopy cover greater than 50 percent and young trees for hiding cover near the ground (Reynolds et al. 1992).

Goshawk territory size averages 640-2,560 acres with a diameter of 1-3 miles in the western United States (Call 1978). In Colorado, Towry (1984) estimated that a nest territory required 3,264-6,784 acres (5.1-10.6 mi.^{2}). Hoover and Wills (1984) estimate mean territory size for a pair at 3,300-6,800 acres. Within the territory, goshawks require at least 30 acres of unbroken forest for a nest site, with desired forest conditions providing three suitable and three replacement nest sites, totaling 180 acres (Reynolds et al. 1992).

Suitable foraging areas can be as large as 6,000 acres and include a variety of forest cover types and vegetation structural stages. Limited radio-telemetry evidence suggests that goshawks prefer mature forests for foraging. However, forest edges, openings and underneath forest canopies of all timber types are used for hunting. Prey species include rabbits, squirrels, woodpeckers, robins, jays, and other small birds and mammals (Reynolds et al. 1992). Colorado goshawks forage in the forest understory and forest openings for rabbits, hares, squirrels, and blue (dusky) grouse (Towry 1984). Snags, downed logs, woody debris, small openings, large trees, and herbaceous and shrubby understories are important features to many goshawk prey populations. Downed logs (>12 inch dbh and 8 feet long) provide cover, feeding and nest sites for a great variety of species, including several woodpeckers, chipmunks, golden-mantled ground squirrels, cottontail rabbits, red squirrels, and blue grouse. Forest openings of less than four acres benefit blue grouse, chipmunks and golden-mantled ground squirrels, while minimizing the effects on other interior forest prey species of the goshawk (Reynolds et al. 1992).

Populations can be difficult to determine due to paucity of historic quantitative data and because of biases in the various methods used to track populations (NatureServe 2012a). Kennedy (2003) strongly cautions against the use of PIF population estimates for this species "since they are based on absent or potentially spurious estimates of abundance." With that caveat noted, PIF BCR 16, Physiographic Area 62, Southern Rocky Mountains, is reported to have the highest relative abundance of goshawks rangewide and the highest importance ranking for the conservation of this species (Carter et al. 2000). In 2000 habitat conditions were projected to remain as they were into the future, however, the current spruce beetle (*Dendroctonus rufipennis*) epidemic in Colorado could result in a rangewide decrease in suitable nesting and foraging habitat. In 1998 the Colorado population was estimated at 1,249 breeding pairs (Kingery 1998).

Ferland (2005) reported that as of 2004 there were 15 known goshawk territories within the RGNF. These territories average 2.67 nests per territory. In addition to known territories, there also existed three historic and three potential territories. There are 7 total nests/nest sites within

the historic and potential territories (Ferland 2005). On the RGNF 95% of known goshawk nests are in aspen trees; based on available suitable forest types, goshawks are selecting aspen stands in greater proportion than their availability. Known nests occur at elevations between 8,700–10,843 feet (2,719–3,306 m).

The nearest active goshawk nest site is located approximately 15 miles northwest of the project site in the Ivy Creek drainage (D. Gomez, pers. comm, January 31, 2012). No other known active nest sites exist close to the project site. Individuals associated with the Ivy Creek nest site likely do not use the project site as part of their territory because of the distance between the nest site and the project site. An agitated adult goshawk was observed in 2009 approximately 5.6 miles northeast of the project site on the north side of Fox Mountain. Several subsequent visits to the area by Forest Service personnel failed to locate the individual or a nest site (D. Gomez, pers. comm. January 31, 2012). The project site does contain pockets of timber that could be used by goshawks for brief periods of time while goshawks perch and scan for prey items. None of these locations are suitable for nesting because of the disturbance associated with Hwy 160, selective timber harvest on the ski area during summer months, and recreationalists using Forest Road 391.

The impact of the spruce beetle outbreak on the goshawk is likely minimal since goshawks within the RGNF do not preferentially select spruce-fir for nesting sites. The West Fork Fire complex did not burn within the Ivy Creek drainage, thus the nest site was not impacted by the fire. The fire burned very little aspen, thus there likely is not a significant decrease in the amount of preferred nesting habitat available. Lastly, because goshawks have large territories, the loss of foraging habitat is not expected to impact nest success.

Surveys were conducted on July 16 and 20, 2009 within the Village at Wolf Creek project site. A total of 23 survey points approximately 300 m apart were originally identified; however, five survey points were excluded as they were located near the WCSA and FSR 391, both of which see daily recreational use. The exclusion of these survey points was per the 2006 Northern goshawk inventory and monitoring technical guide (Woodbridge and Hargis 2006). In summary, goshawk surveys were conducted according to established begging call broadcast call survey protocols (Woodbridge and Hargis 2006). Calls were broadcast through a Fanon® handheld bullhorn to maximize projection capabilities of the call. At each survey call point surveyors directed three 10 second broadcasts at 60°, 180° and 300° from the direction of travel followed by a 30 second observation period. The broadcast call was again broadcast for 10 seconds at 60° with observation occurring for 30 seconds at 180° and 300°. No northern goshawk were visually observed or aurally detected.

Because the project site does not offer suitable nesting habitat and the project site lies beyond the home range of known nest sites, the analysis area for the goshawk is restricted to the Village at Wolf Creek Access project site.

Alternative 1 would have no direct or indirect impacts on this species because no habitat modifications would occur on NFS lands. Because the goshawk analysis area is limited to the project site, no reasonably foreseeable future actions (i.e. the WCSA MDP) are known within the analysis area that could add cumulative impacts. Cumulative effects to spruce-fir habitat within the analysis area are limited to historic logging which removed old-growth spruce-fir; the construction of Hwy 160 and its associated ROW and cut/fill; and FSR 391. These cumulative

effects have all resulted in the removal of potential nesting and foraging habitat; the amount of loss is unknown.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal exchange parcel and the non-Federal exchange parcel. The exchange would result in the loss of 123.6 acres (Table 6-2) of potential goshawk foraging habitat. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to Northern goshawks from the land exchange itself.

Alternative 2 – Land Exchange Low Density Development: A total of approximately 29.54 acres of mature spruce-fir forest could be indirectly impacted under this concept, 23.94 acres of which are on NFS lands (Table 6-3). Because of the amount of human activity and the lack of a known territory that includes the project site, the loss of 23.94 acres of potential foraging habitat is discountable and insignificant when compared to the amount of habitat on the RGNF that is not near a human activity center and is within a territory. Cumulative impacts are the same as those described under Alternative 1. The determination for the Alternative 2 – Low Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 2 – Land Exchange Moderate Density Development: A total of approximately 61.95 acres of mature spruce-fir forest could be indirectly impacted under this concept, 28.23 acres of which are on NFS lands (Table 6-3). Because of the amount of human activity and the lack of a known territory that includes the project site, the loss of 28.23 acres of potential foraging habitat is discountable and insignificant when compared to the amount of habitat on the RGNF that is not near a human activity center and is within a territory. Cumulative impacts are the same as those described under Alternative 1. The determination for the Alternative 2 – Moderate Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 2 – Land Exchange Maximum Density Development: A total of approximately 134.94 acres of mature spruce-fir forest could be indirectly impacted under this concept, 85.18 acres of which are on NFS lands (Table 6-3). Because of the amount of human activity and the lack of a known territory that includes the project site, the loss of 85.18 acres of potential foraging habitat is discountable and insignificant when compared to the amount of habitat on the RGNF that is not near a human activity center and is within a territory. Cumulative impacts are the same as those described under Alternative 1. The determination for the Alternative 2 – Maximum Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 3 – ANILCA Road Access Low, Moderate and Maximum Density Development: Under this alternative, the Federal land would not be traded. Thus, impacts to mature spruce-fir forests would be less than under the Alternative 2 Land Exchange development concepts.

Potentially 25.11, 38.82, and 69.22 acres of mature spruce-fir forest would be indirectly impacted under the Moderate, Low and Maximum Density Development Concepts; of which 1.93, 4.01, and 4.10 acres, respectively per development concept, are on NFS lands (Table 6-3). The loss of 1.93, 4.01, and 4.10 acres of habitat is discountable and insignificant. Cumulative impacts are the same as those described under Alternative 1. The determination for the Alternative 3 – Low, Moderate and Maximum Density Development Concepts is that they **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Because of likely adverse effects to potential, albeit unoccupied and heavily influenced by human activities, goshawk foraging habitat, Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

6.4 AMERICAN PEREGRINE FALCON, *Falco peregrinus anatum*

Peregrine falcons occur in Colorado as rare breeders and, more commonly, as uncommon, non-nesting migrants. With reduced pesticide use and reintroduction efforts, the number of peregrines nesting and summering in Colorado has been increasing. Population estimates for peregrine falcons were not reported in either the 2009 BCR 16 Report (Blakesley et al. 2010) or Integrated Monitoring in Bird Conservation Regions (IMBCR) 2010 Annual Report (White et al. 2011). Kingery (1998) estimated that the number of peregrines in Colorado at 236 breeding pairs. Viable peregrine nesting sites possess two components: (1) adequate nesting habitat, and (2) extensive hunting habitat with an adequate prey base to support the adults and their offspring (Craig and Enderson 2004). Nesting sites are located on precipitous cliffs ranging in height from 40 to 2,100 feet, averaging 200 to 400 feet tall. Several ledges, potholes, or small caves must be present in the cliff face to function as a suitable nest site. A breeding pair will frequently alternate their nesting activities to different ledges on a cliff face between years, and they will often relocate to adjacent cliff faces. As a result, protective measures must address an entire cliff complex rather than an individual cliff.

In Colorado, peregrines usually return to nesting cliffs in late February or early March and initiate courtship activities, which continue to mid- or late April when eggs are laid. The young hatch from mid- to late May and fledge (i.e., leave the eyrie) in mid- to late June. The young and adults remain near the nesting cliff up to several months after fledging.

Nesting peregrines will not tolerate excessive human encroachment or prolonged disturbance near the nesting cliff. Any activity or development above the nesting cliff will likely cause abandonment. Breeding peregrines become extremely agitated and may abandon the site if disturbance occurs during courtship, before initiation of egg laying. One explanation regarding why some sites are occupied in spite of excessive human activity in the vicinity of the nesting cliff is that the falcons occupied the site early in the nesting season prior to spring increases in human activity and had eggs or young when the disturbance occurred. The birds were, therefore, attached to the site and would not abandon it even when exposed to increased disturbance.

Extensive hunting habitat is a second key component of a viable peregrine nest site. Peregrines will frequently travel at least 10 miles from their eyrie to procure prey. They have been

documented hunting up to 30 miles away from nest sites (G. Craig, CDOW, pers. comm.). It is, therefore, important to maintain the integrity of important hunting areas within at least 10 miles of the nesting cliff. Not all habitats within the 10-mile radius need be considered essential habitat, since only those areas that attract or support peregrine prey need be protected or enhanced. The primary prey captured by nesting Colorado peregrines are small to moderately-sized birds, such as blackbirds, doves, robins, flickers, jays, nutcrackers, meadowlarks, and pigeons. Any habitat that supports or concentrates birds should be considered essential to locally nesting peregrines.

Key hunting areas fall into two categories: (1) those habitats that concentrate or support important prey species, and (2) those habitats that expose prey and make them vulnerable to peregrine attack. Peregrines capture their prey through precipitous dives from considerable height above their quarry. Peregrines must, therefore, frequent habitats permitting this type of pursuit. Peregrines do not hunt below the forest canopy, but capture birds flying above forests or across open expanses. Nesting cliffs, are generally situated at considerable heights above the surrounding terrain, so peregrines have a broad panorama from favorite hunting perches near the cliff top.

The CPW and USFS annually monitors active eyries throughout the state and investigates reports of “new” eyries resulting from hacking and an increasing population. There are 11 active and/or inactive historic nest sites on the RGNF, the closest of which is over 25 miles away from the project site (R. Ghormley pers. comm.). An active peregrine falcon eyrie is present in the San Juan River Valley to the west of the project site such that the project site could be considered to be within a hunting territory. However, birds from this eyrie forage along the major tributaries and main stem of the San Juan River, not up toward Wolf Creek Pass (Thompson, unpubl. data). Similarly, nesting behavior was observed at a site in the East Fork Valley in 1991, but follow-up surveys by the CDOW did not identify a nesting pair. That site remains a viable eyrie, adequately separated from the active eyrie in an adjacent valley. Birds from that eyrie would also likely concentrate foraging along that broad valley bottom and high quality riparian habitats, which support prey concentrations in settings exposing them to peregrine predation.

Because the project site does not contain suitable nesting habitat and all known nests are located at lower elevations miles from the project site, the analysis area is limited to the Federal and private parcels.

Alternative 1 would have no direct or indirect adverse effects on peregrine falcons because no habitat modification would be authorized on NFS lands. Reasonably foreseeable projects near the project site are limited to the WCSA MDP. Planned projects associated with the MDP do not occur within the peregrine falcon analysis area, thus no impacts associated with the MDP would occur within the analysis area. Cumulative effects to peregrine falcon potential foraging habitat within the analysis areas is limited to historic logging which removed late-successional spruce-fir; WCSA ski runs and lift lines; FSR 391; Hwy 160 and its ROW and cut/fill areas; and current thinning of beetle killed trees. These cumulative effects have all resulted in the removal of potential foraging habitat; the amount of loss is unknown.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the loss of 123.6 acres (Table 6-2) of potentially suitable peregrine falcon foraging habitat. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through

development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to peregrine falcons from the land exchange itself.

Alternative 2 development concepts (Low, Moderate, and Maximum) would result in indirect effects to potential peregrine falcon foraging habitat as a result of the conversion of 29.54, 61.95 and 134.94 acres of mixed conifer and spruce-fir habitat, of which 23.94, 28.23, and 85.18 acres are on NFS lands (Table 6-3). Potential secondary effects (not associated with the conversion of habitats) are limited to human activities (i.e. recreation) associated with VWC development on surrounding NFS lands would result in a decrease in habitat effectiveness of low quality, opportunistic foraging habitat that could be used during migration. Cumulative effects are the same as for Alternative 1.

Alternative 3 ANILCA Road Access Low, Medium and Maximum Density Development: Alternative 3 would directly result in minor, adverse, displacement and reduced habitat effectiveness effects to potential peregrine falcon foraging habitat as a result of the access road, Tranquility Road ski area access, and Hwy 160 interchange converting 1.93, 4.01 and 4.10 acres of habitat of NFS lands per the three development concepts (Table 6-3). Indirect effects to mixed conifer and spruce-fir habitats associated with Alternative 3 would result in the conversion of a total of 25.11, 38.82, and 69.22 acres per the three development concepts. Potential secondary effects (not associated with the conversion of habitats) are limited to human activities (i.e. recreation) associated with VWC development on surrounding NFS lands would result in a decrease in habitat effectiveness of low quality, opportunistic foraging habitat that could be used during migration. Cumulative effects are the same as for Alternative 1.

These effects are considered insignificant and discountable. Other reasonably foreseeable projects considered in this analysis would contribute no additional cumulative effects to this species because impact zones associated with those projects do not extend to potential habitat for this species directly and indirectly affected by the proposed Federal Action on NFS land and the analysis area. Regarding peregrine falcons, direct, indirect, and cumulative effects of Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

6.5 WHITE-TAILED PTARMIGAN, *Lagopus leucurus*

The white-tailed ptarmigan (ptarmigan) is found in alpine areas at or above timberline (Braun et al. 1993) in North America. This bird is predominantly found in rocky areas, krummholz, moist vegetation near snowfields and streams, and willow-dominated plant communities. In the winter they generally use willow-dominated basins where wind action allows accumulation of snow (Braun et al. 1976). Females may vertically migrate to winter in willow stands in subalpine basins and along water courses (Braun et al. 1976, Hoffman and Braun 1977, Andrews and Righter 1992, Kingery et al. 1998). They inhabit all alpine regions of Colorado except the Wet Mountains and Spanish Peaks (Kingery et al. 1998). Males generally winter above treeline in areas of short, exposed willow thickets, while females often winter below treeline in taller, denser willow thickets. Pair formation begins in late April when females return to breeding grounds. Areas mostly free from snow early in spring are used for breeding. Females select nest sites among rock fields or alpine grasses adjacent to sheltering and concealing rocks. Egg-laying begins in early

June; one brood of an average of sex eggs per year is the norm. Young hatch in early to mid-July and leave the nest within 6 -12 hours of hatching (Kingery 1998), but remain in a brood with the hen through September. Many of the State's alpine areas are protected by wilderness designations and most summer ptarmigan habitat is inaccessible to substantive human impacts. White-tailed ptarmigan predominantly feed on buds, stems, and leaves, but will also consume insects. The single most important feature of habitats used by ptarmigan is the presence of willow (*Salix* spp.), which is their primary food source from late fall through spring. Any activity that reduces the distribution and abundance of willow will likely have negative consequences to ptarmigan (Hoffman 2006). Impacts to this species have largely come from winter habitat losses, attributable to high-altitude reservoir development, livestock grazing, an expanded elk population, road construction along stream courses, ski area development, and snowmobiling.

Ptarmigan are considered an uncommon species on the RGNF but may be found locally in certain select areas of the alpine tundra (R. Ghormley pers. commun. June 12, 2012). Individual or small groups of ptargiman have been documented on all three districts of the Forest; most group sizes are restricted to less than a half-dozen individuals. Little information on local population trends or wintering areas is currently known. Ptarmigan have not been documented in the Wolf Creek ski area or the project site but they are known to occur in select areas of the Continental Divide to the north and south of Wolf creek Pass.

No evidence of ptarmigan has been detected on or around the project site during numerous field surveys conducted over the past 12 years by Thompson. It is unlikely that this species is even seasonally present. While willow stands present on NFS and private lands may appear in summer to represent potential wintering habitat, these stands are relatively small and distant from wintering areas, making it less likely that females would locate and occupy them, and, more importantly, they are quickly bent over and covered by deep winter snows making this habitat unavailable and ineffective. Other reasonably foreseeable projects considered in this analysis would contribute no additional cumulative effects to this species because impact zones associated with those projects do not extend to potential habitat for this species directly and indirectly affected by the proposed Federal Action on NFS land. Regarding white-tailed ptarmigan, direct, indirect, and cumulative effects associated with Alternatives 1–3 would have **no impact** on this species and it will not be considered further in this document.

6.6 BOREAL OWL, *Aegolius funereus*

Boreal owls are rare to locally uncommon residents of Colorado's mountains that occur in mature to old-age (>150 years) spruce-fir forests above 9,000 feet; they also frequent higher-elevation lodgepole pine and aspen (Kingery 1998). In Colorado, they are primarily year-round residents of spruce-fir forests (Kingery 1998). They inhabit mature and late-successional spruce-fir and spruce-fir/lodgepole pine forests interspersed with small meadows, streams, and wetlands. The forest structure provides nest cavities and the more mesic communities generally support higher small rodent populations. Red-backed voles are their principal prey species and owl populations may fluctuate considerably in response to prey availability (Kingery 1998). Surveys in Colorado showed that the species is widely distributed in suitable habitats, with records from most of the higher mountain ranges in the state (Palmer 1984, Ryder et al. 1987, Stahlecker and Rawinski 1990). Due to this species' nocturnal habits and early nesting season, no population trend information from BBS or other long-term monitoring projects are available. This species is

monitored by MCB with nocturnal surveys. In 1998 the number of pairs of boreal owls in Colorado was estimated at 238 (Kingery 1998).

The male boreal owl does not defend all of the home range or foraging area, but will defend when intruders are within 100 m of the nest site. Nest sites generally are secondary cavities created by woodpeckers. In Colorado, courtship singing by the pair can last for up to 120 days (Hayward and Hayward 1993) with the greatest vocalization occurring between February and April. Boreal owls are typically monogamous and have a single brood annually. In Colorado, laying dates are estimated from 17 April to 1 June with half the known nests being initiated by 10 May (Hayward and Hayward 1993). Clutch size averages four to six eggs. After an approximate 26 day incubation period, the young leave the nest at about four to five weeks. The boreal owl eats mainly small mammals but will include birds and insects in its diet. Boreal owls require large areas of mature spruce-fir forest, home ranges in Colorado are approximately 3,700 acres (Palmer 1986). They can be nomadic and traverse much of their home range over a 2–3 week period (Hayward and Hayward 1993).

The greatest threat to boreal owls is the removal of nest cavities (large trees and snags for nesting) and mature, mesic forests with high canopy closure and large downed woody material – essential habitat features for their primary prey species the red-backed vole (Colorado Partners in Flight 2000). Timber harvest and other land clearing activities greater than three acres in size may reduce primary prey populations, remove forest structure used for foraging, and eliminate nesting cavities (Hayward and Hayward 1993, Colorado Partners in Flight 2000). Population trends for PIF BCR 16 are not known because of the lack of data. The reliable indication of long-term trends has been unavailable because of difficulty in surveying and censusing; further complicated by nomadism and fluctuating prey populations (Hayward and Hayward 1993).The rarity of detecting of boreal owls is exemplified by only one detection during MCB surveys in 2004 (Beason et al. 2004).

No studies investigating boreal owl habitat use have occurred on the RGNF (USDAFS 2003). However, survey detections indicate that this species appears to prefer older stands of spruce-fir. Surveys in 1985 provided the first detections in the Wolf Creek Pass area; there are 23 records of boreal owls occurring on the RGNF (USDAFS 2003). The majority of detections have occurred near Trout Mountain/Shaw Lake on the Divide Ranger District.

Boreal owl surveys were conducted in the vicinity of the private parcel in 2004 and 2005 (Thompson 2005). No boreal owls were detected in 2004; in 2005 a single male and a male/female pair within an active nest territory were detected on lands within the current Federal exchange parcel. In 2009, surveys were completed on both the Federal and private parcels; no boreal owls were detected (Wildlife Specialties 2009). Detailed survey results and maps showing calling stations for these surveys are contained in the project file at the RGNF SO in Monte Vista.

The 2004 detection of the male and female was interpreted as a mated pair within an active nest territory. Based on habitats and structural conditions present, that nest territory probably overlapped onto the private parcel. Boreal owl use of the insular spruce-fir stand (on NFS land) surrounded by Hwy 160 and the ski area's parking lots is less likely because of small patch size, surrounding unsuitable habitat, and chronic disturbances. Nesting would be unlikely in that stand, but it could be used for occasional foraging as part of a larger home range. Boreal owls have been

detected on developed portions of Vail Ski Area (Thompson 1994) using similar structural stages of fragmented spruce-fir as those present on the project site.

The boreal owl analysis area for this project includes all areas within the estimated home range of 3,700 acres, well beyond the disturbance areas associated with Alternatives 2 and 3. To develop the analysis area of potential impacts associated with each alternative, the approximate location of the 2004 detection was plotted in GIS and then buffered by 7,216 feet (2,200 m) to create the estimated home range size of 3,700 acres (actual acreage of the buffered area using this technique is 3,757 acres). This area was then examined to determine what impacts currently exist within the buffered area and to determine if reasonably foreseeable impacts are expected to occur within the buffer. All direct, indirect, and cumulative impacts to suitable habitat within this area were analyzed.

Alternative 1 would have no direct or indirect adverse effects on boreal owls because no habitat modification would be authorized on NFS lands. The only known, reasonably foreseeable future action within the boreal owl analysis area is the WCSA MDP. Indirect impacts associated with the MDP are limited to the potential removal of a nest tree as there are no large (> 3 acre) land clearing planned projects which could result in the drying of mesic areas that would reduce red-backed vole populations. Under planned MDP projects spruce-fir habitat conversion would be minor and discountable since no new trails are planned; all skiing would occur in areas that currently are skied. Cumulative effects to spruce-fir habitat within the analysis area are limited to historic logging which removed old-growth spruce-fir; the construction of Hwy 160 and its associated ROW and cut/fill; the CDOT maintenance facility; the WCSA ski runs, lodge, lift lines, and parking lots; FSR 391; and current thinning of beetle killed trees. These cumulative effects have all resulted in the removal of potential nesting and foraging habitat; the amount of loss is unknown. The current spruce beetle epidemic could lead to a decrease in red-backed vole populations. This could result in the adults not locating enough prey for young or causing an increase in foraging time leading to greater metabolic energy expenditure which, in extreme cases, could decrease fitness.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal exchange parcel and the non-Federal exchange parcel. The exchange would result in the loss of 123.6 acres (Table 6-2) of potentially suitable boreal owl nesting and foraging habitat. This represents 3.3% of a single home range, which is insignificant and discountable when compared to the amount of suitable habitat that is available within the RGNF. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to boreal owls from the land exchange itself.

Alternative 2 – Land Exchange Low Density Development: A total of approximately 29.54 acres of spruce-fir forest would be impacted as an indirect effect under this development concept, of which 23.94 acres are on NFS lands (Table 6-3). The loss of 23.94 acres represents 0.6% of a single home range, which is insignificant and discountable when examined as part of a 3,700 acre home range and when compared to the amount of suitable habitat that is available within the RGNF. However, assuming that the center of the home range is within the center of the project site, development could remove a potential nest site location(s). This would result in the loss of

this nest site and would likely cause a shift of the nest site to a nearby area. With the nomadic nature of this species within its home range, the removal of the nest site would not likely be a negative impact. Adhering to the March 14 – July 15 Project Design Criterion of prohibiting clearing and grubbing during this time period would eliminate the likelihood of direct mortality to adults, active nests, and construction year recruitment. Cumulative impacts are the same as those described under Alternative 1. As a result of the loss of at least potential foraging habitat and potential nesting habitat, the determination for the Alternative 2 – Land Exchange Low Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Alternative 2 – Land Exchange Moderate Density Development: A total of approximately 61.95 acres of spruce-fir forest would be impacted as an indirect effect under this development concept, of which 28.23 acres are on NFS lands (Table 6-3). The loss of 28.23 acres represents 0.8% of a single home range, which is insignificant and discountable when examined as part of a 3,700 acre home range and when compared to the amount of suitable habitat that is available within the RGNF. However, assuming that the center of the home range is within the center of the project site, development could remove a potential nest site location(s). This would result in the loss of this nest site and would likely cause a shift of the nest site to a nearby area. With the nomadic nature of this species within its home range, the removal of the nest site would not likely be a negative impact. Adhering to the March 14 – July 15 Project Design Criterion of prohibiting clearing and grubbing during this time period would eliminate the likelihood of direct mortality to adults, active nests, and construction year recruitment. Cumulative impacts are the same as those described under Alternative 1. As a result of the loss of at least potential foraging habitat and potential nesting habitat, the determination for the Alternative 2– Land Exchange Moderate Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Alternative 2 – Land Exchange Maximum Density Development: A total of approximately 134.94 acres of spruce-fir forest would be impacted as an indirect effect under this development concept, of which 85.18 acres are on NFS lands (Table 6-3). The loss of 85.18 acres represents 2.3% of a single home range, which is insignificant and discountable when examined as part of a 3,700 acre home range and when compared to the amount of suitable habitat that is available within the RGNF. The water storage requirement for the Maximum Density Development Concept would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 . The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. However, assuming that the center of the home range is within the center of the project site, development could remove a potential nest site location(s). This would result in the loss of this nest site and would likely cause a shift of the nest site to a nearby area. With the nomadic nature of this species within its home range, the removal of the nest site would not likely be a negative impact. Adhering to the March 14 – July 15 Project Design Criterion of prohibiting clearing and grubbing during this time period would eliminate the likelihood of direct mortality to adults, active nests, and construction year

recruitment. Cumulative impacts are the same as those described under Alternative 1. As a result of the loss of at least potential foraging habitat and potential nesting habitat, the determination for the Alternative 2– Land Exchange Maximum Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Alternative 3 – ANILCA Road Access Low, Moderate and Maximum Density Development: Impacts to boreal owl spruce-fir habitat would be less under the ANILCA development concepts than under Alternative 2 Land Exchange because less spruce-fir habitat exists within the private parcel. A total of approximately 25.11, 38.82, and 69.22 acres of spruce-fir forest would be impacted as an indirect effect under the ANILCA Alternative Low, Moderate and Maximum Density Development Concepts, of which 1.93, 4.01 and 4.10 acres, respectively per development concept, are on NFS lands (Table 6-3). The loss of habitat under Alternative 3 ranges from 0.05–0.1% of a single home range, which is insignificant and discountable when examined as part of a 3,700 acre home range and when compared to the amount of suitable habitat that is available within the RGNF. The water tank farm sites for the Moderate Density Development Concept would likely accommodate the water storage requirements for this concept. The water storage requirement for the Maximum Density Development Concept would require the water tank farm area plus an additional area estimated at 4.0 acres for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. However, assuming that the center of the home range is within the center of the project site, development could remove a potential nest site location(s). This would result in the loss of this nest site and would likely cause a shift of the nest site to a nearby area. With the nomadic nature of this species within its home range, the removal of the nest site would not likely be a negative impact. Adhering to the March 14 – July 15 Project Design Criterion of prohibiting clearing and grubbing during this time period would eliminate the likelihood of direct mortality to adults, active nests, and construction year recruitment. Cumulative impacts are the same as those described under Alternative 1. As a result of the loss of potential foraging and nesting habitat, the determination for the Alternative 3 – ANILCA Road Access development concepts is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Alternatives 2 and 3 would result in insignificant and discountable adverse direct and indirect effects to potential boreal owl foraging and nesting habitats as a result of road and utility corridor construction through fragmented, mature spruce stands on NFS land. Habitat loss, fragmentation effects, and human activities associated with development on the private parcel under Alternatives 2 and 3 would result in the loss of potential foraging and nesting habitat that probably overlaps the active nest territory of at least one pair of boreal owls. As a worst-case scenario, if the nest tree associated with this territory occurred within an impact area associated with Alternatives 2 and 3, direct mortality would probably be limited to the loss of eggs or nestlings, depending on whether tree removal occurred during the April to July nesting period (Kingery et al. 1998). Boreal owl habitat effectiveness (i.e., foraging and nesting habitat) could also be adversely affected on NFS lands adjacent to the private parcel as a result of the partial loss of territorial habitat on the private

parcel. Aside from the cumulative effects identified under Alternative 1 there are no known cumulative effects on NFS lands. It is unlikely that activities extending from the private parcel onto the Forest under Alternative 3 would directly affect any nest site or result in habitat modifications that would affect the prey base for this species. The creation of defensible space from wildfires around residences would not extend onto NFS lands. Stray cats would extend onto NFS lands and would compete with owls for small mammals and birds. It is unknown to what extent pet cats would contribute to, or adversely affect, the local prey base. These effects are considered minor, but adverse. Some spruce-fir habitats in highway intersection upgrade areas could represent potential foraging habitat within the home range of a local pair of owls, although the effectiveness of that habitat has been degraded by existing highway use and maintenance. Nevertheless, the removal of additional forest along the highway edge would extend the zone of highway influence into adjacent stands, further reducing foraging effectiveness. Additionally, with the current spruce beetle epidemic there will be an increase in potential nesting habitat associated with creation of snags across the landscape; however, the loss of spruce-fir habitat could also result in the drying of mesic habitats occupied by red-backed voles. Regarding boreal owls, direct, indirect, and cumulative effects of Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

6.7 OLIVE-SIDED FLYCATCHER, *Contopus cooperi*

The olive-sided flycatcher primarily breeds in montane and northern coniferous forests at altitudes up to 3,050 m (10,000 ft) in central Colorado (Scott et al. 1982). Olive-sided flycatchers are uncommon summer residents of higher Colorado mountains and migrants through lower elevations (Andrews and Righter 1992). The olive-sided flycatcher breeds from the Canadian border south through Washington, Oregon, California, Nevada, and Sierra Juárez and Sierra San Pedro Mártir of Baja California Norte. This species also breeds from the Canadian border south through Idaho, western Montana, Utah, central and western Wyoming, and the western half of Colorado to the Mogollon Rim of Arizona (Altman and Sallabanks 2000).

This flycatcher preys almost exclusively on flying insects, particularly bees, flies, moths, grasshoppers, and dragonflies (Bent 1942), which they spot from snag perches. Essential components of olive-sided flycatcher habitat include the juxtaposition of forest openings and mature forest, and the presence of snags (Kotliar 2007). They are often associated with the ecotone between wetlands and upland habitats. They may occupy early successional forests (i.e., those resulting from fires and logging), provided snags and/or residual tall trees are available for foraging and singing perches (Scott et al. 1982, Hutto 1995). This flycatcher's affinity to such forest structure may limit its local abundance or distribution (Finch 1992, Kotliar and Melcher 1998).

Pairs form in late May and nest building begins shortly thereafter. One brood per year is typical, second broods are rare. In Colorado, egg laying is at its peak between June 23 and July 3 (Altman and Sallabanks 2000). Nests are open-cup structures placed at various heights above ground, typically in conifers. Typically three eggs are laid, but four is not uncommon. Incubation takes 14 – 16 days (Kotliar 2007). Females do all the brooding of the young but males do assist with some of the feeding. Young fledge at 19-21 days of age. The young are cared for by the adults for approximately one week and remain within the pair's territory for approximately three

weeks. This species shows high site fidelity for breeding and wintering locations (NatureServe 2012c). The estimated home range size can be up to 110 acres (Great Basin Bird Observatory 2012).

Timber harvesting practices and fire management can affect population dynamics and habitat suitability for olive-sided flycatchers (Kotliar 2007). Though undocumented, mosquito and black-fly control may affect local populations (NatureServe 2012c). Nest parasitism is uncommon.

North American Breeding Bird Survey (BBS) data indicate declines since 1966 across much of its North American range with a decline of 3.5% annually (Altman and Sallabanks 2000). This species could be at risk from impacts to its non-breeding habitat in Central and South America. Logged areas are reported to increase breeding areas, but logged areas may act as 'ecological traps' (an area that appears to have superior habitat and is thus actively selected for but in reality high rates of mortality occur and decrease the population) *(*Altman and Sallabanks 2000). Fire suppression throughout the breeding range undoubtedly limits the acreage of available habitat; large areas of dense, second growth forests growing up following cutting or fires are being maintained as closed canopy forests through intensive fire control (NatureServe 2012c). Additionally, forests dominated by dead trees, like those impacted by beetle kill, will not support this species (Peterson and Fichtel 1992).

Current and historical timber harvest may appear to benefit flycatchers, but as stated these areas could be ecological traps and may be contributing factors to the overall decline of this species. Areas in which beetle kill is or has occurred will limit the amount of usable habitat. These factors have and are occurring on both the Federal and non-Federal exchange parcels and the private land not traded.

Of 2003 (USDAFS 2003), the Forest database provided only two records of olive-sided flycatchers occurring on the RGNF. Both detections occurred on the Divide District in spruce-fir habitats. Information from the Colorado Breeding Bird Atlas detected olive-sided flycatchers in several Atlas Blocks on all districts of the RGNF (Kingery 1998). This effort led to the determination that the flycatcher is a possible breeder on the Divide District. Thompson has detected olive-sided flycatchers on both the Federal and non-Federal exchange parcels. Thompson (2005) reported that flycatcher use was concentrated along the interface of the private land and developed ski terrain, south of FSR 391. In 2009 an individual was detected calling near the pond north of Alberta Park Reservoir. Mature stands of timber that contain necessary habitat components through the project site are considered occupied or potential habitat.

The olive-sided flycatcher analysis area for this project includes all areas within the estimated home range of 110 acres at the two locations described above. Based on these two locations it is likely that there could be 2–3 home ranges within the disturbance areas associated with Alternatives 2 and 3. To develop the analysis area of potential impacts associated with each alternative, points were created in ArcGIS within spruce-fir habitat within the concentration area and near the pond north of Alberta Park Reservoir. These points were buffered by 1,312 feet (400 m) to create the estimated home range size of 110 acres (actual size of the buffer using this technique is 124 acres). This area was then examined to determine what impacts currently exist within the buffered area and to determine if reasonably foreseeable impacts are expected to occur

within the buffer. All direct, indirect, and cumulative impacts to suitable habitat within this area were analyzed.

Alternative 1 would have no direct or indirect adverse effects on olive-sided flycatchers because no habitat modification would be authorized on NFS lands. Reasonably foreseeable projects near the Village at Wolf Creek Access project site are limited to the WCSA MDP. Planned projects associated with the MDP do not occur within the olive-sided flycatcher analysis area, thus no impacts associated with the MDP would occur within the analysis area. Cumulative effects to olive-sided flycatcher habitat within the analysis areas is limited to historic logging which removed old-growth spruce-fir; WCSA ski runs and lift lines; FSR 391; and current thinning of beetle killed trees. These cumulative effects have all resulted in the removal of potential nesting and foraging habitat, the amount of loss is unknown.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the loss of 79.2 acres (Table 6-2) of potentially useable olive-sided flycatcher nesting and foraging habitat. The loss of 123.6 acres represents 112% of a summer home range (two are suspected to occur within the project site, see above), which is insignificant and discountable when compared to the amount of suitable habitat that is available within the RGNF. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to olive-sided flycatchers from the land exchange itself.

Alternative 2 – Land Exchange Low Density Development: A total of approximately 29.54 acres of spruce-fir forest would be indirectly impacted under this development concept, of which 23.94 acres are on NFS lands (Table 6-3). The loss of 23.94 acres represents 21.7% of a summer home range (two are suspected to occur within the project site, see above), which is insignificant and discountable when compared to the amount of suitable habitat that is available within the RGNF. The actual amount of olive-sided flycatcher nesting and foraging habitat would be less than this figure since they are dependent on the juxtaposition of forest openings and mature forest associated with the ecotone between wetlands and upland habitats where snags are present. As the spruce beetle epidemic increases in the project site there will be a decrease in suitable nesting and foraging habitat. Adhering to the March 14 – July 15 Project Design Criterion of prohibiting clearing and grubbing during this time period would eliminate the likelihood of direct mortality to adults, active nests, and construction year recruitment. Cumulative impacts are the same as those described under Alternative 1. The determination for the Alternative 2 – Land Exchange Low Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 2 – Land Exchange Moderate Density Development: A total of approximately 61.95 acres of spruce-fir forest would be indirectly impacted under this concept, of which 28.23 acres are on NFS lands (Table 6-3). The loss of 28.23 acres represents 25.6% of a summer home range (two are suspected to occur within the project site, see above), which is insignificant and discountable when compared to the amount of suitable habitat that is available within the RGNF. The actual amount of olive-sided flycatcher nesting and foraging habitat would be less than this

figure since they are dependent on the juxtaposition of forest openings and mature forest associated with the ecotone between wetlands and upland habitats where snags are present. As the spruce beetle epidemic increases in the project site there will be a decrease in suitable nesting and foraging habitat. Adhering to the March 14 – July 15 Project Design Criterion of prohibiting clearing and grubbing during this time period would eliminate the likelihood of direct mortality to adults, active nests, and construction year recruitment. Cumulative impacts are the same as those described under Alternative 1. The determination for the Alternative 2 – Land Exchange Moderate Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide**.

Alternative 2 – Land Exchange Maximum Density Development: A total of approximately 134.94 acres of spruce-fir forest would be indirectly impacted under this concept, of which 85.18 acres are on NFS lands (Table 6-3). The loss of 85.18 acres represents 77.4% of a summer home range (two are suspected to occur within the project site, see above), which is insignificant and discountable when compared to the amount of suitable habitat that is available within the RGNF. The actual amount of olive-sided flycatcher nesting and foraging habitat would be less than this figure since they are dependent on the juxtaposition of forest openings and mature forest associated with the ecotone between wetlands and upland habitats where snags are present. The water storage requirement for the Maximum Density Development Concept would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2. The additional area for the water storage would likely be located in the general area of the water tank farm. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. As the spruce beetle epidemic increases in the project site there could be a decrease in suitable nesting habitat but foraging habitat could increase. Adhering to the March 14 – July 15 Project Design Criterion of prohibiting clearing and grubbing during this time period would eliminate the likelihood of direct mortality to adults, active nests, and construction year recruitment. Cumulative impacts are the same as those described under Alternative 1. The determination for the Alternative 2 – Land Exchange Maximum Density Development Concept is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Alternative 3 – ANILCA Road Access Low, Moderate Development and Maximum Density Development: Impacts to olive-sided flycatcher spruce-fir habitat would be less under the ANILCA development concepts than under Alternative 2 because less spruce-fir habitat exists within the private parcel. A total of approximately 25.11, 38.82, and 69.22 acres of spruce-fir forest would be impacted as an indirect effect under the ANILCA Alternative Low, Moderate and Maximum Density Development Concepts, of which 1.93, 4.01 and 4.10 acres, respectively per development concept, are on NFS lands (Table 6-3). The loss of habitat under Alternative 3 ranges from 1.7-3.7% of spruce-fir habitat within this home range; which is insignificant and discountable when compared to the amount of suitable habitat that is available within the RGNF. However, assuming that the center of the home range is within the center of the project site, development could remove a potential nest site location(s). This would result in the loss of this nest site and would likely cause a shift of the nest site to a nearby area. The water tank farm sites

for the Moderate Density Development Concept for the two Action Alternatives would likely accommodate the water storage requirements for this concept. The water storage requirement for the Maximum Density Development Concept would require the water tank farm area plus an additional area estimated at 4.0 acres for Alternative 3. The additional area for the water storage would likely be located in the general area of the water tank farm. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. Adhering to the March 14 – July 15 Project Design Criterion of prohibiting clearing and grubbing during this time period would eliminate the likelihood of direct mortality to adults, active nests, and construction year recruitment. Cumulative impacts are the same as those described under Alternative 1. As a result of the loss of potential foraging and nesting habitat, the determination for the Alternative 3 – ANILCA Road Access development concepts is that it **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

Alternatives 2 and 3 would result in insignificant and discountable adverse direct and indirect effects to potential olive-sided flycatcher foraging and nesting habitats as a result of road and utility corridor construction through fragmented, mature spruce stands on NFS land. At the most, Alternatives 2 and 3 could lead to the loss of one breeding territory. Habitat loss, fragmentation effects, and human activities associated with development on the private parcel under Alternatives 2 and 3 would result in the loss of potential foraging and nesting habitat that probably overlaps the active nest territory of one to two pairs of olive-sided flycatchers. As a worst-case scenario, if the nest tree associated with this territory occurred within an impact area associated with Alternatives 2 and 3, direct mortality would probably be limited to the loss of eggs or nestlings, depending on whether tree removal occurred during the April to July nesting period (Kingery et al. 1998). Olive-sided flycatcher habitat effectiveness (i.e., foraging and nesting habitat) could also be adversely affected on NFS lands adjacent to the private parcel as a result of the partial loss of territorial habitat on the private parcel. Aside from the cumulative effects identified under Alternative 1 there are no known cumulative effects on NFS lands. It is unlikely that activities extending from the private parcel onto the Forest under Alternative 3 would directly affect any nest site or result in habitat modifications that would affect the prey base for this species. The creation of defensible space from wildfires around residences would not extend onto NFS lands. These effects are considered minor, but adverse. Some spruce-fir habitats in highway intersection upgrade areas could represent potential foraging habitat within the home range of a local pair of olive-sided flycatchers, although the effectiveness of that habitat has been degraded by existing highway use and maintenance. Nevertheless, the removal of additional forest along the highway edge would extend the zone of highway influence into adjacent stands, further reducing foraging effectiveness. Additionally, with the current spruce beetle epidemic there will likely be a decrease in potential nesting and foraging habitat across the landscape. Regarding olive-sided flycatchers, direct, indirect, and cumulative effects of Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

6.8 BOREAL WESTERN TOAD, *Bufo boreas boreas*

The boreal (western) toad historical distribution was throughout the Southern Rockies in Colorado New Mexico, and Wyoming at elevations between 8,000 – 12,000 feet (CPW 2012a). The species is now considered rare throughout its historic range. In Colorado, the boreal toad inhabits marshes, wet meadows, and the margins of streams, beaver ponds, lakes, and glacial kettle ponds between 7,000 and 11,860 feet (Hammerson 1999). During summer months they may be active both day and night, hiding beneath rocks, logs, or in rodent burrows when inactive. Winter months are spent in a state of torpor at the bottom of occupied bodies of water (Hammerson 1999) or within duff associated with lodgepole and spruce-fir forests. These toads emerge from winter chambers during May and begin moving back to the hibernaculum in late August and early September. By October, most toads have entered hibernation. Breeding begins in late spring as the winter snow pack recedes. Strings of eggs are usually deposited in shallow pools or along pond margins in late May to early June. Females typically lay 3,000 to 8,000 eggs and larvae development takes two months or more. Tadpoles metamorphose their first or second summer depending on elevation and water temperature. Post-breeding dispersal of adult toads may extend considerable distances into upland habitats from breeding sites. While males appear to have home ranges within an approximate 300-meter radius of breeding sites, females generally disperse farther (up to 2.5 miles) and into drier habitats than males. The CPW annually monitors known boreal toad populations statewide.

Evidence of population declines in the mountainous regions of Colorado was first documented in the mid 1980s; currently it is believed that these declines are due to the chytrid fungus *Batrachochytrium dendrobatitis* (Bd) infection. Other potential threats include decreases in water quality, changes in pH, habitat modification, and drought. Habitat modification could include timber harvest in lodgepole and spruce-fir forests which would remove winter hibernaculas. In 2007, 80 breeding sites (44 populations) existed in Colorado (CDOW 2008); 40 breeding sites were considered active. Testing for Bd infection showed 22 breeding sites tested positive for Bd, 35 tested negative, and 22 were untested (CDOW 2008).

Because of the noted population declines the CDOW listed the boreal toad as a state endangered species in 1993. In 1994 Colorado developed the interagency boreal toad recovery team. In 1995 the USFWS was petitioned to list the Southern Rocky Mountain population of the boreal toad as threatened or endangered under the ESA. The UFSWS concluded in 1995 that the listing of the boreal toad was "warranted but precluded." On September 29, 2005 the designation of the boreal toad as a candidate species was removed by the USFWS. Status of the Southern Rocky Mountain Population has not changed since the 2005 determination.

The authors have conducted habitat suitability surveys on the Federal and non-Federal exchange parcel and surrounding private lands in 2000, 2002, 2004, 2009 and 2011. Breeding habitat surveys were conducted in 2004 at Alberta Park Reservoir and at the pond located north of Alberta Park Reservoir on the Federal exchange parcel. No boreal toads were found at either location and Alberta Park Reservoir has been determined as not suitable for use as a breeding site. The small pond was determined to offer suitable breeding habitat, however, this site is not within the known dispersal range of boreal toads from other sites and thus it is unlikely that this location could be colonized.

No known breeding sites exist near the project site that are close enough to allow for colonization of the project site (T. Jackson per. comm. February 16, 2012). Data collected by CPW in 2010

identified five known breeding locations within the San Juan Mountains; two of which had confirmed breeding activity, three of which tested positive of Bd. The nearest of these sites is approximately 18 miles from the project area.

The analysis area is restricted to the pond located on NFS lands north of Alberta Park Reservoir.

Alternative 1 would have no direct or indirect impacts on this species because no habitat modifications would occur on NFS lands. Reasonably foreseeable future actions which could occur near the project site are limited to planned projects associated with the WCSA MDP. No projects are planned under the MDP that would impact potentially suitable habitat or result in an increase in human activity near the pond located on NFS lands north of Alberta Park Reservoir. There are no known cumulative impacts that have resulted near the pond that could have reduced its potential for use.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal exchange parcel containing the pond located north of Alberta Park Reservoir. The exchanging of the parcel to private ownership is not expected to impact boreal toads. The indirect impacts, discussed below, would have a much greater impact on the pond than merely a change in land ownership.

Alternative 2 – Land Exchange Low Density Development: Because building envelopes are not known at this time it must be assumed that a home site could be built near the pond located on NFS lands north of Alberta Park Reservoir. The potential indirect impacts include a change in the subsurface hydrogeology leading to reduction in the amount or time of water in the pond; an increase in human activity near and within the pond which could inadvertently lead to the introduction of biological and chemical contamination (e.g. introducing Chytrid fungus); and the capture or killing, both knowingly and unknowingly, of individuals. However, because of the lack of toad detection at this location for over 12 years and the lack of a known nearby population for colonization, it is unlikely that these actions would significantly impact the boreal toad locally or range-wide. The determination for the Alternative 2 – Low Density Development Concept is that it **will have no impact on this species.**

Alternative 2 – Land Exchange Moderate Density Development: Under the Moderate Density Development Concept no homes, roads, etc. would be built near the pond located on NFS lands north of Alberta Park Reservoir, thus there would be no habitat impacts. The potential indirect impacts of the Moderate Density Development Concept are the same as the Low Density Development Concept and an increase in traffic in areas where roads presently do not occur, leading to a potential increase in mortality. However, because of the lack of toad detections at this location for over 12 years and the lack of a known nearby population for colonization, it is unlikely that these actions would significantly impact the boreal toad locally or range-wide. The determination for the Alternative 2 – Moderate Density Development Concept is that it **will have no impact on this species**.

Alternative 2 – Land Exchange Maximum Density Development: Under the Maximum Density Development Concept impacts to the pond located on NFS lands north of Alberta Park Reservoir would be the greatest. For impact analysis the pond was buffered by 100 m to determine direct impacts around the pond. The 100 m buffer was used as this is the recommended minimum

distance that amphibian/reptile habitat should be buffered to protect these sites (Semlitsch and Bodie 2003). Indirect impacts within the 100 m buffer include the road, a detention pond, and all or parts of 13 lots. The road represents 1.17 acres of impervious surface which would increase runoff and potentially sedimentation as well as a source of non-point source contaminants (e.g. magnesium chloride – known to retard metamorphous). The proposed detention pond is within 60 feet of the pond and has a surface area of 0.2 acres. It would be constructed for the purpose of catching runoff from storm events and snow melt. The presence of this detention pond within 60 feet would likely cause a change in the chemistry of the pond, potentially making it unsuitable for use by boreal toads. The 13 lots that are all or partially within the buffer could result in a change in the chemistry of the pond because of the addition of fertilizers, etc. The location of these lots next to the pond would result in a marked increase in the likelihood that any toads using the pond could be captured or killed. The addition of traffic in areas where roads presently do not occur could lead to a potential increase in mortality. Though this development concept would have the greatest indirect impacts to potentially suitable, though unoccupied, habitat it is likely that potential impacts would be insignificant. However, because of the lack of toad detections at this location for over 12 years and the lack of a known nearby population for colonization, it is unlikely that these actions would significantly impact the boreal toad locally or range-wide. The determination for the Alternative 2 – Maximum Density Development Concept is that it **will have no impact on this species.**

Alternative 3 – ANILCA Road Access, Low, Moderate and Maximum Density Development: Under these development concepts the Federal land would not be traded. Thus, there would be no direct impacts to the pond located on NFS lands north of Alberta Park Reservoir. Indirect impacts could be an increase in human activity near and within the pond which could inadvertently lead to the introduction of biological and chemical contamination (e.g. introducing Chytrid fungus); and the capture or killing, both knowingly and unknowingly, of individuals. However, because of the lack of toad detections at this location for over 12 years and the lack of a known nearby population for colonization, it is unlikely that these actions would significantly impact the boreal toad locally or range-wide. The determination for the Alternative 3 development concepts is that they **will have no impact on this species.**

There are no known reasonably foreseeable projects within the analysis area considered in this analysis which would contribute additional deleterious effects to this species. Because of the lack of toad detections at this location for over 12 years and the lack of a known nearby population for colonization, Alternatives 1-3 **will have no impact on this species.**

6.9 NORTHERN LEOPARD FROG, *Rana pipiens*

The northern leopard frog is distributed throughout Colorado in most riparian habitats from an elevation of below 3,500 feet on the plains of the northeastern corner of the state to over 11,000 feet in the San Juan Mountains in the southwestern corner (Hammerson 1999). Although formerly abundant throughout its range, the northern leopard frog has become rare or been extirpated from many areas, especially high elevation populations due to changes in habitat conditions (Hammerson 1999). Northern leopard frogs are widespread across North America, inhabiting the banks and shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds, streams and other bodies of permanent water, especially those having rooted aquatic vegetation (Stebbins 1966, Hammerson 1999). Winter months are spent in a state of torpor at the bottom of occupied bodies

of water (Hammerson 1999). After hibernation, leopard frogs become active in April or May. Breeding occurs in the shallow, non-flowing portions of permanent water bodies and seasonally flooded areas adjacent to permanent pools. Breeding pools typically support fairly clear water with vegetation and algal mats. Eggs are attached to submerged vegetation. Metamorphosis occurs during the first summer, with tadpoles transforming in August or September, depending on elevation. The diet consists of insects, spiders, grubs, and larvae. They avoid overgrazed habitats.

Formerly abundant, northern leopard frog populations have decreased in recent years. Evidence of population declines in the mountainous regions of Colorado have been documented by Corn and Fogleman (1984) and Hammerson (1999); although, these have been primarily restricted to the Front Range of the Rocky Mountains. Hammerson (1999) identified climatic variation (i.e., flooding and drought), as reasons for local shifts in populations. In low elevation habitats, the introduced bullfrog (*Rana catesbeiana*) has been identified as a threat, as has the introduction of predatory game fishes to ponds and other habitats where leopard frogs were formerly common. Other threats include the human induced alteration of wetlands through filling dredging or increases in overall water depth. Flood control activities and other water diversion efforts have also impacted leopard frog populations (Hammerson 1999). Although the CPW recognizes the species as a species of concern, no mapping of species occurrence is available through either the CPW or the Natural Diversity Information Source (NDIS).

A petition to list the western United States population of the northern leopard frog as a threatened or endangered species was filed with the U.S. Department of the Interior on June 5, 2006. On 30 June 2009 the USFWS announced that the northern leopard frog may warrant Federal protection as a threatened or endangered species. No additional information on the listing process was available at the time this document was prepared.

The authors have conducted habitat suitability surveys at the Federal exchange parcel and surrounding private lands in 2000, 2002, 2004, 2009 and 2011. Breeding habitat surveys were conducted in 2004 at Alberta Park Reservoir and at the pond located north of Alberta Park Reservoir on the Federal exchange parcel. No northern leopard frogs were found at either location and Alberta Park Reservoir has been determined as not suitable for use as a breeding site. The small pond was determined to offer suitable breeding habitat, however, this site is not within the known dispersal range of northern leopard frogs from other sites and thus it is unlikely that this location could be colonized.

No known breeding sites exist near the project site which are close enough to allow for colonization of the project site (T. Jackson per. comm. February 16, 2012). Data collected by CPW in 2010 identified five known breeding locations within the San Juan Mountains; two of which had confirmed breeding activity. None of these sites are near the Village at Wolf Creek Access project site.

The analysis area is restricted to the pond located on NFS lands north of Alberta Park Reservoir.

Alternative 1 would have no direct or indirect impacts on this species because no habitat modifications would occur on NFS lands. Reasonably foreseeable future actions which could occur near the project site are limited to planned projects associated with the WCSA MDP. No projects are planned under the MDP that would impact potentially suitable habitat or result in an

increase in human activity near the pond located on NFS lands north of Alberta Park Reservoir. There are no known cumulative impacts that have resulted near the pond that could have reduced its potential for use.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal exchange parcel containing the pond located north of Alberta Park Reservoir. The exchange of the parcel to private ownership is not expected to impact northern leopard frogs. The indirect impacts, discussed below, would have a much greater impact on the pond than merely a change in land ownership.

Alternative 2 – Land Exchange Low Density Development: Because building envelopes are not known at this time it must be assumed that a home site could be built near the pond located on NFS lands north of Alberta Park Reservoir. The potential indirect impacts include a change in the subsurface hydrogeology leading to reduction in the amount or time of water in the pond; an increase in human activity near and within the pond which could inadvertently lead to the introduction of biological and chemical contamination (e.g. introducing Chytrid fungus); and the capture or killing, both knowingly and unknowingly, of individuals. However, because of the lack of frog detection at this location for over 12 years and the lack of a known nearby population for colonization, it is unlikely that these actions would significantly impact the northern leopard frog locally or range-wide. The determination for the Alternative 2 – Low Density Development Concept is that it **will have no impact on this species.**

Alternative 2 – Land Exchange Moderate Density Development: Under the Moderate Density Development Concept no homes, roads, etc. would be built near the pond located on NFS lands north of Alberta Park Reservoir, thus there would be no habitat impacts. The potential indirect impacts of the Moderate Density Development Concept are the same as the Low Density Development Concept and an increase in traffic in areas where roads presently do not occur, leading to a potential increase in mortality. However, because of the lack of frog detections at this location for over 12 years and the lack of a known nearby population for colonization, it is unlikely that these actions would significantly impact the northern leopard frog locally or range-wide. The determination for the Alternative 2 – Moderate Density Development Concept is that it **will have no impact on this species.**

Alternative 2 – Land Exchange Maximum Density Development: Under the Maximum Density Development Concept impacts to the pond located on NFS lands north of Alberta Park Reservoir would be the greatest. For impact analysis the pond was buffered by 100 m to determine direct impacts around the pond. The 100 m buffer was used as this is the recommended minimum distance that amphibian/reptile habitat should be buffered to protect these sites (Semlitsch and Bodie 2003). Indirect impacts within the 100 m buffer include the road, a detention pond, and all or parts of 13 lots. The road represents 1.17 acres of impervious surface which would increase runoff and potentially sedimentation, as well as a source of non-point source contaminants (e.g. magnesium chloride – known to retard metamorphous). The proposed detention pond is within 60 feet of the pond and has a surface area of 0.2 acres. It would be constructed for the purpose of catching runoff from storm events and snow melt. The presence of this detention pond within 60 feet would likely cause a change in the chemistry of the pond, potentially making it unsuitable for use by northern leopard frogs. The 13 lots that are all or partially within the buffer could result in a change in the chemistry of the pond because of the addition of fertilizers, etc. The location of

these lots next to the pond would result in a marked increase in the likelihood that any frogs using the pond could be captured or killed. The addition of traffic in areas where roads presently do not occur could lead to a potential increase in mortality. Though this development concept would have the greatest indirect impacts to potentially suitable, though unoccupied, habitat it is likely that potential impacts would be insignificant. However, because of the lack of frog detections at this location for over 12 years and the lack of a known nearby population for colonization, it is unlikely that these actions would significantly impact the northern leopard frog locally or range-wide. The determination for the Alternative 2 – Maximum Density Development Concept is that it **will have no impact on this species.**

Alternative 3 – ANILCA Road Access Low, Moderate and Maximum Development: Under these development concepts the Federal land would not be traded. Thus, there would be no direct impacts to the pond located on NFS lands north of Alberta Park Reservoir. Indirect impacts could be an increase in human activity near and within the pond which could inadvertently lead to the introduction of biological and chemical contamination (e.g. introducing Chytrid fungus); and the capture or killing, both knowingly and unknowingly, of individuals. However, because of the lack of frog detections at this location for over 12 years and the lack of a known nearby population for colonization, it is unlikely that these actions would significantly impact the northern leopard frog locally or range-wide. The determination for the Alternative 3 – development concepts is that they **will have no impact on this species.**

There are no known reasonably foreseeable projects within the analysis area considered in this analysis which would contribute additional deleterious effects to this species. Because of the lack of frog detections at this location for over 12 years and the lack of a known nearby population for colonization, Alternatives 1-3 **will have no impact on this species.**

6.10 RIO GRANDE CUTTHROAT TROUT, *Oncorhynchus clarkii virginalis*

In addition to their status as an R2 sensitive species and a candidate for listing under the ESA, Rio Grande cutthroat trout (RGCT) were selected as a MIS of the health of montane aquatic ecosystems and to answer the monitoring question as to whether the Forest is being managed in a manner that provides for viable, well-distributed populations of aquatic species across the Forest (USFS 2003b). RGCT were also evaluated for project effects because they are present in the project site and may be affected by the Proposed Action. As a result of their MIS status, MIS issues are also addressed in this section. While RGCT are relatively rare in high elevation streams, significant habitat restoration efforts have occurred on the RGNF and a range-wide conservation agreement was signed in 2003 (CDOW et al. 2003, updated and extended in 2009). RGCT are spring spawners sensitive to management activities that increase sediment, reduce stream cover, create barriers to movement, or impact stream flows or water quality.

6.10.1 LIFE HISTORY AND BACKGROUND INFORMATION

RGCT are the southernmost of 14 subspecies of cutthroat trout (Behnke 1992) and one of four subspecies of cutthroat trout native to Colorado's coldwater streams and lakes (Calamusso and Rinne 1999). RGCT are endemic to the Rio Grande basin in Colorado. They were once widespread throughout the upper Rio Grande, Canadian, and Pecos River basins of New Mexico and may have occurred as far south as Chihuahua, Mexico. They have been extirpated from large

portions of their historic range, and currently occupy approximately 10.6% of historically occupied habitat in Colorado (Alves et al. 2008).

In 1973 Colorado listed the Rio Grande cutthroat trout as threatened. Recovery objectives were achieved and the species was delisted in 1984 to their current status as a "species of special concern" and a game species. Since RGCT are considered a game species in Colorado, populations are subject to state game fish regulations and management.

In February of 1998 the USFWS was petitioned to list the RGCT as endangered (USFWS 1998b). The USFWS made a 90-day finding that listing at that time was not warranted. Legal wrangling ensued over the determination until the USFWS was sued in June of 2005 for failure to list RGCT. In December of 2005 the New Mexico Federal District Court ruled to uphold the USFWS finding of not warranted.

On May 14, 2008 the USFWS found listing of the RGCT as a threatened or endangered species under the ESA to be 'warranted, but preclude' (USFWS 2008). This means the USFWS has determined that a species should be listed based on the available science, but that listing other species takes priority because they are more in need of protection. In October of 2011 the USFWS reported in their Candidate Notice of Review that based on imminent threats of moderate severity a listing priority number (lpn) of 9 was warranted. An lpn is a number from 1 to 12 indicating the relative urgency for listing a species as threatened or endangered. The criteria used to assign this number reflect the magnitude and immediacy of threat to the species, as well as the relative distinctiveness or isolation of the genetic material they possess. This latter criterion is applied by giving a higher priority number to species which are the only remaining species in their genus, and a lower priority number to subspecies and varieties.

The historic range-wide elevation range for RGCT was between 6,000 to over 12,500 feet with the majority of occupied habitat occurring between 7,500 and 8,000 feet above mean sea level (amsl) (Alves et al. 2008). Sixty-nine percent of currently occupied habitat was reported between 8,500 and 11,000 feet (Alves et al. 2008). Throughout their currently occupied range the greatest amount of occupied habitat occurs at or near 9,500 feet. The project site is between 10,300 and 11,500 feet amsl in elevation. This elevation range represents approximately 38.2% of the currently occupied habitat. As elevation increases, the width of streams, and subsequently habitat quality, decreases. Over 90% of currently occupied streams are less than 15 feet wide with most being between 5 and 10 feet wide (Alves et al. 2008). Within the Rio Grande Headwaters GMU 4.5% of occupied streams are 20 feet wide or greater, the widest streams recorded. Stream widths with the project site vary between approximately 3–5 feet.

Restriction to small, high elevation headwater streams above natural or manmade barriers that prevents invasion by downstream populations of nonnative salmonids results in small, isolated populations (USFS 2002m). Dispersal capability from such disjunct populations is likely very low. Additionally, habitat fragmentation has resulted in smaller habitat units that can support only small populations of RGCT, which are at greater risk of extirpation from demographic change, loss of genetic heterozygosity, fixation of rare detrimental alleles, environmental catastrophes, and human disturbance (USFWS 2002).

Earlier categorizations of RGCT populations based on genetic purity relied on an A, B, C, or D rating (Alves et al. 2004). A rating of 'A' represented the most genetically pure and a rating of 'D" represented those with the highest degree of hybridization. These purity ratings have been replaced by the designations of core conservation populations (>99% pure, phenotypically true, and representative of the historic genome of the native cutthroat trout), conservation populations (self-sustaining and at least 90% pure), and recreational (genetically pure populations intended to maintain genetic refugia and provide recreation). Populations previously rated as B- to B+ are now conservation populations; those previously rated from A- to A+ are now core conservation populations. This classification is intended to preserve, protect and enhance the range-wide purity and diversity of the genome of Rio Grande cutthroat trout (Alves et al. 2004). The continuation of genetic tests and advancements in genetic sampling techniques will quantify the amount of hybridization within populations. New information on the genetic purity of populations may require a change in the management classification of RGCT and could identify the need for the conservation of hybridized populations throughout their range (Alves et al. 2004).

RGCT readily hybridize with other spring spawners, including rainbow trout (*O. mykiss*) and other non-native cutthroat trout, resulting in a loss of their genetic integrity and unique phenotypic characteristics. Alves et al. (2008) reported that genetic testing of 80% of RGCT across all of the then currently occupied area was completed. No evidence of introgression was found within populations representing 58 % of occupied habitats (Alves et al. 2008). Sixty-seven percent of conservation populations were reported at no risk of genetic contamination since barriers preventing immigration of hybridizing species existed.

RGCT, like other species of cutthroat trout, habitat requirements include cold, clear gravelly headwater streams and lakes with overhanging banks and vegetation which provide an abundant supply of insects. Although the species prefers cold waters, they are rarely found above timberline where water temperatures are so low that there is insufficient time for spawning, hatching and fry development or temperatures are so low that egg development is inhibited (Center for Biodiversity 2000, Harig and Fuasch 2002, Johnson 2007, Trotter 2008).They generally build redds in cold, well oxygenated, gravel-bottom streams because their incubating eggs require constant water flow to deliver oxygen and remove waste products (Hunter 1991). Spawning habitat is typically found at the top of riffles or the downstream edge of a pool where clean, silt-free gravel, predominantly <4 cm in diameter, can be found (Rinne 1980, Thurow and King 1994). Fine sediment in a redd can lead to low fry emergence success, possibly from lack of dissolved oxygen (Weaver and Fraley 1993), which may ultimately reduce juvenile recruitment and influence adult population levels (Scrivener and Brownlee 1989, Beard and Carline 1991). Sedimentation is greatest during spring runoff, so streams with high sediment loads may inadvertently favor fall-spawning brook (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) over the spring-spawning cutthroat trout (Behnke 1992).

Appropriate water temperatures are also critical for reproduction (USFS 2002m). Temperatures below a daily maximum of 4-8 ^{o}C can delay spawning (Rinne 1980, Thurow and King 1994) and prolong egg incubation, lowering embryo survival and increasing time to hatching (Hubert et al. 1994, Stonecypher et al. 1994). Embryos that hatch late may not be able to attain a body size needed to survive the winter energy deficit (Hunt 1969, Cunjak and Power 1987). Streams with cold summer water temperatures may not have successful recruitment or reproduction in most years.

Winter survival depends on having adequate refugia from low temperature and low flow (USFS 2002m). Salmonids tend to aggregate in deep pools with low flow velocities and areas of cover (Bustard and Narver 1975, Chisholm et al. 1987, Griffith and Smith 1993) or near sources of groundwater discharge (Cunjak and Power 1986). Thick surface ice resulting from severe winter temperatures threatens salmonid survival if few deep pools are present (Chisholm et al. 1987, Harig and Fausch 2002). Cutthroat trout at high elevations may also be subject to rapid winter temperature acclimation and overwinter starvation, so survival depends on their ability to attain a body size large enough to withstand metabolic deficits (Hunt 1969, Cunjak and Power 1987). This is particularly important for young cutthroat trout because most metabolic functions are limited by body size (Shuter and Post 1990).

Streamside vegetation plays an important role in stream channel morphology and the establishment of quality aquatic habitat (Wesche 1993). Riparian plants stabilize streambanks, produce leaf litter energy inputs, filter sediments and nutrients, and provide shade and cover in the form of large and small woody debris (Orth and White 1993). Streamside plants have dense root biomasses that help stabilize erosive streambanks, while the above ground portion of the plant increases floodplain roughness which slows overbank flows and encourages infiltration to promote recharge of the alluvial aquifer. Slowing of the overbank flows allows sediment to be deposited to help build streambanks and filters fine sediments which impact spawning areas and macroinvertebrates.

In addition to genetic introgression non-native salmonids also compete for resources and can be predatory on RGCT. As a result of competition, non-native trout replace RGCT where they co-occur. Interactions with nonnative salmonids usually lead to partial or total displacement of RGCT populations, often within a relatively short time period (i.e., less than 10 years), because RGCT evolved apart from other salmonids and lack isolating mechanisms that would allow co-existence. Invasions of nonnative salmonids are difficult or impossible to reverse even with persistent management efforts. Traditional methods for controlling nonnative salmonids (i.e., application of chemical toxicants and removal of nonnative salmonids with a backpack electroshocker) often result in reinvasion because of incomplete removal in complex habitats, failed artificial barriers, or deliberate reintroduction by anglers (Harig et al. 2000, Kulp and Moore 2000).

RGCT are vulnerable to over-exploitation and whirling disease (Behnke 1979, 1992, Rinne 1995, Calamusso and Rinne 1999, Swift-Miller 2001). In Colorado over-exploitation is not considered a threat to RGCT (Alves et al. 2004). Catch-and-release, limited harvest, bait and tackle restrictions and the combination of isolation of remote populations comprised of small size fish (<10 in) all contribute to the maintenance of populations and protection from angler harvest (Alves et al. 2004). In waters open to the take of trout, Colorado has a daily bag limit of four trout in aggregate or comprised of RGCT only. Special regulations apply at Alberta Park Reservoir where fishing is restricted to artificial flies and lures only and the daily bag limit is two trout (CPW 2011–2012 Fishing Regulations). Increased stress and mortality can occur even in waters designated catch and release, as a result of the stress associated with being played and handled. Whirling disease is more often deadly to native cutthroat trout species than non-native species. In waters containing whirling disease the species composition typically is comprised solely of non-native species. By

state law it is illegal to stock fish that are from waters that have tested positive for whirling disease.

Several studies (Clark and Gibbons 1991, Norris et al. 1991, Bolton and Shellberg 2001) have noted that recreational and construction activities contributing nutrients, bacteria, petrochemicals, pesticides, fertilizers, pathogens, and refuse to adjacent waters can directly and indirectly impact trout populations and vegetation within riparian areas. Such activities can increase sedimentation, alter stream flows, and impact riparian vegetation. Water diversions and stream crossings can impact stream morphology, timing and duration of water flows, and water quantity and quality. Effects on riparian soils, including trampling by foot, animal, and/or vehicles, can lead to compaction, destruction of soil biota, and increased erosion that could adversely affect local and downstream fisheries. Additional RGCT life history information is contained in the USFS Technical Conservation Assessment (Pritchard and Cowley 2006).

Climate change resulting in an increase in air temperatures or the length and severity of drought could have deleterious impacts on RGCT populations. The USFWS (2011) reports that average air temperatures in the Southwest have increased about 2.5 °F over the past 30 years and projections are an additional increase of 3–7 °F degrees by 2050. Since water temperature is influenced by air temperature it is possible that the amount of suitable RGCT habitat could decrease. Sustained droughts can directly lead to stream-drying and also lead to an increase in wildfire. Wildfire could result in ash and sediment loading in streams that would destroy RGCT breeding habitat and eliminate benthic invertebrates.

6.10.2 FOREST-LEVEL INFORMATION

Within Colorado the Rio Grande Headwaters geographic management unit (GMU), in which the Village at Wolf Creek Access project is located, contains the largest amount of historic habitat (49.2%) and currently occupied habitat (43% - Alves et al. 2008). The Rio Grande Headwaters GMU contains the largest amount of occupied habitat (348.4 stream miles). Rio Grande cutthroat trout core (99% genetically pure) and conservation core (>90% genetically pure) populations occupy over approximately 154 miles in 30 streams and 14 surface acres in 3 lakes on the Rio Grande National Forest.

The USFS works closely with CPW to manage the aquatic resources on the RGNF. The Forest Service is responsible for managing the habitat and the CPW is responsible for regulating and managing fish populations. The RGNF is addressing the effects of management activities on streams and the influence of travel management (i.e. increased angler access) on RGCT populations. The CPW is addressing the effects of nonnative trout stockings on native fish species, effects of hatchery-based disease transmissions (whirling disease), and over-utilization of RGCT. With the current and proposed protection measures identified in the Forest Plan, the USFS will manage the total amount of use and disturbance within a watershed to sustain quality habitat and help ensure a high likelihood of RGCT population persistence into the future. By maintaining quality habitat, future opportunities will remain to expand the distribution of RGCT on the Forest.

Since there are no RGCT populations within or downstream of the West Fork Fire Complex (B. Wiley, USFS pers. comm., September 9, 2013) the fire will result in no short or long-term impacts to the recovery of the RGCT.

From a cumulative perspective, it is anticipated that the habitats and populations of RGCT on the RGNF will remain secure and continue to improve with the forest management activities projected by the Forest Plan due to resource protection measures and additional measures identified in the Legal Framework. However, it is unlikely that RGCT will reoccupy historic habitat on lower elevation private land due to non-native fish introductions and stream conditions. Implementation of the current Forest Plan should allow the continued recovery of the RGCT through collaborative efforts to reintroduce populations back into their historical waters and implement protection measures that ensure long-term viable populations free of nonnative influences.

6.10.3 PROJECT-LEVEL INFORMATION

The Village at Wolf Creek Access project site occurs in the headwaters of Pass Creek, a second order tributary to the South Fork Rio Grande River and an historic RGCT water (Alves 1997). North and South Pass Creeks are small perennial streams that flow east through the project site to a confluence point northeast of the project site to form Pass Creek (Figure 3.1-1). North Pass Creek originates northwest of the project site and flows through the northern portion of the project site. South Pass Creek originates west of the project site and flows through the project site to the Alberta Park Reservoir before flowing north to join North Pass Creek.

RGCT are present in the vicinity of the project site. Alberta Park Reservoir (40 surface ac. at 10,183 ft.), a State Wildlife Area managed by the CPW specifically as a RGCT conservation water, occurs approximately 1,230 feet downstream from the private parcel. This RGCT population is currently classified as a recreation population and is managed by CPW to provide sport fish opportunities rather than to secure the species viability. This fishery is unique in that it is the only RGCT fishery in the state being managed to produce trophy class (>14 in.) RGCT at a drive-to destination. The reservoir is maintained at maximum level by the CPW at most times and is sampled every four-five years (J. Nehring, CPW, pers. comm.) and annually stocked with RGCT (in 2011 9,800 fingerlings, 1.18 inches in size were stocked). Fishing is by artificial flies and lures only and all RGCT caught must be immediately released. Sampling of Alberta Park Reservoir indicates that brook trout are the dominant species. Gill net sampling in 2009, the most recent sampling event, resulted in the capture of 267 brook trout (99% of all captures) and 2 RGCT (B. Wiley, USFS, pers. comm.).

Lastly, as a project MIS for the health of montane aquatic ecosystems (USFS 2002 l,m), RGCT also represent the habitat needs of non-native fish (e.g., brown, rainbow, and brook trout) that are important for recreational fishing opportunities on the Forest. Fishing in Pass Creek and the South Fork Rio Grande is important to many businesses and anglers within the San Luis Valley.

There are 16,037 linear feet of perennial streams and 8,586 linear feet of intermittent streams on the project site. Fish sampling of North and South Pass Creeks was conducted on September 23, 2009 using a Smith Root back-pack shocker (WER, 2010e&f). Designated sections of North and South Pass Creeks within the project site were electrofished to determine if RGCT were present. Pool, riffle, and run habitats were sampled in each stream. Two-thousand four-hundred and fifteen feet (736 m) of North Pass Creek and 1,440 feet (439 m) of South Pass Creek were sampled. Brook trout were the only species documented as present in both streams, with adult, juvenile, and young of the year age groups being represented. The upper section of South Pass

Creek (above Alberta Park Reservoir) had many small tributaries, making the main stream small in the sampled area and lower in available in-stream habitat. Willow cover was abundant throughout this area. Adult brook trout in pocket water in the upper section of North Pass Creek indicate that either the fish can find over-winter habitat in the upper section, or they can migrate downstream to appropriate refugia. Suitable RGCT habitat is present within South Pass Creek; however, the presence of brook trout excludes this area from use by RGCT because of the ability of brook trout to outcompete the native RGCT.

6.10.4 PROJECT EFFECTS

Alternative 1 would have no direct impact on this species because no habitat modifications would be authorized on NFS lands. Alternative 1 would result in no direct change to the population, trend, or distribution of occupied and potential aquatic habitats of this species on the RGNF. Reasonably foreseeable future actions within the project site are limited to planned projects associated with the WCSA MDP. Planned projects associated with the MDP that could impact RGCT are minimal as WCSA would not be using additional water for snowmaking above that which they already have water rights for and no new trails would be cut which could contribute to erosion and increased sediment loading in North and South Pass Creek which originate in the project site. It is not expected that planned project associated with the WCSA MDP would create additional cumulative impacts because of the low-impact types of projects planned (e.g. no new trails, minimal footers for lifts). Planned projects would not add secondary impacts that would affect RGCT since there would not be an increase in summer recreation within or near the project site.

Alternatives 2 and 3 would have insignificant and discountable sedimentation effects on this species on NFS lands as a result of avoided and minimized (via implementation of project design criteria) sedimentation effects associated with (Alt. 2:) widening the Tranquility Road across several North Pass Creek tributaries and the new access off Hwy 160 and, (Alt. 3:) the ANILCA access road. Alternatives 2 and 3 effects would result in no direct or indirect changes to the population, trend, or distribution of occupied and potential habitats of this species (i.e., core, conservation core, and recreational populations) on the RGNF. RGCT core and conservation populations would remain uncommon, but well distributed across the Forest. RGCT recreation populations would remain relatively abundant and widely distributed across the Forest.

Likely aquatic effects from VWC development would affect RGCT and its occupied and potential habitats on the private parcel and on downstream NFS lands. Adverse effects would be highest in the vicinity of the VWC, but would diminish in magnitude with distance below the VWC.

The development concepts for the Action Alternatives have the potential to impact streams due to changes in stream flow from water diversions and depletions, as well as from non-point and point source pollution. Each is discussed below.

Stream Diversions and Depletions. Water for the Low Density Development Concepts of the Action Alternatives would be provided by wells and hence there would be no diversions from North and South Pass Creeks, and the effect of the wells on groundwater levels and stream flow is insignificant and immeasurable. Water for the Moderate and Maximum Density Development Concepts of the Action Alternatives would be provided by infiltration galleries located in North

and South Pass Creeks. Water would be diverted from one infiltration gallery on North Pass Creek at the rate of 2 cubic feet per second (cfs) and from two galleries on South Pass Creek at the rates of 2 and 1.34 cfs. Water would be diverted during the spring snow melt period of April, May and June when the average estimated stream flow is 5, 30 and 15 cfs respectively. Diverting water at these times would reduce the magnitude of the impact to stream flow. Water would be diverted during the summer period only following intense storm events when stream flows are elevated.

It should be noted that there are minimum instream flow requirements for Pass Creek as well as the North Pass Creek tributary. In 1990 the Colorado Water Conservation Board (CWCB) adjudicated an instream flow water right of 5 cfs for Pass Creek, located downstream of the project site, during the winter months (October 1- April 30) and 9 cfs druring the summer months (May 1- September 30). The instream flow requirement for North Pass Creek is 0.5 cfs during the winter months and 1.0 cfs during the summer months. However, periodic stream flow measurements and SNOTEL modeling indicated that stream flows often fall below the CWCB minimums.

The estimated volume of the water to be diverted and stored for the Action Alternatives ranges from about 21 to 92 acre feet (AF). The level of water use under the Moderate and Maximum Density Development concepts of the Action Alternatives falls within the limits of use approved in the Proponent's water right plan for augmentation. Case No. 87CW07 provides a legal water supply sufficient to provide a total annual diversion of 272.7 AF and a consumptive use of 30.1 AF.

Non-Point Source Pollution. During construction of the infrastructure including roads, bridges, parking lots, and commercial and residential buildings of the development concepts of the Action Alternatives, there is the potential for temporary non-point source pollution. The construction period for some concepts may extend to 30 years. The construction process will require a National Pollution Discharge Elimination System (NPDES) permit from the Colorado Water Quality Control Division (WQCD). The NPDES permit will address non-point source pollution during the construction periods and specify BMPs for the mitigation of contamination to streams.

Following construction there is the potential for permanent non-point source pollution due to runoff from roads, parking lots and other man-made impervious surfaces. Given the relatively low traffic volumes expected for the development concepts of the Action Alternatives, the amount of roadway runoff pollution is expected to be relatively low. In summary, the application of BMPs during construction and the construction of detention basins with water quality enhancements to capture and treat the majority of the runoff, water quality impacts due to non-point source pollution will likely be minor.

Point Source Pollution. The point source discharge of the Waste Water Treatment Plant (WWTP) to North Pass Creek for the Moderate and Maximum Density Development Concepts of the Action Alternatives represents a point source pollution which would be regulated by the Colorado Department of Public Health and Environment (CDPHE). A major component of the WWTP permit is the assignment of effluent limits which determine the amount of a given pollutant the WWTP is allowed to discharge to North Pass Creek. The limits are designed so that the water quality of North Pass Creek does not significantly degrade beyond the limits established by the Instream Water Quality Standard set by the WQCD for the water basin.

The WWTP discharge volumes for the Moderate and Maximum Density Development Concepts of the Action Alternatives ranges from 0.2 to 0.7 MGD. Due to the seasonal occupancy of the Village, the potential effects of the WWTP discharge on water quality was evaluated by comparing the average monthly discharge from the WWTP as a percent of the average stream flow in North Pass Creek. For the Maximum Density Development Concept of Alternative 2, the effluent flow as a percent of stream flow in North Pass Creek is about 70% in March, a busy time for a ski resort, to 0.12 % in May, a time when the ski resort is closed. Overall, water quality as related to WWTP-type pollutants is predicted to remain below the ISWQS set by WQCD, with the exception of coliform and chlorine which are currently above ISWQS.

Other likely VWC effects to NFS lands include water quality and aquatic habitat degradation resulting from unintended discharges/runoff (e.g., from roads and other impermeable surfaces, snow storage, pet waste, chemical spills, septic systems, highway intersection upgrades, etc.) into occupied RGCT habitat in South Pass Creek and Alberta Reservoir, and unoccupied, but potential RGCT habitat in North Pass Creek. Pollutants affecting aquatic and riparian vegetation could extend further off-site, with effects becoming diluted with increasing distance and water volume. Reduced surface water infiltration could affect seasonal stream flows. Greater fishing pressure at Alberta Park Reservoir from the large number of adjacent VWC residents and guests would likely result in greater mortality of RGCT as a result of injured fish and those taken illegally, however because this population is frequently monitored and maintained by CDOW stocking, management could possibly be adjusted to maintain this population. Effects of degraded riparian zones and aquatic habitat quality resulting from service development (i.e., sewage lines proposed through riparian corridors), service use, and dispersed recreation (e.g., volunteer trails), would largely be confined to the private parcel, although minor sedimentation and other effects could extend downstream. Existing transbasin diversion effects (which do not involve the VWC) would continue to affect stream channels and riparian areas in North Pass Creek and the lower reaches of Pass Creek, which do not currently support RGCT.

In addition to cumulative VWC effects, cumulative effects to potential and occupied RGCT habitat along Hwy 160 could result from any additional toxic highway runoff (e.g., deicers, normal highway runoff, hazardous waste spills, etc.) resulting from the incremental addition of Saddle Brook traffic. Highway intersection upgrades would not immediately affect occupied RGCT habitat because they are not present in North Pass Creek, although sedimentation effects could extend downstream to potential or occupied habitat. Neither the Big Reservoir Timber Salvage nor the Table Salvage Timber Sale would contribute any additional cumulative effects to the Proposed Action at the Village at Wolf Creek for two reasons. First, project design criteria and mitigation measures that would be required for the timber projects would not increase sediment, reduce stream cover, create barriers to movement, or impact stream flows or water quality. Second, both of these projects are located north (3 and 7 miles, respectively) from the project site and would not impact Pass Creek.

While cumulative effects of Alternatives 2 and 3 would adversely affect local RGCT, they would be unlikely to measurably affect the overall population, trend, or aquatic habitat distribution of the species across the RGNF. The local RGCT population in Alberta Park Reservoir was introduced and is maintained as a sport fishery by annual CPW stocking. While that population would be affected by VWC effects, CPW management could possibly be adjusted, if desired, to compensate

for adverse effects and maintain this population as a recreation population. The same situation holds for Pass Creek, downstream from the project site, where adverse effects resulting from VWC development are possible. RGCT are not present in North Pass Creek, but that stream likely represents historic habitat and potential future habitat for RGCT. VWC effects potentially could degrade this stream and may prevent its use as RGCT habitat. However, even if that were to occur, it would not adversely affect the current Forest-wide population or adversely contribute to the habitat trend of occupied habitat.

6.10.5 PROJECT CONSISTENCY WITH KEY MONITORING QUESTIONS AND STRATEGIES

This section addresses project consistency with key monitoring questions and strategies for RGCT.

Habitat components that are important to the viability of RGCT would be maintained as planned in quality, quantity, and distribution. Species habitat maps have been generated as a basis for estimated available habitat on the Forest and to spatially display habitat distribution across the Forest.

RGCT populations on the Forest are being, and would be, maintained in a well-distributed manner and using the habitat as expected. At the project level, ongoing surveys showed both trout species were present in suitable habitat on and/or downstream of the project site. The CPW is responsible for monitoring sport fish populations, including RGCT on the RGNF. At the Forest level, all RGCT core and conservation populations are surveyed on a five-year rotation. Every year, a minimum 20% of the known populations are inventoried.

The population trend status of RGCT are being monitoring at the planning unit level (the Forest). In conjunction with estimates of potential habitat on the Forest, population information from the CPW and the Forest is used to derive rough baseline Forest population estimates. These data will be augmented by MIS monitoring and Forest Plan monitoring on an annual basis. Currently, self-sustaining populations of RGCT across the Forest are relatively stable and populations are expected to increase as habitat improves and nonnative fish issues are addressed. It is not technically feasible to develop Forest-wide population trend data at the project level, although individual stream populations can be surveyed and trends for that specific population determined.

Statewide, it is expected that self-sustaining populations of RGCT will continue to increase as habitat improves and nonnative fish issues are addressed. The Conservation Agreement for the range-wide preservation and management of RGCT defines the shared goals and strategies for the conservation and restoration of RGCT within its historic range in Colorado and New Mexico. This Agreement outlines a process among State and Federal Agencies and Native American Tribes, which ensures RGCT are being monitored at various scales throughout its range.

In summary, although the cumulative effects of private VWC development would adversely affect local RGCT and brook trout populations, those effects would be insignificant and discountable on these species' Forest-wide populations, viability, habitat distributions, and trends. The RGNF would maintain and continue to support healthy montane aquatic habitat, and continued

management would provide for viable, well-distributed populations of aquatic species across the Forest (USFS 2003c).

6.10.6 PROJECT CONSISTENCY WITH FOREST PLAN MIS OBJECTIVES

This section addresses project consistency Forest Plan MIS Objectives for RGCT.

Desired Forest-wide conditions are to maintain viable populations of existing native and desired non-native vertebrate species. Forest-wide objectives provide for sustainability of viable populations and management of wildlife habitat at appropriate scales so as to protect, conserve, and restore terrestrial and aquatic habitats. The Forest Plan also provides Forest-wide objectives specific to fisheries. Objectives include maintaining sport-fishing opportunities by providing quality fishery habitat, supporting the maintenance of native fish species by protecting existing suitable habitats for both natural and reintroduced populations, and maintaining or improving fish habitat in streams, lakes, and ponds.

The MIS Analysis and Monitoring document prepared for the Forest Plan MIS Amendment provides detailed documentation of the Forest Plan framework that guides the resource management operations on the Forest that help provide for viable fish and wildlife populations. A spatial and/or temporal overlap may occur between the major management activities and the habitats of RGCT . This overlap reflects the fact that stream systems occur in all the Forest Land Type Associations (LTA) and can be used to evaluate the condition of entire watersheds as well as specific management activities. Aquatic ecosystems may be influenced by adjacent management activities as well as those distant from the immediate stream environment. The overlap between management activities potentially affecting RGCT can indicate a spatial or temporal overlap, but can also indicate management activities and natural changes will be occurring at the landscape scale and that their influences can be gauged by the overall health of aquatic ecosystems.

Major activities having the greatest potential to affect water quality and aquatic habitat include timber management, travel management and its associated human use, livestock grazing, and prescribed fire. Forest Plan Standards and Guidelines provide protective measures to prevent aquatic habitats and water quality from becoming degraded. However, each activity has the potential to influence aquatic habitats relative to their intensity, distribution, and proximity to the immediate stream environment. Additionally, four streams on the Forest have been impacted by whirling disease.

The Forest works closely with CPW to manage the aquatic resources on NFS lands. The Forest is responsible for managing the habitat and CPW is responsible for regulating and managing fish populations. The Forest is addressing the effects of management activities on streams and the influence of travel management on RGCT populations. The CPW is addressing the effects of nonnative trout on native fish species, effects of hatchery-based disease transmissions (whirling disease), and over-utilization of RGCT

It is anticipated that the Forest-wide habitats and populations of RGCT will remain secure and continue to improve with the forest management activities projected by the Forest Plan due to the resource protection measures and the additional measures identified in the Legal Framework (FEIS, pg. 3-252).

6.10.7 RIO GRANDE CUTTHROAT TROUT SUMMARY

Direct, indirect, and cumulative Alternative 2 and 3 effects would adversely affect the local RGCT and populations, but those effects would be insignificant and discountable on this species' Forest-wide population, viability, habitat distribution, and trend. RGCT would remain uncommon, but well distributed across the Forest. Alternatives 2 and 3 would be consistent with NFMA direction and applicable Forest Plan Objectives, Standards, Guidelines, and the MIS monitoring question for maintaining viable, well distributed RGCT populations and healthy aquatic ecosystems with the estimated numbers and distribution of reproductive individuals to insure their continued existence across the RGNF. The CPW and USFS will continue monitoring RGCT and their habitats to establish and track population trends and habitat conditions across the Forest, consistent with the 2003 MIS Amendment to the Forest Plan (USFS 2003c). Regarding RGCT, direct, indirect, and cumulative effects of Alternatives 2 and 3 **may impact individuals, but are not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide**.

7.0 R2 SENSITIVE SPECIES DETERMINATION SUMMARY

In summary, Alternative 1 would have no direct or indirect effects on any R2 sensitive wildlife species or their habitats on NFS lands. Effects to occupied and/or potential habitats of some R2 sensitive animal species would occur under Alternatives 2 and 3 as a result of direct, indirect, and cumulative effects on the Federal and non-Federal parcels and the private land not exchanged where habitat would be removed and habitat effectiveness would be reduced. Direct, indirect, and cumulative effects of **Alternatives 2 and 3 may impact individual American marten, northern goshawks, American peregrine falcons, boreal owls, olive-sided flycatchers, and Rio Grande cutthroat trout on the RGNF, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide** (Table 7-1). Effects determinations to R2 sensitive animals would be the same for all species under Alternatives 2 and 3 as a result of relatively similar modifications to native habitats on NFS lands under Alternative 3, cumulative effects of private VWC development extending onto the surrounding National Forest where habitat effectiveness of occupied and/or potential habitats would be reduced, and for those reasonably foreseeable projects whose impact areas overlap the home ranges of those wide-ranging species potentially affected by the present Federal Action. The area affected by Alternatives 2 and 3 on NFS lands contains an insignificant proportion of the total population and potential habitat and range of each of the above species on the Forest. Alternatives 2 and 3 would have no discernible effect on the reproductive potential of these species. **Alternatives 2 and 3 would have no impact on any other R2 wildlife species on the RGNF**.

With respect to the animal impact assessments herein, the reader should note that every acre of potential habitat is not necessarily occupied by a particular species, and that every acre of suitable habitat is not of equal importance, nor must it be maintained to maintain effective, well-distributed habitat for any particular species across the Forest. The USFS concludes that some habitat loss or impact may affect individuals so long as sufficient habitat components exist which maintain population viability across the Forest. In addition, "impacts" and "adverse effects" on individuals

considered herein do not necessarily equate to the death of those individuals. In most cases, adverse effects to species on NFS lands simply refer to the displacement of individuals from a small portion of their former territory or potential habitat. Furthermore, as a document evaluating worst case scenarios, many of the predicted adverse effects may be unrealized, for example, where unoccupied, but **potential** habitat that would be lost to an action is actually uninhabited by a particular species.

Table 7-1. Determination summary of Village at Wolf Creek Access EIS alternative effects on R2 sensitive animal species potentially present on the RGNF.

Common name, *Scientific name*	Alternative		
	1	2	3
MAMMALS			
Hoary bat, *Lasiurus cinereus*	NI	MAII	MAII
American marten, *Martes americana*	NI	MAII	MAII
BIRDS			
Northern goshawk, *Accipiter gentilis*	NI	MAII	MAII
American peregrine falcon, *Falco peregrinus anatum*	NI	MAII	MAII
White-tailed ptarmigan, *Lagopus leucurus*	NI	NI	NI
Boreal owl, *Aegolius funereus*	NI	MAII	MAII
Olive-sided flycatcher, *Contopus cooperi*	NI	MAII	MAII
AMPHIBIANS			
Boreal western toad, *Bufo boreas boreas*	NI	NI	NI
Northern leopard frog, *Rana pipiens*	NI	NI	NI
FISH			
Rio Grande cutthroat trout, *Oncorhynchus clarki virginalis*	NI	MAII	MAII

Wildlife are listed phylogenetically.
NI = No impact.
MAII = may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide.
Determinations in this table only consider NFS lands that may be directly, indirectly, or cumulatively affected by the Proposed Action, which R2 species determinations are based on. Where potential or occupied habitat is present on adjacent private lands that are part of the project site, additional discussion is provided in the text.

8.0 MANAGEMENT INDICATOR SPECIES

Section 6(g)(3)(B) of the National Forest Management Act (NFMA) of 1976 directed the USFS to provide for a diversity of plant and animal species based on the suitability and capability of a specific land area. The 1982 Forest Planning regulations established the process and guidelines for development and revision of the Forest Plans Act and directed the USFS to maintain populations of existing native and desired non-native vertebrate species with the estimated numbers and distribution of reproductive individuals to insure their continued existence is well distributed in the planning area (CFR 219.19). To estimate the effects of management activities on fish and wildlife populations, the RGNF selected Management Indicator Species (MIS, per 36 CFR 219.19) to serve as an additional planning, analysis, and evaluation tool in conjunction with other Forest Plan and program monitoring and analyses to assure that viable populations of vertebrate species are maintained on the Forest (USFS 2003b). MIS are those whose population changes are believed to indicate the effects of management activities on a larger group of species with similar habitat requirements. Other MIS definitions and selection criteria are provided in USFS (2003b, 2004). Management direction specific to MIS on the RGNF is as follows:

- *Activities will be managed to avoid loss of population viability to MIS. The protection will vary depending upon the species, potential for impact, topography, location of important habitat components, and other potential factors. Special attention will be given during breeding, young rearing, and other times that are critical to survival. Where appropriate, measures to mitigate adverse effects shall be applied.*

The amended RGNF Forest Plan (USFS 2003) lists nine species as MIS on the Forest, with three additional fish species to serve as proxies if Rio Grande cutthroat trout are not present in the project site. At the project level, MIS are evaluated to address issues, concerns and opportunities for meeting overall goals, standards and guidelines of the Forest Plan (FSM 2621.1). For the Village at Wolf Creek Access EIS project, all RGNF MIS (USFS 2003b) were initially considered for analysis. From this list, eight species were retained as MIS to be evaluated at the project level, based on Forest Plan selection criteria and the presence or potential occurrence of these species and their habitats within or adjacent to the NFS portion of the project site. These species are Rocky Mountain elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), Wilson's warbler (*Wilsonia pusilla*), Lincoln's sparrow (*Melospiza lincolnii*), brown creeper (*Certhia familiaris*), hermit thrush (*Catharus guttatus*), Rio Grande cutthroat trout, and brook trout (*Salvelinus fontinalis*). For each of the selected MIS, this section provides a review of Forest-wide status, Forest Plan estimates of population and habitat trend, Forest Plan monitoring data, and a discussion of habitat and population conditions in the project site in the context of Forest Plan expectations. Other Forest MIS were not evaluated as project MIS because their habitats are not found within the NFS portion of the affected project site, they have no affinities to project site habitats, they have distributional ranges excluding the project site, and/or activities on NFS lands related to the proposed alternatives would not affect the species. Brown (*S. trutta*) and rainbow trout (*O. mykiss*) are only present relatively far downstream of the project site.

Table 8-1. Management Indicator Species for the Rio Grande National Forest.

Species Name	Representative Habitat and Land Type Associations (LTAs)	Analyzed for Project-Level Effects?	Rationale For Carrying the Species Forward or Ending the Analysis
Mammals			
Mule Deer *(Odocoileus hemionus)*	Forest-wide habitats. All LTAs.	Yes	Habitat and populations present in the analysis area, including winter range (MA 5.41). Species can be influenced by changes in vegetation structure and composition due to project activities.
Elk (*Cervus elaphus*)	Forest-wide habitats. All LTAs.	Yes	Habitat and populations present in the analysis area. Species can be influenced by changes in vegetation structure and composition due to project activities.
Birds			
Pygmy Nuthatch (*Sitta pygmaea*)	Ponderosa pine forests. LTA 5 Structure Class 5	No	Suitable habitat is not present within or near the project site.

Table 8-1. Management Indicator Species for the Rio Grande National Forest.			
Species Name	Representative Habitat and Land Type Associations (LTAs)	Analyzed for Project-Level Effects?	Rationale For Carrying the Species Forward or Ending the Analysis
Wilson's Warbler *(Wilsonia pusilla)*	Riparian-willow habitat. LTA 10.	Yes	Habitat and populations present in the analysis area. Habitat and populations present in the analysis area. The analysis for this species is complete at this level because there will be no measurable effect on populations or habitat by project activities. Abundance tied to other factors.
Vesper Sparrow (*Pooecetes gramineus*)	Grasslands. LTAs 8,9, and 12	No	Suitable habitat is not present within or near the project site.
Lincoln's Sparrow (*Melospiza lincolnii*)	Riparian-willow habitat. LTA 10.	Yes	Habitat and populations present in analysis area. Habitat and populations present in analysis area. The analysis for this species is complete at this level because there will be no measurable effect on populations or habitat by project activities. Abundance tied to other factors.
Brown Creeper *(Certhia americana)*	Mature to late successional spruce/fir and mixed-conifer. LTAs 1, 3, and 13.	Yes	Habitat and populations present in the analysis area and can be influenced by changes in vegetation structure and composition due to project activities.
Hermit Thrush *(Catharus guttatus)*	Mature to late successional spruce/fir and mixed-conifer. LTAs 1, 3, and 13.	Yes	Habitat and populations present in the analysis area and can be influenced by changes in vegetation structure and composition due to project activities.
Fish			
Rio Grande Cutthroat Trout (*Oncorhynchus clarki virginalis*)	High altitude streams and lakes. LTA 10.	Yes	Habitat and populations present in the analysis area can be influenced by changes in water flow quantity and quality due to project activities.
Brook Trout (*Salvelinus fontinalis*)	High altitude streams and lakes. LTA 10.	Yes	Habitat and populations present in the analysis area can be influenced by changes in water flow quantity and quality due to project activities.

Thompson conducted systematic and species-specific surveys of the project site, including NFS and private lands from 2000–2002 and in 2004, and the senior author conducted additional surveys in 2009. Surveys were conducted in part to identify and document MIS use of the project site. All animal species and suitable habitat detected during surveys were noted resulting in daily assessments of species presence and distribution and overall habitat suitability. All MIS discussed in detail in this section have been detected within the project site as a result of project-specific surveys and ongoing CPW monitoring. Once MIS species were detected, suitable habitat was considered to be occupied to the full extent of its local (i.e., habitat type and structural) distribution and to the full extent of its potential seasonal use (e.g., breeding, resident, summer,

etc.). Estimated effects to MIS habitats, by species, across all alternatives are displayed in Table 8-2.

For all evaluated MIS, population trends are best defined at appropriate biological scales, which are larger than the project analysis area itself. Effects to MIS are analyzed at three principal levels: the Planning Area (RGNF), site-specific disturbance areas on NFS lands, and the project site (including the private land not exchanged and all applicable cumulative effects). Other analysis levels that vary by species are defined under each MIS account. The Village at Wolf Creek Access project site totals 504.3 acres. This includes the 204.4 acre Federal exchange parcel, the 119.3 acres of the private land not exchanged, and the ±177.8 acre non-Federal exchange parcel.

For avian MIS, project level population information is an estimate of potential densities, based on species biology and suitable habitat that is presumed to be occupied. Because MIS were recently amended into the RGNF Forest Plan and avian MIS surveys specific to the Forest were only initiated in 2004, available trend data is derived from existing sources including the Rocky Mountain Bird Observatory (RMBO) Monitoring Colorado Birds (MCB) program and the RMBO Integrated Monitoring in Bird Conservation Regions (IMBCR). The IMBCR grew out of the 2007 North American Bird Conservation Initiative report 'Opportunities for Improving Avian Monitoring' (NABCI 2007). The IMBCR provides more rigorous statistical methodology, integrates monitoring programs, and makes data and results widely accessible to land managers and the public. The IMBCR does provide population estimates, etc. at the state level as well as at the forest level. Information included in the Colorado Breeding Bird Atlas project (Kingery et al. 1998) also is used in these assessments. Project level surveys documented species presence and habitat occupancy.

Table 8-2. Acreage of Occupied and Potential Management Indicator Species (MIS) Habitat That Could Be Indirectly Affected by Alternatives 1-3 on NFS and Private Lands.

MIS	Acreage: NFS/*Private* (Total [a])		
	Alternative 1	Alternative 2 (L,I,M [b])	Alternative 3 (L,I,M [b])
Mammals			
American Elk	0 /*0* (371[a])	23.94, 28.23, 85.18[b] /*0.16, 0.20, 0.32*[b] (0.47, 0.86, 0.98[a])	1.93, 4.01, 4.10[b] /*23.18, 34.81, 65.12*[b] (25.11, 38.82, 69.22[a])
Mule Deer	0 /*0* (371[a])	23.94, 28.23, 85.18[b] /*0.16, 0.20, 0.32*[b] (0.47, 0.86, 0.98[a])	1.93, 4.01, 4.10[b] /*23.18, 34.81, 65.12*[b] (25.11, 38.82, 69.22[a])
Birds			
Wilson's Warbler	0 /*0* (17.3[a])	0.31, 0.66, 0.66[b] /*0.16, 0.20, 0.32*[b] (0.47, 0.86, 0.98[a])	0.30, 0.30, 0.65[b] /*0.60, 0.38, 0.62*[b] (0.90, 0.68, 1.27)
Lincoln's Sparrow	0 /0 (17.3 [a])	0.31, 0.66, 0.66[b] /*0.16, 0.20, 0.32*[b] (0.47, 0.86, 0.98[a])	0.30, 0.30, 0.65[b] /*0.60, 0.38, 0.62*[b] (0.90, 0.68, 1.27)
Brown Creeper	0 /*0* (371[a])	23.94, 28.23, 85.18[b] /*0.16, 0.20, 0.32*[b] (0.47, 0.86, 0.98[a])	1.93, 4.01, 4.10[b] /*23.18, 34.81, 65.12*[b] (25.11, 38.82, 69.22[a])
Hermit Thrush	0 /*0* (371[a])	23.94, 28.23, 85.18[b] /*0.16, 0.20, 0.32*[b] (0.47, 0.86, 0.98[a])	1.93, 4.01, 4.10[b] /*23.18, 34.81, 65.12*[b] (25.11, 38.82, 69.22[a])

Fish			
Rio Grande Cutthroat Trout	0 /*0* (0 [a])	0 /*0* (0 [a])	0 /*0* (0 [a])
Brook Trout	0 /*0* (0 [a])	0 /*0* (0 [a])	0 /*0* (0 [a])

[a] Includes all HSS for each specific habitat type (e.g. spruce-fir forest). Indirect effects to spruce-fir shown Table 6-2 are based on HSS of 4A-C as these are the only HSS that are critical to spruce-fir dependent species. Indirect effects to scrub-shrub wetlands shown in Table 6-2 are based on HSS of 2T and 2S as these are the only HSS that are critical to scrub-shrub dependent species.
[b] Reflects the Low, Moderate, and Maximum Density Development Concepts.
[c] Total amount of habitat indirectly effected on both the Federal and non-Federal exchange parcels and the private land not exchanged.

For elk, deer, and fish, Forest level population trend information is available from the CPW and was used for analysis of project level effects and impacts to Forest level population and habitat objectives.

8.1 ROCKY MOUNTAIN ELK, *Cervus elaphus*

Elk was selected as a MIS on the Forest because while it is a habitat generalist, it is of special interest from economic and recreational perspectives (USFS 2003b). It is also a species sensitive to road use and may compete with other ungulates and livestock. Its intent as a MIS is to evaluate habitat effectiveness relative to road use and management, and related travel impacts, and to answer the monitoring question as to whether elk habitat is being managed in a manner that provides for a viable and well-distributed population across the Forest during all seasons. Use of elk will assist in monitoring whether Forest Plan Standards and Guidelines are being met for wildlife, with an emphasis on road densities and providing adequate cover to maintain screening along roads. Elk was evaluated for project effects because local habitats used by elk might be affected by the Proposed Action on NFS lands.

8.1.1 LIFE HISTORY AND BACKGROUND INFORMATION

Rocky Mountain Elk inhabit the central and northern Rocky Mountains, including western Canada, south through eastern Oregon and Washington, Idaho, western Montana, Wyoming, Colorado, Utah, Nevada, New Mexico and Arizona. Colorado supports the largest elk population of any state or province where they range over much of the western two-thirds of the state. Elk range over most of the RGNF and use essentially all habitats.

In Colorado, the breeding season for elk begins in early September, peaks during the last week of September and first week of October, and is over by late October (Boyd and Ryland 1971, Armstrong et al. 2011). Mature bulls compete for females and gather harems of adult cows and calves. Most of the breeding is done by bulls three years of age or older (Freddy 1987). Other bulls continually attempt to usurp cows in the harem. As a result of this constant activity of protecting the harem, herd bulls lose considerable weight during this time of the year. Harem size typically ranges between 15 and 20 cows (Boyd 1978, Thomas and Towell 1982). Elk have a 240-255-day gestation period and most calves are born in late May or early June, with the peak of calving from June 4-6. Yearling cows can breed in Colorado, but less than one third of them are successful at producing offspring that survive into the fall, compared to about three fourths of adult cows (Freddy 1987).

Calving grounds are carefully selected by the cows and are generally in locations where cover, forage and water are in close proximity (Seidel 1977). Calving sites occur in the middle to upper portions of summer range and often occur in the same general area each year. Although selected sites are used for a brief period in the spring there are some key characteristics required for optimum reproductive success. Sites must provide security from harassment and be within or adjacent to high-quality summer range. They can occur in any forest type on gentle slopes, given that cover, food, and water are nearby. The aspen habitat association is often regarded as the most productive type for elk reproduction in Colorado and in the San Juan Mountains. Cows with calves isolate themselves from the herd for two to three weeks or until the calves are large enough to travel. Then they begin to gather up into nursery groups. By mid-July, herds of several hundred animals are common on some summer ranges.

Hiking and other recreational activities in or near elk calving areas can have a significant impact on reproductive success. Phillips and Alldredge (2000) studied reproductive success of elk following disturbance by humans during calving seasons in central Colorado. They reported a significant drop in reproductive success below an undisturbed control group.

During the winter, spring, and summer adult bulls usually segregate from cows, calves and younger bulls and remain alone or form small herds of five or six animals. Younger bulls are usually mixed with cow-calf herds (Armstrong et al. 2011). While the bulls may control the harem, the older cows are the true leaders of the herd. Cows usually give the alarm and lead the rest of the herd away from real or imagined danger (Boyd 1978).

Elk inhabit higher elevations during spring and summer and migrate to lower elevations for winter range. The length of seasonal migration varies from just a few miles to nearly 50 miles in some cases. When early winter snows begin to accumulate, cows, calves and younger bulls begin to move down to winter ranges, where they usually remain from December through March (Boyd 1978). During winter, elk form large, mixed herds on favored winter range and more than 1,000 animals may be observed together. Mature bulls typically winter at higher elevations than cows and are found in small bachelor groups. As winter moderates in late March, elk start a gradual movement back up to their summer ranges and the cycle begins again (Boyd 1978). Winter range availability and habitat effectiveness may be the most critical seasonal range for elk survival. Chronic wasting disease has been discovered in elk herds various parts of the state, including a captive herd in the San Luis Valley, and could be a threat to elk populations and recreational hunting on the RGNF.

Elk studies have consistently demonstrated that they avoid roads (Lyon 1979, 1983, Thomas et al. 1979, Christensen et al. 1993, Rowland et al. 2000, Lyon and Jensen 1980, Sawyer and Nielson 2005, and Hebblewhite 2008). The amount of vehicular travel on roads appears to be the key factor that causes avoidance. A study by Lyon (1983) demonstrated that elk habitat effectiveness decreases by approximately 25% with a density of one mile of road per square mile of land, and by at least 50% with a density of 2 miles of road per square mile. The same research concluded that the best method of maximizing elk habitat effectiveness is by closing and obliterating roads. Road closure needs should be assessed on a site-specific basis to determine the limiting habitat conditions in each area.

The CPW manages elk to provide healthy populations capable of supporting both significant harvests and opportunities for non-consumptive uses (Freddy et al. 1993). Elk license sales account for a large percentage of all license revenue, indicating the importance of elk herd management and population viability in the state.

8.1.2 FOREST-LEVEL INFORMATION

Elk formerly occupied much of central and western North America (Armstrong et al. 2011). Elk were almost extirpated from Colorado in the early 1900s when market hunting caused populations to decline to 500 to 1,000 individuals (Armstrong 1972). A successful restoration program (using elk from Wyoming) and careful management have led to the current high elk populations in Colorado (Armstrong et al. 2011). In 1990, Colorado's elk population was estimated at 185,000 (Freddy et al. 1993), probably the highest in the United States. Today, 'Colorado has the largest elk herd in the world' at over 300,000 individuals, distributed mainly through the mountainous part of the State (Armstrong et al. 2011). The 2010 post-hunt population estimate was approximately 283,430, well above Long-Term Objectives (LTOs)

Elk are widely distributed across the RGNF and inhabit all 13 LTAs. They are more abundant at higher elevations during summer and at lower elevations during winter.

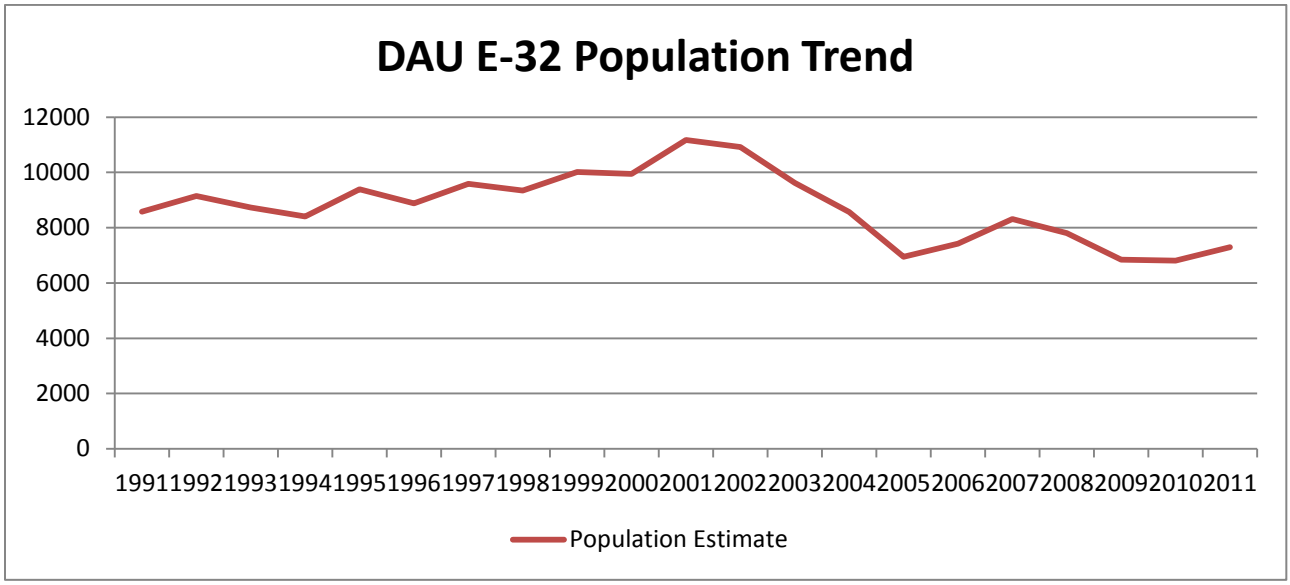
Population trends throughout the species range are generally increasing. The trend throughout most of the Forest is stable to decreasing in response to management objectives and local hunting strategies. There are seven Game Management Units (GMUs) on the Forest (681, 68, 76, 79, 80, 81 and 82) contained within four Data Analysis Units (DAUs), as follows:

1. Upper Rio Grande Elk Herd, DAU E-34, GMUs 76/79
2. Lower Rio Grande Elk Herd, DAU E-32, GMUs 80/81
3. Saguache Elk Herd, DAU E-26, GMUs 68/681
4. Sand Dunes Elk Herd, DAU E-11, GMU 82

DAUs are used by the CDOW to manage herds of big game animals, are generally geographically discrete, and, for the most part, contain discrete big game populations. DAUs are designed to support and accomplish the objective of the CPW's Long Range Plan and meet the public's objectives for big game. Game Management Units specifically look at local populations within the larger DAU, for this analysis GMUs 80 and 81 are examined as they contain the population(s) which would be affected by each of the Alternatives. The DAU for the lower Rio Grande elk herd is located in south central Colorado, on the southwest side of the San Luis Valley. DAU E-32 has an area of 2,100 square miles and encompasses portions of Alamosa, Rio Grande, Conejos, Mineral, and Archuleta Counties. Its main drainages are the Rio Grande, Conejos, and Alamosa Rivers. Elk generally occupy the western portion of the DAU from the grassland/shrub winter range adjacent to the foothills to above timberline on the alpine in the summer. The overall range for elk in the DAU is about 1270 square miles or 61% of the DAU (CPW 2007a).

The GMU E-32 population started increasing during the early 1980s and in 1990 wildlife managers began efforts to control the growth by increasing the number of antlerless elk licenses. The herd continued to grow and became the largest in 2001 with an estimated post-hunt population of 11,179 animals (CPW 2012d). Since then the population has been decreasing and is

currently estimated at 7,300 animals, above the objective of 6,000–7,000 (CPW 2012d). Elk populations and trends are influenced by a host of natural factors (e.g., habitat availability, winter severity and over-winter survival, etc.), but can be profoundly controlled over time by CPW objectives and their ability to manage populations via hunter harvest. Habitat improvement projects, including vegetative treatments such as timber harvest, prescribed fire, and mechanical treatments, are expected to increase. At the Forest level, elk numbers are near CPW management targets.



Graph 1: Elk DAU E-32 1991-2011 population trend.

There is a total of 682 square miles of winter range in the DAU of which 76.2% or 519 square miles are publicly administered (CPW 2007a). Severe winter range totals 507 square miles of which 57.8% is on public lands. Winter range conflicts on public lands are primarily snowmobile and OHV harassment, and illegal harvest (CPW 2007a). Winter range occurs at lower-elevations, primarily in the non-forested LTAs that are generally in poorer condition than upland areas due to historic livestock use (USFS 1996). Winter range, particularly severe winter range, is the limiting factor to elk populations in this DAU (CPW 2007a). Elk use of these areas is widely distributed with isolated areas of concentrated use. With population estimates demonstrating an ability of the resource to support larger herd numbers in the past (10,700 in 2001 – CPW 2007a) and the CPWs current objective to r reduce herd sizes, the trend in winter range habitat availability and condition on the Forest should only improve. This assumes maintaining the status quo with respect to stocking levels on active grazing allotments and restrictions on new road development, in conjunction with the beneficial effects of habitat enhancement practices and the improved winter range in the burn area of the Million Fire.

Approximately 39% of the winter range may be considered highly effective based on estimated open road densities (< 1 mile/sq. mile, USFS 2003a). Another 46% of this may be considered moderately effective due to road densities within the two-mile per square mile range, while 15% may be considered ineffective. The actual influence of these road density categories will vary depending upon the type and frequency of vehicle use during the winter period. Elk winter range

Management-Area Prescriptions (5.41) are in place that emphasize the habitat needs of wintering big game. Road closures on winter range areas are a key factor in this Management-Area Prescription.

The geographic area for cumulative analysis for both elk and mule deer is DAU E-32, which includes the RGNF, adjacent Bureau of Land Management lands, and private lands within the San Luis Valley. This boundary contains most, if not all, of the area used by both the elk and deer herds in GMUs 80 & 81.

Cumulatively, local elk populations are expected to decrease slightly during the first decade of Forest Plan implementation due to more aggressive hunting strategies developed by the CPW. For the purposes of this analysis, it is assumed that elk population objectives will be met sometime after or during the first decade and that populations will have stabilized by the fifth decade. This is due to more effective hunting strategies developed by the CPW, as well as increased habitat improvement on the RGNF.

From a cumulative perspective, Forest-wide elk habitats are projected to remain secure, with the forest management activities projected by the Forest Plan alternatives expected to have both positive and negative effects, but continue to supply the quantity and quality of habitat needed to meet CPW population objectives over time.

8.1.3 PROJECT-LEVEL INFORMATION

Elk are present in the vicinity of the project site from June through October. They begin drifting into the area in early June (i.e., following snowmelt and spring green-up) as they move to the highest elevation summer ranges from lower elevation winter and transitional ranges. The project site and its concentrated (as opposed to dispersed) indirect effects zone of influence do not contain effective winter range, transitional range, calving habitat, or highway crossings because of the relatively high elevation, habitat types and landforms present, and proximity to chronic anthropogenic disturbances (i.e. year-round recreation and Hwy 160 operation and maintenance). The project site represents an extremely small portion of the year-round home range used by animals present on-site during summer.

The project site's spruce-fir forests are fragmented by native meadows, ski trails, and glades. Ski trail development has increased forage availability and much of it is effective because of limited human disturbance on the ski area. However, while these more open habitats have increased foraging values, associated cover and security values are suboptimal because of chronic summer disturbances that closely surround (WCSA and Hwy 160) and permeate (FSR 391) the project site. Hwy 160 physically and behaviorally results in some elk avoidance of adjacent habitats. WCSA's base area and parking lots, and FSR 391, also result in some displacement during the summer maintenance/ recreation season. Elk have adapted to this context by using the project site and local surrounding habitats nocturnally and moving into larger, secure forest blocks outside the project site during the day.

Elk movements in the vicinity of the project site are primarily east-west, although they don't cross through the developed base area and parking lots (i.e., the west end of the project site is a dead end, bounded on the north by Hwy 160 and on the west and south by base area parking lots,

retaining walls and facilities). Movements also occur north-south (i.e., over the Continental Divide), as Rio Grande elk mix with San Juan elk in the East Fork Valley (Thompson 1986, USFS 1987). However, elk rarely cross Hwy 160 adjacent to the project site (i.e., between the ski area entrance and about 0.5 mi. below the snow shed) because of (1) adjacent local facilities (e.g., the CDOT maintenance buildings, ski area entrance road, parking lots, and base area facilities, snow shed, parking area downhill of snow shed) that deflect elk from their approach to the area; (2) the steep canyon below the snow shed; (3) broad, boulder-covered fill slopes along the highway; and (4) the location of this area in the larger landscape (i.e., there are no compellingly important adjacent habitats and it is simply easier to avoid this cluster of development in an otherwise undeveloped landscape).

Elk use the entirety of the project site once the snow level decreases in the spring and until the snow level becomes too deep in the fall for the animals to move through or get food. The entirety of the project site is mapped by NDIS as elk summer concentration area. The Federal exchange parcel is mapped as containing 48.5 acres (19.6 ha) of elk production area; the non-Federal exchange parcel and private land not exchanged are mapped as containing 217.5 acres (88 ha) of elk production area. Summer concentration areas and production areas are not mapped per one specific habitat type (e.g. spruce-fir) but instead cover a much larger area that incorporates many habitat types. However, for this analysis the amount of spruce-fir (the dominant habitat type across the landscape and the habitat type in which production would occur) impacted was used. The production area within the project site is a subset of a much larger elk production polygon containing 2,588 acres (1047 ha). Elk production areas are defined as “That part of the overall range of elk occupied by the females from May 15 to June 15 for calving.” Summer concentration areas are defined as "those areas where elk concentrate from mid-June through mid-August. High quality forage, security, and lack of disturbance are characteristics of these areas to meet the high energy demands of lactation, calf rearing, antler growth, and general preparation for the rigors of fall and winter." This designation is a subset of “summer range”, defined, in part, as “that part of the range of elk where 90% of the individuals are located between spring green-up and the first heavy snowfall or during a site-specific period of summer”. While portions of the project site are adjacent to human use areas where roads and human disturbance locally reduce elk habitat effectiveness, many of these disturbances are so benign, chronic, brief, and adequately buffered from disturbances that habitat use does not appear to be adversely affected. Indeed, a low number of elk and deer exhibit concentrated use in the northwestern corner of the private land parcel and adjacent NFS lands as a result of relatively lush forb/willow communities. Based on detailed field surveys throughout the project site and corroboration by the CPW, the NDIS habitat mapping is considered valid.

Another large polygon of mapped elk production area is located approximately 1.7 miles (2.68 km) east of the project site located on Fox Mountain. This polygon contains approximately 3,475 acres (1,406 ha) of mapped elk production area. Other elk production areas are mapped north of the project site (containing approximately 29,642 acres [11,996 ha] of mapped production area) and south of the project site on the SJNF in the East Fork Valley (containing approximately 8,151 acres [3,299 ha] of mapped production area). The East Fork Valley is important because it is presently undeveloped, although 3.5-mi.^{2} of the valley bottom is privately owned by one party. This valley supports hundreds of elk in the summer and even several dozen wintering animals. Calving values are of particular importance because of the large area of high quality habitat

isolated from human disturbances (Thompson 1986, USFS 1987, NDIS maps). Currently, there is no access or dispersed recreational use into that valley originating from the Wolf Creek Pass area.

The closest mapped winter range to the project site is south in the East Fork Valley. Most of the mapped winter range is located north and east of the project site is lower elevation habitats.

NDIS maps indicate that there are no elk highway crossings (defined as where ≥ 6 elk are killed along a one mile stretch of highway per year) along Hwy 160 over Wolf Creek Pass, although such a crossing occurs near the confluence of the East and West Forks of the San Juan River between the western base of the pass and Pagosa Springs and on the east side of the pass around the Town of South Fork. Elk do cross Hwy 160 over Wolf Creek Pass, although road-kill density might not meet the above highway-crossing criterion.

8.1.4 PROJECT EFFECTS

Alternative 1 would have no direct, indirect, or cumulative impacts on elk because no habitat modifications would be authorized on NFS lands. The WCSA MDP would result in the conversion of minor and insignificant amounts of summer range and elk production habitat. Since impacts associated with human activity would be greatest during the winter, when elk are not present near the project site, it is unlikely that there would be impacts to elk. Summer use of the WCSA SUP area likely would not increase as no amenities are planned under the MDP that would encourage an increase in human activity during the calving season or the summer. Secondary impacts associated with the VWC would likely result in the increase in human activity on adjacent NFS lands which could impact elk production. However, the impacts associated with the MDP or VWC are not expected to impact the local population. Of greater concern is the overall increase in recreation on both summer and winter ranges that are not associated with the Village at Wolf Creek Access project. Cumulative impacts near the Village at Wolf Creek Access project site include the operation and maintenance of Hwy 160, the CDOT maintenance facility, FSR 391, and the WCSA and its associated infrastructure. The Saddle Brock development would add additional traffic within all elk habitat types year-round. Saddle Brook is east of the project area at a much lower elevation close to elk winter range. Traffic in the winter traveling to and from Saddle Brook would cause an increase in vehicle traffic in winter range. The additional traffic likely will lead to an increase in vehicle related mortality in elk and will remove additional habitat when the development is built. Neither the Big Reservoir Timber Salvage nor the Table Salvage Timber Sale adds cumulative impacts, since both of these project exist north of the project site in a different DAU. The Pass Creek Yurt is within DAU E-32 but it is not located in winter range and only operates in the winter when elk are not present.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the loss of 123.6 acres of spruce-fir potential suitable elk summer range and elk production habitat. Summer range is not a limiting factor; the loss of 123.6 acres of mapped elk production area used in this analysis equates to 4.7% of the mapped production area polygon in which the project site occurs. The loss of 4.7% of the production area is insignificant and discountable since the mapped production habitat within the project site is likely seldom used, it is degraded because of the high amount of human activity surrounding the project site, and the reduced effectiveness of the project site in relation to the amount of production habitat that is away from human activity. The

exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to elk from the land exchange itself.

Alternative 2 development concepts (Low, Moderate, and Maximum Density) would result in the conversion of 23.94, 28.23, and 85.18 acres, respectively, of summer range and elk production habitat on NFS lands (Table 6-3). Summer range is not a limiting factor; the loss of 23.94, 28.23, and 85.18 acres of mapped elk production area used in this analysis equates to 0.9, 1, and 3.2% of the mapped production area polygon in which the project site occurs. The maximum loss of 3.2% of the production area is insignificant and discountable since the mapped production habitat within the project site is likely seldom used, it is degraded because of the high amount of human activity surrounding the project site, and the reduced effectiveness of the project site in relation to the amount of production habitat that is away from human activity. Alternative 3 development concepts (Low, Moderate, and Maximum Density) would result in the conversion of 1.93, 4.01, and 4.10 acres, respectively, of forested summer range on NFS lands (Table 6-3). These losses are all less than 1% of the mapped production habitat in which the project site is located and are insignificant and discountable when compared to the amount of these habitats that exist within the DAU. Total conversion of summer range associated with the Alternative 3 development concepts is approximately 25.11, 38.82 and 69.22 acres (Table 8-2). The water tank farm sites for the moderate density development concepts would likely accommodate the water storage requirements for these concepts. The water storage requirement for the Maximum Density Development Concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. No elk winter range exists within the project site, thus no winter range on NFS lands would be indirectly affected.

Indirect effects associated with the VWC development and associated seasonal activities that would occur under Alternatives 2 and 3 would completely displace all seasonal elk use from the developed land and reduce elk habitat effectiveness in a considerable area of surrounding NFS lands. Reduced habitat effectiveness would affect an area far greater than the project site. While the project site and contiguous habitats primarily provide summer range, with more limited use as spring and fall transitional range, dispersed recreational activities (e.g., new mountain bike, hiking, equestrian, and ATV trails) could affect these habitats and calving areas in a large area of the surrounding landscape. Much greater, year-round human presence in the landscape will result in greater vehicular use of secondary and backcountry roads, which will reduce elk habitat effectiveness in adjacent habitats. Elk highway mortality along Hwy 160 and other high-speed highways will increase as a direct result of commuting residents, guests, construction personnel, resort employees, other infrastructure support personnel and their families in the landscape between regional airports (e.g., Durango and Alamosa) and the most distal commuting destinations. Traffic volumes, and associated elk highway mortality, are projected to increase in the future even without the addition of traffic associated with the Village at Wolf Creek. Traffic volume above the 2043 baseline contributed by the Village at Wolf Creek under the Alternative 2

Maximum Density Development Concept will account for an increase of 40% for east bound traffic and 71% for west bound traffic crossing Wolf Creek Pass. Under the Alternative 3 Maximum Density Development Concept these values are an increase above baseline of 73% for east bound traffic and 143% for west bound traffic. The additional off-site commercial, residential, and municipal infrastructure required to support such a large, year-round development will result in additional habitat loss, both direct, through habitat conversion, and indirect, through wildlife displacement from human activity areas, at lower elevations that would likely affect some elk winter ranges, although more of these effects would occur off the Forest.

No other reasonably foreseeable projects occur within the DAU that could impact elk habitat.

While cumulative effects of Alternatives 2 and 3 would be appreciable and far ranging, they would be unlikely to adversely affect the population, trend, or habitat distribution of elk across the RGNF. Elk herds are near management objectives across the Forest and in DAU E-32, which contains the project site and much of the cumulative effects area. While populations are influenced primarily by winter range availability, winter severity, and hunter harvest, cumulative VWC effects (the more substantive of which involve induced secondary development affecting winter range) would have an incremental, adverse influence on DAU E-32 herd numbers and trend, though the effects may not be discernible from other variables and may not measurably affect the population, trend, or habitat distribution of elk on a Forest-wide basis.

8.1.5 PROJECT CONSISTENCY WITH KEY MONITORING QUESTIONS AND STRATEGIES

This section addresses project consistency with key monitoring questions and strategies for elk.

The population trend status of the Forest's elk herd is being monitoring at the appropriate scale, the DAU level, and data are collected by CDOW. Forest level analysis of population trend data will include all 4 CDOW DAU reports and be incorporated into the Forest's annual Monitoring and Evaluation Report.

Habitat components that are important to the viability of elk are being maintained as planned in quality, quantity and distribution. At the Forest level, NDIS habitat maps have been generated by the CPW, and in conjunction with annual monitoring data by CPW, are used as a basis for estimating available habitat and spatially displaying habitat distribution across the Forest.

The elk population on the Forest is being maintained in a well-distributed manner and is using the intended habitat as planned. NDIS maps show summer and winter range distribution across the Forest and areas of concentrated use. DAU management plans identify herd management problems and develop management strategies (harvest) to achieve management goals. Annual CPW monitoring data are used to adjust management strategies (season structures). Currently, elk are widely distributed across the Forest and are using habitats as expected.

In summary, although the direct, indirect, and cumulative effects of Alternatives 2 and 3 would affect elk habitat effectiveness relative to road use and management and related travel impacts, those effects would be insignificant and discountable Forest-wide. The RGNF would continue

management of elk habitat providing for viable, well-distributed elk populations across the Forest during all seasons.

8.1.6 PROJECT CONSISTENCY WITH FOREST PLAN MIS OBJECTIVES

Desired Forest-wide conditions are to maintain viable populations of existing native and desired non-native vertebrate species. Forest-wide objectives provide for sustainability of viable populations and management of wildlife habitat at appropriate scales so as to protect, conserve, and restore terrestrial and aquatic habitats. This section addresses project consistency with Forest Plan MIS Objectives, which are the same for elk and mule deer.

Much of the potential habitat on NFS lands on the RGNF occurs in areas with protective land management designations. The Forest manages habitat and uses on the Forest to promote winter range and reduce harassment during critical periods. Winter range has been designated as a management area prescription to ensure critical areas are managed to supply adequate amounts of quality forage, cover, and solitude while on winter range. Road closures on winter range areas are a key factor in this Management-Area Prescription (5.41).

There are wildlife standards specific to elk/mule deer in the Forest Plan to provide for adequate cover to minimize disturbance and harassment. The Forest Plan also assumes that management activities would be conducted in a manner that optimizes the ratio and juxtaposition of cover:forage areas and that all treated areas will result in improved forage opportunities for elk/mule deer.

Elk/mule deer habitats are projected to remain secure, as Forest management activities projected by the Forest Plan are expected to have both positive and negative effects, but to continue to supply the quantity and quality of habitat needed to meet CPW elk/mule deer population(s) objectives over time.

8.1.7 ROCKY MOUINTAIN ELK SUMMARY

While indirect and cumulative effects of Alternatives 2 and 3 would be appreciable and far ranging, they would be unlikely to measurably affect the population, trend, or habitat distribution of elk across the RGNF. Alternatives 2 and 3 would be consistent with NFMA direction and applicable Forest Plan Objectives, Standards, Guidelines, and the MIS monitoring question for maintaining viable elk populations with the estimated numbers and distribution of reproductive individuals to insure their continued existence is well distributed across the RGNF year-round. The CPW and USFS will continue monitoring elk and their habitats to establish and track populations and habitat trend across the Forest, consistent with the 2003 MIS Amendment to the Forest Plan (USFS 2003c).

8.2 MULE DEER, *Odocoileus hemionus*

Mule deer were selected as a MIS on the Forest because while it is a habitat generalist, it is of special interest from economic and recreational perspectives (USFS 2003b). Mule deer were evaluated for project effects to answer the monitoring question as to whether mule deer habitat is

being managed in a manner that provides for a viable and well-distributed population across the Forest during all seasons (USFS 2002k,l). Use of the mule deer will assist in monitoring whether Forest Plan standards and guidelines are being met for wildlife, as an indicator for forest management issues that influence the early successional stages of plant communities in relation to foraging and other habitat attributes. Mule deer were also evaluated for project effects because local habitats used by deer might be affected by the Proposed Action on NFS lands.

8.2.1 LIFE HISTORY AND BACKGROUND INFORMATION

Mule deer are widely distributed in western North America. They inhabit every major vegetation type in western North America and every climatic zone except the arctic and tropic. Rocky Mountain mule deer is the subspecies found in Colorado and they occur throughout the state in all ecosystems (Armstrong et al. 2011). Mule deer range over most of the RGNF and use essentially all habitats. Like elk, mule deer inhabit higher elevations during spring and summer and migrate to lower elevations for winter range. Winter range availability and habitat effectiveness may be the most critical seasonal range for deer survival.

Mule deer are a big-game species and the Colorado Wildlife Commission regulates seasons and bag limits. Hunting and fishing license fees are expected to continue to be the major source of revenue for wildlife programs in Colorado. Deer license sales account for a large percentage of all license revenue, indicating the importance of deer herd management and population viability in the state.

In Colorado, mule deer breed in November and December. A variety of factors stimulate the complex endocrine system that manipulates the physiological processes involved in the timing of reproduction. In males these factors cause growth of antlers and neck swelling prior the rut. At the time of ovulation, the peak of estrus, females are receptive for breeding for only a few hours to less than a day. If not bred, however, they recycle until fertilized (Wallmo 1981). A Colorado study (Anderson and Medin 1967) documented that 70% of the breeding occurred in a 20-day period. The mean length of gestation is 203 days, with individual variance of up to 30 days (Anderson and Medin 1967, Robinette et al. 1973). With the breakup of winter, the inclination of the fertile doe is to drift off by herself a week or two before she drops her fawn. Most fawns are born from early to mid-morning. Fawns are precocious and weigh 8 to 10 pounds at birth. In Colorado, fawns are normally born from June 15 to July 15. Yearling females typically produce a single fawn, while older females in good condition normally produce twins (Armstrong et al. 2011). Family groups are usually made up of mature and young does, young bucks, and yearling fawns. When not in rut, adult males often form pairs or small groups of three to five individuals (Armstrong et al. 2011). The males shed their antlers from late December to late February.

Mule deer eat a wide variety of plant species. The seasonal use of foods may change quickly and within a few weeks a highly palatable plant may fall into complete disuse. During the spring months, grasses may make up a high percentage of the diet in some areas. This early growth is high in protein. During the summer when the variety of plants available reach their maximum, grasses may drop as a percent of the total diet. Forb use and new growth of shrubs is high during this period (Armstrong et al. 2011). Autumn frosts bring great changes to mule deer diets. A high portion of the diet is comprised of grasses, leaves and forbs, but this period marks the transition to

shrubby vegetation. In winter, succulent vegetation is at a minimum and in many areas snow covers herbaceous plants and many shrubs, leaving only taller browse (Armstrong et al. 2011).

Cover may be a key factor that determines the amount of use deer will make of foraging areas. In optimal deer range 40% of an area will be in cover type habitat. Ideally, cover habitat is comprised of 50% hiding cover and 50% thermal cover. Hiding cover generally is any vegetation that will hide 90% of a deer at 200 feet or less. Optimal hiding cover will be in patches at least 800-1,600 feet wide. Optimal winter range contains thermal cover consisting of evergreen trees with 75% or greater canopy closure. Spring and summer thermal cover may be as important as winter thermal cover for protection from high temperatures. Spring and summer thermal cover may be provided by coniferous or deciduous trees, which provide at least 75% canopy closure. Escape cover used by deer may include thermal or hiding cover. Broken terrain or topographic features are also used as escape cover (Hoover and Wills 1984, Thomas et al. 1979). Loft et al. (1991) documented that deer prefer meadow-riparian habitats in the absence of domestic livestock grazing.

Fawning may occur in any habitat type found on the forest. However, fawns are most often found on sites with slopes of less than 15% that have good ground cover in the form of herbaceous vegetation mixed with low shrubs or small trees 2 to 6 feet in height. Normally these areas are within 600 yards of a water source and in areas that have quality forage for the doe that assures adequate milk production. Fawning areas are normally 1 to 5 acres in size if located on sites with characteristics different from the surrounding habitats (Hoover and Wills 1984). Fawns are relatively inactive during the first few days of their lives, but gradually become more active and begin to explore their surroundings. They begin to consume solid foods at 15 to 20 days of age. Riley and Dood (1984) reported an average summer home range of 456 acres for fawns in a Montana study. They found that fawns selected habitat types with dense vegetative cover and typically used the mid- and lower one-third of slopes, possibly to minimize encounters with coyotes.

Deer are thought to experience less reduced habitat effectiveness compared to elk with respect to road effects, however, they are still adversely influenced by the presence of roads that are open to vehicular traffic. Some level of reduced use of areas adjacent to roads extended for distances ranging from ¼ to ½ mile (Thomas et al. 1979). Road type, its location, and its degree of use influenced mule deer habitat effectiveness (Rost and Bailey 1979). Roads also provide access for hunters and poachers alike, leading to increased deer mortality.

Mule deer are sympatric with elk across large areas of western North America, where populations of mule deer have declined while elk populations have increased (Johnson et al. 2000). While more study is needed to specifically determine if elk population increases are the direct cause of mule deer population declines, Johnson et al. (2000) documented mule deer avoidance of areas used by elk. Consequently increasing elk populations are suspected to be a causative factor in the decline of mule deer populations in some areas.

Winter range conditions are most critical for mule deer survival. A high elevation winter range lacking in abundant browse and hard winters lower the quality of the habitat in the DAU for deer (CPW 2007b). The CPW has identified the loss and lack of high-quality winter range as the primary limiting factor restricting mule deer populations in the Lower Rio Grande Data Analysis

Unit (DAU – CPW 2007b). Pressures are increasing on most winter range from human developments such as reservoirs, housing developments, access roads, highways and cultivated fields. Overgrazing of mule deer winter range by domestic livestock can have significant impacts on deer populations. The communal life of the deer in mid-winter concentrations brings a critical period in the life of the young deer. In habitats with adequate forage, and during mild weather, no crisis occurs, but where growing conditions are poor and where overpopulations of domestic livestock and deer both use the range, the winter months of excessive cold and deep snow often become critical for the younger deer. Yearlings and fawns may have been in excellent condition as winter approaches, but larger and more mature animals press forage back, often standing up on hind legs to reach the remaining browse, the smaller deer fail to secure adequate nourishment. Immature deer make up from 60 to 80 percent of the mortality in critical winter conditions (Einarson 1969). In a study in northwest Colorado, White and Bartmann (1998) documented significant increases in fawn survival rates after wintering densities of mule deer were lowered.

Chronic wasting disease is a potential threat to mule deer populations and recreational hunting on the RGNF. Chronic wasting disease has not been detected in wild deer populations in both GMUs 80 & 81 (CPW 2007b).

8.2.2 FOREST-LEVEL INFORMATION

Around the turn of the century, mule deer populations were greatly depleted in Colorado due to market hunting. The rise of a conservation ethic and establishment of the CDOW led to the recovery of this species in the state. Mule deer populations declined again over much of the western United States in the 1950's due to overhunting, habitat loss, habitat alteration, and deterioration of winter range (CPW 2007b). At the present time, most mule deer herds in the state are below population objective levels and there has been a marked decline in population sizes throughout the west.

Mule deer are widely distributed across the RGNF and inhabit all 13 LTAs. They are more abundant at higher elevations during summer and at lower elevations during winter. There are 300,000 acres of elk/deer winter range on the Forest. Winter range consists of the following LTAs: Ponderosa Pine, Pinyon, Gambel Oak, Arizona Fescue, and Western Wheatgrass. The winter range is bunch grass dominated with isolated pockets of mountain mahogany, winter fat, and oak browse. Winter range studies on the Forest to help determine winter range condition and trend of have been undertaken, but the data have been inconclusive. Overall winter range productivity on the Forest is more the result of soil type and moisture regimes. Grass and forb productivity is generally good. Shrub trend is stable to declining in most areas of the Forest. The RGNF has completed several winter range improvement projects for big game. Opportunities for partnership projects between the Forest, CPW and the Mule Deer Foundation are excellent.

There are seven Game Management Units (GMUs) on the Forest (681, 68, 76, 79, 80, 81 and 82) contained within four DAUs, as follows:

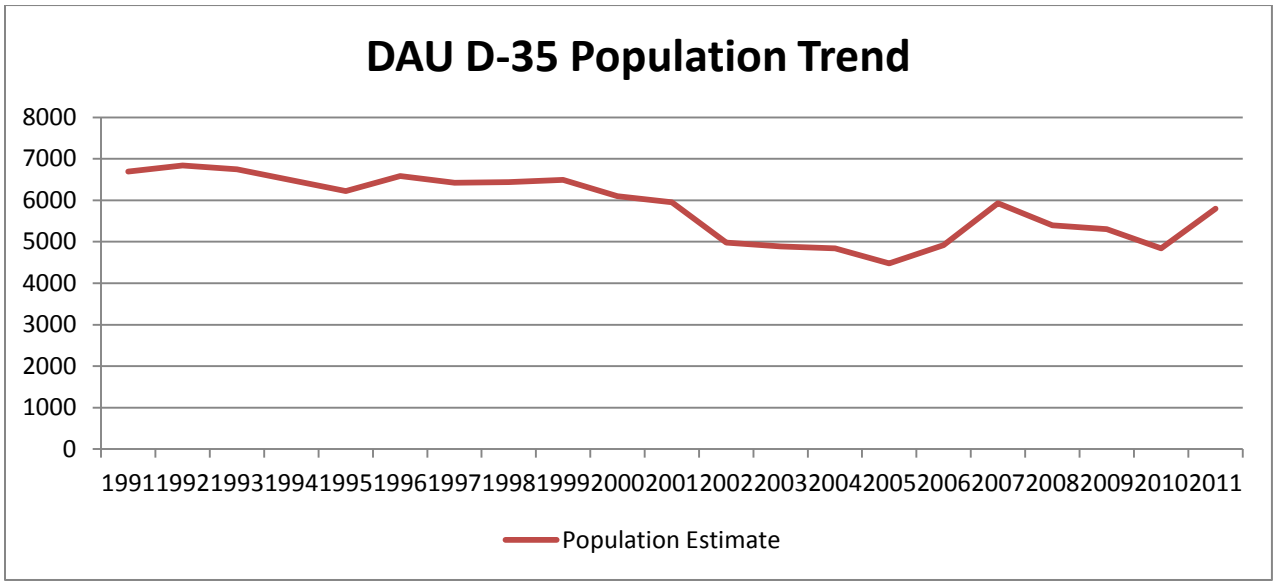
1. Upper Rio Grande Mule Deer Herd, DAU D-36, GMUs 76/79
2. Lower Rio Grande Mule Deer Herd, DAU D-35, GMUs 80/81
3. Saguache Mule Deer Herd, DAU D-26, GMUs 68/681
4. Sand Dunes Mule Deer Herd, DAU D-37, GMU 82

DAUs are used by the CPW to manage herds of big game animals, are generally geographically discrete, and, for the most part, contain discrete big game populations. DAUs are designed to support and accomplish the objective of the CPW's Long Range Plan and meet the public's objectives for big game. The Village at Wolf Creek Access project site lies at the intersection of DAUs 80 and 81on the east side of the Continental Divide and adjacent to DAU 78 west of the Continental Divide. Game Management Units specifically look at local populations within the larger DAU, for this analysis GMUs 80 and 81 are examined as they contain the population(s) which would be affected by each of the Alternatives.

Population estimates obtained from the CPW indicate that between 1991 and 2011 the herd has averaged 5,827 animals in GMUs 80 and 81 (CPW 2012d). This is below the 2011 LTO of 6–7,000 animals (CPW 2012d). Attempts to increase the size of this herd will be a continued effort most likely throughout this DAU plan's life.

Deer numbers decreased beginning in the early to mid-1990's. The cause of the decline is unknown but could be attributed to one or more of the following: 1) interspecies competition with an increasing elk herd, 2) forest succession limiting the amount of quality habitat, 3) record drought in 1999 to 2004, and 4) habitat loss.

Mule deer populations and trends are influenced by a host of natural factors (e.g., winter range conditions, winter range availability, winter severity, winter range competition with elk, etc.), but can also be influenced over time by CPW's ability to manage populations via hunter harvest. Reduced elk populations and habitat improvement projects, including vegetative treatments such as timber harvest, prescribed fire, and mechanical treatments, are expected to benefit deer. A significant amount of range improvement resulted from the Million fire.



Graph 2: Mule deer DAU D-35 1991 to 2011 population trend.

Summer recreation is continually increasing in DAU-D-35. Activities include camping, hiking, horseback riding, mountain biking, fishing, and use of off highway vehicles (OHVs). Most

recreation is focused on NFS lands where most of the summer range within the DAU is located. The impacts by these various forms of recreation are unknown but are believed to disturb deer to some degree. This could possibly affect distribution of deer and more importantly reproduction in fawning areas (CPW 2007b).

Off highway vehicles continue to be a growing concern in the summer and during hunting seasons. Although designed to travel in all but the most rugged terrain, Forest Service laws prohibit the use of OHVs off maintained roads and marked trails. Unfortunately these laws are often ignored and users go where they please, often damaging the resource and creating new roads. Impacts on the deer herds are not known but it is expected that OHV traffic off roads put undue stress on animals. This is especially important to fawning or lactating does and new born fawns. During the hunting season, illegal OHV use often displaces deer, making them more difficult for hunters to find which in return decreases harvest and hunter satisfaction.

8.2.3 PROJECT-LEVEL INFORMATION

Mule deer are present in the vicinity of the project site from June through October and use the area in much the same way as elk (i.e., as summer range). Deer begin drifting into the area in mid- to late June (i.e., following snowmelt and spring green-up) as they move to the highest elevation summer ranges from lower elevation winter and transitional ranges. Field surveys indicate that some fawning occurs on the project site. The project site and its concentrated (as opposed to dispersed) indirect effects zone of influence do not contain effective winter range, transitional range, or highway crossings (as defined by the CPW) because of the relatively high elevation, habitat types and landforms present, and proximity to chronic anthropogenic disturbances (NDIS maps). The project site represents an extremely small portion of the year-round home range used by animals present on-site during summer.

The project site's spruce-fir forests are fragmented by native meadows, ski trails, and glades. Ski trail development has increased forage availability and much of it is effective because of limited human disturbance on the ski area. These increased foraging values are largely effective despite chronic summer disturbances that closely surround (WCSA and Hwy 160) and permeate (FSR 391) the project site. Hwy 160 physically and behaviorally results in some deer avoidance of adjacent habitats. WCSA's base area and parking lots and FSR 391, also results in some displacement during the summer maintenance/ recreation season. Deer have adapted to this context by using the project site and local surrounding habitats nocturnally and moving into forest blocks during the day.

Deer movements in the vicinity of the project site are primarily east-west, including some nocturnal movements across and through portions of the developed base area and parking lots. Movements also occur north-south (i.e., over the Continental Divide), as Rio Grande deer mix with San Juan deer in the East Fork Valley (Thompson 1985, USFS 1987). Deer also cross Hwy 160 in the vicinity of the project site, although no evidence of highway crossings has been found in areas immediately adjacent to the project site (i.e., between the ski area entrance and about 0.5 mi. below the snow shed) because of (1) adjacent local facilities (e.g., the CDOT maintenance buildings, ski area entrance road, parking lots, and base area facilities, snow shed, parking area downhill of snow shed) that deflect deer from their approach to the highway; (2) the steep canyon below the snow she; (3) broad, coarse, boulder-covered fill slopes along the highway; and (4) the

location of this area in the larger landscape (i.e., there are no compellingly important adjacent habitats and it is simply easier to avoid this cluster of development in an otherwise undeveloped landscape).

NDIS maps indicate that the only polygon of seasonal mule deer habitat overlapping the project site is a widespread block of summer range that extends between the Towns of South Fork and Pagosa Springs. Based on field surveys throughout the project site, the NDIS designation is considered valid.

The closest NDIS blocks of mule deer winter range designations occur at lower elevations relatively distant from the project site, located along the Continental Divide. The closest winter range to the east begins in Rio Grande County around Fun Valley, and extends east down valley. The closest winter range to the west begins at the confluence of the East and West Forks of the San Juan River and extends west down valley. The closest severe winter range or winter concentration areas to the east begin in Rio Grande County around the junction of Highways 160 and 149 (South Fork) on private lands. The closest severe winter range or winter concentration areas to the west begin several miles west and south of Pagosa Springs, also on mostly private lands.

No other seasonal mule deer ranges occur closer to the project site than the Towns of South Fork and Pagosa Springs. As indicated above, there is a limited amount of fawning that occurs on the project site, based on field surveys. NDIS mapping does not map deer fawning areas (largely because they are so widespread).

NDIS maps indicate that there are no mule deer highway crossings (defined as where ≥ 6 deer are killed along a one mile stretch of highway per year) along Hwy 160 over Wolf Creek Pass, although such a crossing occurs near the confluence of the East and West Forks of the San Juan River between the western base of the pass and Pagosa Springs and on the east side of the pass around the Town of South Fork. Mule deer do cross Hwy 160 over Wolf Creek Pass, although road-kill density might not meet the above highway-crossing criterion.

8.2.4 PROJECT EFFECTS

Alternative1 would have no direct, indirect, or cumulative impacts on mule deer because no habitat modifications would be authorized on NFS lands. The WCSA MDP would result in the conversion of minor and insignificant amounts of summer range and mule deer production habitat. Since impacts associated with human activity would be greatest during the winter, when mule deer are not present near the project site, it is unlikely that there would be impacts to deer. Summer use of the WCSA SUP area likely would not increase as no amenities are planned under the MDP that would encourage an increase in human activity during the calving season or the summer. Secondary impacts associated with the VWC would likely result in the increase in human activity on adjacent NFS lands which could impact mule deer production. However, the impacts associated with the MDP or VWC are not expected to impact the local population. Of greater concern is the overall increase in recreation on both summer and winter ranges that are not associated with the Village at Wolf Creek Access project.

Cumulative impacts near the Village at Wolf Creek Access project site include the operation and maintenance of Hwy 160, the CDOT maintenance facility, FSR 391, and the WCSA and its associated infrastructure. The Saddle Brock development would add additional traffic within all mule deer habitat types year-round. Saddle Brook is east of the project area at a much lower elevation close to mule deer winter range. Traffic in the winter traveling to and from Saddle Brook would cause an increase in vehicle traffic in winter range. The additional traffic likely will lead to an increase in vehicle related mortality in mule deer and will remove additional habitat when the development is built. Neither the Big Reservoir Timber Salvage nor the Table Salvage Timber Sale add to cumulative impacts since both of these project exist north of the project site in a different DAU. The Pass Creek Yurt is within DAU D-35 but it is not located in winter range and only operates in the winter when deer are not present.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the loss of 123.6 acres (Table 6-2) of potentially suitable mule deer forested summer range. The loss of 123.6 acres of mule deer summer range is insignificant and discountable since this is the most widespread of any mule deer habitat type. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to mule deer from the land exchange itself.

Alternative 2 development concepts (Low, Moderate, and Maximum Density) would result in the conversion of 23.94, 28.23, and 85.18 acres, respectively, of forested summer range on NFS lands (Table 6-3). The loss of these varying acres of mule deer summer range is insignificant and discountable since this is the most widespread of any mule deer habitat type. Alternative 3 development concepts (Low, Moderate, and Maximum Density) would result in the conversion of 1.93, 4.01, and 4.10 acres, respectively, of forested summer range on NFS lands (Table 8-2). Total conversion of summer range associated with the Alternative 3 development concepts is approximately 25.11, 38.82 and 69.22 acres (Table 6-3). The water tank farm sites for the Moderate Density Development Concepts for the two Action Alternatives would likely accommodate the water storage requirements for these concepts. The water storage requirement for the Maximum Density Development Concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence.

VWC development and associated seasonal activities that would occur under Alternatives 2 and 3 would completely displace all seasonal deer use from the developed land and reduce deer habitat effectiveness in a considerable area of surrounding NFS lands. Habitat effectiveness would be reduced in an area far greater than the project site, though not as large of an area as that reduced for elk. While the project site and contiguous habitats primarily provide summer range, with more limited use as spring and fall transitional range, dispersed recreational activities (e.g., new mountain bike, hiking, equestrian, and ATV trails) could affect these habitats and calving areas in

a large area of the surrounding landscape. Much greater, year-round human presence in the landscape will result in greater vehicular use of secondary and backcountry roads, which will reduce deer habitat effectiveness in adjacent habitats. Deer highway mortality along Hwy 160 and other high-speed highways would increase as a direct result of commuting residents, guests, construction personnel, resort employees, other infrastructure support personnel and their families in the landscape between regional airports (e.g., Durango and Alamosa) and the most distal commuting destinations. Traffic volumes, and associated deer highway mortality, are projected to increase in the future even without the addition of traffic associated with the Village at Wolf Creek. Traffic volume above the 2043 baseline contributed by the Village at Wolf Creek under the Alternative 2 Maximum Density Development Concept will account for an increase of 40% for east bound traffic and 71% for west bound traffic crossing Wolf Creek Pass. Under the Alternative 3 Maximum Density Development Concept these values are an increase above baseline of 73% for east bound traffic and 143% for west bound traffic. The additional off-site commercial, residential, and municipal infrastructure required to support such a large, year-round development would result in additional habitat loss, both direct, through habitat conversion, and indirect, through wildlife displacement from human activity areas, at lower elevations that would likely affect some deer winter ranges, although more of these effects would occur off the Forest.

While cumulative effects of Alternatives 2 and 3 would be appreciable and far ranging, they would be unlikely to adversely affect the population, trend, or habitat distribution of mule deer across the RGNF. While populations are influenced primarily by winter range availability, winter severity, competition with elk, and hunter harvest, cumulative VWC effects (the more substantive of which involve induced secondary development affecting winter range) would have an incremental, adverse influence on local herd numbers and trend, though the effects may not be discernible from other variables and may not measurably affect the population, trend, or habitat distribution of mule deer on a Forest-wide basis.

No other reasonably foreseeable projects occur within the DAU that could impact deer habitat.

8.2.5 PROJECT CONSISTENCY WITH KEY MONITORING QUESTIONS AND STRATEGIES

This section addresses project consistency with key monitoring questions and strategies for mule deer.

The population trend status of the Forest's mule deer herd is being monitoring at the appropriate scale, the DAU and GMU levels, and data are collected by CPW. Forest level analysis of population trend data will include all 4 CPW DAU reports and be incorporated into the Forest's annual Monitoring and Evaluation Report.

Habitat components that are important to the viability of mule deer are being maintained as planned in quality, quantity and distribution. At the project level, implementation monitoring will be conducted post-treatment, to determine compliance with Forest Plan standards and guidelines and project design criteria. At the Forest level, NDIS habitat maps have been generated by CPW, and in conjunction with annual monitoring data by CPW, are used as a basis for estimating available habitat and spatially displaying habitat distribution across the Forest.

The mule deer population on the Forest is being maintained in a well-distributed manner and is using the intended habitat as planned. NDIS maps show summer and winter range distribution across the Forest and areas of concentrated use. DAU management plans identify herd management problems and develop management strategies (harvest) to achieve management goals. Annual CPW monitoring data are used to adjust management strategies (season structures). Currently, mule deer are widely distributed across the Forest and are using habitats as expected.

In summary, although the direct, indirect, and cumulative effects of Alternatives 2 and 3 would affect mule deer habitat effectiveness, those effects would be insignificant and discountable Forest-wide. The RGNF would continue management of mule deer habitat providing for viable, well-distributed mule deer populations across the Forest during all seasons.

8.2.6 PROJECT CONSISTENCY WITH FOREST PLAN MIS OBJECTIVES

Project consistency with Forest Plan MIS Objectives for mule deer is the same as that for elk and is addressed above in Secton 8.1.6.

8.2.7 MULE DEER SUMMARY

While direct, indirect, and cumulative effects of Alternatives 2 and 3 would be appreciable and far ranging, they would be unlikely to measurably affect the population, trend, or habitat distribution of mule deer across the RGNF. Alternatives 2 and 3 would be consistent with NFMA direction and applicable Forest Plan Objectives, Standards, Guidelines, and the MIS monitoring question for maintaining viable mule deer populations with the estimated numbers and distribution of reproductive individuals to insure their continued existence is well distributed across the RGNF year-round. The CPW and USFS will continue monitoring mule deer and their habitats to establish and track populations and habitat trend across the Forest, consistent with the 2003 MIS Amendment to the Forest Plan (USFS 2003b).

8.3 WILSON'S WARBLER, *Wilsonia pusilla*

Wilson's warbler was selected as a MIS on the Forest because it is a riparian species tied to different structural elements susceptible to grazing and other activities within riparian areas (USFS 2003b). This species is monitored as a group with Lincoln's sparrow because of close habitat associations with willow communities at various elevations. Its intent as a MIS is to represent the habitat components and biological community of riparian willow habitats in relationship to Forest-wide Standards and Guidelines as applied to management activities within these habitat types and to answer the monitoring question as to whether riparian willow systems are being managed in a manner that provides for viable, well-distributed populations of Wilson's warblers and associated species across the Forest. Wilson's warbler was also evaluated for project effects because it is present in local riparian willow communities that might be affected by the Proposed Action on NFS lands.

8.3.1 LIFE HISTORY AND BACKGROUND INFORMATION

In Colorado, Wilson's warblers are fairly common summer residents in higher mountains and mountain parks (Toolen 1998). Andrews and Righter (1992) reported a summer elevation range

for this species as 10,000 to 13,000 feet. Toolen (1998) reported Wilson's warblers most frequently from 9,000 to 10,500 feet. Wilson's warblers are migratory and winter from northern Mexico to Central America and the Caribbean. Small numbers of Wilson's warblers also winter along the Pacific Coast and the Gulf-states (Toolen 1998). Toolen (1998) reported Wilson's warbler as a confirmed breeder in the San Juan Mountains and Sangre de Cristo Range, both of which comprise the Rio Grande National Forest. Rawinski (2001) listed this warbler as a fairly common breeder in the San Luis Valley and adjacent mountains.

Wilson's warblers return to the higher mountains of Colorado by late May, as snowmelt allows. In Colorado, they breed in willow shrublands associated with lake and stream riparian areas and wet meadows, particularly at mid-elevations (Andrews and Righter 1992, Toolen 1998). Nest cups are usually placed on the ground, frequently at the base of a small tree or shrub, often well concealed in a grass hummock, and occasionally are reused for up to 10 years (DeGraaf et al. 1991, Ammon and Gilbert 1999). Ground level at the nest sites is higher than average, avoiding high water levels (Ammon and Gilbert 1999). However, they also occasionally place the nest above ground in low, dense tangles of vegetation. Four to six eggs are produced usually with hatching occurring after 10-13 days of incubation. The female incubates the eggs and broods the young. One brood is produced per nesting season. Wilson's warblers are migratory with most leaving their high elevation breeding grounds by mid-October. This warbler is common in western valleys and on the eastern plains from mid-August to late October (Ehrlich et al. 1988, Toolen 1998, Andrews and Righter 1992).

Wilson's warblers mostly eat insects (about 93%) gleaned from the ground and twigs or caught by fly catching (DeGraaf et al. 1991, Hutto 1981, Stewart et al. 1977). Ehrlich et al. (1988) reported that their diet also consists of some berries. Wilson's warblers are frequently found in close association with Lincoln's Sparrows (Toolen 1998, Bent 1953).

Wilson's warblers prefer to breed in boggy habitats throughout their range (Ehrlich et al. 1988). In Colorado, they are strongly associated with mid- to high elevation willow carrs, with more than 90% of the documented nests in the Colorado Breeding Bird Atlas occurring in these habitat types (Toolen 1998). Thick willow-shrubs appear to be an important component of the breeding habitat for this species (Andrews and Righter 1992, Toolen 1998). Nests were closer to willow thickets and closer toward willow patch interiors than unused sites (Ammon and Gilbert 1999). On the RGNF, this species is observed most frequently in willows below five feet in height (R. Ghormley, USFS, pers. comm., Rawinski 2001). These observations are consistent with low foraging heights in willows observed in other applicable studies (Stewart 1973, Hutto 1981, Cody and Smallwood 1996). During migration Wilson's warblers are reported to utilize a broader range of habitats including thickets, shrubs, parks and gardens (Bison-M 2001a). The quality of migratory stopover habitat might significantly influence survival (Young et al. 1998). In spring, males appear on the breeding grounds earlier than females and are generally in healthier condition due to higher fat reserves (Francis and Cooke 1986, Young et al. 1998).

8.3.2 FOREST-LEVEL INFORMATION

Wilson's warblers are a fairly common, widely distributed summer resident in the higher mountains and mountain parks of Colorado (Andrews and Righter 1992). This warbler is relatively common on the RGNF where suitable habitat exists. Wilson's warblers have been

located in suitable habitat on all ranger districts of the RGNF (Gillihan 2001, unpubl. internal RGNF data). The Colorado Breeding Bird Atlas documented Wilson's warblers as confirmed breeders in a high percentage of the survey blocks in the mountainous areas of the state that contained willow communities above 9,000 feet elevation, including many blocks on the RGNF (Toolen 1998). Primary habitat for Wilson's warbler on the RGNF occurs in Land Type Association (LTA) 10 - Willows and Sedges on Floodplains (USFS 2002g,h). LTA 10 represents approximately 54,000 acres (3%) of the Forest and is generally confined to narrow bands of vegetation associated with riparian zones from about 8,600 to 11,600 feet. However, about 11,365 (0.6% of the Forest) acres of primary habitat may be available on the RGNF based on a GIS query of riparian willow types that occur on slopes of 20% or less (USFS 2002g,h). This figure represents the current baseline estimate of potential habitat on the RGNF although adjustments may be needed as additional habitat relationship information becomes known and more mapping iterations are produced. This figure does not include willow carr habitats associated with alpine tundra on the RGNF, where this species also occurs at moderately high densities (Gillihan 2001, unpubl. internal USFS data). Future LTA 10 habitat conditions are expected to remain stable, with no known threats to both breeding and non-breeding Wilson's warbler populations (unpubl. internal RGNF data). However, because of the vulnerability of riparian willow communities that these species are primarily associated with, careful management is required to maintain the structural components and hydrologic processes that promote habitat quality and quantity over time. Managing domestic livestock use of willow communities is an important management consideration for this species.

Wilson's warbler has a moderate relative abundance throughout its global range and occurs in high relative abundance in the Southern Rocky Mountains where suitable habitat exists (Gillihan 2001, unpubl. internal USFS data). It is one of the most common breeding birds in montane and subalpine willow carrs in Colorado (Toolen 1998), with mid-point densities estimated at over 206,000 breeding pairs (Kingery et al. 1998).

Current population estimates for RGNF MIS avian species are based on the rigorous analysis of data collected for the MCB program from 1998-2007; the Monitoring the Birds of Southern Rockies/Colorado Plateau Bird Conservation Region (BCR 16) 2009 Annual Report; and the 2010 IMBCR Annual Report. These reports provide estimated densities (birds/km^2), estimated population sizes, and percent coefficient of variation (%CV) of estimates (a measurement of the amount of variation in a data set, the lower the %CV value the better the data set is. A %CV of less than 50 is considered robust; species with CVs of >50%, but <80% still provide solid data; those species will simply require more years of data to detect population trends).

The density for Wilson's warbler for the Colorado state-wide 2004 MCB field season (Beason et al. 2005) was reported at 2.74 with a %CV of 27. Blakesley (2008) reported there was no evidence of population declines from 1998-2008 from the MCB data for Wilson's warblers and there was evidence of an increasing log-linear trend in population size between 1999 and 2007 in the San Juan Mountains. Blakesley further concluded that the estimated density of Wilson's warblers in high-elevation riparian habitat varied more state-wide than within the San Juan Mountains. In the Monitoring the Birds of Southern Rockies/Colorado Plateau BCR16 2009 Annual Report (Blakesley et al. 2009) no population parameters for Wilson's warbler were calculated for 2008; values for 2009 were reported at 1.8, 14,814, and 64, respectively. Colorado state-wide Wilson's warbler population parameters reported in the 2010 IMBCR Annual Report

(White et al. 2011) were 1.71, 461,197, and 43, respectively. Population parameters specific to the RGNF were not reported in the 2010 IMBCR Annual Report Gillihan (2002) suggests that a reasonable baseline density estimate for Wilson's warblers on the RGNF is about 100 breeding territories per 40 ha (1 territory per 2.5 hectares) of suitable willow carr habitat. This equates to an average territory size of about one breeding pair per acre and suggests that the RGNF may be capable of supporting a relative density of about 11,300 pairs of Wilson's warblers based on the current estimates of potential primary habitat and full occupancy. The assumption of full occupancy of all potential habitat probably over-estimates Forest level populations. Wilson's warblers have also been found in low densities in aspen stands on the RGNF (where they appear to prefer larger-sized stands [>25 ha] in the older structural stages [HSS 4 and 5; Gillihan 2001]) and at higher densities in alpine willow carrs on the Forest. If Wilson's warbler use of aspen and willow carr habitats were considered, Forest-wide distributions and populations would be even higher.

Wilson's warbler populations on the RGNF are expected to remain relatively unchanged during the first decade of Forest Plan implementation due to an increased management focus on riparian areas that will include the completion of Allotment Management Plans. These Allotment Management Plans will evaluate the relationship between upland areas, riparian areas, forage utilization, and livestock distribution and result in improvements to riparian willow habitat where needed. These improvements may also occur prior to completion of Allotment Management Plans by incorporating changes into the Annual Operating Instructions. Effects from travel management are also expected to lessen due to a reduction in open road densities on the RGNF. By the end of the fifth decade, a potential population response to these habitat improvements is expected that may result in slightly increased populations of Wilson's warbler (USFS 2003b).

The vast majority of potential Wilson's warbler habitat in the upper Rio Grande basin occurs on NFS land. The quality and quantity of potential habitat that occurs on private land may have been altered to a less suitable condition; however, those acreages and potential species effects are most likely minor because of the limited distribution of private lands within the relatively high elevations of this species' habitat. Much of the potential habitat on NFS land occurs in areas with protective land management designations or management prescriptions. The RGNF Forest Plan contains several goals, objectives, desired conditions, and standards and guidelines intended to maintain and promote healthy riparian zones and willow communities. Provisions of the Clean Water Act also restrict project-level impacts to these habitats. Conditions of these habitats on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local Wilson's warbler populations and provide source habitat on a larger scale. Current protection measures on the Forest will help ensure a high likelihood of population persistence into the future. These projections are based on planned activities only, and do not account for the resumption of unplanned natural disturbance factors, such as wildfire or climate change, or effects that may influence populations off the Forest.

8.3.3 PROJECT-LEVEL INFORMATION

Wilson's warblers have been detected breeding in the stunted planeleaf willow (*Salix planifolia*) stands in the subalpine wetlands on NFS and private lands associated with North and South Pass Creek within the project site. Survey effort that detected this species is described above. For this analysis, all riparian willow communities in the project site ≥0.5 acre (this includes all willow

stands) are considered occupied or potential Wilson's warbler habitat at an average territory size of one breeding pair per acre. Based upon the 17.3 acres (20.4% of wetland habitat types) of scrub-shrub wetland habitat type present within the project site (Table 8-2) and full occupancy of available habitat at an average territory size, the project site may currently be capable of supporting about 17 pairs. Based upon qualitative field surveys, this estimate is considered higher than the density present.

8.3.4 PROJECT EFFECTS

Alternative 1 would have no direct or indirect effects on Wilson's warblers because no habitat modifications to montane and subalpine willow carrs representing occupied or potential habitat for this species would be authorized on NFS lands (Table 8-2). As such, Alternative 1 would affect no Wilson's warbler habitat or any portion of the RGNF population. Because the Wilson's warbler analysis area is limited to the project site (because of their small territory sizes), no reasonably foreseeable future actions (i.e. the WCSA MDP) are known within the analysis area that could add cumulative impacts. Cumulative effects to spruce-fir habitat within the analysis area are limited to historic logging which removed late successional spruce-fir; the construction of Hwy 160 and its associated ROW and cut/fill; and FSR 391. These cumulative effects have all resulted in the removal of potential nesting and foraging habitat, the amount of loss is unknown.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the gain of 3.2 acres (Table 6-2) of potentially suitable Wilson's warbler nesting and foraging habitat. The gain of 3.2 acres represents a potential increase of 3 breeding territories on NFS lands. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek did not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to Wilson's warblers from the land exchange itself.

Alternatives 2 and 3 Hwy 160 access road construction would result in habitat modification to montane or subalpine willow carrs representing occupied or potential Wilson's warbler habitat within the project site. Though wetlands would be bridged, there would still be the loss of scrub-shrub willow habitat in these areas because of shading, and the access road has the potential to disrupt hydrologic connectivity that support adjacent occupied willow habitat. As a result, project design criteria have been incorporated into Alternatives 2 and 3 to ensure that access road construction would not disrupt hydrologic connectivity that may support down-gradient willow stands that are inhabited by this species, which would increase these indirect impact totals. Indirect effects to high elevation riparian habitat potentially used for nesting and foraging by Wilson's warbler for the Low, Moderate, and Maximum Density Development Concepts under Alternatives 2 and 3 total 0.47, 0.86, and 0.98 acres, respectively, for Alternative 2 and 0.90, 0.68, and 1.27 acres, respectively, for Alternative 3 (Table 6-2). Indirect effects to high elevation riparian on NFS lands for these development concepts are 0.31, 0.66, and 0.66 for Alternative 2 and 0.30, 0.30, and 0.65 for Alternative 3. The water tank farm sites for the Moderate Density Development Concepts for the two Action Alternatives would likely accommodate the water storage requirements for these concepts. The water storage requirement for the Maximum Density Development Concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for Alternative 3. The additional areas for the water storage

would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. Regardless of the Alternative 2 and 3 development concepts, these indirect impacts are discountable and insignificant since they represent a worst-case scenario of impacting potentially, at the most, one pair of Wilson's warbler under all Alternative 2 and 3 development concepts (Table 6-2). The potential loss of one breeding territory is insignificant and discountable when compared to the RGNF Wilson's warbler population and the amount of potential habitat within the RGNF.

The effect of indirect effects associated with Alternatives 2 and 3 on private land has no bearing on NFMA directives and applicable Forest Plan objectives, standards, and guidelines, which are considered on NFS lands only.

Secondary impacts to Wilson's warbler habitat associated with the private development of the VWC under Alternatives 2 and 3 would likely have little effect on willows inhabited by Wilson's warblers on the project site because such habitats, surrounding buffer zones, and surrounding wetlands on NFS lands (with hydrologic connections to the project site) would likely be protected by provisions of the Clean Water Act and 404 permitting, including the potential disruption of groundwater flows that could adversely affect wetlands, including willows stands, on NFS lands down gradient from the project site. Reduced habitat effectiveness resulting from adjacent human activities and dispersed recreation would likely be confined to the project site. Stray cats from the Village at Wolf Creek would extend onto the Forest and would likely present a potential mortality source for this species. Effects to this species and its habitat on private land would have no bearing on NFMA directives, which are considered on NFS lands only. Cumulative effects of VWC development on Wilson's warbler habitat on contiguous NFS lands would be insignificant and discountable reductions to this species' Forest-wide population, habitat distribution, and trend.

There are no known reasonably foreseeable projects within the analysis area that would impact Wilson's warbler habitat on NFS lands.

8.3.5 PROJECT CONSISTENCY WITH KEY MONITORING QUESTIONS AND STRATEGIES

This section addresses project consistency with key monitoring questions and strategies for Wilson's warblers and other avian MIS, which are the same.

Habitat components that are important to the viability of Wilson's warbler (and other avian MIS addressed herein) would be maintained as planned in quality, quantity, and distribution. Species habitat maps have been generated as a basis for estimated available habitat on the Forest and to spatially display habitat distribution across the Forest.

The Wilson's warbler (and other avian MIS addressed herein) population(s) on the Forest is (are) being, and would be, maintained in a well-distributed manner and using the habitat as expected. At the project level, surveys showed Wilson's warblers (and other avian MIS addressed herein) were present and occupying primary habitats as distributed in the project site. Incidental

observations, BBS data, and occurrence data from the project provide information as to distribution and habitat use by the brown creeper (and other avian MIS addressed herein) across the Forest.

At the Forest level, species monitoring protocols are designed as part of the IMBCR program and to provide trend information at an appropriate scale. Data from IMBCR transects on the RGNF is being used to develop trend data for the Forest. It is not technically feasible to develop population trend data at the project level. MIS population trends will be monitored at the planning unit level (the Forest) and will use data from existing IMBCR transects on the Forest. MIS monitoring data will provide trend data at both the biological population (San Juan Mountains) and planning unit population (Forest) scales.
Project consistency with key monitoring questions and strategies for the Wilson's warbler is the same for other avian MIS and is addressed above under brown creeper.

In summary, although the direct, indirect, and cumulative effects of Alternatives 1-4 could affect the primary habitat of Wilson's warblers, those effects would be insignificant and discountable Forest-wide. The RGNF would continue management of riparian willow systems providing for viable, well-distributed populations of Wilson's warbler and associated species across the Forest.

8.3.6 PROJECT CONSISTENCY WITH FOREST PLAN MIS OBJECTIVES

Desired Forest-wide conditions are to maintain viable populations of existing native and desired non-native vertebrate species. Forest-wide objectives provide for sustainability of viable populations and management of wildlife habitat at appropriate scales so as to protect, conserve, and restore terrestrial and aquatic habitats. Wilson's warbler and Lincoln's sparrow are considered together because of similar habitat affinities and MIS objectives.

The vast majority of potential Wilson's warbler and Lincoln's sparrow habitat in the upper Rio Grande basin occurs on NFS land. Much of the potential habitat on NFS land occurs in areas with protective land management designations or management prescriptions. The RGNF Forest Plan contains several goals, objectives, desired conditions, and standards and guidelines intended to maintain and promote biodiversity, healthy riparian zones, and willow communities. Provisions of the Clean Water Act also restrict project-level impacts to habitats important for these species. Conditions of these habitats on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local populations and provide source habitat on a larger scale. Current protection measures on the Forest will help ensure a high likelihood of population persistence into the future. Future primary habitat conditions for both species are expected to remain stable, with no known threats to breeding or non-breeding populations (unpubl. internal RGNF data).

Wilson's warbler and Lincoln's sparrow populations on the RGNF are expected to remain relatively unchanged during the first decade of Forest Plan implementation due to an increased management focus on riparian areas that will include the completion of Allotment Management Plans. Effects from travel management are also expected to lessen due to a reduction in open road densities on the RGNF. By the end of the fifth decade, a potential population response to these habitat improvements is expected that may result in slightly increased population, trend, and viability of Wilson's warbler and Lincoln's sparrow on the RGNF (USFS 2003b).

8.3.7 WILSON'S WARBLER SUMMARY

Indirect and cumulative Alternative 2 and 3 effects would be insignificant and discountable on this species' Forest-wide population, habitat distribution, and trend. Wilson's warblers and montane and subalpine willow carrs would remain relatively abundant and widely distributed across the Forest. Considering direct, indirect, and cumulative Alternative 2 and 3 effects, the quality and quantity of Wilson's warbler habitat would remain unchanged and Wilson's warblers would remain relatively abundant and widely distributed across the Forest. Alternatives 2 and 3 would be consistent with NFMA direction and applicable Forest Plan Objectives, Standards, Guidelines, and the MIS monitoring question for maintaining viable populations of Wilson's warbler and other species associated with montane and subalpine willow carrs with the estimated numbers and distribution of reproductive individuals to insure their continued existence is well distributed across the RGNF. The USFS will continue monitoring Wilson's warblers and their habitats to establish and track populations and habitat trend across the Forest, consistent with the 2003 MIS Amendment to the Forest Plan (USFS 2003b).

8.4 LINCOLN'S SPARROW, *Melospiza lincolnii*

Lincoln's sparrow was selected as a MIS on the Forest because it is a riparian species tied to different structural elements susceptible to grazing and other activities within riparian areas (USFS 2003e). This species is monitored as a group with Wilson's warbler because of close habitat associations with willow communities at various elevations. Its intent as a MIS is to represent the habitat components and biological community of riparian willow habitats in relationship to Forest-wide Standards and Guidelines as applied to management activities within these habitat types and to answer the monitoring question as to whether riparian willow systems are being managed in a manner that provides for viable, well-distributed populations of Lincoln's sparrows and associated species across the Forest. Lincoln's sparrow was also evaluated for project effects because it is present in local riparian willow communities that might be affected by the Proposed Action on NFS lands.

8.4.1 LIFE HISTORY AND BACKGROUND INFORMATION

In Colorado, Lincoln's sparrows are common summer residents in higher mountains and mountain parks above 8,000 feet. This species is a Neotropical migrant that winters from the southwestern U.S. south throughout Mexico to Costa Rica (Andrews and Righter 1992, National Geographic Society 1991, Versaw 1998). They return to their breeding grounds in the higher mountains of Colorado by early May, as snowmelt allows. They breed in riparian willow shrublands, shrubby meadows, and krummholz habitats, and also use aspen groves (Ammon 1995, Andrews and Righter 1992). The vast majority of nests have been documented in willow carr communities (Versaw 1998). They build a cup nest on the ground lined with fine grass or hair (DeGraaf et al. 1991, Cicero 1997). Usually four or five eggs are produced with hatching occurring after 12-14 days of incubation. Females incubate the eggs and brood the young. Double brooding occurs only during favorable years (Ammon 1995) and appears to occur in Colorado (Versaw 1998). Lincoln's sparrows usually vacate their high elevation breeding grounds by late September. However, they may be common in western valleys and on the eastern plains until late October (Ammon 1995, Ehrlich et al. 1988, Versaw 1998, Andrews and Righter 1992, Bent 1968).

Lincoln's sparrows forage on the ground in wet areas close to their nest location, which is often in dense foliage. The young are fed insects. The diet of adults consists of spiders, millipedes, and grass and forb seeds. However, their slow feeding style tends to include slower and more hidden arthropods (Ammon 1995, Versaw 1998, Bent 1968, Ehrlich et al. 1988). This foraging strategy reduces direct competition with Wilson's warblers, which are often found in the same habitat, but which consume different types of insects (Raley and Anderson 1990).

In Colorado, Lincoln's sparrows are riparian obligates strongly associated with mid- to high elevation willow riparian communities. They have also been documented nesting at moderately high densities in aspen stands on the RGNF in larger (>25 ha), older (HSS 4 and 5) aspen stands, in willow carr habitats associated with alpine tundra, and in areas with a mosaic of wet meadows dominated by shrubby cinquefoil (Gillihan 2001, unpubl. internal RGNF data). Regardless of the community, these birds typically build their nests at the base of a shrub or in a thick growth of sedges (Cicero 1997, Versaw 1998). In Oregon and California, Cicero (1997) noted that singing males were strongly associated with particular habitat features, with the most important attribute being the presence of nearby surface water. Approximately 93% of the males observed were in either boggy or flooded sites that contained tussocks of sedges or grasses, while about 84% occurred near clumps of willows.

8.4.2 FOREST-LEVEL INFORMATION

Lincoln's sparrows are a fairly common, widely distributed summer resident in the higher mountains and mountain parks of Colorado (Andrews and Righter 1992). Rawinski (2001) reported a patchy, but widely distributed occurrence of this sparrow on the RGNF, indicative of the distribution of its primary habitat, willow riparian and willow carr wet meadows. This sparrow is relatively common on the RGNF where suitable habitat exists. Lincoln's sparrows have been located in suitable habitat on all ranger districts of the RGNF (unpubl. internal RGNF data). The Colorado Breeding Bird Atlas documented Lincoln's sparrows as confirmed breeders in a high percentage of the survey blocks in the mountainous areas of the state, including many blocks on the RGNF (Versaw 1998). Primary habitat for Lincoln's sparrow on the RGNF occurs in Land Type Association (LTA) 10 - Willows and Sedges on Floodplains (USFS 2002e,f). LTA 10 represents approximately 54,000 acres (3%) of the Forest and is generally confined to narrow bands of vegetation associated with riparian zones from about 8,600 to 11,600 feet. However, about 11,365 (0.6% of the Forest) acres of primary habitat may be available on the RGNF based on a GIS query of riparian willow types that occur on slopes of 20% or less (USFS 2002e,f). This figure represents the current baseline estimate of potential habitat on the RGNF although adjustments may be needed as additional habitat relationship information becomes known and more mapping iterations are produced. This figure does not include aspen and willow carr habitats associated with alpine tundra on the RGNF, where this species also occurs at moderately high densities (Gillihan 2001, unpubl. internal RGNF data). Future LTA 10 habitat conditions are expected to remain stable, with no known threats to both breeding and non-breeding Lincoln's sparrow populations (Gillihan 2001, unpubl. internal RGNF data). However, because of the vulnerability of riparian willow communities that these species are primarily associated with, careful management is required to maintain the structural components and hydrologic processes that promote habitat quality and quantity over time.

Lincoln's sparrow has a moderate relative abundance throughout its global range and occurs in high relative abundance in the Southern Rocky Mountains (Gillihan 2001, unpubl. internal USFS data). It is one of the most common breeding birds in montane and subalpine willow carrs in Colorado (Toolen 1998, Versaw 1998), with mid-point densities estimated at over 487,000 breeding pairs (Kingery et al. 1998).

Current population estimates for RGNF MIS avian species are based on the rigorous analysis of data collected for the MCB program from 1998-2007; the Monitoring the Birds of Southern Rockies/Colorado Plateau Bird Conservation Region (BCR 16) 2009 Annual Report; and the 2010 IMBCR Annual Report. These reports provide estimated densities (birds/km^2), estimated population sizes, and percent coefficient of variation (%CV) of estimates (a measurement of the amount of variation in a data set, the lower the %CV value the better the data set is. A %CV of less than 50 is considered robust; species with CVs of >50%, but <80% still provide solid data; those species will simply require more years of data to detect population trends).

Blakesley (2008) reported that the estimated density of Lincoln's sparrows in high-elevation riparian habitat varied more state-wide than within the San Juan Mountains and there was evidence of an increasing log-linear trend in population size between 1999 and 2007 in the San Juan Mountains. In the Monitoring the Birds of Southern Rockies/Colorado Plateau BCR16 2009 Annual Report (Blakesley et al. 2009) reported Lincoln's sparrow population parameters for 2008 of 15.7, 128,488, and43, respectively. In 2009 these values were reported at 14.1, 114,928, and 48, respectively. Colorado state-wide Lincoln's sparrow population parameters reported in the 2010 IMBCR Annual Report (White et al. 2011) were 2.71, 732,030, and 19, respectively. Population parameters specific to the RGNF in the 2010 IMBCR Annual Report were 2.15, 17,579, and 103, respectively. The high %CV associated with this data suggests that it likely is not of much value and should be used with extreme caution. Gillihan (2002) suggests that a reasonable baseline density estimate for Lincoln's sparrow on the RGNF is about 40 breeding territories per 40 hectare (1 territory per ha.) of suitable willow carr habitat. This equates to an average territory size of about two breeding pairs per acre and suggests that the RGNF may be capable of supporting a relative density of about 23,360 pairs of Lincoln's sparrows based on the current estimates of primary habitat at full occupancy. The assumption of full occupancy of all potential habitat probably over-estimates Forest level populations. However, this population estimate does not include aspen and willow carr habitats associated with alpine tundra on the RGNF, where this species also occurs at moderately high densities (Gillihan 2001, unpubl. internal RGNF data). If Lincoln's sparrow use of aspen and willow carr habitats were considered, Forest-wide distributions and populations would be even higher.

Lincoln's sparrow populations on the RGNF are expected to remain relatively unchanged during the first decade of Forest Plan implementation due to an increased management focus on riparian areas that will include the completion of Allotment Management Plans. These Allotment Management Plans will evaluate the relationship between upland areas, riparian areas, forage utilization, and livestock distribution and result in improvements to riparian willow habitat where needed. These improvements may also occur prior to completion of Allotment Management Plans by incorporating changes into the Annual Operating Instructions. Effects from travel management are also expected to lessen due to a reduction in open road densities on the RGNF. By the end of the fifth decade, a potential population response to these habitat improvements is expected that may result in slightly increased populations of Lincoln's sparrow (USFS 2003b).

The vast majority of potential Lincoln's sparrow habitat in the upper Rio Grande basin occurs on NFS land. The quality and quantity of potential habitat that occurs on private land may have been altered to a less suitable condition; however, those acreages and potential species effects are most likely minor because of the limited distribution of private lands within the relatively high elevations of this species' habitat. Much of the potential habitat on NFS land occurs in areas with protective land management designations or management prescriptions. The RGNF Forest Plan contains several goals, objectives, desired conditions, and standards and guidelines intended to maintain and promote healthy riparian zones and willow communities. Provisions of the Clean Water Act also restrict project-level impacts to these habitats. Conditions of these habitats on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local Lincoln's sparrow populations and provide source habitat on a larger scale. Current protection measures on the Forest will help ensure a high likelihood of population persistence into the future. These projections are based on planned activities only, and do not account for the resumption of unplanned natural disturbance factors, such as wildfire or climate change, or effects that may influence populations off the Forest.

8.4.3 PROJECT-LEVEL INFORMATION

Lincoln's sparrows have been detected in the stunted planeleaf willow (*Salix planifolia*) stands in the subalpine wetlands on NFS and private lands associated with the North and South Pass Creeks within the project site. Survey effort that detected this species is described above. For this analysis, all riparian willow communities in the project site ≥0.5 acre (this includes all willow stands) are considered occupied or potential Lincoln's sparrow habitat at an average territory size of two breeding pairs per acre. Based upon the 17.3 acres (20.4% of wetland habitat types) of scrub-shrub wetland habitat type present within the project site (see Table 8-2, above) and full occupancy of available habitat at an average territory size, the project site may currently be capable of supporting about nine pairs. Based upon qualitative field surveys, this estimate is considered higher than the density present.

8.4.4 PROJECT EFFECTS

Alternative 1 would have no direct or indirect effects on Lincoln's sparrows because no habitat modifications to montane and subalpine willow carrs representing occupied or potential habitat for this species would be authorized on NFS lands (Table 8-2). As such, Alternative 1 would affect no Lincoln's sparrow habitat or any portion of the RGNF population. Because the Lincoln's sparrow analysis area is limited to the project site (because of their small territory sizes), no reasonably foreseeable future actions (i.e. the WCSA MDP) are known within the analysis area that could add cumulative impacts. Cumulative effects to spruce-fir habitat within the analysis area are limited to historic logging which removed old-growth spruce-fir; the construction of Hwy 160 and its associated ROW and cut/fill; and FSR 391. These cumulative effects have all resulted in the removal of potential nesting and foraging habitat, the amount of loss is unknown.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal parcel and the private parcel. The exchange would result in the gain of 3.2 acres (Table 6-2) of potentially suitable Lincoln's sparrow nesting and foraging habitat. Assuming a territory size of two pairs per acre, this represents an increase of potentially six

breeding territories on NFS lands. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek did not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to Lincoln's sparrows from the land exchange itself.

The Alternatives 2 and 3 Hwy 160 access road construction would result in habitat modification to montane or subalpine willow carrs representing occupied or potential Lincoln's sparrow habitat within the project site. Though wetlands would be bridged there would still be the loss of scrub-shrub willow habitat in these areas because of shading and the access road has the potential to disrupt hydrologic connectivity that supports an adjacent occupied willow carr. As a result, project design criteria have been incorporated into Alternatives 2 and 3 to ensure that access road construction would not disrupt hydrologic connectivity that may support down-gradient willow stands that are inhabited by this species which would increase these indirect impact totals. Indirect effects to high elevation riparian habitat potentially used for nesting and foraging by Lincoln's sparrow for the Low, Moderate, and Maximum Density Development Concepts under Alternatives 2 and 3 total 0.47, 0.86, and 0.98 acres respectively for Alternative 2 and 0.90, 0.68, and 1.27 acres respectively for Alternative 3 (Table 6-3). Indirect effects to high elevation riparian on NFS lands for these development concepts are 0.31, 0.66, and 0.66 for Alternative 2 and 0.30, 0.30, and 0.65 for Alternative 3. Under Alternative 2 this represents a loss of, at the most based on one pair per 0.5 acres, of one breeding territory. Under Alternative 3 this represents a loss of, at the most based on one pair per 0.5 acres, one breeding territory (Table 6-3). The potential loss of one breeding territory, at the most for both Alternatives 2 and 3, is insignificant and discountable when compared to the RGNF Lincoln's sparrow population and the amount of potential habitat within the RGNF. The water tank farm sites for the Moderate Density Development Concepts for the two Action Alternatives would likely accommodate the water storage requirements for these concepts. The water storage requirement for the Maximum Density Development Concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence.

The effect of indirect effects associated with Alternatives 2 and 3 on private land has no bearing on NFMA directives and applicable Forest Plan objectives, standards, and guidelines, which are considered on NFS lands only.

Secondary impacts to Lincoln's sparrow habitat associated with the private development of the VWC under Alternatives 2 and 3 would likely have little affect on willows inhabited by Lincoln's sparrows on the non-Federal exchange parcel because such habitats, surrounding buffer zones, and surrounding wetlands on NFS lands (with hydrologic connections to the non-Federal exchange parcel) would likely be protected by provisions of the Clean Water Act and 404 permitting, including the potential disruption of groundwater flows that could adversely affect wetlands, including willows stands, on NFS lands down gradient from the non-Federal exchange parcel. Reduced habitat effectiveness resulting from adjacent human activities and dispersed recreation would likely be confined to the project site. Stray cats from the Village at Wolf Creek would

extend onto the Forest and would likely present a potential mortality source for this species. Effects to this species and its habitat on private land would have no bearing on NFMA directives, which are considered on NFS lands only. Cumulative effects of VWC development on Lincoln's sparrow habitat on contiguous NFS lands would be insignificant and discountable reductions to this species' Forest-wide population, habitat distribution, and trend.

There are no known reasonably foreseeable projects within the analysis area that would impact Lincoln's sparrow habitat on NFS lands.

8.4.5 PROJECT CONSISTENCY WITH KEY MONITORING QUESTIONS AND STRATEGIES

Project consistency with key monitoring questions and strategies for the Lincoln's sparrow is the same for other avian MIS and is addressed above under Wilson's warbler.

In summary, although the direct, indirect, and cumulative effects of Alternatives 2 and 3 could affect the primary habitat of Lincoln's sparrows, those effects would be insignificant and discountable Forest-wide. The RGNF would continue management of riparian willow systems providing for viable, well-distributed populations of Lincoln's sparrows and associated species across the Forest.

8.4.6 PROJECT CONSISTENCY WITH FOREST PLAN MIS OBJECTIVES

Project consistency with Forest Plan MIS Objectives for the Lincoln's sparrow is the same for Wilson's warbler and is addressed above in that section.

8.4.7 LINCOLN'S SPARROW SUMMARY

Indirect and cumulative Alternative 2 and 3 effects would be insignificant and discountable on this species' Forest-wide population, habitat distribution, and trend. Lincoln's sparrows and montane and subalpine willow carrs would remain relatively abundant and widely distributed across the Forest. Considering direct, indirect, and cumulative Alternative 2 and 3 effects, the quality and quantity of Lincoln's sparrow habitat would remain relatively unchanged and Lincoln's sparrow populations would remain relatively abundant and widely distributed across the Forest. Alternatives 2 and 3 would be consistent with NFMA direction and applicable Forest Plan Objectives, Standards, Guidelines, and the MIS monitoring question for maintaining viable populations of Lincoln's sparrow and other species associated with montane and subalpine willow carrs with the estimated numbers and distribution of reproductive individuals to insure their continued existence is well distributed across the RGNF. The USFS will continue monitoring Lincoln's sparrows and their habitats to establish and track populations and habitat trend across the Forest, consistent with the 2003 MIS Amendment to the Forest Plan (USFS 2003c).

8.5 BROWN CREEPER, *Certhia familiaris*

Brown creeper was selected as a MIS on the Forest due to the close relationship between its primary habitat type(s) and identified Forest management activities (USFS 2003b). Creepers are tied to complex structural forest elements, specifically large tree structure and standing and down

coarse woody debris (CWD). Its intent as a MIS is to represent the habitat components and biological community of mature and late successional spruce-fir and mixed-conifer habitats in relationship to Forest-wide Standards and Guidelines as applied to management activities within these habitat types and to answer the monitoring question as to whether spruce-fir/mixed-conifer systems are being managed in a manner that provides for viable, well-distributed populations of brown creepers and associated species across the Forest. Brown creeper was also evaluated for project effects because it is present in mature and late successional spruce-fir stands in the project site.

8.5.1 LIFE HISTORY AND BACKGROUND INFORMATION

Throughout its range, brown creepers are closely associated with old forest conditions (Hejl et. al. 1995, Hutto and Young 1998). In Colorado, creepers prefer old-growth spruce-fir and lodgepole pine forests (Versaw 1998, Wiggins 2005). Hutto and Young (1999) documented twice as much use of old-growth forest as mature forests. The preference for old-growth could be correlated with an abundance of snags, stand density, and higher humidity (Siegel 1989, Hejl et al. 2002).They require large-diameter green trees with older bark characteristics for foraging and a large number of dead branches (Hejl et al. 2002). The bark characteristics of older trees are a preferred foraging substrate, with creepers selecting for tree size rather than species (Franzreb 1985, Wiggins 2005). Rall (2006) reported that 84% of all observations were on large, living trees that showed evidence of beetle use and a lower canopy cover. In the summer brown creepers are 100% insectivorous with beetles comprising 63% of the diet; the winter diet may be composed of up to 6% vegetable matter (Williams and Batzli 1979). Snags are selected for foraging as readily as large green trees when available in larger size classes (Franzreb 1985, Mariani 1987). Morphological adaptations concerning the bill, tail, legs, and claws permit the brown creeper to specialize on arthropods and other food resources hidden in and beneath the bark. They are secondary cavity nesters and require a specific type of snag component in the early stages of decay for nesting. Large tree structure, CWD density, dense canopy closures, and other structural attributes of old forest condition appear to be closely related to abundance and distribution of the species (Mannan and Meslow 1984, Mariani 1987). Most studies show preference for unburned forests (Hutto and Young 1999, Kotliar et al. 2002); the benefits of burned forests are short-lived (seldom greater than five years) because wood-boring insect use decreases with time. Brown creepers are considered a forest interior species that stays far from edges and reaches maximum densities deep within forest patches (Wiggins 2005). Studies have documented that the mean distance to edge of disturbance was 252 m in Oregon (Nelson 1989) and the species was twice as common in areas greater than 400 m from the edge as near the edge in a California study (Brand and George, 2001). Wiggins (2005) reported that brown creepers are more sensitive to fragmentation than other old-growth specialists (e.g. American three-toed woodpecker). In a study in Wyoming, brown creepers were never documented breeders in fragmented 111 acre (45 ha) patches but breeding was documented in nearby 247 acre (100 ha) patches (Keller and Anderson 1992). Brown creepers are permanent residents in Colorado, although short migrations to lower elevations may occur during the winter. BBS data suggests that R2 populations are typically at lower densities compared to the rest of their range (NatureServe 2012e).

8.5.2 FOREST-LEVEL INFORMATION

Based on late successional conifer stand conditions and distributions that this species is associated with, suitable brown creeper habitat is well distributed across the RGNF and should support viable populations of this species (USFS 2002a,b). Existing (pre-West Fork Fire) potential habitat on the Forest totaled approximately 634,000 acres based on current estimates of late successional conifer stages. Total historic potential habitat for brown creepers may have averaged around 487,000 acres based on estimates of the historic average in their associated spruce-fir LTA (USFS 2002a,b). It is anticipated that the quality, quantity, and distribution of brown creeper habitat will decrease from current estimates, yet remain above the historic average of 487,000 acres during the life of the Forest Plan as a result of the activities planned within their associated cover types (USFS 2002a,b). Approximately 1.4% of the late successional spruce-fir and white-fir/Douglas-fir cover types may be affected by timber harvest activities during the first decade under the full budget level. When projected out for five decades (i.e., probably beyond the life of the current Forest Plan), approximately 18% of these cover types may be affected.

Current population estimates for the MIS avian species on the RGNF are based on the rigorous analysis of data collected for the MCB program from 1998-2007; the Monitoring the Birds of Southern Rockies/Colorado Plateau Bird Conservation Region (BCR 16) 2009 Annual Report; and the 2010 IMBCR Annual Report. These reports provide estimated densities (birds/km^2), estimated population sizes, and percent coefficient of variation (%CV) of estimates (a measurement of the amount of variation in a data set, the lower the %CV value the better the data set is. A %CV of less than 50 is considered robust; species with CVs of >50%, but <80% still provide solid data; those species will simply require more years of data to detect population trends).

The brown creeper IMBCR population estimate for the RGNF is 32,175 breeding pairs at a density of 3.94 pairs (White et al. 2010). However, because of a low sample size these estimates must be used with caution. The Colorado state-wide estimate, with a higher degree of certainty, was estimated at 334,694 pairs at a density of 1.24 pairs per square kilometer (White et al. 2010).

Local brown creeper populations are expected to remain relatively stable during the first decade of the Forest Plan, but decrease over time in response to changes in their preferred habitat (USFS 2002a,b). Based on Gillihan (2002), a Forest-wide decrease of approximately 1,900 to 3,800 pairs (up to <-0.03% loss) could occur by the end of the fifth decade under the experienced budget level if timber harvest areas result in unsuitable habitat. The resulting population would remain above the average relative density that may have occurred under the natural disturbance regime (USFS 2002a,b).

Cumulatively, management actions in spruce-fir and mixed-conifer habitats throughout the range of the brown creeper have affected the distribution and viability of the species. Habitats in the Southern Rocky Mountains Physiographic Area (SRMPA, Area 62) are estimated to be relatively secure (USFS 2002a,b). Blakesley (2008) reported no change in population estimates either state-wide in Colorado or within the San Juan Mountains from 1998–2007.

The vast majority of potential brown creeper habitat in the upper Rio Grande basin occurs on NFS land. The quality and quantity of potential habitat that occurs on private land may have been altered to a less suitable condition; however, those acreages and potential species effects are most likely minor because of the limited distribution of private lands within the relatively high elevations of this species' habitat. Much of the potential habitat on NFS land occurs in areas with

protective land management designations or management prescriptions. On the RGNF, for instance, approximately 244,395 acres of potential brown creeper habitat occurs in wilderness, backcountry, scenic area, or other protective areas where minimal habitat alteration is anticipated from planned management activities. Habitat conditions on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local brown creeper populations and provide source habitat on a larger scale. Current and proposed protection measures on the Forest will help ensure a high likelihood of population persistence into the future. These projections are based on planned activities only, and does not account for the resumption of unplanned natural disturbance factors, such as wildfire or disease, or effects that may influence populations off the Forest.

Based on GIS analysis, approximately 380,035 acres of HSS 4A-C habitat have been impacted between the spruce beetle epidemic (373,129 acres) and the West Fork Fire Complex (42,853 acres of HSS 4A-C was burned within the RGNF during the West Fork fire, however, approximately 35,947 acres of the burned area was within habitat already affected by the spruce beetle epidemic. Therefore, approximately 6,906 acres of HSS 4A-C were burned in areas not previously mapped as impacted by the spruce beetle epidemic.). The 380,035 acres of HSS 4A-C habitat affected as a result of the spruce beetle epidemic and the fire are not contiguous and they do not represent a large area devoid of habitat. However, because brown creepers are considered a forest interior species that avoids edges (Wiggins, 2005; Nelson, 1989; Brand and George, 2001) it is likely that the majority of the areas impacted by the spruce beetle epidemic and within moderately and highly burned areas, and areas of suitable habitat within up to 0.25 miles (Brand and George, 2001) of these impacted areas, is not suitable brown creeper breeding habitat. Assuming an average territory size of one pair per five acres (Gillihan 2002), the loss of 380,035 acres of HSS 4A-C habitat represents a potential loss of 76,007 territories. Prior to the spruce beetle epidemic and West Fork fire, the USFS (2002c,d) estimated that there were 634,000 acres (126,800 territories) of potential habitat within the RGNF. The potential loss of 76,007 territories (a worst-case scenario) is an approximate reduction of 59.9 percent. With the assumed complete alteration (extremely unlikely) of an estimated 380,035 acres of suitable brown creeper habitat into unsuitable habitat, the amount of suitable habitat present within the RGNF is less than the total historic potential habitat estimate of 487,000 acres (USFS 2002c,d).

8.5.3 PROJECT-LEVEL INFORMATION

Brown creepers have been detected on NFS and private lands associated with the project site. Survey effort that detected this species is described above. Suitable habitat is present and widespread on and around the project site. For this analysis, all Habitat Structural Stage (HSS) 4A–C (no HSS 5, old-growth, habitat exists within the project site) spruce-fir habitats in the project site are considered occupied or potential brown creeper habitat. Brown creepers have been detected during field surveys in all three of these structural stages on the project site, including NFS and private lands that would be affected by Alternatives 2 and 3, and they are assumed to be using these structural stages at an average territory size of about one pair per five acres (Gillihan 2002). Based upon the 371 acres (73.6% of the project site) of HSS 4A–C spruce-fir in the 504.3-acre project site (Table 8-2) and full occupancy of available habitat at an average territory size, the project site may currently be capable of supporting about 74 pairs. Based upon qualitative field surveys, this estimate is considered higher than the density present.

8.5.4 PROJECT EFFECTS

Alternative 1 would have no direct or indirect effects on brown creepers because no habitat modifications would be authorized on NFS lands. Because the brown creeper analysis area is limited to the project site (because of their small territory sizes), no reasonably foreseeable future actions (i.e. the WCSA MDP) are known within the analysis area that could add cumulative impacts. Cumulative effects to spruce-fir habitat within the analysis area are limited to historic logging which removed old-growth spruce-fir; the construction of Hwy 160 and its associated ROW and cut/fill; and FSR 391. These cumulative effects have all resulted in the removal of potential nesting and foraging habitat, the amount of loss is unknown.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the loss of 123.6 acres (Table 6-2) of potentially suitable brown creeper nesting and foraging habitat. This represents a loss of, based on the average territory size of one pair per five acres, approximately 25 breeding pairs, which is insignificant and discountable when compared to the estimated RGNF total population and the amount of suitable habitat that is available within the RGNF. The actual amount of brown creeper nesting and foraging habitat impacted likely would be much less than 123.6 acres since brown creepers prefer old-growth large diameter trees (which are not present within the project site in any great numbers) that have evidence of beetle use and a large number of dead branches. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to brown creepers from the land exchange itself.

Table 8-2 displays indirect losses of primary and secondary brown creeper (and other MIS) habitats resulting from Alternatives 2 and 3. Alternative 2 and 3 Low, Moderate and Maximum Development Concepts would result in the conversion of a total of 29.54, 61.95, and 134.94 acres, respectively, for Alternative 2 and 25.11, 38.82, and 69.22 acres, respectively, for Alternative 3 (Table 6-3). Impacts to NFS lands under the Alternative 2 and 3 development concepts are 23.94, 28.23, and 85.18 acres, respectively, for Alternative 2 and 1.93, 4.01, and 4.10, respectively, for Alternative 3 (Table 6-3). Based on the acres of HSS 4B&C spruce-fir in the areas that would be indirectly affected by Alternative 2 NFS lands (Table 6-2), and on the mean territory size of this species on the Forest (one pair per five acres), and on full occupancy of available habitat, Alternative 2 development concepts would affect from 5–17 brown creeper pairs. The potential loss of 5-17 pairs of brown creeper territories is insignificant and discountable when compared to the estimated RGNF total population and the amount of habitat available within the RGNF. The actual amount of brown creeper nesting and foraging habitat impacted likely would be less than the amount of habitat impacted under the Alternative 2 development concepts since brown creepers prefer old-growth large diameter trees (which are not present within the project site in any great numbers) that have evidence of beetle use and a large number of dead branches. The water tank farm sites for the moderate density development concepts for the two Action Alternatives would likely accommodate the water storage requirements for these concepts. The water storage requirement for the maximum density development concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for

Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence. Under Alternative 3 development concepts, at the most, one brown creeper pair would be affected. The addition of edge, fragmentation, and disturbance considerations would not change this finding. The effect of indirect effects associated with Alternatives 2 and 3 on private land has no bearing on NFMA directives and applicable Forest Plan objectives, standards, and guidelines, which are considered on NFS lands only.

Cumulative effects within the project site would not add to the amount of brown creeper habitat loss as the historic loss of habitat associated with logging, Hwy 160 and its ROW and cut/fill areas, WCSA ski runs and lifts, FSR 391 and thinning of beetle killed trees is not known and no reasonably foreseeable projects are expected to occur within the project site. Loss of occupied habitat and the displacement of resident birds on the project site would result in locally increased territory competition and a reconfiguration of existing territories on surrounding NFS lands. This territorial flux would extend over the habitat conversion period of the VWC development. It is unlikely that activities extending from the project site onto the Forest would directly affect any nest site or result in habitat modifications that would affect the prey base for this species. The creation of defensible space from wildfires around residences should not extend onto the Forest. Stray cats would extend onto the Forest and would likely present a potential mortality source for this species. However, no habitat conversion would occur on the contiguous NFS lands under Alternatives 2 and 3, and because of multiple variables involved, the extent of reduced habitat effectiveness is unclear, probably ranging from zero to several affected territories, possibly with no net loss of territories on the Forest. Cumulative effects associated with Alternatives 2 and 3 on brown creeper habitat on contiguous NFS lands would result in insignificant and discountable reductions to this species' Forest-wide population, habitat distribution, and trend.

The amount of suitable breeding habitat impacted as a result of the combination of the spruce beetle epidemic and the West Fork fire when examined in association with the potential amount of habitat directly and indirectly impacted as part of the Proposed Action is large. However, the amount of habitat impacted under the Proposed Action, enough to support a maximum of 25 pairs (less than 0.01 percent of the habitat impacted by the spruce beetle epidemic and fire), is minor and would not impact the local or Forest-wide population in any significant manner. Populations and habitat for the brown creeper are therefore expected to remain well-distributed and sustainable within suitable habitat throughout the administrative boundaries of the Rio Grande National Forest.

8.5.5 PROJECT CONSISTENCY WITH KEY MONITORING QUESTIONS AND STRATEGIES

Project consistency with key monitoring questions and strategies for the brown creeper is the same for other avian MIS and is addressed above under Wilson's warbler.

In summary, although the direct, indirect, and cumulative effects of Alternatives 2 and 3 would affect the primary habitat of brown creepers, those effects would be insignificant and discountable

Forest-wide. The RGNF would continue management of spruce-fir/mixed-conifer systems providing for viable, well-distributed populations of brown creepers and associated species across the Forest.

8.5.6 PROJECT CONSISTENCY WITH FOREST PLAN MIS OBJECTIVES

Desired Forest-wide conditions are to maintain viable populations of existing native and desired non-native vertebrate species. Forest-wide objectives provide for sustainability of viable populations and management of wildlife habitat at appropriate scales so as to protect, conserve, and restore terrestrial and aquatic habitats.

Much of the potential habitat on NFS lands on the RGNF occurs in areas with protective land management designations. Approximately 244,395 acres of potential brown creeper (and hermit thrush) habitat occurs in wilderness, backcountry, scenic area, or other protective areas where minimal habitat alteration is anticipated from planned management activities. Forest Plan standards and guidelines and management area prescriptions are intended to provide a framework for management activities to maintain biodiversity, wildlife and riparian resources.

Timber management and fuel treatment are the major management activities occurring on the Forest that could potentially affect the habitat and populations of the brown creeper (and hermit thrush). Over 90% of the timber management activities are projected to occur in LTAs 1 and 13 (spruce/fir) while 1,000 to 3,000 acres of fuel treatment per year could occur in LTA 3 (white fir/Douglas-fir). There is little, if any, spatial overlap projected to occur between these activities. The Forest Plan projects approximately 6% of the available habitat and estimated populations will be potentially affected by management activities at the end of the fifth decade. This is due to a current amount of late-successional forest habitat in relation to the amount suspected to have occurred under the estimated historic range of variability. Other factors that limit the effects of timber management activities include the spatial and temporal distribution of the harvest activities and the Forest Plan standards and guidelines designed to conserve wildlife habitat and species viability.

Given these estimates, timber management activities on the Forest are projected to have a relatively minor effect on the overall viability of brown creeper (and hermit thrush) due to the minimal amount of habitat affected and the low contribution of the physiographic area to the global population.

Habitat conditions on the Forest are expected to help maintain local brown creeper (and hermit thrush) populations and perhaps provide source habitat on a larger scale. Current Forest Plan guidance will help ensure a high likelihood of population persistence into the future.

Two factors beyond the control of the Forest Plan, climate change and the current spruce beetle epidemic, could cause a significant decrease is suitable brown creeper (and hermit thrush) habitat across the Forest. These factors would have a much greater impact on brown creepers (and hermit thrush) populations than the insignificant and discountable effects on mixed conifer/spruce-fir habitats associated with Alternatives 2 and 3.

8.5.7 BROWN CREEPER SUMMARY

Indirect and cumulative Alternative 2 and 3 effects would be insignificant and discountable on this species' Forest-wide population, habitat distribution, and trend. Brown creepers would remain relatively abundant and widely distributed across the Forest. Considering direct, indirect, and cumulative Alternative 2 and 3 effects, the quality and quantity of creeper habitat would remain above historic averages and creeper populations would remain above the average relative density that may have occurred under the natural disturbance regime prior to the spruce beetle epidemic and the West Fork Fire. The amount of brown creeper habitat lost under Alternatives 2 and 3 is small (less than 0.01%) in comparison to the amount of habitat altered by the combination of the spruce beetle epidemic and the West Fork fire and would be consistent with NFMA direction and applicable Forest Plan Objectives, Standards, Guidelines, and the MIS monitoring question for maintaining viable populations of brown creepers and other species associated with mature and late successional conifer habitats with the estimated numbers and distribution of reproductive individuals to insure their continued existence is well distributed across the RGNF. The USFS will continue monitoring brown creepers and their habitats to establish and track populations and habitat trends across the Forest, consistent with the 2003 MIS Amendment to the Forest Plan (USFS 2003b).

8.6 HERMIT THRUSH, *Catharus guttatus*

Hermit thrush was selected as a MIS on the Forest due to the close relationship between its primary habitat type(s) and identified Forest management activities (USFS 2003b). This species is primarily associated with spruce/fir and is commonly associated with, but not restricted to, older forest structure. It is tied to complex structural forest elements, including mature to late successional conifer forest floor characteristics (CWD). Its intent as a MIS is to represent the habitat components and biological community of mature to late successional spruce-fir and mixed-conifer habitats in relationship to Forest-wide Standards and Guidelines as applied to management activities within these habitat types and to answer the monitoring question as to whether spruce-fir/mixed-conifer systems are being managed in a manner that provides for viable, well-distributed populations of hermit thrushes and associated species across the Forest. Hermit thrush was also evaluated for project effects because it is present in mature and late successional spruce-fir stands in the project site.

8.6.1 LIFE HISTORY AND BACKGROUND INFORMATION

The hermit thrush is primarily associated with mature, dense spruce-fir stands and/or mixed-conifer forest throughout its range in Colorado (Andrews and Righter 1992, Yeager 1998). Other habitats used to various degrees include ponderosa pine, quaking aspen, pinyon-juniper and deciduous shrublands. Dense canopy closures, downed woody material, and other structural attributes of mature forest conditions appear to be closely related to the abundance and distribution of the species. In Colorado, they primarily nest in bushes, small trees and conifers within 3 to 10 feet of the ground (Yaeger 1998) and actively search ground litter, bark and foliage for insects (Holmes and Robinson 1988). They are considered sensitive to management activities that promote open canopy conditions and alter thermal properties near the forest floor.

8.6.2 FOREST-LEVEL INFORMATION

Based on late successional conifer stand conditions and distributions that this species is associated with, suitable hermit thrush habitat is well distributed across the RGNF and should support viable populations of this species (USFS 2002c,d). The total historic potential habitat for the hermit thrush on the Forest may have averaged around 487,000 acres based on estimates of the historic average in their associated land type associations. Existing (pre-West Fork Fire) potential habitat on the Forest totals approximately 634,000 acres based on current estimates of late successional conifer stages (USFS 2002c,d). It is anticipated that the quality, quantity, and distribution of hermit thrush habitat will decrease from current estimates, yet remain above the historic average of 487,000 acres during the life of the Forest Plan as a result of the activities planned within their associated cover types (USFS 2002c,d). However, climate change and the current spruce beetle epidemic could alter these estimates. Approximately 1.4% of the late successional spruce-fir and white-fir/Douglas-fir cover types may be affected by timber harvest activities during the first decade under the full budget level.

Current population estimates for RGNF MIS avian species are based on the rigorous analysis of data collected for the MCB program from 1998-2007; the Monitoring the Birds of Southern Rockies/Colorado Plateau Bird Conservation Region (BCR 16) 2009 Annual Report; and the 2010 IMBCR Annual Report. These reports provide estimated densities (birds/km^2), estimated population sizes, and percent coefficient of variation (%CV) of estimates (a measurement of the amount of variation in a data set, the lower the %CV value the better the data set is. A %CV of less than 50 is considered robust; species with CVs of >50%, but <80% still provide solid data; those species will simply require more years of data to detect population trends).

Blakesley (2008) reported that hermit thrush did not show a decrease in estimated population sizes from MCB data collected state-wide from 1998–2007; however, data specific to the San Juan Mountains over this period showed a log-linear decrease in populations of hermit thrushes in spruce-fir habitat. Blakesley did not attempt to provide an explanation for this decrease. In the Monitoring the Birds of Southern Rockies/Colorado Plateau BCR16 2009 Annual Report (Blakesley et al. 2009) the reported hermit thrush population parameters for the RGNF for 2008 were 5.5, 45,070, and 25, respectively. In 2009 these values were reported at 8.0, 65,569, and 25, respectively. Colorado state-wide hermit thrush population parameters reported in the 2010 IMBCR Annual Report (White et al. 2011) were 5.49, 1,481,251, and 13, respectively. Population parameters specific to the RGNF in the 2010 IMBCR Annual Report were 18.37, 150,116, and 24, respectively. The density and population estimates for the RGNF for the period of 2008–2010 are trending upward based on data with low %CV values. This suggests that current environmental conditions within the RGNF are favorable to hermit thrush.

Local hermit thrush populations are expected to remain relatively stable during the first decade of the Forest Plan, but decrease over time in response to changes in their preferred habitat (USFS 2002c,d). Based on Gillihan (2002), a Forest-wide decrease of approximately 3,800 pairs (up to <0.03% loss) could occur by the end of the fifth decade under the experienced budget level if timber harvest areas result in unsuitable habitat. The resulting population would remain above the average relative density that may have occurred under the natural disturbance regime (USFS 2002c,d).

The vast majority of potential hermit thrush habitat in the upper Rio Grande basin occurs on NFS land. The quality and quantity of potential habitat that occurs on private land may have been altered to a less suitable condition; however, those acreages and potential species effects are most likely minor because of the limited distribution of private lands within the relatively high elevations of this species' habitat. Much of the potential habitat on NFS land occurs in areas with protective land management designations or management prescriptions. On the RGNF, for instance, approximately 244,395 acres of potential hermit thrush habitat occurs in wilderness, backcountry, scenic area, or other protective areas where minimal habitat alteration is anticipated from planned management activities. Habitat conditions on the Forest are, therefore, reasonably assured to be protected and are expected to help maintain local hermit thrush populations and provide source habitat on a larger scale. Current and proposed protection measures on the Forest will help ensure a high likelihood of population persistence into the future. These projections are based on planned activities only, and do not account for the resumption of unplanned natural disturbance factors, such as wildfire and the current spruce beetle epidemic, or effects that may influence populations off the Forest.

Based on GIS analysis, approximately 380,035 acres of HSS 4A-C habitat have been impacted between the spruce beetle epidemic (373,129 acres) and the West Fork Fire Complex (42,853 acres of HSS 4A-C was burned within the RGNF during the West Fork fire, however, approximately 35,947 acres of the burned area was within habitat already affected by the spruce beetle epidemic. Therefore, approximately 6,906 acres of HSS 4A-C were burned in areas not previously mapped as impacted by the spruce beetle epidemic.). The 380,035 acres of HSS 4A-C habitat lost as a result of the spruce beetle epidemic and the fire are not contiguous and they do not represent a large area devoid of habitat. Assuming an average territory size of one pair per 10 acres (Gillihan 2002), the potential loss of 380,035 acres of HSS 4A-C habitat represents a worst-case potential loss of 3,004 territories. Prior to the spruce beetle epidemic and West Fork fire, the USFS (2002c,d) estimated that there were 634,000 acres (63,400 territories) of potential habitat within the RGNF. The potential loss of 63,400 territories (a worst-case scenario) is an approximate reduction of 59.9 percent. With the assumed complete alternation (extremely unlikely) of an estimated 380,035 acres of suitable hermit thrush habitat into unsuitable habitat, the amount of suitable habitat present within the RGNF is less than the total historic potential habitat estimate of 487,000 acres (USFS 2002c,d).

8.6.3 PROJECT-LEVEL INFORMATION

Hermit thrushes have been detected on NFS and private lands associated with the project site. Survey effort that detected this species is described above. Suitable habitat is present and widespread on and around the project site. For this analysis, all HSS 4A–C spruce-fir habitats in the project site are considered occupied or potential hermit thrush habitat. Hermit thrushes have been detected during field surveys in all three of these structural stages on the project site, including NFS and private lands that would be affected by Alternatives 2 and 3, and they are assumed to be using these structural stages at an average territory size of about one pair per 10 acres (Gillihan 2002). Based upon the 371 acres (73.6% of the project site) of HSS 4A–C spruce-fir in the 504.3-acre project site (Table 8-2) and full occupancy of available habitat at an average territory size, the project site may currently be capable of supporting about 37 pairs. Based upon qualitative field surveys, this estimate is considered higher than the density present.

8.6.4 PROJECT EFFECTS

Alternative 1 would have no direct or indirect effects on hermit thrushes because no habitat modifications would be authorized on NFS lands (Table 8-2). Because the hermit thrush analysis area is limited to the project site (because of their small territory sizes), no reasonably foreseeable future actions (i.e. the WCSA MDP) are known within the analysis area that could add cumulative impacts. Cumulative effects to spruce-fir habitat within the analysis area are limited to historic logging which removed old-growth spruce-fir; the construction of Hwy 160 and its associated ROW and cut/fill; and FSR 391. These cumulative effects have all resulted in the removal of potential nesting and foraging habitat, the amount of loss is unknown.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal parcel and the private parcel. The exchange would result in the loss of 123.6 acres (Table 6-2) of potentially suitable hermit thrush nesting and foraging habitat. This represents a loss, based on the average territory size of one pair per 10 acres, of approximately 12 breeding pairs, which is insignificant and discountable when compared to the estimated RGNF total population and the amount of suitable habitat that is available within the RGNF. The actual amount of hermit thrush potential nesting and foraging habitat would be less than this figure since they primarily nest in bushes and small trees within 3 to 10 feet of the ground in forests with a dense canopy closure and an abundance of downed woody material. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to hermit thrushes from the land exchange itself.

Alternative 2 and 3 Low, Moderate and Maximum Density Development Concepts would result in the conversion of a total of 29.54, 61.95, and 134.94 acres, respectively, for Alternative 2 and 25.11, 38.82, and 69.22 acres, respectively, for Alternative 3 (Table 6-3). Impacts to NFS lands under the Alternative 2 and 3 development concepts are 23.94, 28.23, and 85.18 acres, respectively, for Alternative 2 and 1.93, 4.01, and 4.10, respectively, for Alternative 3 (Table 6-3). Based on the acres of HSS 4A-C spruce-fir in the areas that would be indirectly affected by Alternative 2 NFS lands (Table 6-3), and on the mean territory size of this species, and on full occupancy of available habitat, Alternative 2 development concepts would affect from 2–9 hermit thrush pairs. Under Alternative 3 development concepts at the most one hermit thrush pair would be affected. The loss of, at most, 2-9 territories is insignificant and discountable when compared to the estimated RGNF total population and the amount of suitable habitat that is available within the RGNF. The actual amount of hermit thrush potential nesting and foraging habitat would be less than this figure since they primarily nest in bushes and small trees within 3 to 10 feet of the ground in forests with a dense canopy closure and an abundance of downed woody material. The addition of edge, fragmentation, and disturbance considerations would not change this finding. The water tank farm sites for the Moderate Density Development Concepts for the two Action Alternatives would likely accommodate the water storage requirements for these concepts. The water storage requirement for the Maximum Density Development Concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This

potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence.

The effect of indirect effects associated with Alternatives 2 and 3 on private land has no bearing on NFMA directives and applicable Forest Plan objectives, standards, and guidelines, which are considered on NFS lands only.

Cumulative effects within the project site would not add to the amount of hermit thrush habitat loss as the historic loss of habitat associated with logging, Hwy 160 and its ROW and cut/fill areas, WCSA ski runs and lifts, FSR 391 and thinning of beetle killed trees is not known and no reasonably foreseeable projects are expected to occur within the project site. Loss of occupied habitat and the displacement of resident birds on the project site would result in locally increased territory competition and a reconfiguration of existing territories on surrounding NFS lands. This territorial flux would extend over the habitat conversion period of the VWC development. It is unlikely that activities extending from the project site onto the Forest would directly affect any nest site or result in habitat modifications that would affect the prey base for this species. The creation of defensible space from wildfires around residences should not extend onto the Forest. Stray cats would extend onto the Forest and would likely present a potential mortality source for this species. However, no habitat conversion would occur on the contiguous NFS lands under Alternatives 2 and 3 and because of multiple variables involved, the extent of reduced habitat effectiveness is unclear, probably ranging from zero to several affected territories, possibly with no net loss of territories on the Forest. Cumulative effects associated with Alternatives 2 and 3 on hermit thrush habitat on contiguous NFS lands would result in insignificant and discountable reductions to this species' Forest-wide population, habitat distribution, and trend.

The amount of suitable breeding habitat impacted as a result of the combination of the spruce beetle epidemic and the West Fork fire when examined in association with the potential amount of habitat directly and indirectly impacted as part of the Proposed Action is large. However, the amount of habitat impacted under the Proposed Action, enough to support a maximum of 12 pairs (less than 0.01 percent of the habitat impacted by the spruce beetle epidemic and fire), is minor and would not impact the local or Forest-wide population in any significant manner. . Populations and habitat for the hermit thrush are therefore expected to remain well-distributed and sustainable within suitable habitat throughout the administrative boundaries of the Rio Grande National Forest.

8.6.5 PROJECT CONSISTENCY WITH KEY MONITORING QUESTIONS AND STRATEGIES

Project consistency with key monitoring questions and strategies for the hermit thrush is the same for other avian MIS and is addressed above under brown creeper.

In summary, although the direct, indirect, and cumulative effects of Alternatives 2 and 3 would affect the primary habitat of hermit thrushes, those effects would be insignificant and discountable Forest-wide. The RGNF would continue management of spruce-fir/mixed-conifer systems providing for viable, well-distributed populations of hermit thrush and associated species across the Forest.

8.6.6 PROJECT CONSISTENCY WITH FOREST PLAN MIS OBJECTIVES

Project consistency with Forest Plan MIS objectives for the hermit thrush is the same for brown creeper and is addressed above in that section.

8.6.7 HERMIT THRUSH SUMMARY

Indirect and cumulative Alternative 2 and 3 effects would be insignificant and discountable on this species' Forest-wide population, habitat distribution, and trend. Hermit thrushes would remain relatively abundant and widely distributed across the Forest. Considering direct, indirect, and cumulative Alternative 2 and 3 effects, the quality and quantity of hermit thrush habitat would remain above historic averages and hermit thrush populations would remain above the average relative density that may have occurred under the natural disturbance regime prior to the spruce beetle epidemic and the West Fork Fire. The amount of hermit thrush habitat lost under Alternatives 2 and 3 is small (less than 0.01%) in comparison to the amount of habitat altered by the combination of the spruce beetle epidemic and the West Fork fire and would be consistent with NFMA direction and applicable Forest Plan Objectives, Standards, Guidelines, and the MIS monitoring question for maintaining viable populations of hermit thrushes and other species associated with mature and late successional conifer habitats with the estimated numbers and distribution of reproductive individuals to insure their continued existence is well distributed across the RGNF. The USFS will continue monitoring hermit thrushes and their habitats to establish and track populations and habitat trends across the Forest, consistent with the 2003 MIS Amendment to the Forest Plan (USFS 2003b).

8.7 RIO GRAND CUTTHROAT TROUT, *Oncorhynchus clarki virginalis*

RGCT is being used as a MIS to evaluate effects of the Proposed Action on local aquatic ecosystems. However, RGCT is also a R2 sensitive species and it is addressed above in that section.

8.8 BROOK TROUT, *Salvelinus fontinalis*

Brook trout were selected as a management indicator of the health of montane aquatic ecosystems and to answer the monitoring question as to whether the Forest is being managed in a manner that provides for viable, well-distributed populations of aquatic species across the Forest (USFS 2003b). They are a recreationally important local species and are a fall spawner found mostly in high elevation stream reaches. Brook trout are sensitive to management activities that increase sediment, reduce stream cover, create barriers to movement, or impact stream flows or water quality. Brook trout were also evaluated for project effects because they are present in the project site and may be affected by the Proposed Action. Most information below is after USFS 2003a.

The timing of flow, water quality, and availability of various habitat features such as deep pools, cover, and spawning gravels influence trout abundance. Geology, elevation, temperature, gradient, and substrate distribution are other factors that commonly influence trout abundance. As habitats are degraded, either by chemical pollutants, increased sediment, or unfavorable changes in flow (especially severe reductions), trout typically respond with lower abundance and poor year class distribution.

8.8.1 LIFE HISTORY AND BACKGROUND INFORMATION

Brook trout are native to eastern Canada and northeastern United States and have been extensively transplanted over most of the United States, Canada, and around the World (Sublette et al. 1990). They have adapted well to the western United States and occur in many high elevation lakes and streams (Lusch 1988). They were introduced into Colorado during the late 1800s and are now well established in high elevation streams and lakes above 6,000 feet (Woodling 1980).

Brook trout life history can vary considerably to match the environmental conditions of particular streams at different latitudes and elevations (Raleigh 1982, Kennedy et al. 2001, Power 1980, Reimers 1979, Peterson and Fausch 2001). Raleigh (1982) separated brook trout life histories into two basic ecological forms: a relatively short-lived (3-4 years), small (200-250 mm) form, typical of small, cold lakes and streams and a larger (4-6 kg), long-lived (8-10 years) predaceous form associated with larger lakes and rivers. These two life history forms are also seen in populations at different stream elevations.

In mid-elevation streams, with typically warmer water temperatures, brook trout tend to grow faster, mature earlier, and have shorter life spans when compared to those in high-elevation streams (Kennedy et al. 2001, Peterson and Fausch 2001). Early maturation and fast growth maximizes fitness and may lead to rapid establishment and high population growth rates in mid-elevation streams. In high-elevation streams slow growth, later maturity, and a long reproductive life span may allow brook trout to successfully establish populations in marginal habitats where recruitment is often poor (Kennedy et al. 2001). Kennedy et al. (2001) found the average life span in brook trout from high-elevation streams to be two to three times longer than from mid-elevation streams. They found many trout to be ages 8 to 10 and (up to 14) in high-elevation streams and only age 2 to 3 (up to 5) in mid-elevation streams.

Brook trout spawn in the fall when day length and temperature are decreasing. Spawning occurs at temperatures ranging from 4.5-10°C. Depending upon the water temperature, spawning may begin from mid-September to late December or early January (White 1930; Hazzard 1932, McAfee 1966). Brook trout are very prolific and may attain sexual maturity at an early age. Typically, female brook trout reach sexual maturity during their second year whereas male brook trout attain sexual maturity during their first year (McAfee 1966, Becker 1983), although mature males have been reported as early as age 0+ (Buss and McCreary 1960, Hunt 1969) and as small as 8.9 cm long (McFadden 1961).

Brook trout require areas of current, such as stream riffles, areas of ground water upwellings, or wave swept shorelines for spawning (Raleigh 1982). Preferred spawning substrate ranges from buckshot size to golf ball size gravel in streams (Lusch 1988) to sandy or silty-sand bottoms in lakes (Meehan and Bjornn 1991). Areas of ground water upwellings appear to be highly preferred spawning sites (Webster and Eiriksdottier 1976, Carline and Brynildson 1977) and tend to override substrate size as a site selection factor (Mullen 1958, McAfee 1966).

Spawning occurs in shallows where the females dig out typical salmonid redds by displacing gravel and small rocks with sweeping movements of her tail (Smith 1947). After the redd is completed, the female will drop into the depression with the male alongside. Eggs and milt are

released simultaneously with several nests completed in the same fashion. The eggs are covered with gravel after they are laid and are protected by the male (Lusch 1988). Spawning success is reduced as the amount of fine sediments is increased and the intergravel oxygen concentration is reduced (McFadden 1961, Peters 1965, Harshbarger 1975).

Brook trout are opportunistic sight feeders and feed on invertebrates, terrestrial and aquatic insects, and planktonic crustaceans (Raleigh 1982). Fish are an important food item in lake populations (Webster 1975). Sight feeding habits make them susceptible to moderate turbidity levels, which can reduce their ability to locate food (Bachman 1958, Herbert and Merkens 1961). The optimum temperature for feeding is about 19°C and occurs primarily in the early morning and evening hours (Becker 1983).

Brook trout movement in streams is minimal, with most migrations limited to short spawning runs into headwater streams (Brasch et al 1958) or relatively short seasonal migrations to avoid temperature extremes (Powers 1929, Scott and Crossman 1973). Power (1980) reported two and three year old brook trout migrating from streams to lakes when they reached lengths of 80-150 mm. Peterson and Fausch (2001) found that brook trout movement was most common during early summer and coincided with the descending hydrograph limb and also identified increased activity in the fall, which likely represented spawning-related movements. Their study showed that the proportion of brook trout moving upstream was significantly greater than the proportion moving downstream. Hunt (1966) observed upstream and downstream movement following fry emergence from the redd.

Raleigh (1982) reported brook trout in their native range being sensitive to introduced brown and rainbow trout and actually being displaced by the them. Webster (1975) reported brook trout displacing native cutthroat trout in the headwaters and tributaries of western streams. Brook trout can naturally hybridize with brown trout (*Salmo trutta*) and such hybrids are called “tiger trout (Sublette et al. 1990). Brook trout can also be artificially hybridized with rainbow trout (Buss and Wright 1957).

Five habitat factors affect the distribution and abundance of stream fish: streamflow, water quality, energy source, physical habitat structure, and biotic interactions (Karr et al. 1986). Orth and White (1993) recommends managing these habitat factors with the riparian zone and adjacent uplands as a single riparian-stream ecosystem. Brook trout require four specific types of habitat during the various stages of their life history: spawning habitat, rearing habitat, adult habitat, and over-wintering habitat. Deficiencies in any one of the four habitat types can limit populations (Behnke 1992).

Brook trout are the most generalized and adaptable of all *Salvelinus* species. They are typically found in cold, clear high elevation streams and lakes that maintain very cool year-round temperatures with an absolute upper limit of 24°C or less (Raleigh 1982). This trout fares poorly in waters that rarely drop below 18°C, or do not offer below 18°C temperatures via springs or tributaries. Warm water temperatures appear to be the most important factor limiting brook trout distribution and production (McCormick et al. 1972; Creaser 1930; Mullen 1958). Spring fed headwater streams and high mountain lakes provide the conditions necessary for this species survival and propagation in the West (Lusch 1988). The normal range of water temperature found in brook trout habitat is 0-20°C with preferred water temperatures ranging from 10-12°C (Meehan

and Bjornn 1991). Power (1980) reported the upper lethal temperature for yearling brook trout to be 25.3°C.

Optimal stream habitat consists of silt-free cobble substrate, an approximate 1:1 pool-riffle ratio with areas of slow, deep water; well vegetated stream banks; and relatively stable water flow, temperature regimes, and stream banks. Optimal lacustrine habitat is characterized by clear, cold, lakes that are typically oligotrophic (Raleigh 1982). Raleigh (1982) reported a definite relationship between annual stream flow regime and the quality of trout habitat, with the most critical period being during base flow which is usually during late summer or winter. A base flow ≥ 55% of the average annual daily flow is considered excellent for maintaining quality brook trout habitat, a base flow of 25 to 50% is considered fair, and a base flow less than 25% is considered poor (Wesche 1974, 1980, Binns and Eiserman 1979).

Where spawning gravels are extensive enough, trout typically produce more young than the habitat can absorb. Brook trout typically produce 1,800 to 2,200 eggs per kilogram of female body weight. Egg development is similar to that of other salmonids. Development depends on water temperature and ranges from 47 days in 10°C water to 165 days in 3°C water. About 80 percent of the eggs normally hatch. After absorbing the yolk sac, the fry are about 2 centimeters long. At that point, they emerge from the gravel to start feeding on plankton and other minute food items. During this stage, they quickly disperse from the redd site and seek out water only a few inches deep (Stolz and Schnell 1991).

The survival of brook trout varies greatly with environmental factors, including competition from other species and water temperature. Various studies have shown that only one to two percent of fry normally survive to become nine-month-old fingerlings (Stolz and Schnell 1991). Stable populations can be maintained if only two progeny from each pair of spawning parents survive to reproduce. This leaves a tremendous surplus of young fish expendable to natural mortality. Before any effort is made to improve spawning habitat, an assessment should be made to be sure that spawning success truly is limiting populations (Behnke 1992).

Resting habitat requirements for adults and juveniles are similar. Both life stages require areas of low water velocity such as typically found behind large rocks or woody debris and deep pools. These areas provide both feeding and resting cover (Bison-M 2001b). Brook trout can be found in the smallest of spring-fed streams, especially where cover is available. In streams, they prefer substrates of gravel or cobble up to 25 centimeters in diameter and prefer water about 41 centimeters deep (Stolz and Schnell 1991).

Overwintering habitat is crucial for long-term trout survival in stream environments. Winter survival is related to the amount of low velocity, deep water habitats with adequate amounts of protective cover. Deep pools with large boulders and woody vegetation (e.g., root wads) or areas with deep beaver ponds are ideal overwintering habitat (Bjornn 1971; Bustard and Narver 1975).

Stream habitat essential for trout survival is strongly influenced by the riparian area. The riparian area serves as a transition zone between terrestrial and aquatic environments and helps shape stream channel morphology (Wesche 1993). This area includes portions of the terrestrial ecosystem that significantly influence exchanges of energy and matter with aquatic ecosystems

(i.e. water influence zone) and are adjacent to perennial, intermittent, and ephemeral streams, lakes, and reservoirs (National Research Council 2002).

Streamside vegetation plays an important role in stream channel morphology and establishment of quality aquatic habitat (Wesche 1993). Riparian plants stabilize streambanks, produce leaf litter energy inputs, filter sediments and nutrients, and provide shade and cover in the form of large and small woody debris (Orth and White 1993). Streamside plants have dense root biomasses that help stabilize erosive streambanks, while the above-ground portion of the plant increases floodplain roughness which slows overbank flows and encourages infiltration to promote recharge of the alluvial aquifer. Slowing of the overbank flows allows sediment to be deposited to help build streambanks and filters fine sediments which impact spawning areas and macroinvertebrates.

Riparian vegetation also helps control nonpoint-source pollution by filtering out sediments delivered from upland slopes by overland flow. Burroughs and King (1985, 1989) concluded that non-channelized sediment flow rarely travels more than 300 feet and that 200-300 foot riparian "filter strips" are generally effective at protecting streams from sediment from non-channelized flow. Raleigh (1982) recommended a “buffer strip” about 30 meters wide, 80% of which should be either well vegetated or have stable rocky stream banks, to provide erosion control and to help maintain undercut stream banks. Buffer (filter) strips reduce the amount of fines entering a stream and reduce the impacts on spawning areas, pool depths, food production (invertebrate fauna), and cover for juvenile fish (Raleigh et al. 1986).

Riparian vegetation provides shade that helps maintain cooler water temperatures in the summer, warmer temperatures in the winter and contributes large woody debris, which is an important structural and functional component of stream ecosystems (Richmond and Fausch 1995). Large woody debris provide cover and food for a variety of fish, insects, and wildlife; helps stabilize stream channels by absorbing the force of high flows, effectively reducing bank erosion; traps sediment and organic matter which helps create bars and islands; and redirects flow that scours streambeds and in turn creates pool habitat (O’Neal et al. 2000). Sedell et al. (1985) found that raising the amount of large woody debris in streams could increase salmonid production.

Whatever the size of the stream, riparian areas are critical for maintaining the ecological health of the stream (Bolton and Shellberg 2001). The water quantity and quality in streams reflects the conditions in the watershed including the riparian and upland areas (Naiman et al. 1992). Maintaining healthy, productive and diverse riparian areas is important for flood control, channel morphology, clean water, fish/wildlife/livestock habitat, and recreational opportunities (Bolton and Shellberg 2001).

The Natural Heritage Ranking for brook trout is G5 (demonstrably secure globally). Brook trout are considered a game species in Colorado, so populations are subject to state game fish regulations and management. The CPW is responsible for regulating and managing brook trout as a sport fish and is responsible for setting fishing regulations, bag and possession limits. Many angling opportunities for brook trout in Colorado occur on lands administered by the U. S. Forest Service. The Forest Service is responsible for managing trout habitat within Forest boundaries and works closely with CPW to monitor trout populations and maintain or improve fish habitat.

The Colorado Department of Public Health and Environment, Water Quality Control Commission (No. 31), establishes state water quality classifications and numeric standards for specific water quality parameters pertaining to aquatic life (Water Quality Control Commission [WQCC] Regulation 2001). Regulation No. 36 (WQCC 2002) establishes classifications and standards specific to the Rio Grande basin. Most streams on the Forest are classified as Cold Water Aquatic Life Class 1. Class 1 waters are capable of sustaining a wide variety of cold water biota, including sensitive species. Waters are considered capable when the physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species. Class 2 waters are not capable of sustaining a wide variety of biota due to physical habitat, inadequate water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species (WQCC Regulation No. 31).

8.8.2 FOREST-LEVEL INFORMATION

Trout occur in most of the perennial water bodies on the RGNF, including streams, rivers, lakes, and reservoirs. Trout may be excluded from some areas due to chemical contamination below mines or by natural or human-caused barriers. At high elevations, trout may be absent due to water temperature and low winter flows.

The timing of flow, water quality, and availability of various habitat features such as deep pools, cover, and spawning gravels influence trout abundance. Geology, elevation, temperature, gradient, and substrate distribution are other factors that commonly influence trout abundance. As habitats are degraded, either by chemical pollutants, increased sediment, or unfavorable changes in flow (especially severe reductions), trout typically respond with lower abundance and poor year class distribution.

Brook trout are common and widely distributed in suitable waters throughout the state, including self-sustaining populations found on all districts of the RGNF. There are approximately 11,160 miles of stream channel on the Forest, including 1,810 perennial stream miles with 1,050 miles suitable for trout. The Forest also has 75 lakes totaling over 1,220 surface acres (USFS 1996). Brook trout are found primarily in the higher elevation streams and lakes.

The CPW manages brook trout as a sport fish and maintains a brook trout hatchery-stocking program within the Upper Rio Grande drainage. The CPW is responsible for monitoring sport fish populations, including brook trout, on the RGNF. The Forest is responsible for monitoring the habitat, but works closely with the CPW to develop management strategies, monitor fish populations and habitat conditions, and conduct surveys and inventories.

Considerable survey and fish stocking information is available for streams on the RGNF (e.g., Alves 2003). Stream surveys are conducted annually and data dating back to the late 1960's and 1970's is available for some of the Forest streams. Older survey data are useful for historical reference, but current, standardized information is needed for the species is to be used as an indicator for management activities. Current information establishes baseline information, population parameters, trends, and species distribution. By utilizing standardized protocols established by CPW and the Forest Service, data are collected on brook trout populations that can identify changes in population parameters that may be the result of specific management activities. Most of CPW brook trout population surveys are conducted in streams and lakes that receive high

angler use. The purpose of the surveys is to ensure quality fishing experiences for anglers and to assess fish populations and habitat conditions. Most brook trout populations are found in smaller streams that receive less angling pressure or where CPW does not conduct their creel surveys. Nevertheless, brook trout accounted for 15% and 26% of the fish reported in the 2003 and 2004 CDOW District Wildlife Manager Creel Surveys, respectively (B. Wiley, USFS, pers. comm., Alves 2004).

Brook trout populations can be affected by a wide variety of management activities on the RGNF. Although management activities may differ, the environmental effects upon fish habitat are similar (Meehan 1991). Timber harvest, roads, grazing, mining, and recreation all impact sedimentation, flows, water quality, canopy and instream cover, and channel morphology. There are also other factors, man-made and natural processes, that can impact stream habitat and brook trout populations and they also tend to share these common environmental effects. Maintaining productive aquatic habitats on the forest can be accomplished through a combination of protection, rehabilitation, and enhancement.

Timber harvest and silviculture practices can impact the quantity, quality, and timing of runoff and may impact stream habitat, not only in the immediate action area, but also downstream of the action area (Chamberlin et al. 1991). The effects of timber harvest and silviculture can influence snow accumulation and melt rates, evapotranspiration and soil water, and influence soil structure that affect infiltration and water transmission rates (Chamberlin et al. 1991). These effects may impact fish habitat by changing the timing and/or magnitude of runoff events; changing stream bank stability; changing the supply of sediment to channels; changing sediment storage and channel structure, especially large woody debris; and changing energy relationships involving water temperature, snowmelt, and freezing (Meehan and Bjornn 1991, Chamberlin et al. 1991, Rinne and Platania 1995). Activities associated with timber harvest such as road building, yarding, burning, and scarification can cause water to run off, rather than through the soil, resulting in higher peak flows and increased sediment transportation (Chamberlin et al. 1991).

Roads can affect streams and fish habitats by directly accelerating erosion and sediment loading, by altering channel morphology, and by changing the runoff characteristics of watersheds. These processes interact to cause secondary changes in channel morphology (Furniss et. al. 1991). Improper placement and size of road culverts can impact stream channel morphology and create barriers to fish movement that could lead to population fragmentation and have negative impacts on spawning activities.

Riparian zones receive considerable recreational use on the RGNF. Activities associated with recreational use can have adverse impacts on fish production, but they are likely to be minor when compared to the influence of timber harvest, roads, grazing, and mining (Clark and Gibbons 1991). The biggest recreational impact to brook trout is the direct harvesting of fish, although indirect impacts to fish habitat can result from loss of riparian vegetation and increase sedimentation, especially at stream crossings and at areas receiving high visitor use. Recreational activities can also contribute nutrients, bacteria, petrochemicals, pesticides, pathogens, and refuse to adjacent waters (Clark and Gibbons 1991). Effects on riparian soils include trampling by foot, animal, and/or vehicles and leads to compaction, destruction of soil biota, and increased erosion. Damage to riparian vegetation can occur from trampling, construction of facilities, and collection of firewood (National Research Council 2002).

Additional activities on the Forest, or adjacent to the Forest, can directly and indirectly impact brook trout populations. Activities such as the application of chemicals, including pesticides, fertilizers, and fire retardants, can have direct impacts on trout populations and vegetation within riparian areas (Norris et al. 1991); construction activities (buildings, private developments, storage facilities, etc.) can increase sedimentation, alter stream flows, and impact riparian vegetation (Clark and Gibbons 1991); water diversions can impact stream morphology, timing and duration of water flows, and water quantity and quality (Bolton and Shellberg 2002); and supplemental fish stockings can directly impact brook trout populations by increasing competition for limited resources, increasing predation, cross-breeding, and introducing diseases (Li and Moyle 1993).

Brook trout are not as adversely impacted by whirling disease as rainbow trout, but they are carriers of the spores that cause the disease. The whirling disease parasite has a two-host lifecycle that involves trout and an alternate host, a bottom-dwelling tubifex worm. Forest management activities can contribute to the impact and spread of whirling disease by conducting activities that increase stream sediment, which creates habitat for the intermediate host, and by direct transfer of spores in mud and water that may be on vehicles and equipment that have crossed or have been used in infected waters. Although whirling disease appears to be limited to the main Rio Grande drainages, once it is established it can be easily transferred from one stream to another and can persist indefinitely and have tremendous impacts on wild trout populations. Currently, there is no practical cure to treat wild trout infected with the disease.

All of these risk factors can impact brook trout populations and the habitat they live in. These impacts can lead to loss of age classes, reduction in stream biomass, create habitats more suitable for other fish species, or impact streams so severely it renders the stream unsuitable for aquatic life.

In summary, brook trout are a common and widely distributed fish across suitable, upper elevation habitats on the RGNF. Habitat quality across the Forest is considered stable to slightly improving (B. Wiley, USFS, pers. comm., J. Alves, CDOW, pers. comm.). The CPW database, derived from annual CPW and USFS monitoring across the Forest, indicates a stable to slightly increasing population trend (B. Wiley, USFS, pers. comm., J. Alves, CDOW, pers. comm.).

8.8.3 PROJECT-LEVEL INFORMATION

The Village at Wolf Creek Access project site occurs in the headwaters of Pass Creek, a second order tributary to the South Fork Rio Grande River and an historic RGCT water (Alves 1997). A first order tributary to Pass Creek flows through the project site. North Pass Creek is the main tributary paralleling Hwy 160, mostly along its south side, from its sources south of Lobo Overlook. A second tributary is on the south side of the project site and flows into Alberta Park Reservoir. Village at Wolf Creek water rights and proposed water use are also described above under RGCT. Brook trout are present in all local creeks and Alberta Park Reservoir.

Alberta Park Reservoir is a State Wildlife Area managed by the CPW specifically as a RGCT conservation water and fishery. The reservoir is maintained at maximum level by the CPW at most times and is sampled every four-five years (J. Nehring, CPW, pers. comm.) and annually stocked with RGCT (in 2011 9,800 fingerlings, 1.18 inches in size were stocked). Fishing is by

artificial flies and lures only and all RGCT caught must be immediately released. Sampling of Alberta Park Reservoir indicates that brook trout are the dominant species. Gill net sampling in 2009, the most recent sampling event, resulted in the capture of 267 brook trout (99% of all captures) and 2 RGCT (B. Wiley, USFS, pers. comm.).

There are 19,732 linear feet of perennial streams and 8,619 linear feet of intermittent streams on the project site (Table 3.1-1). Fish sampling of North and South Pass Creeks was conducted on September 23, 2009 using a Smith Root back-pack shocker (WER, 2010e&f). Designated sections of North and South Pass Creeks within the project site were electrofished to determine if RGCT were present. Pool, riffle, and run habitats were sampled in each stream. Two-thousand four-hundred and fifteen feet (736 m) of North Pass Creek and 1,440 feet (439 m) of South Pass Creek were sampled. Brook trout were the only species documented as present in both streams, with adult, juvenile, and young of the year age groups being represented. The upper section of South Pass Creek (above Alberta Park Reservoir) had many small tributaries, making the main stream small in the sampled area and lower in available in-stream habitat. Willow cover was abundant throughout this area. Adult brook trout in pocket water in the upper section of North Pass Creek indicate that either the fish can find over-winter habitat in the upper section, or they can migrate downstream to appropriate refugia.

Fishing in Pass Creek and the South Fork Rio Grande is important to many businesses and anglers within the San Luis Valley. Brook trout were stocked in the South Fork Rio Grande in 1956 and gradually spread throughout the Pass Creek drainage, displacing RGCT (Alves 2003).

8.8.4 PROJECT EFFECTS

Alternative 1 would have no direct impact on brook trout because no habitat modifications would be authorized on NFS lands. Alternative 1 would result in no direct change to the population, trend, or distribution of occupied and potential aquatic habitats of this species on the RGNF. No reasonably foreseeable projects exist within the analysis area.

Alternatives 2 and 3 would have insignificant and discountable sedimentation effects on this species on the Forest as a result of avoided and minimized (via implementation of project design criteria) sedimentation effects associated with (Alt. 2 and 3:) widening the Tranquility Road across several North Pass Creek tributaries, (Alt. 2 and 3:) construction of the access road. Alternative 2 and 3 effects would result in no direct or indirect changes to the population, trend, or distribution of occupied and potential habitats of this species on the RGNF. Brook trout would remain abundant and widely distributed across the Forest.

Likely effects extending onto the Forest from the VWC development could affect brook trout and its occupied and potential habitats on the project site and on downstream NFS lands. These effects would be the same as those described above for Rio Grande cutthroat trout (RGCT). In addition, water quality and quantity effects resulting from VWC development would affect occupied brook trout habitat in North Pass Creek (which presently represents potential, but unoccupied RGCT habitat) and spawning success in all creeks downstream of water diversion points.

In addition to cumulative Village at Wolf Creek effects, cumulative effects to potential and occupied brook trout habitat along Hwy 160 could result from any additional toxic highway runoff (e.g., deicers, normal highway runoff, hazardous waste spills, etc.) resulting from the incremental

addition of traffic, highway intersection upgrades, and other ongoing CDOT highway improvement projects.

While cumulative effects of Alternatives 2 and 3 could adversely affect local brook trout populations, they would not measurably affect the overall population, trend, or aquatic habitat distribution of the species across the RGNF. CPW management of local populations could be adjusted to a certain extent, if desired, to compensate for adverse VWC effects and maintain all local populations. The same situation holds for Pass Creek, downstream from the project site, where adverse effects resulting from VWC development are possible.

8.8.5 PROJECT CONSISTENCY WITH KEY MONITORING QUESTIONS AND STRATEGIES

Project consistency with key monitoring questions and strategies for brook trout is the same as that for RGCT and is described above in that section.

8.8.6 PROJECT CONSISTENCY WITH FOREST PLAN MIS OBJECTIVES

Project consistency with Forest Plan MIS Objectives for brook trout is the same as that for RGCT and is described above in that section.

8.8.7 BROOK TROUT SUMMARY

Direct, indirect, and cumulative Alternative 2 and 3 effects would adversely affect local populations, but would be insignificant and discountable on this species' Forest-wide population, habitat distribution, and trend. Brook trout would remain relatively abundant and widely distributed across the Forest. Alternatives 2 and 3 would be consistent with NFMA direction and applicable Forest Plan Objectives, Standards, Guidelines, and the MIS monitoring question for maintaining viable, well-distributed populations of brook trout, other aquatic species, and healthy aquatic ecosystems with the estimated numbers and distribution of reproductive individuals to insure their continued existence across the RGNF. The CPW and USFS will continue monitoring brook trout and their habitats to establish and track population trends and habitat conditions across the Forest, consistent with the 2003 MIS Amendment to the Forest Plan (USFS 2003b).

9.0 RESIDENT AND NEOTROPICAL MIGRATORY LANDBIRDS

Neotropical migratory landbirds (NTMB) are those avian species that breed in the U.S. and winter south of the border in Mexico, Central and South America. Resident landbirds include those that remain during the winter period, or move to winter habitats that occur primarily within the U.S. Landbirds include many of our passerine songbirds, hawks, owls and woodpeckers, but do not include waterfowl, shorebirds, or colonial water birds (e.g. coots and rails). Several landbird species may be experiencing population declines and have become an issue of international concern (Terborgh 1992, Finch and Stangel 1993, Dobkin 1994).

The Migratory Bird Treaty Act (MBTA) of 1918 was passed to enforce a treaty between the United States, Mexico and Canada for the protection of migratory birds. The MBTA was passed primarily due to the concern of unregulated commercial over harvest of migratory birds for the

food and fashion industries and in response to the extinction of the passenger pigeon (*Ectopistes migratorius*). Except as regulated by permit, it is unlawful under the MBTA for anyone at anytime, by any means or in any manner, to pursue, hunt, export, import, transport or carry any migratory bird. Until recently, it was maintained that the MBTA was intended to address issues related to the hunting and poaching of migratory birds but not habitat modification. However, inconsistent interpretations of the MBTA by Federal agencies and contradictory rulings by various circuit courts left the issue regarding habitat modification unclear.

On January 10, 2001, Executive Order 13186 was signed and entitled "Responsibilities of Federal Agencies to Protect Migratory Birds". The Executive Order states that "environmental analysis of Federal actions, required by NEPA or other established environmental review processes, shall evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of special concern." The Executive Order further directs action agencies to develop and implement a Memorandum of Understanding (MOU) with the US Fish and Wildlife Service (USFWS) that promotes the conservation of migratory birds. This MOU was finalized and signed by the Forest Service and USFWS in December 2008. The MOU and additional correspondence by the Forest Service Washington Office outlines commitments and responsibilities intended to reduce the direct, indirect and cumulative effects of land management activities on migratory birds, including those dealing with habitat modification.

Direction when completing National Environmental Policy Act (NEPA) evaluations for project activities concerning landbird conservation in Forest Service Region 2 is to reference the 2008 Birds of Conservation Concern (BCC) list produced by the USFWS for Bird Conservation Regions (BCRs). Furthermore, Forest Service units are encouraged to interface with the State and Bird Conservation Region working groups for actions and objectives to pursue concerning migratory bird conservation. Bird Conservation Regions consist of a hierarchical framework of nested ecological units that allow for the use of multiple scale-specific approaches to on-the-ground management. Bird Conservation Regions encompass areas that become progressively more ecologically similar as the units are stepped-down to a smaller scale. At the smallest and most local scale, the physiographic area is used for bird conservation efforts. State groups such as local Partners-In-Flight (PIF) Chapters are the primary workforce involved with translating the BCR information into conservation action at the local scales.

There are 37 BCRs in North America of which four occur at least partially in Colorado. The Rio Grande National Forest occurs within the Southern Rockies Colorado Plateau Bird Conservation Region (BCR 16), which encompasses portions of Colorado, New Mexico, Arizona, Utah and Wyoming. Information from BCR 16 was synthesized for use in Colorado through the development of the BCC list (USFWS 2008) and the Colorado Partners in Flight Bird Conservation Plan (Beidleman 2000 [BCP]). These Plans have been or are being developed by every state in the nation based on the individual physiographic areas encompassed by the BCR's. Thus at the finest scale of analysis, the RGNF occurs within the Southern Rocky Mountains Physiographic Area (Area 62) of the Southern Rockies Colorado Plateau Bird Conservation Region. Table 9-1 lists BCC for BCR 16, their status within the project site, and projected influence from the Proposed Action.

Table 9-1. FWS Birds of Conservation Concern for BCR 16 and the Anticipated Effect of the Proposed Action Upon Their Conservation Needs[a].

Species	General Habitat	Occurrence in Project Site	Effect of Alternatives [b]
American Bittern	Wetlands	No*	No effect.
Bald Eagle	Lakes and rivers	No*	No effect.
Ferruginous Hawk	Grassland, Mountain Shrub, Semi-Desert Shrubland, Sagebrush Shrublands	No*	No effect.
Golden Eagle	Agricultural, Grassland, Cliff/Rock/Talus	Yes	MAII[c]. Project site likely used as part of a large home range or during migration. No nesting within Analysis Area.
Peregrine Falcon	Agricultural, Pinyon-Juniper, Spruce-Fir, Ponderosa Pine, Cliff/Rock/Talus, Wetlands	Yes	MAII[C]. Project site likely used as part of a large home range or during migration. No nesting within Analysis Area.
Prairie Falcon	Agricultural, Grassland, Semi-Desert Shrubland, Cliff/Rock/Talus	No*	No effect.
Gunnison's sage-grouse	Mountain Shrub, Sagebrush Shrubland, Low Elevation Riparian	No*	No effect.
Snowy Plover	Wetlands	No*	No effect.
Mountain Plover	Agricultural, Grassland, Semi-Desert Shrubland, Sagebrush Shrubland	No*	No effect.
Long-billed Curlew	Shorelines	No*	No effect.
Southwestern Willow Flycatcher	Willow-Riparian	Not previously located; results of 2012 surveys pending	Analyzed in VWC Access EIS Biological Assessment (Thompson 2012). Effect determination will not be possible until after the 2012 survey season.
Juniper Titmouse	Pinyon-Juniper Woodlands	No*	No effect.
Yellow-billed Cuckoo	Low Elevation Riparian, Wetlands	No*	No effect.
Flammulated Owl	Aspen, Ponderosa Pine, Mixed-Conifer, Spruce-Fir	No*	No effect.
Burrowing Owl	Grassland, Semi-Desert Shrubland, Sagebrush Shrubland	No*	No effect.
Veery	Dense riparian thickets, willow-riparian	No*	No effect.
Lewis's Woodpecker	Ponderosa Pine, Low Elevation Riparian	No	No effect.
Gray Vireo	Oak woodlands/scrub	No*	No effect.
Pinyon Jay	Pinyon-Juniper, Ponderosa Pine	No*	No effect.
Bendire's Thrasher	Semi-Desert Shrubland	No*	No effect.
Black Rosy Finch [d]	Spruce-fir forest; alpine	No*	No effect.
Brown-capped Rosy Finch [d]	Nests above timberline in alpine zone in cliffs, crevices; also utilizes spruce-fir forest	No*	No effect.
Cassin's Finch	Primarily spruce-fir, but also mixed-conifer forest	No*	No effect.
Grace's warbler	Ponderosa pine	No*	No effect.

Table 9-1. FWS Birds of Conservation Concern for BCR 16 and the Anticipated Effect of the Proposed Action Upon Their Conservation Needs[a].

Species	General Habitat	Occurrence in Project Site	Effect of Alternatives [b]
Brewer's sparrow	Sagebrush Shrubland	No*	No effect.
Grasshopper Sparrow	Grasslands	No*	No effect.
Chestnut-collared longspur	Shortgrass Prairie	No*	No effect.

[a] Quantification of impacts by Alternative and net gain/loss to NFS lands are presented in Table 3.
[b] No effects associated with Alternative 1, effects associated with Alternatives 2&3 presented in *Summary of Effects of Alternatives on Migratory Birds* section.
[c] MAII = May impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide.
[d] Species is restricted to uncommon winter use of the project site; no nesting occurs within the project site or adjacent forests. Alternatives 1–3 will have no impact on individuals or local populations.
* Excluded from analysis because the species does not occur, suitable habitat is not present, the project area is above the species altitudinal range, or has very rare migratory occurrence near Wolf Creek Pass.

The BCP (Beidleman 2000) identified priority species within each physiographic area in Colorado based on the PIF Species Prioritization Process. The species that occur within the project site are identified below in Table 9-2.

Table 9-2. Species of the Southern Rocky Mountains Province and the Effect of Alternatives on PIF Priority Species [a].

Habitat Type	BCP Priority Species	BCP Potential Issues(s)	Potential Influence from Project Activities	Effect of Alternatives
High Elevation Riparian	Cordilleran flycatcher American dipper MacGillivray's warbler Wilson's warbler	Recreation impacts	Changes in forest structure and composition; snag habitat.	Alternative 1 will have no impact on these species. The effect determination for Alternatives 2&3 for these species is MAII. See Table 10-3 for net gain/loss of habitat on NFS lands.
Mixed Conifer	Blue grouse Williamson's sapsucker	Altered disturbance regimes, snags, timber mgmt.	Changes in forest structure and composition; snag habitat.	Alternative 1 will have no impact on these species. The effect determination for Alternatives 2&3 for these species is MAII. See Table 10-3 for net gain/loss of habitat on NFS lands.
Spruce/Fir	Boreal owl Olive-sided flycatcher Hammond's flycatcher	Timber mgmt., snags, altered disturbance regimes	Changes in forest structure and composition; snag habitat.	Alternative 1 will have no impact on these species. The effect determination for Alternatives 2&3 for these species is MAII. See Table 10-3 for net gain/loss of habitat on NFS lands.
Wetlands	Willet Short-eared owl	Wetland loss, development	No impact.	Project site is not within known distribution for either species.

[+] Quantification of impacts by Alternative and net gain/loss to NFS lands are presented in Table 9-3.
[b] MAII = May impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide.

Impacts to PIF priority species likely to occur within the project site are presented in Table 9-3. All impact calculations were conducted using ArcGIS. Under the Low Density Development Concepts, since actual building envelopes are not known, two acres per potential lot were considered to occur within each parcel's dominant vegetation type. These impacts were then added to impacts (roads, etc.) which currently are quantifiable.

Table 9-3. Alternative 2 and 3 Effects (Acres) to PIF Species of the Southern Rocky Mountains Province by Habitat Type and Alternative and Development Concept[a]

Habitat Type	Species	Alternative & Development Concept	Federal Exchange Parcel	Non-Federal Exchange Parcel	Net Gain/Loss of Habitat to NFS Lands	Private Land Parcel [b]
High Elevation Riparian[c]	Cordilleran flycatcher American dipper MacGillivray's warbler Wilson's warbler	Alternative 2 – Land Exchange Low Density	0.31	0	-0.31	0.16
		Alternative 2 – Land Exchange Moderate Density	0.66	0	-0.66	0.20
		Alternative 2 – Land Exchange Maximum Density[d]	0.66	0	-0.66	0.32
		Alternative 3 – ANILCA Low Density	0.30[d]	0	-0.30	0.60
		Alternative 3 – ANILCA Moderate Density	0.30	0	-0.30	0.38
		Alternative 3 – ANILCA Maximum Density	0.65	0	-0.65	0.62
Mixed Conifer And Spruce/Fir[e]	Boreal owl Olive-sided flycatcher Hammond's flycatcher	Alternative 2 – Land Exchange Low Density	23.94	0	-23.94	5.60
		Alternative 2 – Land Exchange Moderate Density	28.23	0.76	-27.47	32.96
		Alternative 2 – Land Exchange Maximum Density	85.18	0.76	-84.42	49.00
		Alternative 3 – ANILCA Low Density	1.93[d]	0	-1.93	23.18
		Alternative 3 – ANILCA Moderate Density	4.01	0	-4.01	34.81
		Alternative 3 – ANILCA Maximum Density	4.10	0	-4.10	65.12

[a] All impacts combined.
[b] Indirect effects associated with development of the Private Land Parcel. Under Alternative 3 there is no differentiation of private parcel traded and not traded. Thus, impacts are combined for each the non-Federal Exchange Parcel and Private Land Parcel. This results in a value of zero in the Non-Federal Exchange column.
[c] Scrub-shrub and forested wetland vegetation types used in the analysis. Herbaceous wetlands were not used as they do not represent suitable habitat.
[d] Impacts associated with the access road.
[e] Spruce-fir forest HSS 4 B&C used in the analysis.

9.1 SUMMARY OF EFFECTS OF ALTERNATIVES ON MIGRATORY BIRDS

The golden eagle and peregrine falcon are the only BCC for BRC 16 known or potentially likely to occur within the project site. These species may potentially occur within the individual parcels when foraging, but suitable nesting habitat is not present within the project site or on immediately adjacent NFS lands. The golden eagle is primarily associated with lower elevation mixes of sagebrush with nearby cliffs and has an average territory size of 22–66 mi^2 (Kingery 1998). See section 6.1.5 for peregrine falcon impact analysis. Golden eagles and peregrine falcons will not be negatively impacted by any of the Alternatives as the amount of habitat lost is a very small percentage of their large territories and suitable nesting habitat is not present within or near the project site. Some individuals may occasionally use the project area and nearby forests while foraging; Thompson (Thompson, pers. comm. February 23, 2012) has observed peregrine falcon south of the project area in the Silver Creek drainage. These BCC species will continue to be tracked in the Integrated Monitoring of Bird Conservation Regions (IMBCR) Program, which includes survey grids on the Rio Grande National Forest, to determine population trends over time or in special species monitoring programs developed for other non-songbird species groups.

Of the four PIF high elevation riparian priority species (Cordilleran flycatcher, American dipper, MacGillivray's warbler, and Wilson's warbler), only the MacGillivray's and Wilson's warblers are confirmed to occur within the project site. See Section 8.3 for the Wilson's warbler impact analysis. Because of small territory sizes ranging from 2.5–8 acres (Ainsley 1992) for the Cordilleran flycatcher; and 2–4 acres (Blakesely and Reese 1988, Morrison 1981, Morrison and Meslow 1983) for MacGillivray's warbler; and the extremely small amount of American dipper habitat within the project site, the analysis area for these three species is restricted to the project site.

Alternative 1 would have no direct or indirect adverse effects on Cordilleran flycatcher, American dipper and MacGillivray's warbler because no habitat modification would be authorized on NFS lands. Cumulative effects for the high altitude riparian habitat analysis area are unknown. The development of the VWC will cause an increase in human and pet activities in potential nesting habitat. Two factors, the placement of the nest on the ground and the small amount of habitat in which to nest, could result in the loss of nests by humans or pets.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the gain of 3.2 acres (Table 6-2) of potentially suitable high altitude riparian nesting and foraging habitat. Using the most conservative over-lapping home range size of 2.5 acres for the Cordilleran flycatcher and Wilson's warbler, there could be an increase of one breeding territory on NFS lands. The exchange of the parcels in its own right does not mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to high altitude riparian PIF priority species.

The Alternatives 2 and 3 Hwy 160 access road construction would result in habitat modification to montane or subalpine willow carrs representing occupied or potential habitat within the project site. Though wetlands would be bridged there would still be the loss of scrub-shrub willow habitat

in these areas because of shading and the potential disruption in hydrologic connectivity between adjacent occupied willow carr habitat. As a result, project design criteria have been incorporated into Alternatives 2 and 3 to ensure that access road construction would not disrupt hydrologic connectivity that may support down-gradient willow stands that are inhabited by this species which would increase these indirect impact totals. Indirect effects to high elevation riparian habitat potentially used for nesting and foraging by Cordilleran flycatchers and MacGillivray's warbler for the Low, Moderate, and Maximum Density Development Concepts under Alternatives 2 and 3 total 0.47, 0.86, and 0.98 acres, respectively, for Alternative 2 and 0.90, 0.68, and 1.27 acres, respectively, for Alternative 3 (Table 6-3). Indirect effects to high elevation riparian on NFS lands for these development concepts are 0.31, 0.66, and 0.66 for Alternative 2 and 0.30, 0.30, and 0.65 for Alternative 3. Alternative 2 impacts represent 12.4% and 26% of a 2.5 acre breeding territory which could result in, at the most, the loss of one breeding territory. Alternative 3 impacts represent 12% and 26% of a 2.5 acre breeding territory which could result in, at the most, the loss of one breeding territory. The potential loss of one breeding territory is insignificant and discountable when compared to the RGNF Cordilleran flycatcher and MacGillivray's warbler populations and the amount of potential habitat within the RGNF. Cumulative impacts are the same as those identified for Alternative 1. The water tank farm sites for the Moderate Density Development Concepts for the two Action Alternatives would likely accommodate the water storage requirements for these concepts. The water storage requirement for the Maximum Density Development Concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence.

All three PIF spruce-fir priority species (boreal owl, olive-sided flycatcher and Hammond's flycatcher) are known to occur within the project site and are potentially present in each of the parcels. See Sections 6.1.7 and 6.1.8 for the impact analysis for the boreal owl and olive-sided flycatcher. Because of a small territory size ranging from 1.5–5 acres (Manuwal 1970, Sedgwick 1994), the analysis area for the Hammond's flycatcher is restricted to the project site.

Alternative 1 would result in no impact to the three spruce-fir PIF priority species. Cumulative effects are limited to those areas of the analysis area which overlap with areas historically logged; Hwy 160 operation/maintenance and its ROW and cut/fill areas; and FSR 391. The amount of habitat lost as a result of these cumulative effects is not known. Because of the small home range of the Hammond's flycatcher, planned projects associated with the WCSA MDP are out of the analysis area and therefore will not impact this species. Secondary impacts associated with the development of the VWC and an increase in human activities on adjacent NFS lands is not expected to negatively impact the spruce-fir priority species.

Alternative 2 – Land Exchange: The direct impact of the land exchange would be the change in ownership of the Federal and non-Federal exchange parcels. The exchange would result in the loss of 123.6 acres (Table 6-2) of potentially suitable spruce-fir nesting and foraging habitat. Using the most conservative home range size of 1.5 acres for the Hammond's flycatcher, there could be a loss of 82 breeding territories on NFS lands. The exchange of the parcels in its own right does not

mean that the indirect conversion of habitat through development of the Village at Wolf Creek necessarily would occur. If development of the Village at Wolf Creek does not occur, habitat is expected to not be impacted in any manner, thus, there would be no impact to high altitude riparian PIF priority species.

Alternative 2 and 3 Low, Moderate and Maximum Density Development Concepts would result in the conversion of a total of 29.54, 61.95, and 134.94 acres, respectively, for Alternative 2 and 25.11, 38.82, and 69.22 acres, respectively, for Alternative 3 (Table 6-3). Impacts to NFS lands under the Alternative 2 and 3 development concepts are 23.94, 28.23, and 85.18 acres, respectively, for Alternative 2 and 1.93, 4.01, and 4.10, respectively, for Alternative 3 (Table 6-3). Based on the acres of HSS 4B&C spruce-fir indirectly affected by Alternative 2 (Table 6-2), and on the most conservative territory size of one pair per 1.5 acres, and on full occupancy of available habitat, Alternative 2 development concepts could affect 16, 19, and 57 breeding territories. The potential loss of up to 57 Hammond's flycatcher breeding territories is insignificant and discountable when compared to the estimated RGNF total population and the amount of habitat available within the RGNF. The actual amount of Hammond's flycatcher nesting and foraging habitat impacted likely would be less than the amount of habitat impacted under the Alternative 2 development concepts since Hammond's flycatchers prefer mature forests with little understory (Kingery 1998). The Alternative 3 development concepts could affect 1 to 3 breeding territories. The potential loss of up to 3 Hammond's flycatcher breeding territories is insignificant and discountable when compared to the estimated RGNF total population and the amount of habitat available within the RGNF. The addition of edge, fragmentation, and disturbance considerations would not change this finding. The water tank farm sites for the Moderate Density Development Concepts for the two Action Alternatives would likely accommodate the water storage requirements for these concepts. The water storage requirement for the Maximum Density Development Concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time (D. Johnson pers. comm. April 18, 2012). This potential increase could result in additional habitat loss and reduced habitat effectiveness in surrounding habitats as a result of fragmentation, perforation, and human activity and presence.

The effect of indirect effects associated with Alternatives 2 and 3 on private land has no bearing on NFMA directives and applicable Forest Plan objectives, standards, and guidelines, which are considered on NFS lands only.

Direct, indirect, and cumulative impacts to PIF priority species analyzed within this document would result in an effect determination of **no effect** for Alternative 1 and **may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to Federal listing or a loss of species viability rangewide** for Alternatives 2 and 3.

Direct mortality to high elevation riparian and spruce-fir PIF priority species adults on nests and eggs or young within nests would be eliminated by implementing a seasonal restriction on clearing and grubbing of vegetation between March 14 and July 15. These dates are based on breeding phenology presented in Kingery (1998). Failure to comply with this Project Design Criterion could lead to direct impacts of individuals, which the EO and Migratory Bird MOU seeks to avoid for Forest Service actions and funded projects.

10.0 REFERENCES AND DATA SOURCES

Ainsley, D. T. J. 1992. Vocalizations and nesting behaviour of the Pacific-slope Flycatcher, Empidonax difficilis. Master's Thesis. Univ. of Victoria, Victoria, BC.

Altman, Bob and Rex Sallabanks. 2000. Olive-sided Flycatcher (Contopus cooperi), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/502doi:10.2173/bna.502

Alves, J. 1996. 1996 fisheries inventories Rio Grande River basin. Colorado Division of Wildlife. Monte Vista, CO.

Alves, J. 1997. 1997 fisheries inventories Rio Grande River basin. Colorado Division of Wildlife. Monte Vista, CO.

Alves, J. 1999. 1999 fisheries inventories Rio Grande River basin. Colorado Division of Wildlife. Monte Vista, CO.

Alves, J. 2003. 2003 fisheries inventories Rio Grande River basin. Colorado Division of Wildlife. Monte Vista, CO. 208 pp.

Alves, J. 2004. 2004 fisheries inventories Rio Grande River basin. Colorado Division of Wildlife. Monte Vista, CO.

Alves, J., T. Nesler, and D. Krieger. 2002. Rio Grande cutthroat trout status review for Colorado. Colorado Division of Wildlife. Denver, CO. 45 pp.

Alves, J., D. Krieger, and T. Nesler. 2004. Conservation plan for Rio Grande cutthroat trout (Oncorhynchus clarki virginalis). Colorado Division of Wildlife. Denver, CO. 75 pp.

Alves, J. E. K.A. Patten, D.E. Brauch, and P.M. Jones. 2008. Range-wide status of Rio Grande cutthroat trout (Oncorhynchus clarki virginalis): 2008. 145 pp.

Ammon, E.M. 1995. Lincoln's sparrow. *In* A. Poole and F. Gill eds.: The birds of North America. No. 191. Acad. Nat. Sci., Philadelphia, and Amer. Ornithol. Union,Wash., DC. (as cited in USFS 2002f)

Anderson, A.E., and D.E. Medin. 1967. The breeding season in migratory mule deer. Colorado Div. Game, Fish, and Parks, Inf. Leafl., 60:1-4.

Andrews, R. and R. Righter. 1992. Colorado birds: a reference to their distribution and habitat. Denver Museum of Natural History. Denver, CO. 442 pp.

Armstrong, D.M. 1972. Distribution of mammals in Colorado. Mono No. 3. Mus. Nat. Hist. Univ. Kansas. Lawrence. 415 pp.

Armstrong, D.M., Fitzgerald, J.P., and C.A. Meaney. 2011. Mammals of Colorado. 2nd Ed., Denver Mus. Nat. Hist. and Univ. Press of Colorado. Niwot, CO. 620 pp.

Bachman, R.W. 1958. The ecology of four north Idaho trout streams with reference to the influence of forest road construction. M.S. Thesis, Univ. of Idaho, Moscow. 97 pp. (as cited in USFS 2002m)

Banfield, A.W.F. 1974. The mammals of Canada. Univ. Toronto Press, Toronto. 438 pp.

Beard, T.D., and R.F. Carline. 1991. Influence of spawning and other stream habitat features on spatial variability of wild brown trout. Trans. Amer. Fish. Soc. 120:711-722. (as cited in USFS 2002m).

Beason, J., R. Levad, and T. Leukering. 2005. Monitoring Colorado's Birds: The 2004 field season report. Rocky Mountain Bird Observatory unpub. report. 59 pp.

Becker, G.C. 1983. Fishes of Wisconsin. Univ. Wisconsin Press, Madison. (as cited in USFS 2002m)

Behnke, R. J. 1979. The native trouts of the genus *Salmo* of western North America. Report to the U. S. Fish and Wildlife Service, Denver, Colorado. (as cited in USFS 2002m)

Behnke, R.J. 1992. Native trout of western North America. Amer. Fish. Soc. Mono. 6. Amer. Fish. Soc., Bethesda, MD. (as cited in USFS 2002m)

Bent, A.C. 1953. Life histories of North American wood warblers. U.S. Natl. Mus. Bull. 203, Washington, DC. (as cited in USFS 2002h)

Bent, A.C. 1968. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. U.S. Natl. Mus. Bull. 237, Wash., DC. (as cited in USFS 2002f)

Beidleman, C.A. (facilitator). 2000. Colorado Partners In Flight Land Bird Conservation Plan. 320 p.

Binns, N.A. and F.M. Eiserman. 1979. Quantification of fluvial trout habitat in Wyoming. Trans. Am. Fish. Soc. 108:215-228. (as cited in USFS 2002m)

BISON-M. 2001a. Biota Information System of New Mexico Wilson's warbler species account 042435. New Mexico Department of Game & Fish and U.S. Fish & Wildlife Service. Santa Fe, NM. (as cited in USFS 2002h)

BISON-M. 2001b. Biota Information System of New Mexico BISON brook trout species account 010570. The New Mexico Department of Game & Fish, and The Fish & Wildlife Service. Santa Fe, NM. (as cited in USFS 2003d)

Bjornn, T.C. 1971. Trout and salmon movements in two Idaho streams as related to temperature, food, stream flow, cover, and population density. Trans. of the Amer. Fish. Soc. 100:423-438. (as cited in USFS 2002m)

Blakesley, J.A. 2008. Population densities and trend detection of avian Management Indicator Species on the Rio Grande National Forest. Supplemental Report M-MCB-USFS07-03. Rocky Mountain Bird Observatory, Brighton, CO. 19 pp.

Blakesley, J. A., D. C. Pavlacky, Jr., and D. J. Hanni. 2010. Monitoring the birds of the Southern Rockies/Colorado Plateau Bird Conservation Region (BCR 16), 2009 field season report. Tech. Rep. SC-RMR-USFS09-01. Rocky Mountain Bird Observatory, Brighton, CO, 40 pp.

Blakesley, J. A. and K. P. Reese. 1988. Avian use of campground and non-campground sites in riparian zones. J. Wildl. Manage. 52:399-402.

Bolton, S. and J. Shellberg. 2001. White Paper: Ecological issues in floodplains and riparian corridors. Univ. of Washington, Center for Streamside Studies. (as cited in USFS 2002m)

Boyd, R.J. 1978. American elk. Pp. 11-29 *in* J.W. Schmidt and D.L. Gilbert. Big game of North America. Stackpole Books. Harrisburg, PA. 494 pp. (as cited in USFS 2002jm)

Boyd, R.J. and E.E. Rayland. 1971. Breeding dates of Colorado elk as estimated by fetal growth curves. Colorado Div. Wildl. Info. Leaf. No. 88. 2 pp. (as cited in USFS 2002j)

Brand, L.A. and T.L. George. 2001. Response of passerine birds to forest edge in coast redwood forest fragments. Auk 118:678-686.

Brasch, J., J. McFadden and S. Kmiotek. 1958. Brook trout. Life history, ecology, and management. Wisc. Dept. Nat. Resourc. Publ. 226. 15 pp. (as cited in USFS 2003d)

Braun, C. E., K. Martin, and L. A. Robb. 1993. White-tailed Ptarmigan (Lagopus leucurus). In The Birds of North America, No. 68 (A. Poole and F. Gill, eds.). Philadlephia: The Acedemy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union. 24 pp.

Burroughs, J.W. and J.G. King. 1985. Surface erosion control on roads in granitic soils. Pp. 183-190 *in*: ASCE Committee on Watershed Management Proceedings. Denver, CO. (as cited in USFS 2002m)

Burroughs, J.W. and J.G. King. 1989. Reduction of soil erosion on forest roads. Gen. Tech. Rep. INT-GTR-264. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, UT. 21 pp. (as cited in USFS 2002m)

Buskirk, S.W. 1983. Ecology of the marten in south-central Alaska. Univ. Alaska, Fairbanks. Ph.D. Thesis. 131 pp. (as cited in Buskirk and Ruggiero 1994)

Buskirk, S.W. and L.F. Ruggiero. 1994. American marten. Pages 7-37 in Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, tech. eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. Gen. Tech. Rep. RM-254. USDA For. Serv. Rocky Mountain Range and Exper. Stn., Ft. Collins, CO. 184 pp.

Buss, K. and R. McCreary. 1960. A comparison of egg production of hatchery reared brook, brown, and rainbow trout. Prog. Fish-Cult. 22(1):7-10. (as cited in USFS 2003d)

Buss, K. and J.E. Wright. 1957. Results of species hybridization within the family Salmonidae. Prog. Fish-Cult. 18(4):149-158. (as cited in USFS 2002m)

Bustard, D.R., and D.W. Narver. 1975. Preferences of juvenile coho salmon (*Oncorhynchus kisutch*) and cutthroat trout (*Salmo clarki*) relative to simulated winter habitat. J. Fish. Res. Bd. of Canada 32:681-687. (as cited in USFS 2002m)

Call. M.W. 1978. Nesting Habitats and Surveying Techniques for Common Western Raptors. Tech. Note TN-316. Bureau of Land Management. Denver Service Center.

Calamusso, B. and J.N. Rinne. 1999. Native montane fishes of the middle Rio Grande ecosystem: status, threats, and conservation. Pp. 231-237 *in* Finch, D.M., J. Whitney, J.F. Kelly and S.R. Loftin, eds. Rio Grande ecosystems: linking land, water, and people. U. S. Forest Service Rocky Mountain Res. Stn. Proc. RMRS-P-7, Ogden, UT. (as cited in USFS 2002m)

Center for Biodiversity. 2000. Petition to list the Colorado River cutthroat trout Oncorhynchus clarki pleuriticus as a threatened or endangered species under the U.S. Endangered Species Act. 56 pp.

Chisholm, I.M., W.A. Hubert and T.A. Wesche. 1987. Winter stream conditions and use of habitat by brook trout in high-elevation Wyoming streams. Trans. Amer. Fish. Soc. 116:176-184. (as cited in USFS 2003d)

Cicero, C. 1997. Boggy meadows, livestock grazing, and interspecific interactions: influences on the insular distribution of montane Lincoln's sparrows (*Melospiza lincolnii alticola*). Great Basin Nat. 57:104-115. (as cited in USFS 2002f)

Carline, R. F. and O. M. Brynildson. 1977. Effects of hydraulic dredging on the ecology of native trout populations in Wisconsin spring ponds. Dept. Nat. Resourc. Madison, WI. Tech. Bull. 98. 40 pp. (as cited in USFS 2002m)

Carter, M.F., W.C. Hunter, D.N. Pashley, and K.V. Rosenberg. 2000. Setting conservation priorities for landbirds in the United States: The Partners In Flight approach. Auk 117:541-548.

Chamberlin T. W., R. D. Harr and F. H. Everest. 1991. Timber harvesting, silviculture, and watershed process. Pp. 181-205 in Meehan, W. R. 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. Amer. Fish. Soc. Spec. Publ. 19. Bethesda, Md. 751 pp. (as cited in USFS 2002m)

Clark, R.N. and D.R. Gibbons. 1991. Recreation. Pp. 459-481 *in* Meehan, W.R. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. Amer. Fish. Soc. Special Publ. 19. Bethesda, MD. 751 pp. (as cited in USFS 2002m)

Clark, T.W., M. Bekoff, T.M. Campbell, T. Hauptman, and B.D. Roberts. 1989. American marten, Martes americana, home ranges in Grand Teton National Park, Wyoming. Can. Field-Nat. 103:423-425.

Clark, T.W. and T.M. Campbell. 1977. Short-term effects of timber harvest on pine marten behavior and ecology. Idaho State Univ., Pocatello. 60 pp. (as cited in Fitzgerald et al. 1994)

Cody, M.L., and J.A. Smallwood. 1996. Long-term studies of vertebrate communities. Academic Press, San Diego, CA. pp 291-342. (as cited in USFS 2002h)

Colorado Division of Wildlife. 2002. Rio Grande cutthroat trout status review for Colorado. Colorado Division of Wildlife, Denver, CO. 45 pp. (as cited in USFS 2002m)

Colorado Division of Wildlife. 2004. Conservation plan for Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) in Colorado. Colorado Division of Wildlife, Denver, CO. 70 pp.

Colorado Division of Wildlife. 2008. Report on the status and conservation of the boreal toad (Bufo boreas boreas) in the Southern Rocky Mountains 2006-2007. Prepared by Tina Jackson, Herptile Coordinator. Colorado Division of Wildlife, Denver, CO. 134 pp.

Colorado Division of Wildlife, New Mexico Department of Fish and Game, U.S. Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, and Jicarilla Apache Nation. 2003. Conservation agreement for the range-wide preservation and management of Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*). 23 pp.

Colorado Parks and Wildlife. 2007a. Lower Rio Grande Elk Herd Data Analysis Unit E-32 Game Management Units 80 and 81. January 2007. Revised by Brad Weinmeister, Terrestrial Biologist. Approved by the Colorado Wildlife Commission January 2007

_____.2007b. Lower Rio Grande Deer Herd Data Analysis Unit D-35 Game Management Units 80 and 81. January 2007. Revised by Brad Weinmeister, Terrestrial Biologist. Approved by the Colorado Wildlife Commission January 2007

_____. 2012. Boreal toad. Available at: http://wildlife.state.co.us/Research/Aquatic/BorealToad/Pages/BorealToad.aspx

_____. 2012b. Colorado Endangered, Threatened and Species of Special Concern. http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/Mammals/Pages/MammalsOfConcern.aspx

_____. 2012C. Colorado Parks and Wildlife 2011 post-hunt deer and elk population estimates. Provided to R. Ghormley, USDA FS Rio Grande National Forest.

Colorado Partners in Flight. 2000. Colorado Land Bird Conservation Plan.

Craig, G.R. and J.H. Enderson. 2004. Peregrine falcon biology and management in Colorado. Colorado Div. of Wildlife Techn. Publ. No. 43. DOW-R-T-43-04. CDOW, Denver, CO. 80 pp.

Creaser, C.W. 1930. Relative importance of hydrogen-ion concentration, temperature, dissolved oxygen, and carbon-dioxide tension, on habitat selection by brook trout. Ecol. 11(2):246-262. (as cited in USFS 2003d)

Crockett, A.B. and P.L. Hansley. 1978. Apparent response of Picoides woodpeckers to outbreaks of the pine bark beetle. Western Birds. 9:67-70.

Cunjak, R.A., and G. Power. 1986. Winter habitat utilization by resident brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*). Can. J. Fish. Aq. Sci. 43:1970-1981. (as cited in USFS 2003d)

Cunjak, R.A. and G. Power. 1987. The feeding and energetics of stream-resident trout in winter. J. Fish Biol. 31:493-511. (as cited in USFS 2003d)

Deems, E.F. and D. Pursley. 1978. North American furbearers: their management, research and harvest status in 1976. Int. Assoc: Fish Wildl. Agencies. Univ. Maryland, College Park, MD.

DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forests and rangeland birds of the United States, natural history and habitat use. USDA Forest Service, Agriculture Handbook 688. 625 pp. (as cited in USFS 2002f)

Dobkin, D.S. 1994. Conservation and management of Neotropical migrant landbirds in the Northern Rockies and Great Plains. University of Idaho Press. Moscow, ID.

Ellis, M.M. 1914. Fishes of Colorado. Univ. of Colorado, Boulder, CO. II(1):1-136. (as cited in USFS 2003d)

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon and Schuster, New York, NY. 436 pp. (as cited in USFS 2002f)

Ferland, C. 2005. Northern Goshawk (*Accipiter gentilis atricapillus*) breeding status in the

San Juan and Rio Grande National Forests, Southwestern Colorado.

Finch, D. M. 1992. Threatened, endangered, and vulnerable species of terrestrial vertebrates in the Rocky Mountain Region. Gen. Tech. Rep. RM-215. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 38 p. [18440].

Finch, D.M. and P.W. Stangel. 1993. Introduction, Pp. 1-4 in D.M. Finch and P.W. Stangel, eds; Status and Management of Neotropical Migratory Birds; 1992 September 21-25, Estes Park, CO. USDA Forest Service General Technical Report RM-229, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Francis, C.M. and F. Cook. 1986. Differential timing of spring migration in wood warblers (Paruline). Auk 103:548-556. (as cited in USFS 2002h)

Franzreb, K.E. 1985. Foraging ecology of brown creepers in a mixed-conifer forest. J. Field Ornithol. 56:9-16. (as cited in USFS 2002b)

Freddy, D.J. 1987. The White River elk herd: a perspective, 1960-85. Tech. Publ., Colorado Div. Wildl., Denver, CO. 37:1-64. (as cited in USFS 2002j)

Freddy, D.J., D.L. Baker, R.M. Bartmann, and R.C. Kufeld. 1993. Deer and elk management analysis guide, 1992-94. Div. Rep. No. 17. Colorado Div. Wildl., Ft. Collins, CO. (as cited in USFS 2002j)

Furniss, M. J., T. D. Roelofs and C. S. Yee. 1991. Road construction and maintenance. Pp. 64-65 *in* Meehan, W. R. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. Amer. Fish. Soc. Spec. Publ. 19. Bethesda, Md. 751 pp. (as cited in USFS 2002m)

Gillihan, S.W. 2001. Influence of aspen stand characteristics on bird communities: preliminary report. Rocky Mountain Bird Observatory. Brighton, CO. 9 p. + tables and figures. (as cited in USFS 2002b)

Gillihan, S.W. 2002. Population data for avian management indicator species on the Rio Grande National Forest. Rocky Mtn. Bird Obs. Brighton, CO. 23 pp. (as cited in USFS 2002b)

Great Basin Bird Observatory. 2012. Olive-sided flycatcher. http://www.gbbo.org/pdf/bcp/58_Olive-sided_Flycatcher.pdf. Accessed March 6, 2012.

Griffith, J. S., and R. W. Smith. 1993. Use of concealment cover by juvenile cutthroat and brown trout in the South Fork of the Snake River, Idaho. N. Amer. J. Fish. Manage. 13:823-830.

Halfpenny, J.C., R.W. Thompson, S.C. Morse, T. Holden, and P. Rezendes. 1995. Chapter 5: Snow tracking. Pages 91-163 in Zielinski, W.J. and T.E. Kucera, tech. eds. American marten, fisher, lynx, and wolverine: survey methods for their detection. Gen. Tech. Rep. PSW-GTR-157. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Dept. Agric. 163 pp.

Hall, E.R. 1981. Mammals of North America. John Wiley and Sons, New York.

Hammerson, G.A. 1999. Amphibians and reptiles in Colorado. Univ. Press of Colorado and Colo. Div. Wildl. Niwot, CO. 484 pp.

Harig, A.L. and K.D. Fausch. 2002. Minimum habitat requirements for establishing translocated cutthroat trout populations. Ecol. Applic. 12:535-551. (as cited in USFS 2002m)

Harig, A.L. K.D. Fausch and M.K. Young. 2000. Factors influencing success of greenback cutthroat trout translocations. N. Amer. J. Fish. Manage. 20:994-1004. (as cited in USFS 2002m)

Harshbarger, T.J. 1975. Factors affecting regional trout stream productivity. Pp. 11-27 in U.S.D.A. For. Serv. Proc. Southeastern trout resource: ecology and management symposium. Southeastern Forest Exp. Stn., Asheville, NC. 145 pp. (as cited in USFS 2002m)

Hayward, G. D. and P. H. Hayward. 1993. Boreal Owl (Aegolius funereus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/063doi:10.2173/bna.63

Hazzard, A.S. 1932. Some phases in the life history of the eastern brook trout, *Salvelinus fontinalis*, Mitchill. Trans. Am. Fish. Soc. 62:344-350. (as cited in USFS 2003dm)

Hebblewhite, M. 2008. A literature review of the effects of energy development on ungulates: implications for central and eastern Montana. Report prepared for Montana Fish, Wildlife and Parks, Miles City, MT. Page 85.

Hejl, S.J., R.J. Hutto, C.R. Preston, and D.M. Finch. 1995. Effects of silvicultural treatments in the Rocky Mountains. Pp. 55-84 in T.E. Martin and D.M. Finch, eds.; Ecology and management of neotropical migratory birds. Oxford Univ. Press. Oxford, UK. 489 pp.

Hejl, S. J., K. R. Newlon, M. E. Mcfadzen, J. S. Young and C. K. Ghalambor. 2002. Brown Creeper (Certhia americana), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/669 doi:10.2173/bna.669

Herbert, D.W.M. and J.C. Merkens. 1961. The effects of suspended mineral solids on the survival of trout. Int. J. Air and Water Poll. 5:46-55. (as cited in USFS 2003d)

Hoffman, R.W. and C.E. Braun. 1977. Characteristics of a wintering population of white-tailed ptarmigan in Colorado. Wilson Bull. 89:107-115. (as cited in Kingery 1998)

Hoffman, R.W. 2006. White-tailed Ptarmigan (Lagopus leucura): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/whitetailedptarmigan.pdf [February 23, 2012].

Holmes, R.T. and S.K. Robinson. 1988. Spatial patterns, foraging tactics and diets of ground-foraging birds in a northern hardwood forest. Wilson Bull. 100:377-394. (as cited in USFS 2002d)

Hoover, R.L. and D.L. Wills, eds. 1984. Managing forested lands for wildlife. Colorado Div. Wildlife in coop. with USDA Forest Service, Rocky Mtn. Reg. Denver, CO. 459 pp.

Hubert, W.A., R.W. Stonecypher, W.A. Gern and J. Bobbit. 1994. Response of cutthroat trout embryos to reduced incubation temperatures at different developmental stages. Progr. Fish-Cult. 56:185-187. (as cited in USFS 2002m)

Hunt, R.L. 1969. Production and angler harvest of wild brook trout in Lawrence Creek, Wisconsin. Wisc. Div. Conserv., Madisno. Tech. Bull. 35. 52 pp. (as cited in USFS 2003d)

Hunt, R.L. 1969. Overwinter survival of wild fingerling brook trout in Lawrence Creek, Wisconsin. J. Fish. Res. Bd. of Canada 26:1473-1483. (as cited in USFS 2003d)

Hunter, C.J. 1991. Better trout habitat, a guide to stream restoration and management. Montana Land Reliance, Island Press, Washington, DC. (as cited in USFS 2003d)

Hutto, R.L. 1981. Seasonal variation in the foraging behavior of some migratory western wood warblers. Auk 98:765-777. (as cited in USFS 2002b)

Hutto, R.L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology 9:1041-1058.

Hutto, R.L. and J.S. Young. 1998. USDA Forest Service Northern Region landbird monitoring project field methods. Div. Biol. Sci., Univ. Montana, Missoula, MT. 17 pp. (as cited in USFS 2002b)

Hutto, R.L. and J.S. Young. 1999. Habitat relationships of landbirds in the Northern Region, USDA Forest Service. U. S. Forest Service General Technical Report, RMRS-GTR-32, Ogden, UT.

Johnson, B. K, J. W. Kern, M. J. Wisdom, S. L. Findholt, and J. G. Kie. 2000. Resource selection and spatial separation of elk and mule deer in spring. Journal of Wildlife Management 64:685-697.

Johnson, D. 2007. Fish of Colorado field guide. Adventure Publications Inc. Cambridge MN. 175 pp.

Jordan, D.S. 1891. Report of expeditions in Colorado and Utah during the summer of 1889, with an account of the fishes founding each of the rivers examined. Bull. U.S. Comm. 9:1-40. (as cited in USFS 2002m)

Karr, J. R., K. O. Fausch, P.L. Angermeier, P. R. Yant, and I. J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. Page 206 *in* C. C. Kohler, and W. A. Hubert. eds.; Inland fisheries management in North America. American Fisheries Society, Bethesda, Maryland. (as cited in USFS 2002m)

Keller, M.E. and S.H. Anderson. 1992. Avian use of habitat configurations created by forest cutting in southeastern Wyoming. Condor 94:55-65.

Kennedy, B.M., D.P. Peterson and K.D. Fausch. 2001. Different life history of brook trout populations invading mid-elevation and high elevation cutthroat trout streams. Unpublished manuscript. Department of Fishery and Wildlife Biology, Colorado State Univ., Fort Collins, CO. (as cited in USFS 2002m)

Kennedy, P.L. (2003, January 2). Northern Goshawk (Accipiter gentiles atricapillus): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northerngoshawk.pdf [February 23, 2012].

Kingery, H., ed. 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership. Denver, CO. 636 pp.

Koehler, G.M. and K.B. Aubry. 1994. Lynx. Pages 74-98 in Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, tech. eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. Gen. Tech. Rep. RM-254. USDA For. Serv. Rocky Mountain Range and Exper. Stn., Ft. Collins, CO. 184 pp.

Koehler and M. G. Hornocker. 1977. Fire effects on marten habitat in the Selway-Bitterroot Wilderness. Journal of Wildlife Management 41:500-505.

Koplin, J.R. 1969. The numerical response of woodpeckers to insect prey in a subalpine forest in Colorado. Condor 71:436-438.

Koster, W.J. 1957. Fishes of New Mexico. Univ. of New Mexico Press, Albuq., NM. 293 pp. (as cited in USFS 2002m)

Kotliar, N. B. 2007. Olive-sided Flycatcher (Contopus cooperi): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/olivesidedflycatcher.pdf

Kotliar, N.B., S.J. Hejl, R.L. Hutto, V. Saab, C.P. Melcher, and M.E. McFadzen. 2002. Effects of wildfire and post-fire salvage logging on avian communities in conifer-dominated forests of the western United States. Studies in Avian Biology :218-225.

Kotliar, N.B. and C.P. Melcher. 1998. Habitat selection and behavior of Olive-sided Flycatchers under natural and managed disturbance regimes. Unpublished annual report prepared for U.S. Fish and Wildlife Service, USGS, Fort Collins, CO.

Kulp, M.A. and S.E. Moore. 2000. Multiple electrofishing removals for eliminating rainbow trout in a small southern Appalachian stream. N. Amer. J. Fish. Manage. 20:259-266. (as cited in USFS 2002m)

Lechleitner, R.R. 1969. Wild mammals of Colorado: their appearance, habitats, distribution, and abundance. Pruett Publ. Co. Boulder, CO. 254 pp.

Li, H.W. and P. B. Moyle. Management of introduced fishes. Pages 287-307 *in* C. C. Kohler and W. A. Hubert, editors. Inland Fisheries Management in North America. Amer. Fish. Soc., Bethesda, Md. 594 pp. (as cited in USFS 2002m)

Loft, E. R., J. W. Menke, and J. G. Kie. 1991. Habitat shifts by mule deer – the influence of cattle grazing. Journal of Wildlife Management 55:16−26.

Lusch, E. 1988. Comprehensive guide to western gamefish. Frank Amato Publications. Portland, OR. 125 pp. (as cited in USFS 2002m)

Lyon, L.J. 1979. Habitat effectiveness for elk as influenced by roads and cover. J. Forestry. 77:658-660. (as cited in USFS 2002j)

Lyon, L.J. 1983. Road density models describing habitat effectiveness for elk. J. Forestry. 81:592-595. (as cited in USFS 2002j)

Lyon, L.J. and C. E. Jensen. 1980. Management implications of elk and deer use of clear-cuts in Montana. J. Wildl. Manage. 44:352-361. (as cited in USFS 2002j)

Mannan, R.W. and E.C. Meslow. 1984. Bird populations and vegetation characteristics in managed and old-growth forests, northeastern Oregon. J. Wildl. Manage. 44:787-797. (as cited in USFS 2002b).

Manuwal, D.A. 1970. Notes on the territoriality of Hammond's Flycatcher (Empidonax hammondi) in western Montana. Condor 72: 364-365.

Mariani, J.M. 1987. Brown creeper (Certhia americana) abundance patterns and habitat use in the southern Washington Cascades. M.S. Thesis. Univ. Washington, Seattle, WA. 72 pp. (as cited in USFS 2002b)

McAfee, W.R. 1966. Eastern brook trout. Pp. 242-260 i*n*: Calhoun, A. (ed.) Inland Fisheries Management, California Dept. Fish and Game. (as cited in USFS 2003d)

McCormick, J.H., K.E.F. Hokansen and B.R. Jones. 1972. Effects of temperature on growth and survival of young brook trout, *Salvelinus fontinalis*. J. Fish. Res. Board Can. 29:1107-1112. (as cited in USFS 2003d)

McFadden, J.T. 1961. A population study of brook trout, *Salvelinus fontinalis*. Wildl. Monogr. 7. 73 pp. (as cited in USFS 2003d)

Meehan, W.R. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. Amer. Fish. Soc. Spec. Publ. 19. Bethesda, MD. 251 pp. (as cited in USFS 2003d)

Meehan, W.R and T.C. Bjornn. 1991. Salmonid Distributions and Life Histories. Pp. 64-65 *in* Meehan, W.R. 1991. influences of forest and rangeland management on salmonid fishes and their habitats. Amer. Fish. Soc. Spec. Publ. 19. Bethesda, Md. 751 pp. (as cited in USFS 2003d)

Minckley, W.L. 1973. Fishes of Arizona. Arizona Game and Fish Dept. 127 pp. (as cited in USFS 2002m).

Morrison, M. L. 1981. The structure of western warbler assemblages: analysis of foraging behavior and habitat selection in Oregon. Auk 98:578-588.

Morrison, M. L. and E. C. Meslow. 1983. Bird community structure on early growth clear cuts in western Oregon. Am. Midl. Nat. 110:129-137.

Mullen, J.W. 1958. A compedium of the life history and ecology of the eastern brook trout, *Salvelinus fontinalis*, Mitchill. Mass. Div. Fish Game, Fish. Bull. 23. 37 pp. (as cited in USFS 2003d)

Naiman, R.J., Beechie, T.J., Benda, L.E., Berg, D.R., Bisson, P.A., MacDonald, L.H., O'Connor, M.D., Olson, P.L. and Steel, E. A. 1992. Fundamental element of ecologically healthy watersheds in the Pacific Northwest coastal ecoregion. Pp. 127-188 *in* R.J. Naiman, ed. Watershed Management: balancing sustainability and environmental change. Springer-Verlag, New York, NY. (as cited in USFS 2002m)

National Geographic Society. 1991. Field Guide to the Birds of North America. National Geographic Society, Wash., D.C. Pp. 406-407. (as cited in USFS 2002f)

National Research Council. 2002. Riparian areas: functions and strategies for management. National Academy Press. Washington, D.C. (as cited in USFS 2003d)

NatureServe. 2012a. NatureServe Explorer: An online encyclopedia of life [web application]. Northern goshawk. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 23, 2012).

_____. 2012b. NatureServe Explorer: An online encyclopedia of life [web application]. American three-toed woodpecker. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 23, 2012).

_____. 2012c. NatureServe Explorer: An online encyclopedia of life [web application]. Olive-sided flycatcher. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 23, 2012).

_____. 2012d. NatureServe Explorer: An online encyclopedia of life [web application]. American marten. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 23, 2012).

_____. 2012e. NatureServe Explorer: An online encyclopedia of life [web application]. Brown creeper. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: February 23, 2012).

Nelson, S.K. 1989. Habitat use and densities of cavity-nesting birds in the Oregon Coast Ranges. M. S. thesis, Oregon State University, Corvallis, OR.

Norris, L.A., H.W. Lorz. and S.V. Gregory. 1991. Forest chemicals. Pp. 207-296 *in* Meehan, W.R. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. Amer. Fish. Soc. Special Publ. 19. Bethesda, MD. 751 pp. (as cited in USFS 2003d)

North American Bird Conservation Initiative Monitoring Subcommittee. 2007. Opportunities for Improving Avian Monitoring. U.S. North American Bird Conservation Initiative Report. 50 pp. Available from the Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Arlington, VA; on-line at http://www.nabci-us.org/.

O'Neil, J., A. Watts, T. Sibley and S. Bolton. 2000. Hydraulic and biologic effects of engineered large woody debris in stream rehabilitation. Center for Streamside Studies. University of Washington, Seattle, WA. (as cited in USFS 2003d)

Orth, D.J. and R.J. White. 1993. Stream Habitat Management. Pp. 205-230 *in* C.C. Kohler and W.A. Hubert, eds. Inland fisheries management in North America. Amer. Fish. Soc., Bethesda, MD. (as cited in USFS 2003d)

Palmer, D .A. 1984. Current Status of the Boreal Owl in Colorado. C.F.O. Journal 18:662.

Palmer, D. A. 1986. Habitat selection, movements, and activity of Boreal and Saw-whet owls. Master's Thesis. Colorado State Univ., Ft. Collins.

Peters, J.C. 1965. The effects of stream sedimentation on trout embryo survival. Seminar on biological. problems in water pollution. U.S. Dept. Health, Education and Welfare. Public Health Service, Cincinnati, OH. 1962. 275-279 pp. (as cited in USFS 2003d)

Peterson, D.P., and K.D. Fausch. 2001. Effects of nonnative brook trout on Colorado River cutthroat trout populations. Annual report to Central Utah Project Completion Act Office (U. S. Department of Interior), Colorado Division of Wildlife, USDA Forest Service, and Trout Unlimited. Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO. (as cited in USFS 2003d)

Peterson, J. M. C., and C. Fichtel. 1992. Olive-sided flycatcher, Contopus borealis. Pages 353-367 in K. J. Schneider and D. M. Pence, editors. Migratory nongame birds of management concern in the Northeast. U.S. Fish and Wildlife Service, Newton Corner, Massachusetts. 400 pp.

Phillips, G.E. and A.W. Alldredge. 2000. Reproductive success of elk following disturbance by humans during calving season. J. Wildl. Manage. 64:521-530.

Power, G. 1980. The brook charr, *Salvelinus fontinalis* . Pp. 142-203 *in* E.K. Balon, editor, Charrs: Salmonid Fishes of the Genus *Salvelinus*. Dr. W. Junk, The Hague, the Netherlands. (as cited in USFS 2003d)

Powers, E.B. 1929. Freshwater studies I. Ecology 10:97-111. (as cited in USFS 2003d)

Pritchard, V.L. and D.E. Cowley. (2006, July 28). Rio Grande Cutthroat Trout (Oncorhynchus clarkii virginalis): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/riograndecutthroattrout.pdf [February 23, 2012].

Raleigh, R.F. 1982. Habitat suitability index models: Brook trout. U. S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.24. 42 pp. (as cited in USFS 2003d)

Raleigh, R.F., L.D. Zukerman and P.C. Nelson. 1986. Habitat suitability index models and instream flow suitability curves: brown trout. U.S. Fish and Wildl. Serv., Biol. Rept. 82 (10.124). 65 pp. (as cited in USFS 2003d)

Raley, C.M. and S.H. Anderson. 1990. Availability and use of arthropod food resources by Wilson's warblers and Lincoln's sparrows in southeastern Wyoming. Condor 92:141-145. (as cited in USFS 2002f)

Rall, C.J. 2006. The response of bark-gleaning birds and their prey to thinning and prescribed fire in eastside pine forests in Northern California. Master's Thesis, Humboldt State University. 146 pp.

Rawinski, J.J. 2001. Birds of the Rio Grande National Forest and San Luis Valley area. A summary of observations on file at the Supervisor's Office, Monte Vista, CO. 40 pp. (as cited in USFS 2002f).

Rees, D.E., R.J. Carr, and W.J. Miller. (2005, May 11). Rio Grande Chub (Gila pandora): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/riograndechub.pdf [February 23, 2012].

Reimers, N. 1979. A history of a stunted brook trout population in an alpine lake: a lifespan of 24 years. California Fish and Game 65:196-215. (as cited in USFS 2003d)

Reynolds, Richard T.; Graham, Russell T.; Reiser, M. Hildegard; [and others]. 1992. Management recommendations for the northern goshawk in the southwestern United States. Gen. Tech. Rep. RM-217. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 90 p. [19721]

Richmond, A.D. and K.D. Fausch. 1995. Characteristics and function of large woody debris in subalpine Rocky Mountain streams in northern Colorado. Can. J. Fish. Aquat. Sci. 52: 1789-1802. (as cited in USFS 2003d)

Riley, S. J., and A. R. Dood. 1984. Summer movements, home range, habitat use, and hehavior of mule deer fawns. J. Wildl. Manage. 48: 302- 310.

Rinne, J.N. 1980. Spawning habitat and behavior of Gila trout, a rare salmonid of the southwestern United States. Trans. Amer. Fish. Soc. 109:83-91. (as cited in USFS 2002m)

Rinne, J.N. 1995. Rio Grande cutthroat trout. Pp. 24-27 *in* Young, M.K., tech. ed. Conservation assessment for inland cutthroat trout. Gen. Tech. Rep. RM-GTR-256, U.S. Forest Service Rocky Mountain Research Station, Fort Collins, CO. (as cited in USFS 2002m)

Rinne, J.N. and S.L. Platania. 1995. Fish Fauna. Pp. 165-175 *in* Finch, D.M. and J.Tainter (tech eds.) 1995. Ecology, diversity, and sustainability of the Middle Rio Grande Basin. Gen. Tech. Rep. RM-GTR-268. Fort Collins, Co. USDA. Forest Service, Rocky Mountain Forest and Range Experiment Station. 186 pp. (as cited in USFS 2002m)

Robinette, W. L., C. H. Baer, R. E. Pillmore, and C. E. Knittle. 1973. Effects of nutritional change on captive mule deer. Journal of Wildlife Management 37:312–326.

Robbins, C.S., D.K. Dawson, and B.A. Dowell. 1989. Habitat area requirements of breeding forest birds of the Middle Atlantic states. Wildlife Monographs 103:1-34.

Robinson, W.B. 1953. Coyote control with compound 1080 stations in National Forests. J. Forest. 51(12):880-885.

Rost, G. R., and J. A. Bailey. 1979. Distribution of mule deer and elk in relation to roads. Journal of Wildlife Management 43:634-641.

Rowland, M.M., M.J. Wisdom, B.K. Johnson and J.G. Kie. 2000. Elk distribution and modeling in relation to roads. J. Wildl. Manage. 64:672-684. (as cited in USFS 2002j)

Ryder, R. A., et al. 1987. Distribution and status of the boreal owl in Colorado. Pages 169-174 in Nero, R. W., et al., eds. Biology and conservation of northern forest owls. USDA For. Serv., Gen. Tech. Rep. RM-142. (as cited in NatureServe)

Sawyer, H. and R. Nielson 2005. Seasonal distribution and habitat use patterns of elk in the Jack Morrow Hills Planning Area, Wyoming. Western EcoSystems Technology, Inc., Cheyenne, Wyoming.

Scrivener, J.C. and M.J. Brownlee. 1989. Effects of forest harvesting on spawning gravel and incubation survival of chum (*Oncoryhnchus keta*) and coho salmon (*O. kisutch*) in Carnation Creek, British Columbia. Can. J. Fish. Aq. Sci. 46:681-696. (as cited in USFS 2002m)

Scott, V.E., G.L. Crouch, and A.J. Whelan. 1982. Responses of birds and small mammals to clearcutting in a subalpine forest in central Colorado. U.S.D.A. For. Serv. Res. Note RM-422. Ft. Collins, CO. 6 pp.

Scott, W.B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Board Can. Bull. 184. 966 pp. (as cited in USFS 2002m)

Sedell, J.R., Swanson, F.J.and S. V. Gregory. 1985. Evaluating fish response to woody debris. Pp. 222-245 *in* Hassler, T.J. ed. Proceedings: Pacific Northwest Stream Habitat Management Workshop. Humboldt State University, Arcata, CA. (as cited in USFS 2002m).

Sedgwick, J.A. 1994. Hammond's Flycatcher (Empidonax hammondii), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/109

Seidel, J.W. 1977. Elk calving behavior in west central Colorado. Pp. 38-40, *in* Proc. Western States Elk Workshop, Colorado Div. of Wildl., Denver, CO. 64 pp. (as cited in USFS 2002j)

Semlitsch, R.D., and J. R. Bodie. 2003. Biological Criteria for Buffer Zones around Wetlands and Riparian Habitats for Amphibians and Reptiles. Conservation Biology, Vol. 17, No.5:1219–1228

Shuster, W. C. 1980. Northern goshawk nest site requirements in the Colorado Rockies. West. Birds 11:89-96

Shuter, B. J. and J.R. Post. 1990. Climate, population viability, and the zoogeography of temperate fishes. Trans. Amer. Fish. Soc. 119:314-336. (as cited in USFS 2002m)

Siegel, J.J. 1989. An evaluation of the minimum habitat quality standards for birds in old-growth ponderosa pine forests, northern Arizona. M. Sc. thesis, University of Arizona, Tucson, AZ.

Smith, O.R. 1947. Returns from natural spawning of cutthroat trout and eastern brook trout. Trans. Am. Fish. Soc. 74:281-296. (as cited in USFS 2003d)

Soutiere, E.C. 1979. Effects of timber harvesting on marten in Maine. J. Wildl. Manage. 43:850-860.

Stahlecker, D. W., and J. J. Rawinski. 1990. First records for the boreal owl in New Mexico. Condor 92:517-519.

Stewart, R.M. 1973. Breeding behavior and life history of the Wilson's warbler. Wilson Bull. 85:21-30. (as cited in USFS 2002h)

Stewart, R.M., R.P. Henderson and K. Darling. 1977. Breeding ecology of the Wilson's warbler in the high Sierra Nevada, California. Living Bird 16: 83-102. (as cited in USFS 2002h)

Stolz, S. and J. Schnell. 1991. The wildlife series, trout pages 196-207. Stackpole Books. Harrisburg, PA. 370 pp. (as cited in USFS 2002m)

Stonecypher, R.W., W.A. Hubert and W.A. Gern. 1994. Effect of reduced incubation temperatures on survival of trout embryos. Progr. Fish-Cult. 56:180-184. (as cited in USFS 2003d)

Streeter, R.G. and C.E. Braun. 1968. Occurrence of pine marten, Martes americana (Carnivora: Mustelidae) in Colorado alpine areas. Southwest. Nat.13:449-451.

Strickland, M.A., C.W. Douglas, M. Novak, and N.P. Hunzinger. 1982. Marten. Pp. 599-612, in J.A. Chapman and G.A. Feldhamer, eds. Wild mammals of North America: biology, management, and economics. Johns Hopkins Univ. Press, Baltimore, MD. 1147 pp.

Sublette, J.E., M.D. Hatch and M. Sublette. 1990. The fishes of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. (as cited in USFS 2002m)

Swift-Miller, S. 2001. Region 2 sensitive species evaluation form: *Oncorhynchus clarki virginalis*/ Rio Grande cutthroat trout. USDA Forest Service. 5 pp.

Terborgh, J. 1992. Perspectives on the conservation of Neotropical migratory birds. Plenary Address, Pp. 7-12 in J.M. Hagan III and D.W. Johnston, eds.; Ecology and Management of Neotropical Migrant Landbirds. Papers from the Symposium on Ecology and Conservation of Neotropical Migrant Landbirds, December 6-9 1989, Woods Hole, Massachusetts.

Thomas, J.W. ed. 1979. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. U.S. D.A. Forest Service. Agric. Hand. No. 553. 512 pp.

Thomas, J.W. and D.E. Toweill, eds. 1982. Elk of North America: ecology and management. Stackpole Books, Harrisburg, PA. 698 pp.

Thomas, J.W., H. Black, Jr., R. J. Scherzinger and R. J. Pedersen. 1979. Deer and elk. pp 104-127. *in*: J. W. Thomas, ed. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. USDA Forest Service. Agricultural Handbook No. 553. Pacific Northwest Forest and Range Experiment Station. Portland, OR.

Thompson, I.D. and P.W. Colgan. 1987. Numerical responses of martens to a food shortage in northcentral Ontario. J. Wildl. Manage. 51:824-835.

Thompson, R.W. 1986. Wildlife assessment of the proposed East Fork Ski Area, Colorado. Western Ecosystems, Inc. Lafayette, CO. 97. pp.

_____. 1994. 1992-93 baseline wildlife studies for Vail Ski Area's proposed Category 3 expansion. Western Ecosystems, Inc. Boulder, CO. 113 pp.

_____. 2005. Biological Assessment for transportation and utility systems and facilities for the Village at Wolf Creek, Divide Ranger District, Rio Grande National Forest, Colorado. Western Ecosystems, Inc. Boulder, CO. 142 pp.

Thurow, R.T. and J.G. King. 1994. Attributes of Yellowstone cutthroat trout redds in a tributary of the Snake River, Idaho. Trans. Amer. Fish. Soc. 123:37-50. (as cited in USFS 2002m)

Toolen, J.F. 1998. Wilson's warbler. Pp. 436-437 *in* Kingery, H., ed., Colorado Breeding Birds Atlas. Denver Museum of Natural History and Colorado Division of Wildlife, Denver, CO. 636 pp.

Towry, R.K. 1984. Wildlife habitat requirements. Pages 72-209 in R.L. Hoover and D.L. Wills, eds. Managing forested lands for wildlife. Colorado Div. Wildlife in coop. with USDA Forest Service, Rocky Mtn. Reg. Denver, CO. 459 pp.

Trotter, P. 2008. Cutthroat: native trout of the west. University Press of California, Berkeley CA. 547 pp.

U.S. Environmental Protection Agency. 1999. Consideration of cumulative impacts in EPA review of NEPA documents. U.S. Environmental Protection Agency, Office of Federal Activities (2252A). EPA 315-R-99-002/May 1999.U.S. Fish and Wildlife Service. 2002. Endangered and threatened wildlife and plants; candidate status review for Rio Grande cutthroat trout. 50 CFR Part 17 on June 11, 2002. Prop. Rules 67(112):39936-39947. (as cited in USFS 2002m)

U.S. Fish and Wildlife Service. 1998. Endangered and threatened wildlife and plants; 90-day finding for a petition to list the Rio Grande Cutthroat Trout. 63 FR 49062 49063.

_____. 2008. Endangered and threatened wildlife and plants; Status review for Rio Grande Cutthroat Trout. 73 FR 27900 27926.

_____. 2008. Birds of Conservation Concern 2008. Division of Migratory Bird Management, Arlington, Virginia. 87 p.

_____. 2011. Endangered and threatened wildlife and plants; Review of native species that are candidates for listing as endangered or threatened; annual notice of findings on resubmitted petitions; annual description of progress on listing actions. 76 FR 66370 66439.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered species consultation handbook: procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act. U.S. Fish and Wildlife Serv. and Nat'l Marine Fisheries Serv. March.

U.S. Forest Service. 1987. East Fork Ski Area final environmental impact statement. USDA Forest Service, San Juan National Forest, Durango, CO.

_____. 1995. Data definitions for Dillon District RMRIS maps. USDA For. Serv. Dillon Ranger Distr. Silverthorne, CO. Feb. 9.

_____. 1996. Revised Land and Resource Management Plan. USDA Forest Service, Rio Grande National Forest, Monte Vista, CO.

_____. 2002a. MIS analysis and monitoring document: brown creeper. Rio Grande National Forest. Monte Vista, CO. 8 pp.

_____. 2002b. Species assessment: brown creeper (*Certhia americana*). Rio Grande National Forest. Monte Vista, CO. 23 pp. Aug. 26.

_____. 2002c. MIS analysis and monitoring document: hermit thrush. Rio Grande National Forest. Monte Vista, CO. 8 pp.

_____. 2002d. Species assessment: hermit thrush (*Catharus guttatus)*. Rio Grande National Forest. Monte Vista, CO. 18 pp. Aug. 26.

_____. 2002e. MIS analysis and monitoring document: Lincoln's sparrow. Rio Grande National Forest. Monte Vista, CO. 7 pp.

_____. 2002f. Species assessment: Lincoln's sparrow (*Melospiza lincolnii*). Rio Grande National Forest. Monte Vista, CO. 17 pp. Mar. 30.

_____. 2002g. MIS analysis and monitoring document: Wilson's warbler. Rio Grande National Forest. Monte Vista, CO. 7 pp.

_____. 2002h. Species assessment: Wilson's warbler (*Wilsonia pusilla*). Rio Grande National Forest. Monte Vista, CO. 18 pp. Mar. 30.

_____. 2002i. MIS analysis and monitoring document: elk. Rio Grande National Forest. Monte Vista, CO. 8 pp.

_____. 2002j. Species assessment: Rocky Mountain elk (*Cervus elaphus nelsoni*). Rio Grande National Forest. Monte Vista, CO. 18 pp. May 25.

_____. 2002k. MIS analysis and monitoring document: mule deer. Rio Grande National Forest. Monte Vista, CO. 8 pp.

_____. 2002l. Species assessment: Mule deer (*Odocoileus hemionus*). Rio Grande National Forest. Monte Vista, CO. 18 pp. May 25.

_____. 2002m. Species assessment: Rio Grande cutthroat trout. Rio Grande National Forest. Monte Vista, CO. 25 pp.

_____. 2003a. Species assessments, management indicator species, a supporting analysis and report to the Management Indicator Species A Forest Plan Amendment To The Revised Land and Resource Management [Plan] for the Rio Grande National Forest. Rio Grande National Forest. RGNF, Monte Vista, CO. 245 pp. Jan.

_____. 2003b. Management Indicator Species: A forest plan amendment to the Revised Land and Resource Management Plan for the Rio Grande National Forest. Rio Grande National Forest, Monte Vista, CO. Oct.

_____. 2004. R2 management indicator species "checklist" for decision-makers. USDA Forest Service. Lakewood, Colorado. vers. 3/10/04. 4 pp.

_____. 2005. Revised Sensitive Species List. Regional Forester's 2670 memo to Forest Supervisors. USDA Forest Service. Rocky Mountain Region. Lakewood, Colorado. April 28, 2005.

_____. 2006. Forest Service Manual Rocky Mountain Region (Region 2) Denver, Colordo. FSM 2600 – Wildlife, fish, and sensitive plant habitat management. Chapter 2670 – Threatened, Endangered, and Sensitive Plants and Animals. Approved April 19, 2006.

_____. 2008. Memorandum of Understanding Between the U.S. Department of Agriculture Forest Service and the U.S. Fish and Wildlife Service to promote the Conservation of Migratory Birds. FS Agreement # 08-MU-1113-2400-264. December 8, 2008.

_____. 2009. Memorandum of Understanding on the Migratory Bird Treaty Act. USDA Forest Service Correspondence Memo regarding Forest Service commitments to migratory birds under the Migratory Bird MOU with the U.S. Fish and Wildlife Service. February 23, 2009

Wallmo, O. C. 1981. Mule and black-tailed deer of North America. University of Nebraska Press, Lincoln, USA.

Water Quality Control Commission. 2001. Regulation No. 31. The basic standards and methodologies for surface water. Colorado Department of Public Health and Environment. (as cited in USFS 2002m)

_____. 2002. Regulation No. 36. Classifications and Numeric Standards for Rio Grande Basin. Colorado Department of Public Health and Environment. (as cited in USFS 2002m)

Weaver, T.M. and J.J. Fraley. 1993. A method to measure emergence success of Westslope cutthroat trout fry from varying substrate compositions in a natural stream channel. N. Amer. J. Fish. Manage. 13:817-822. (as cited in USFS 2002m)

Webster, D. (ed.) 1975. Proceedings of brook trout seminar. Wisc. Dept. Nat. Resour., Univ. Wisc., Madison. 16 pp. (as cited in USFS 2003d)

Webster, D. and Eiriksdottier. 1976. Upwelling water as a factor influencing choice of spawning sites by brook trout (*Salvelinus fontinalis*). Trans. Am. Fish. Soc. 75:257-266. (as cited in USFS 2003d)

Wesche, T.A. 1974. Evaluation of trout cover in small streams. Proc. Western Assoc. Game and Fish Commissioners. 54:286-294. (as cited in USFS 2003d)

_____. 1980. The WRRI trout cover rating method: development and application. Water Res. Res. Inst., Laramie, WY. Water Resource Ser. 78. 46 pp. (as cited in USFS 2003d)

_____. 1993. Watershed management and land-use practices. Pp. 181-203 *in* C.C. Kohler and W.A. Hubert, eds. Inland fisheries management in North America. Amer. Fish. Soc., Bethesda, MD. 594 pp. (as cited in USFS 2003d)

White, C. M., N. J. Clum, T. J. Cade and W. G. Hunt. 2002. Peregrine Falcon (Falco peregrinus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/660 doi:10.2173/bna.660. Accessed March 5, 2012.

White, C. M., N. J. Van Lanen, D.C. Pavlacky Jr., J. A. Blakesley, R. A. Sparks. J. M. Stenger, J. A. Rehm-Lorber, M. F. McLaren F. Cardone, J. J. Birek and D. J. Hanni. 2011. Integrated Monitoring of Bird Conservation Regions (IMBCR): 2010 Annual Report. Rocky Mountain Bird Observatory. Brighton, Colorado, USA.

White, G.C. and R.M. Bartmann 1998. Effect of density reduction on overwinter survival of free-ranging mule deer fawns. J. Wildl. Manage. 62(1):214-225.

White, H.C. 1930. Some observations on the eastern brook trout (*Salvelinus fontinalis*) of Prince Edward Island. Trans. Am. Fish. Soc. 60:101-108. (as cited in USFS 2003d)

Wiggins, D.A. (2005, January 27). Brown Creeper (*Certhia americana*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/ assessments/browncreeper.pdf [March 9, 2012].

Williams, J.B. and G.O. Batzli. 1979. Winter diet of a bark-foraging guild of birds. Wilson Bulletin 91:126-131.

Woodbridge B, Hargis CD. 2006. Northern Goshawk Inventory and Monitoring Technical Guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service, 80 p.

Woodling, J. 1980. Game fish of Colorado. Colorado Division of Wildlife. Department of Natural Resources. Denver, Co. 40.

_____. 1985. Colorado's little fish: a guide to the minnows and other lesser known fishes in the state of Colorado. CDOW Denver, CO. 77 pp.

Yaeger, M. 1998. Hermit Thrush. Pp. 394-395 in Kingery, H., ed.; Colorado Breeding Birds Atlas. 1998. Denver Mus. Nat. Hist. and Colorado Div. Wildl. Denver, CO. 636 pp.

Young, W., D.M. Finch, F.R. Moore and J.F. Kelly. 1998. Stopover ecology and habitat use of migratory Wilson's warblers. Auk 115 (4):829-842. (as cited in USFS 2002h)

11.0 FIGURES

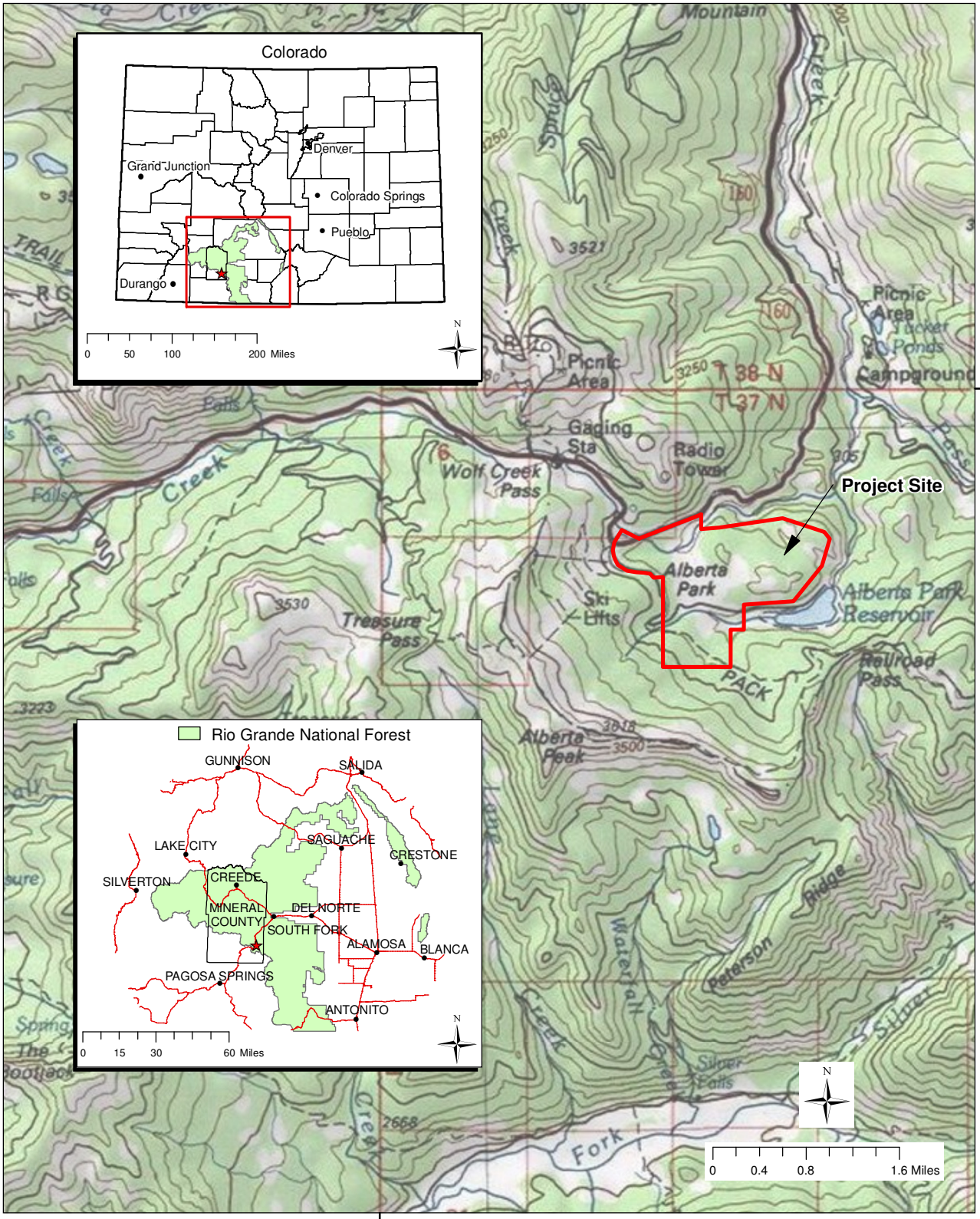
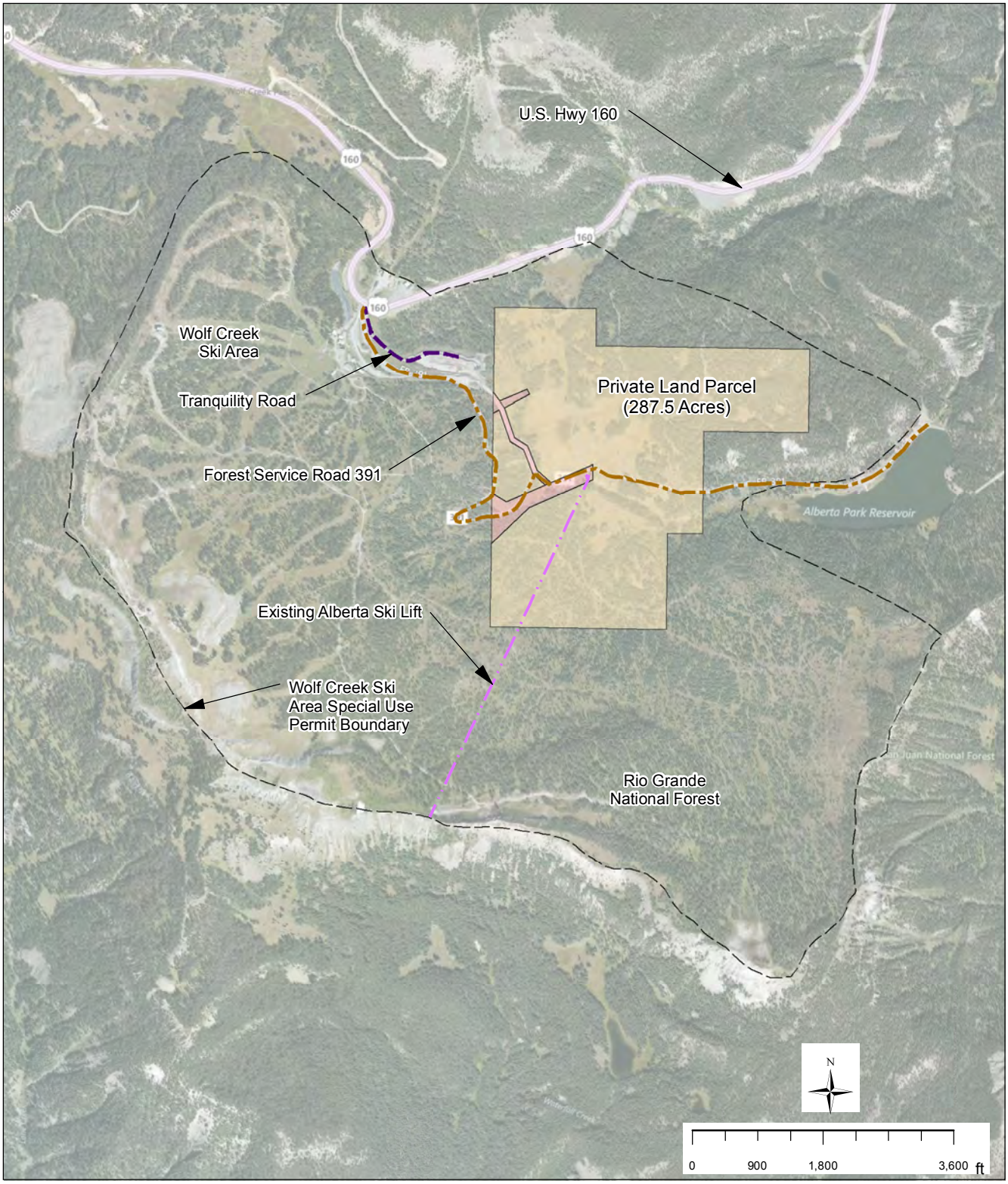


Figure 1. Vicinity Map

Legend

Project Site

Rio Grande National Forest

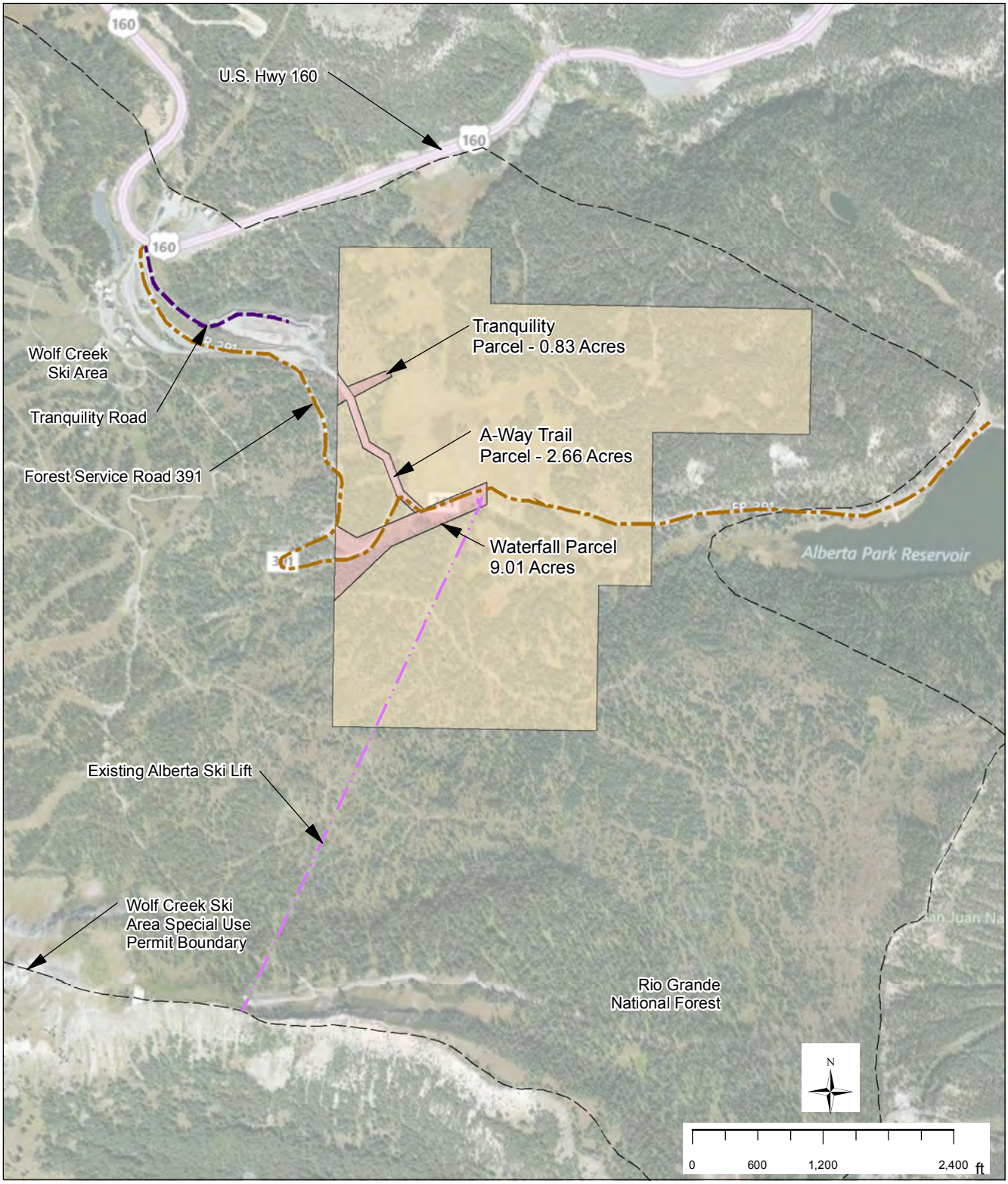


Legend

- Private Land Parcel
- Ski Area Property
- Tranquility Road
- Forest Service Road 391
- Ski Area Special Use Permit Boundary
- Existing Alberta Ski Lift

Figure 2. Alternative 1. No Action Alternative

Rio Grande
National Forest

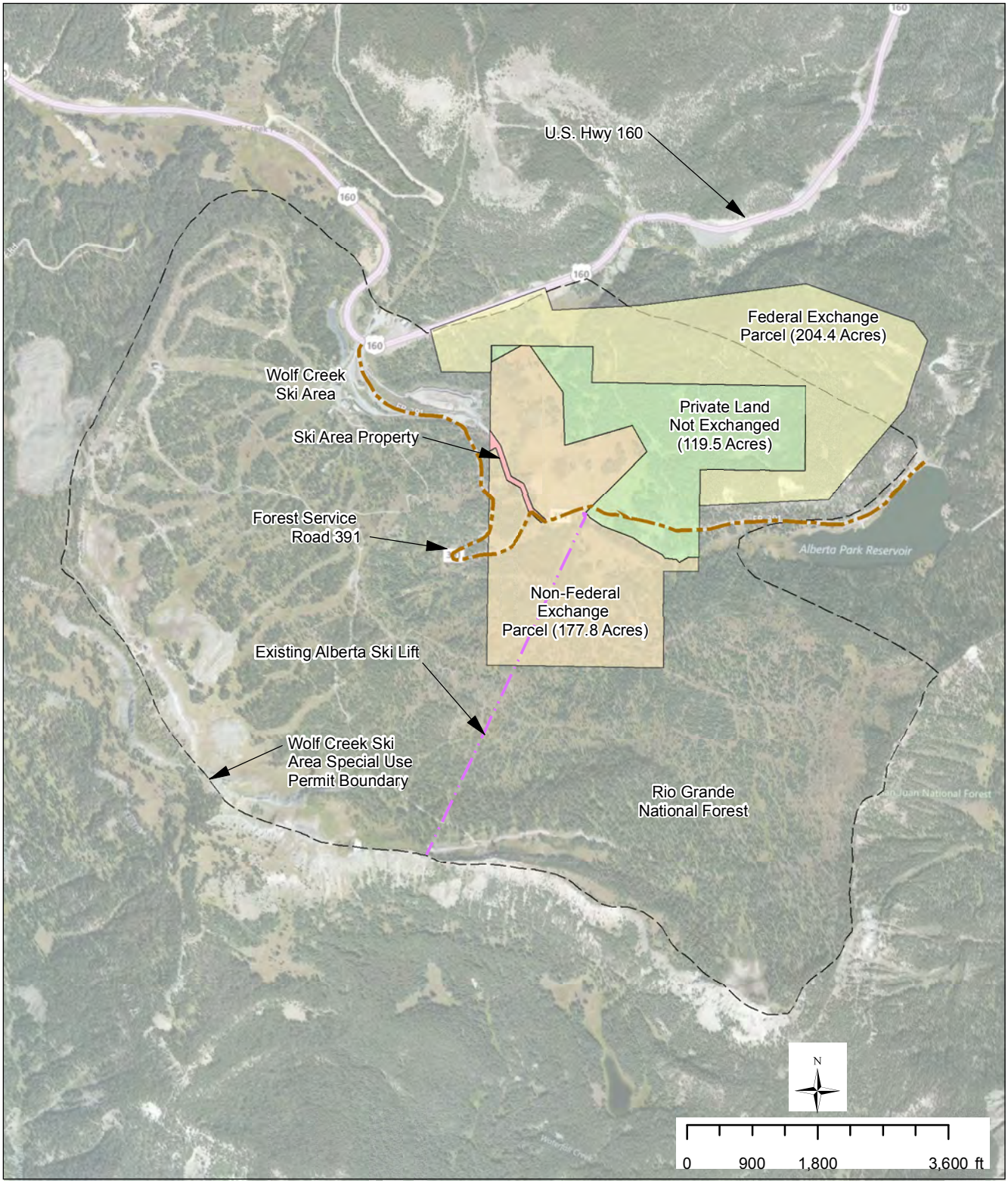


Legend

- Private Land Parcel
- Ski Area Property
- Tranquility Road
- Forest Service Road 391
- Ski Area Special Use Permit Boundary
- Existing Alberta Ski Lift

Figure 3. Land Parcels Owned by Wolf Creek Ski Corporation

Rio Grande
National Forest

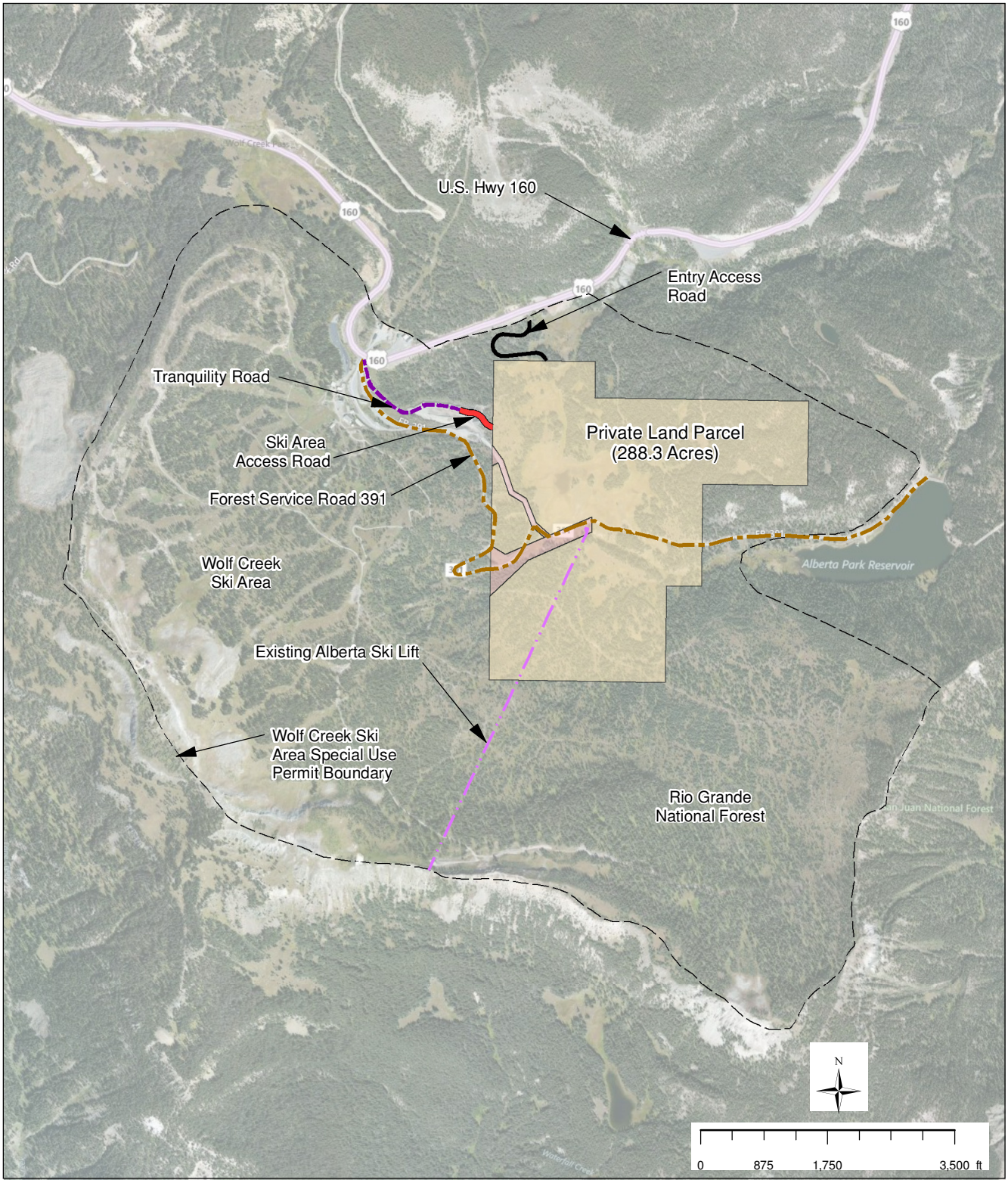


Legend

- Non-Federal Exchange Parcel
- Federal Exchange Parcel
- Private Parcel Not Exchanged
- Ski Area Property (Not Included in the Exchange)
- Forest Service Road 391
- Ski Area Special Use Permit Boundary
- Existing Alberta Ski Lift

Figure 4. Alternative 2.
Land Exchange (Proposed Action)

Rio Grande
National Forest

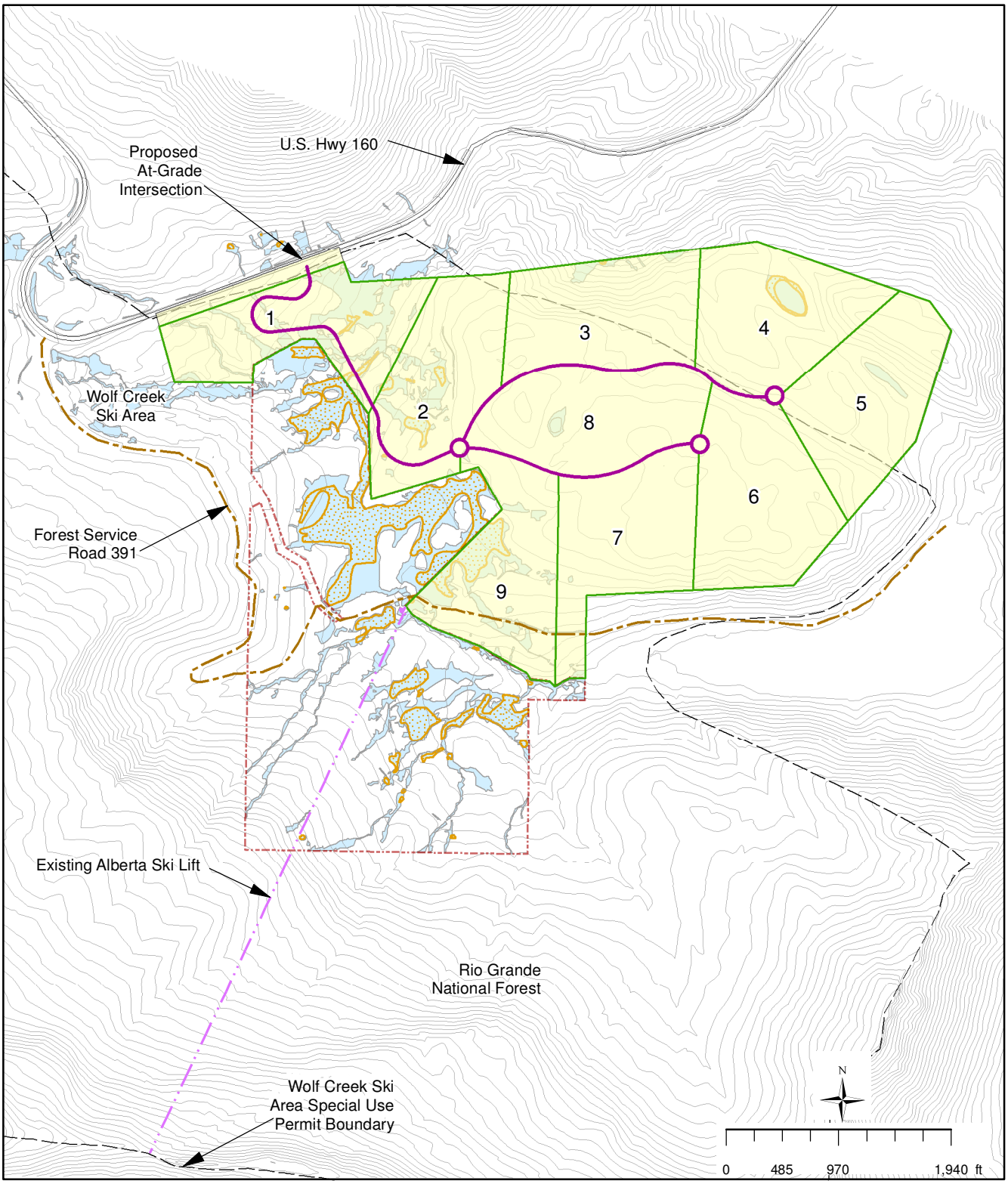


Legend

- Private Land Parcel
- Ski Area Property
- Tranquility Road
- Forest Service Road 391
- Ski Area Access Road
- Entry Access Road
- Ski Area Special Use Permit Boundary
- Existing Alberta Ski Lift

Figure 5. Alternative 3.
ANILCA Road Easement

Rio Grande National Forest



Legend

- Non-Federal Exchange Parcel
- Development Area Boundary
- 35 Acre (Minimum) Lots
- Wetlands
- Histosols and Histic Epipedons
- Forest Service Road 391
- Proposed Development Roadway
- U.S. Highway 160
- Ski Area Special Use Permit Boundary
- Existing Alberta Ski Lift

Figure 6. Alternative 2. Land Exchange
Low Density Development Concept

Rio Grande
National Forest

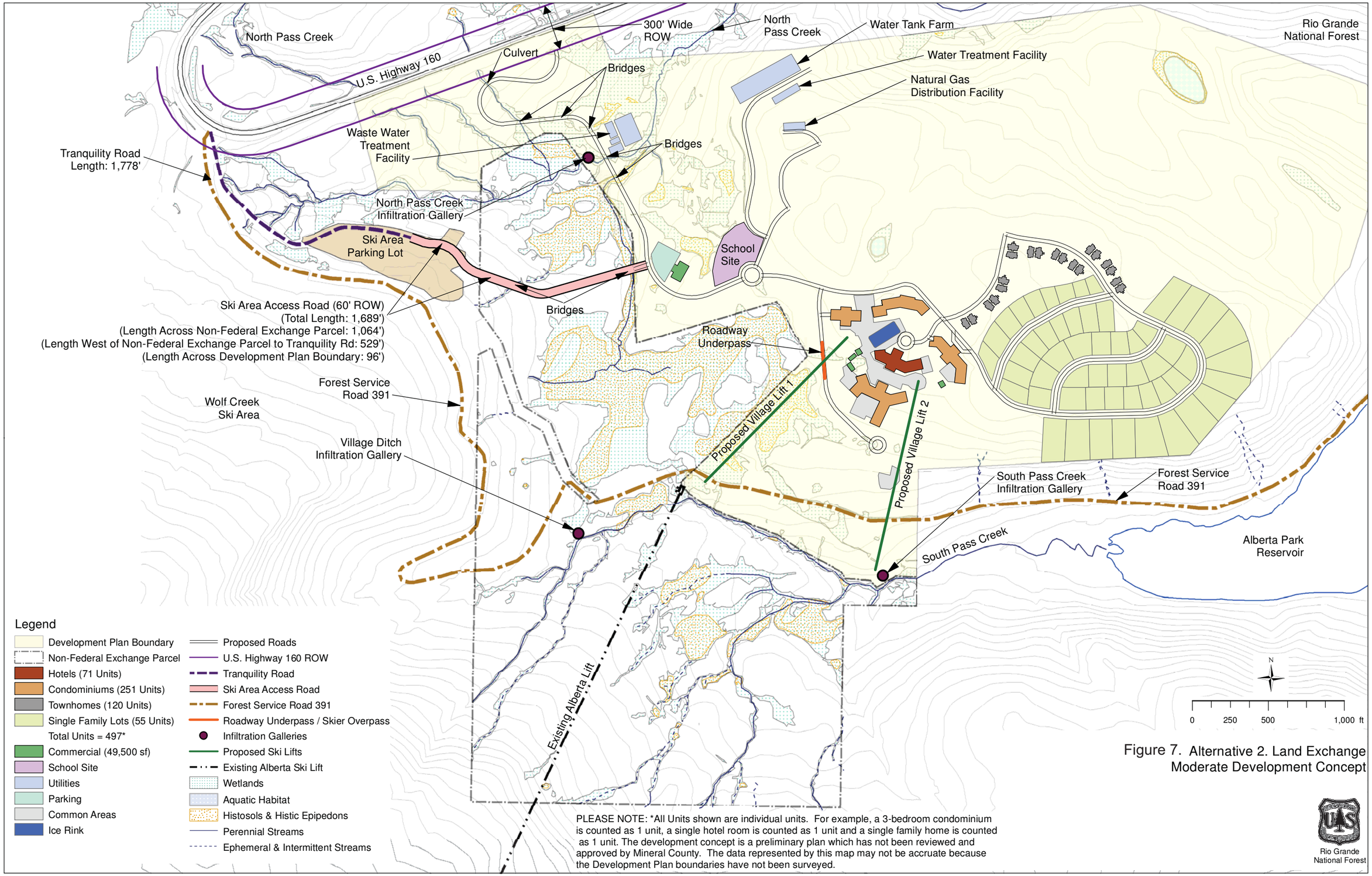


Figure 7. Alternative 2. Land Exchange Moderate Development Concept

PLEASE NOTE: *All Units shown are individual units. For example, a 3-bedroom condominium is counted as 1 unit, a single hotel room is counted as 1 unit and a single family home is counted as 1 unit. The development concept is a preliminary plan which has not been reviewed and approved by Mineral County. The data represented by this map may not be accruate because the Development Plan boundaries have not been surveyed.

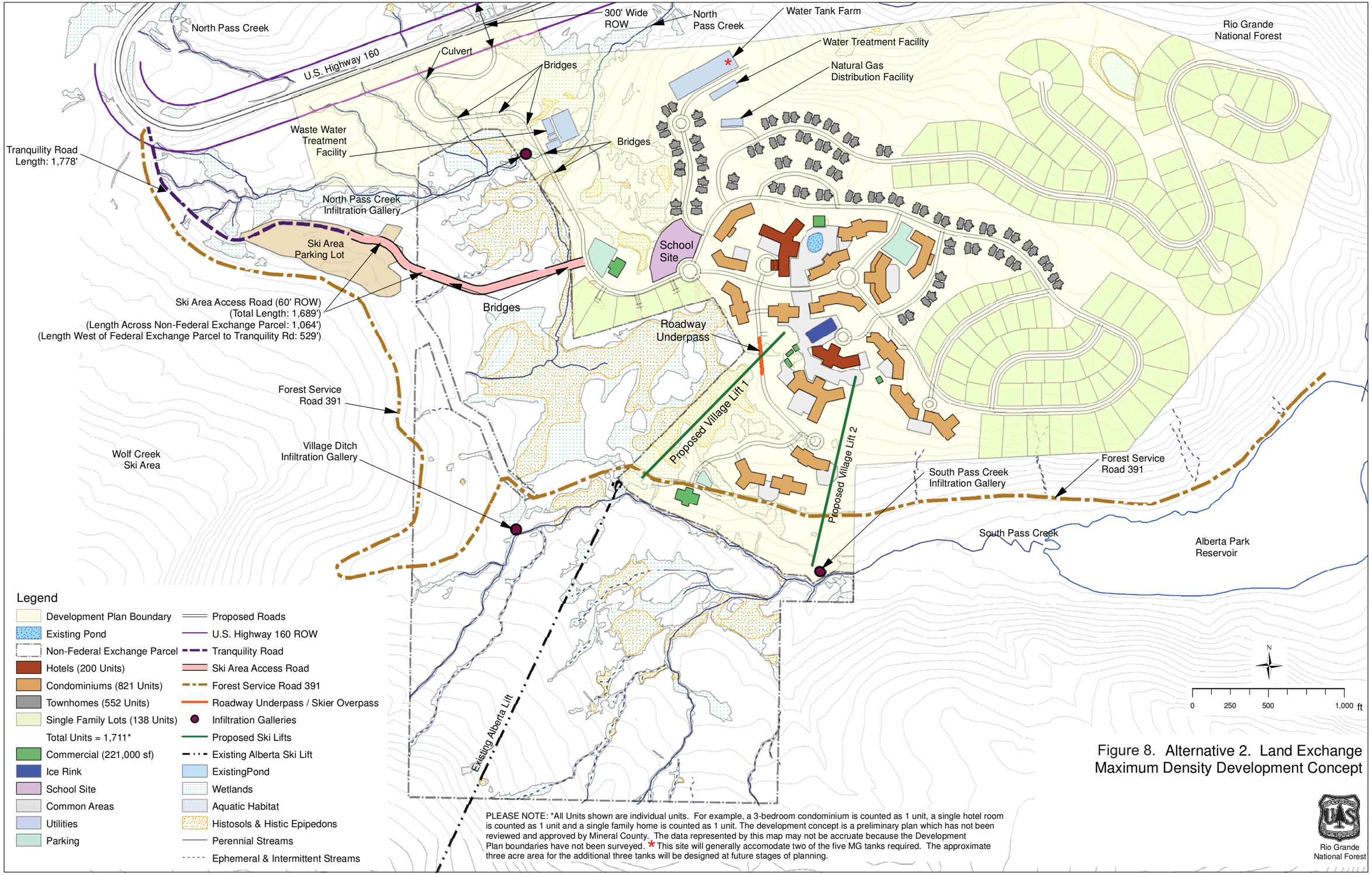
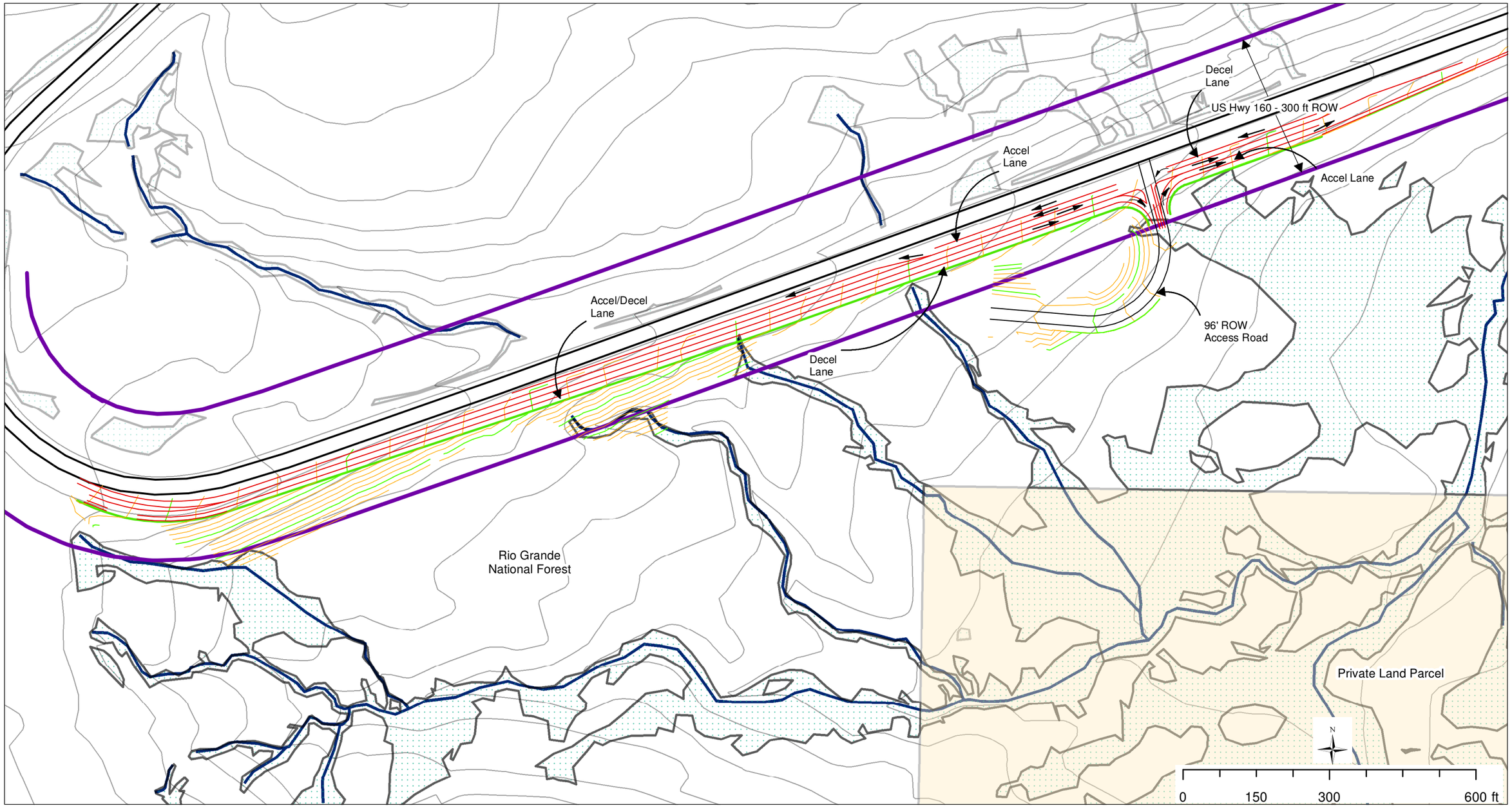


Figure 8. Alternative 2. Land Exchange Maximum Density Development Concept

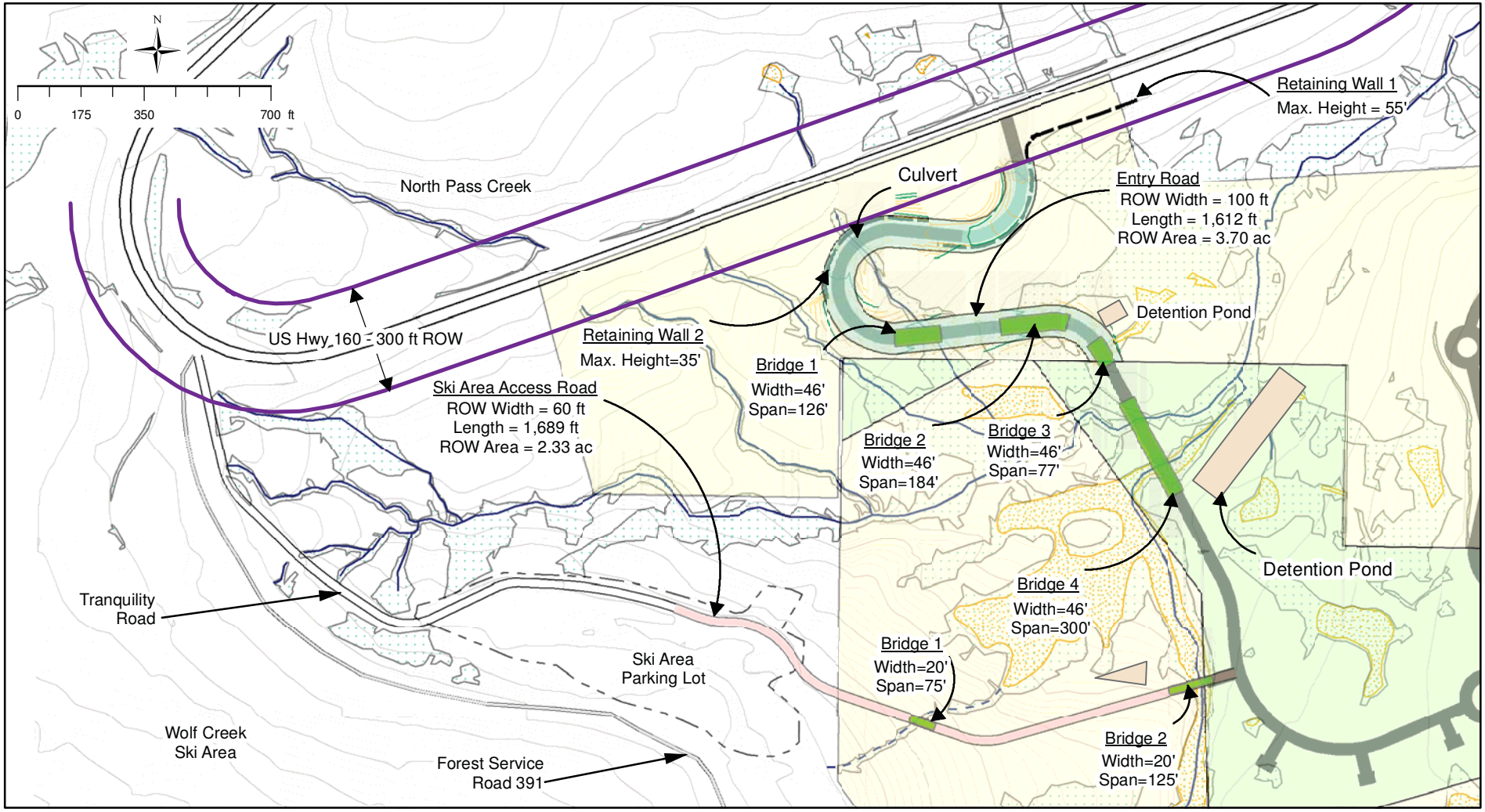


Legend

- Private Land Parcel
- Highway 160 ROW
- Highway 160 Proposed Traffic Lanes
- Highway 160 Proposed Edge of Pavement
- Entry Access Road
- Wetlands
- Perennial Streams
- Ephemeral and Intermittent Streams

Figure 9. At-Grade Intersection Design
Alternatives 2 & 3
Moderate & Maximum Density Development Concepts

Rio Grande
National Forest

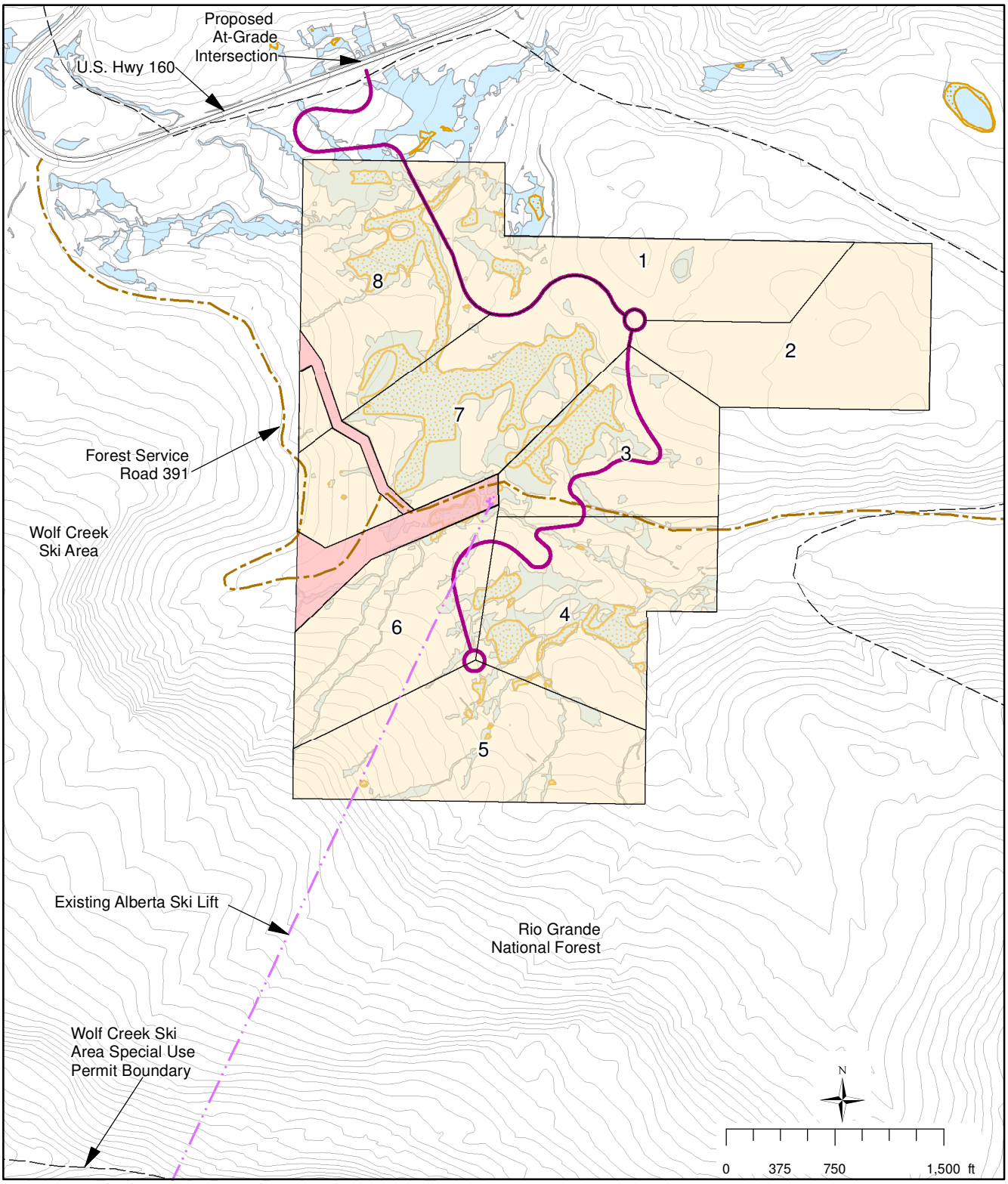


Legend

- Non-Federal Exchange Parcel
- Federal Exchange Parcel
- Private Parcel (Not to be Exchanged)
- Entry Access Road
- Ski Area Parking Lot
- Bridges
- Detention Ponds
- Proposed Roads
- Ski Area Access Road
- Tranquility Road
- Highway 160 ROW
- Retaining Wall
- Wetlands
- Aquatic Habitat
- Histosols and Histic Epipedons
- Perennial Streams
- Ephemeral and Intermittent Streams

Figure 10. Entry and Ski Area Access Roads
Land Exchange Alternative
Moderate & Maximum Density Development Concepts

Rio Grande
National Forest



Legend

- Private Land Parcel
- 35 Acre (Minimum) Lots
- Ski Area Property
- Wetlands
- Histosols and Histic Epipedons
- Proposed Development Roadway
- Forest Service Road 391
- U.S. Highway 160
- Ski Area Special Use Permit Boundary
- Existing Alberta Ski Lift

Figure 11. Alternative 3.
ANILCA Road Easement
Low Density Development Concept

Rio Grande
National Forest

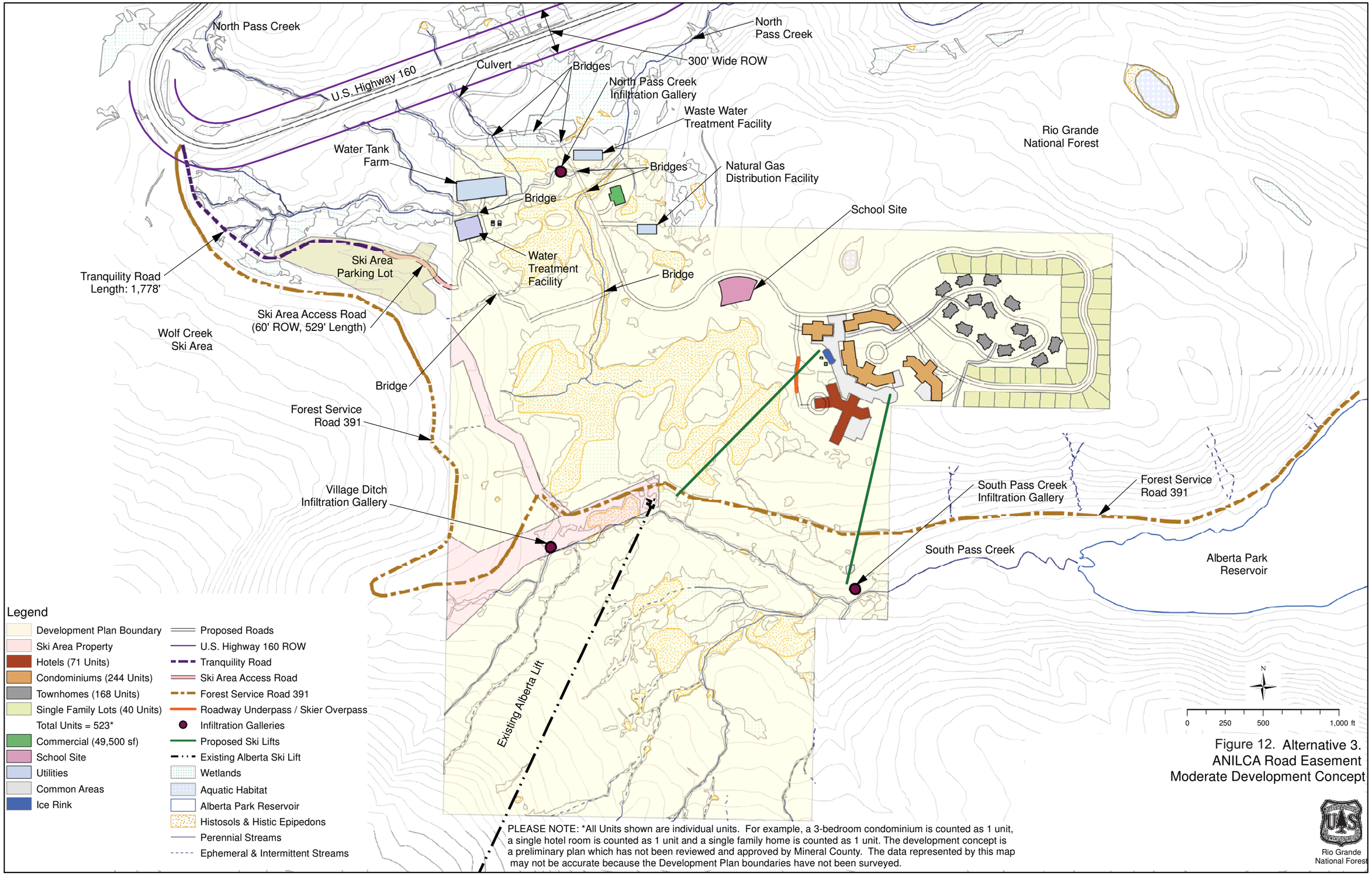


Figure 12. Alternative 3.
ANILCA Road Easement
Moderate Development Concept

PLEASE NOTE: *All Units shown are individual units. For example, a 3-bedroom condominium is counted as 1 unit, a single hotel room is counted as 1 unit and a single family home is counted as 1 unit. The development concept is a preliminary plan which has not been reviewed and approved by Mineral County. The data represented by this map may not be accurate because the Development Plan boundaries have not been surveyed.

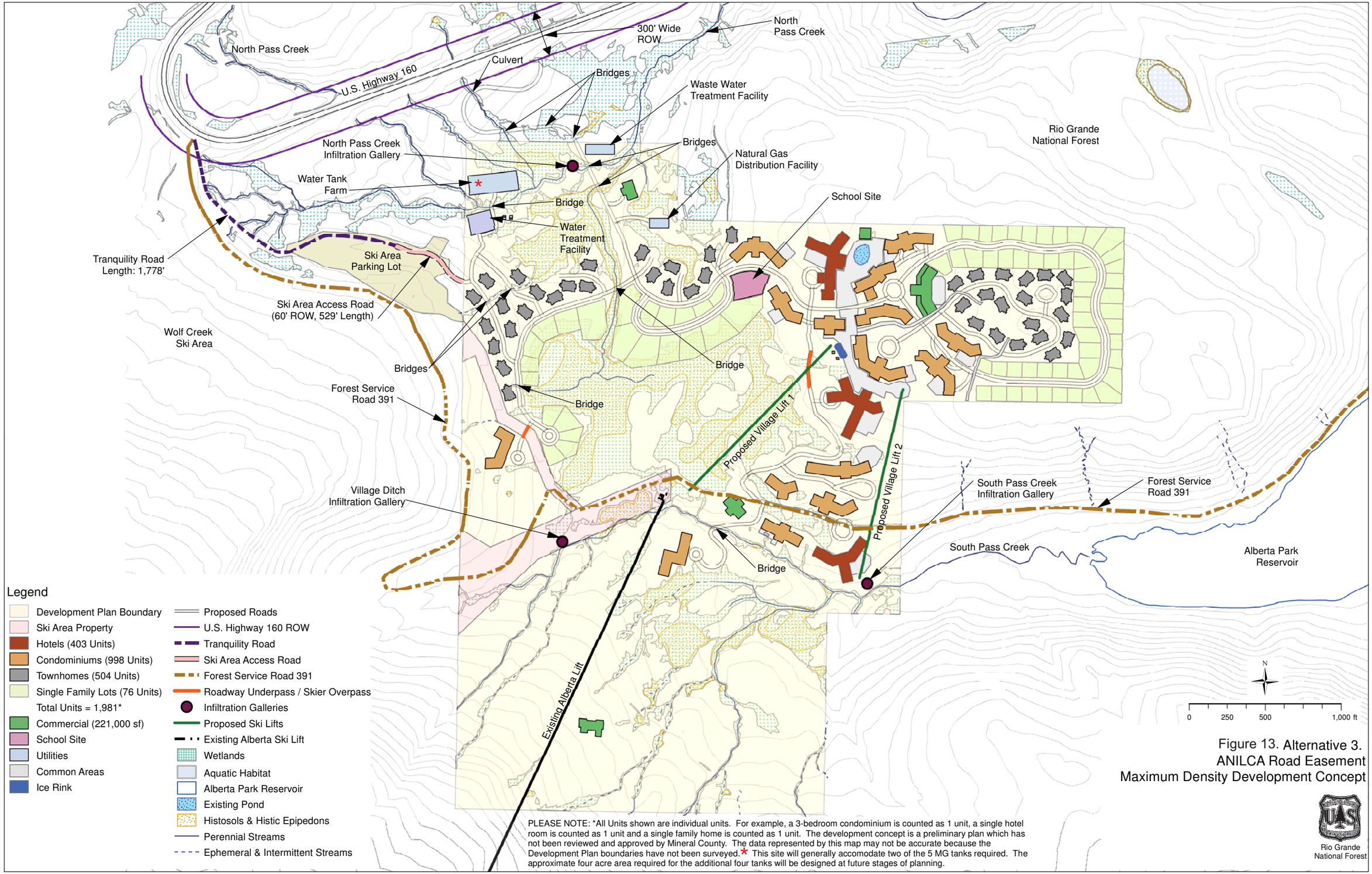


Figure 13. Alternative 3.
ANILCA Road Easement
Maximum Density Development Concept

12.0 APPENDICES

12.1 PROJECT DESIGN CRITERIA

The USFS uses many measures to reduce or prevent negative impacts to the environment in the planning and implementation of management activities. The application of these measures begins at the planning and design phase of a project. Project design criteria (PDC) identified in Section 3.3 that, if implemented in good faith, could avoid, minimize, or mitigate potential impacts to USFS resources in the proposed project area are required to make Alternatives 1-3 consistent with RGNF, Forest Plan standards and guidelines for anticipated alternative effects on NFS lands, infrastructure, and resources. To ensure consideration in the impact assessments for each alternative, these PDC have been incorporated into each alternative described in Section 2.0. Other mitigation measures may be incorporated during the project implementation. The effectiveness, feasibility, cost, and acceptability of the mitigation measures are assessed based on the following rating system. Party (or Parties) responsible for implementing, overseeing, consulting, and/or enforcing the measures are also noted.

Effectiveness:

E1 *Unknown.* Little or no experience exists in applying this measure.
E2 *Low*. May not significantly reduce the level of impact.
E3 *Moderate.* Usually results in a significant reduction in impacts. Commonly applied.
E4 *High.* Almost always reduces impacts significantly. Commonly applied.
E5 Not directly applicable to impact reduction.

Feasibility:

F1 Unknown or experimental. Little or no experience exists in applying this measure.
F2 Technically easy.
F3 Technically probable.
F4 Technically difficult.

Cost:

C1 Costs low in comparison to other options.
C2 Costs moderate in comparison to other options.
C3 Costs high in comparison to other options.

Acceptability:

A1 Legally or socially acceptable.
A2 May be legally or socially difficult.

Responsible Parties May Include:

Applicant	Private property owner
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service.
CDOW	Colorado Division of Wildlife
U.S. Army Corps of Engineers	USCOE

12.2 STRUCTURE CLASS AND HABITAT STRUCTURAL STAGE

Table 12.2-1. Cross walk defining structure class and habitat structural stage as used in the ecological analyses. Structure Class and Habitat Structural Stage are related habitat classification systems forming the basis for the R2Veg data base used to classify and evaluate wildlife habitats across NFS lands, including the RGNF (e.g., USFS 2004b).

Structure Class	Habitat Structural Stage	Description
1	1&2	GRASS/FORB/SHRUB/SEEDLING. Stand dominance by grasses, forbs (broad-leaved herbaceous plants), shrubs and/or tree seedlings up to 1" Diameter at Breast Height -- 4.5 feet (DBH) for softwoods and 2" DBH for hardwoods.
2	3a	SAPLING-POLE. Stand dominance by trees in the majority of the 1-8.9" DBH size for softwoods and 2-8.9" DBH for hardwoods with a canopy closure of less than or equal to 40%.
3	3b & 3c	SAPLING-POLE. Same as Structure Class 2 except canopy closure is 41-100%.
4	4a	MATURE. Stand dominance by trees in the majority of the 9" or larger DBH size and tree age under 200 years for softwoods and under 100 years for hardwoods. Canopy closure is 40% or less.
5	4b, 4c, & 5	LATE-SUCCESSIONAL FOREST. Two conditions are possible for meeting this category: a) Stand dominance by trees in the majority of the 9" or larger DBH size and tree age under 200 years for softwoods and under 100 years for hardwoods. Canopy closure is greater than 40%. b) Stand dominance by trees in the 5" DBH or greater size with a tree age over 200 years for softwoods and over 100 years for hardwoods. Tree crown cover is over 70 percent.

Note: Both systems are tree size and canopy closure classifications for forested cover types.

12.3 DETAILS OF DEVELOPMENT CONCEPTS

Table 12.3-1 Development Assumptions – Alternative 2. Land Exchange

Alternative 2: Land Exchange (Proposed Action) – Low Density Development Concept

- See Figure 2.4-1
- Development Parcel – ±325 acres
- 9 Lots – 35 acres or more in size
- Entry road in alignment similar to the road alignment of the maximum density development concept
- Culverts to be used for stream crossings
- At-Grade Intersection with Hwy 160 and no accel/decel lanes
- On-site water wells
- On-site septic systems
- Power from adjacent power lines
- Telephone, cable TV and fiber optics in road system
- No ski area access road would be authorized

Alternative 2: Land Exchange (Proposed Action) – Moderate Density Development Concept

- Figure 2.4-2 illustrates the moderate density development concept.
- Development Parcel – ±325 acres
- Number of Units – 497
  - Hotel 71
  - Condominium 251
  - Townhomes 120
  - Single Family Lots 55
  - Commercial 49,500 ft²
- Scenic Easement in Effect
  - All buildings and structures on the ±120 acres of private property not included in the land exchange to be at a maximum height of 48 feet. Please note, the Scenic Easement does not apply to the ±205 acres of the Federal exchange parcel to be acquired by Leavell-McCombs Joint Venture. The Mineral County Zoning Regulations as amended on April 10, 1996 would limit buildings and structures on the Federal exchange parcel to a height of 50 feet, unless specifically authorized by the County.
- Ski area access road is in 60 foot corridor which extends ±1,689 linear feet from the development internal circulation road to connect with Tranquility Road, and then follows Tranquility Road ±1,778 feet to Hwy 160. Following the land exchange, ±1,593 feet of this road would be on NFS lands, including ±1,064 linear feet across the non-Federal parcel to be acquired by the Forest Service, and ±529 linear feet across existing NFS lands west of the existing private parcel boundary. All of the landscape of the proposed road alignment across the exchange parcel and the existing Forest Service property is undeveloped except for the last ±279 linear feet, which has been disturbed by the ski area parking lot (See Figure 2.4-3).
- At-Grade Intersection with Hwy 160 with Accel/Decel Lanes (Figure 2.4-5).
- To include water storage and treatment, waste water treatment, gas distribution, and school site.

Alternative 2: Land Exchange (Proposed Action) – Maximum Density Development Concept

- Figure 2.4-6 illustrates maximum build-out of the development.
- Development Parcel – ±325 acres
- Number of Units at Build-out – 1,711
  - Hotel 200
  - Condominium 821
  - Townhomes 522
  - Single Family Lots 138
  - Commercial 221,000 square feet

Table 12.3-1 Development Assumptions – Alternative 2. Land Exchange

- Scenic Easement in Effect
  - All buildings and structures on the ±120 acres of private property not included in the land exchange to be at a maximum height of 48 feet. Please note, the Scenic Easement does not apply to the ±205 acres of the Federal exchange parcel to be acquired by Leavell-McCombs Joint Venture. The Mineral County Zoning Regulations as amended on April 10, 1996 would limit buildings and structures on the Federal exchange parcel to a height of 50 feet, unless specifically authorized by the County.
- Ski area access road is in 60 foot corridor which extends ±1,689 linear feet from the development internal circulation road to connect with Tranquility Road, and then follows Tranquility Road ±1,778 feet to Hwy 160. Following the land exchange, ±1,593 feet of this road would be on NFS lands, including ±1,064 linear feet across the non-Federal exchange parcel, and ±529 linear feet across existing NFS lands west of the existing private parcel boundary. All of the landscape of the proposed road alignment across the exchange parcel and the existing Forest Service property is undeveloped except for the last ±279 linear feet, which has been disturbed by the ski area parking lot (See Figure 2.4-3).
- At-Grade Intersection with Hwy 160 with Accel/Decel Lanes (Figure 2.4-5).

Table 12.3-2 Development Assumptions – Alternative 3. ANILCA Road Access

Alternative 3: ANILCA Road Access: Low Density Development Concept

- Figure 2.4-7 illustrates the low density development area.
- Development Parcel – ± 288 acres
- 8 lots – 35 acres or more in size
- Entry road in alignment similar to the road alignment of the maximum density development concept
- Culverts to be used for stream crossings
- At-Grade Intersection with Hwy 160 and No Accel/Decel Lanes
- On-site wells
- On-site septic systems
- Power from adjacent power lines
- Telephone, cable TV and fiber optics in road system
- No ski area access road would be authorized

Alternative 3: ANILCA Road Access: Moderate Density Development Concept

- See Figure 2.4-8
- Development Parcel – ±288 acres
- Number of Units at Build-out – 523
  - Hotel 71
  - Condominiums 244
  - Townhomes 168
  - Single Family Lots 40
  - Commercial 49,500 ft²
- Scenic Easement in Effect
  - Height of buildings and structures limited to 48 feet.
- Ski area access road in 60 foot corridor which crosses ±529 linear feet of existing NFS lands to connect with Tranquility Road, which then extends ±1,778 linear feet to connect with Hwy 160 (Figure 2.4-8). Please note, ±250 linear feet of the ski area access road crosses an undisturbed landscape and ±279 linear feet crosses a ski area parking lot disturbance.
- At-Grade Intersection with Hwy 160 with Accel/Decel Lanes (Figure 2.4-5)
- To include water storage and treatment, waste water treatment, gas distribution facility, and school site.

Table 12.3-2 Development Assumptions – Alternative 3. ANILCA Road Access

Alternative 3: ANILCA Road Access: Maximum Density Development Concept

- See Figure 2.4-9
- Development Parcel – ±288 acres
- Number of Units at Build-out – 1,981
  - Hotel 403
  - Condominiums 998
  - Townhomes 504
  - Single Family Lots 76
  - Commercial 221,000 ft²
- Scenic Easement in Effect
  - Height of buildings and structures limited to 48 feet.
- Ski area access road in 60 foot corridor which crosses 529 linear feet of existing NFS lands to connect with Tranquility Road, which then extends 1,778 linear feet to connect with Hwy 160. Please note, ±250 linear feet of the ski area access road crosses an undisturbed landscape and ±279 linear feet crosses a ski area parking lot disturbance.
- At-Grade Intersection with Hwy 160 with Accel/Decel Lanes (Figure 2.4-5)

Table 12.3-3 General Details Common to Alternatives 2 and 3 – Moderate and Maximum Density Development Concepts

General Details

- Parking
  - Residential parking underground and/or covered parking structures
  - Minimal surface parking for commercial and utility buildings, including a market, gas station/convenience store, utility facilities, and retail center
- Outdoor Lighting
  - Primarily in pedestrian plazas and development core area
  - Additional safety lighting may occur along roads, walkways, structures, and residences
  - To use dark sky friendly devices
- Fireplaces
  - Natural gas and/or propane fireplaces and limited wood fireplaces in commercial and public use areas and air quality monitoring will determine when wood can be burned
  - Spark arrestors and fire protection measures will be incorporated into any wood burning fireplace
- Trails
  - Internal trail system with connection to trails planned on NFS lands
  - Trails for hiking, biking in summer
  - Trails for snow shoeing and cross-country skiing in winter
- Landscape Sprinkle Irrigation Areas
  - Limited to 25 acres using xeriscape techniques using no more than 11.3 acre feet of water
- Shuttle Buses
  - Inter-property transportation to ski lifts
  - Shuttle buses to WCSA parking lots via ski area access road
- School Site
  - A site will be reserved for a school if a threshold of school age children in the development is met and a school is necessary
  - Must be approved by Mineral County

Table 12.3-3 General Details Common to Alternatives 2 and 3 – Moderate and Maximum Density Development Concepts

- See Figures 2.4-6 & 2.4-9

- Employee Housing
  - Housing anticipated for residential managers, facility manager and emergency personnel
  - Any other employee housing to be determined by Mineral County

- Emergency Services Plan
  - Will have emergency facility for medical clinic, fire department and sheriff sub-station
  - Development to have service agreements with ROI law enforcement, fire protection districts, hospitals, EMS, U.S. Forest Service fire protection, etc.

- Potential Number of Skier Guests On High Volume Ski Days
  - Initial Phase – 2,000
  - Maximum build-out – 6,500
  - Full time residents – Very low

- Solid Waste Management
  - Compacted on-site and transported to landfill in San Luis Valley per service agreement with waste disposal provider

Power Supply

- San Luis Valley Rural Electric Cooperative (SLVREC) has stated they can provide power for the development concepts.

- They further stated that they have plans to upgrade two segments (2.5 miles and 1.0 mile in length) of the transmission line east of the project site in the near future. Those upgrades are unrelated to, and would occur before any development at the project site, and would require Forest Service approval and analysis.

- Supplemental power options may include:
  - Propane
    - Requires shipment of propane to project site
  - Liquid Natural Gas (LNG)
    - On-site generator
    - Requires shipment of LNG to project site
    - Requires gas distribution facility
  - Natural Gas Pipeline
    - Pipeline to be extended from gas supplies west of project site and perhaps to San Luis Valley
  - Some of the power options may require a NEPA analysis

- Internal Electrical Distribution Lines within Development
  - To be within the road corridors

Water Source, Storage & Treatment

- Water Source
  - Diverted from North and South Pass Creeks via three galleries (See Figure 2.4-6)

- Diversion Points & Rates
  - North Pass Creek North Gallery – 2 cfs
  - South Pass Creek Ditch – 1.34 cfs
  - South Pass Creek South Gallery – 2 cfs

- Diversion Times
  - Filled primarily during spring/summer runoff

Table 12.3-3 General Details Common to Alternatives 2 and 3 – Moderate and Maximum Density Development Concepts

- Water also to be diverted during periods of high stream flow as induced by precipitation events

- Potential Storage Volumes
  - Alternative 2
    - Moderate Density – 7.04 mg
    - Maximum Density – approximately 26 mg
  - Alternative 3
    - Moderate Density – 7.4 mg
    - Maximum Density – approximately 30 mg

- Water Storage
  - The water tank farm sites for the moderate density development concepts for the two Action Alternatives, as illustrated by Figures 2.4-2 and 2.4-8, would likely accommodate the water storage requirements for these concepts. The water storage requirement for the maximum density development concepts would require the water tank farm area plus an additional area estimated at 3.5 acres for Alternative 2 and 4.0 for Alternative 3. The additional areas for the water storage would likely be located in the general area of the water tank farms. However, the precise location of the area for the additional water storage has not been determined at this time.
  - Alternative 2
    - Moderate Density – two 3.5 mg tanks
      - Water tank farm site is adequate.
    - Maximum Density – five 5 mg tanks
      - Need water tank farm plus about 3.5 acres more.
  - Alternative 3
    - Moderate Density – two 4 mg tanks
      - Water tank farm site is adequate.
    - Maximum Density – six 5 mg tanks
      - Need water tank farm plus about 4.0 acres more.
  - Tank Heights – estimated at 25 feet
  - Water tank farms will likely be fenced for security purposes

- Water Treatment Facility
  - To be located south of water storage tanks

- Water Treatment Capacity
  - Will exceed volume needed
  - Initial Phase – 0.15 million gallons/day (MGD)
  - Maximum Build-out – 0.45 MGD

Waste Water Treatment Facility

- Location
  - Near North Infiltration Gallery

- Treatment Processes
  - Liquid Treatment Processes
    - Equalization Basin
    - Fine Screen
    - Biological Nutrient Removal
    - Membrane Bioreactor
    - UV Disinfection
  - Solids Treatment Processes
    - Digester
    - Solids Dewatering
  - Air Handling
    - Odor control – Biofilter or scrubber

Table 12.3-3 General Details Common to Alternatives 2 and 3 – Moderate and Maximum Density Development Concepts

- Heat capture

- Estimated Chemical & Physical Characteristics of Wastewater Discharge
  - Discharge limits will be based upon the non-degradation of the receiving stream.
  - Projected Discharge Requirements:
    - TSS – 30 mg/L
    - BOD – 30 mg/L
    - BOD & TSS % removal – 85%
    - TN – 6 mg/L
    - TP – 0.3 mg/L
    - pH – 6.5 -9.0
    - WET Test – positive survival

- Treatment Facility Capacity
  - Initial Phase – 0.3 MGD
  - Maximum Build-out – 0.6 MGD

- Wastewater Discharge Volume
  - Initial Phase :
    - Flow = 0.2 MGD
    - Design = 0.3 MGD
  - Maximum Build-out :
    - Flow = 0.6 MGD
    - Design = 0.7 MGD

- Location of Sanitary Sewer Collection Lines and Pump Stations
  - Sanitary sewer to be in road system and there will be two pump stations

- Location of wastewater discharge point to North Fork
  - Ten feet or less from the point of diversion on North Pass Creek

Roads, Bridges & Highway 160 Interchange

- Road Corridor Width
  - 100 feet for entry, but may be wider in areas with landscaped medians, turning lanes, etc.
  - 60 feet for ski area access road.

- Pavement Width
  - 46 feet with 12 foot landscaped median for portion of entry road
  - 22-24 feet in most locations elsewhere

- Stream Crossings
  - Figures 2.4-6 & 2.4-9
  - 6 stream crossings
  - All to be bridged, except for first stream crossing on entry road from Hwy 160

- Roadside Ditches
  - Swales with vegetation, check dams and retention basins
  - Will accommodate snow storage

- Hwy 160 Interchange
    - At-grade intersection for Moderate Density Development (Figures 2.4-3 & 2.4-5)
  - Based on traffic counts, CDOT may require a grade-separated interchange at some point in the future of the maximum build-out development

Stormwater Management

- See the Stormwater Management Plan for Alternative 2 as described in the Preliminary Drainage

Table 12.3-3 General Details Common to Alternatives 2 and 3 – Moderate and Maximum Density Development Concepts

Report, The Village at Wolf Creek, Mineral County by TST Inc., July 25, 2011.

- Stormwater management for Alternative 3, the ANILCA Road Easement, would be similar to that of the land exchange alternative.

Snow Management Plan

- The Preliminary Drainage Report, The Village at Wolf Creek, Mineral County, Colorado prepared by TST Inc., July 25, 2011 and TST's July 18, 2012 revision provides a Snow Management Plan for the Maximum Density Development Concept for Alternative 2. Snow would be stored to a depth of about 12 feet in 20 foot wide swales constructed along one side of the access and circulation roads and in eight shallow basins scattered throughout the development. See Appendix C.

There are no snow storage plans for any of the Low and Moderate Density Development Concepts for Alternative 2 or for any of the development concepts for Alternative 3. Therefore, the assumption has been made that snow management plans for the Moderate Density Development Concepts of Alternative 2 and the Moderate and Maximum Density Development Concepts of Alternative 3 would follow a similar approach and store snow in swales along the road system and in shallow basins within the development. Furthermore, for the Low Density Development Concepts of the Action Alternatives, it is assumed that snow would simply be graded to the edges of the roads.

Fire Protection Plan

- Fire Station
  - Location to be determined during platting for Mineral County
  - Will have on-site fire department
  - Service Agreement with ROI fire protection districts and Forest Service
- Roads & Bridges
  - To be designed to accommodate fire trucks
- Building Materials
  - As per Mineral County Regulations and the International Building Code
  - Roofs
    - Asphalt shingles, metal, etc.
  - Siding
    - Woods within 15 feet of grade and non-combustible siding 15 feet above grade
    - Stony veneer
  - Trim
    - Some wood, heavy timber and log, and some non-combustible trim
- Property Owners Association
  - To enforce architectural design standards

Emergency Access

- The initial and maximum density development concepts would use the ski area access road year-round and Forest Service Road 391 during snow-free periods.
- Forest Service Road 391 can be used during snow-free periods.

Communications Utility

- Telephone, fiber optics, cable TV
- In road corridor and hung from bridges