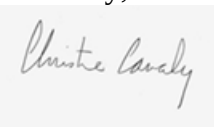
April 13, 2015

Dan Dallas, Supervisor
Rio Grande National Forest
1803 W. Highway 160
Monte Vista, CO 81144

Dear Supervisor Dallas:

On behalf of the undersigned organizations, we are pleased to present to you the attached submission for consideration and incorporation in the assessment phase of the Rio Grande National Forest Land Management Plan revision. The references cited in our submission are included in the copy sent via ground mail. We are pleased to be participating in this important process, and look forward to the opportunity to review the draft forest assessment report. If you have any questions regarding this matter, please do not hesitate to contact us.

Sincerely,



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I. Introduction

On behalf of the undersigned organizations, we are pleased to present to you the following comments for consideration and incorporation in the assessment phase of the Rio Grande National Forest Land Management Plan revision. The 2012 National Forest System Land Management Planning Rule requires the Forest Service to provide opportunities for public participation in the development of the assessment, including the submission of existing information by the public.[1]

This submission specifically addresses several of the elements the Forest Service is required to evaluate in a plan assessment, including designated areas, transportation infrastructure, and ecological integrity and wildlife.[2] While certainly not exhaustive, we believe the information contained in this letter and its appendices represents the best available science, which the 2012 planning rule requires the agency to utilize.[3] We anticipate that the Forest Service will have additional forest-specific information available and will also utilize that information in the assessment.

II. Organizational Interests

The San Luis Valley Ecosystem Council (SLVEC) is a public lands advocacy organization whose mission is to protect and restore—through research, education, and advocacy—the biological diversity, ecosystems, and natural resources of the Upper Rio Grande bioregion, balancing ecological values and human needs. SLVEC embraces and promotes the preservation of beauty, biodiversity and the health of the San Luis Valley and upper Rio Grande bioregion.

The Quiet Use Coalition is a non-profit environmental organization founded in 1997 with 300 members. Based in Salida, Colorado, its mission is to preserve and create quiet use areas on our public lands and waters, while protecting natural soundscapes and wildlife habitat. Although the Quiet Use Coalition focuses its work on central Colorado, it also engages in federal lands planning and management issues across the state.

Rocky Smith is a forest management analyst and consultant with more than 30 years of experience in national forest management. He has reviewed every national forest plan issued in Colorado and led the preparation of a citizen's alternative for the first revision of the Rio Grande National Forest (RGNF) management plan in the early 1990s. He has analyzed and commented on hundreds of project proposals, including many on the RGNF. He enjoys recreating in the Rio Grande National Forest in all seasons.

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[1] 36 C.F.R. § 219.4(a) (generally requiring "opportunities to the public for participating in the assessment process"); *id.* § 219.6(a)(2) (agency must "[c]oordinate with or provide opportunities for . . . non-governmental parties[] and the public to provide existing information for the assessment").

[2] 36 C.F.R. § 219.6(b) enumerates 15 categories for which "the responsible official shall identify and evaluate existing information relevant to the plan area." The categories most relevant to this submission include: (1) "potential need and opportunity for additional designated areas," *id.* § 219.6(b)(15); (2) "[i]nfrastructure, such as recreational facilities and transportation and utility corridors," *id.* § 219.6(b)(11); (3) "[t]errestrial ecosystems, aquatic ecosystems, and watersheds," *id.* § 219.6(b)(1); and (4) "[t]hreatened, endangered, proposed and candidate species, and potential species of conservation concern present in the plan area," *id.* § 219.6(b)(5).

[3] 36 C.F.R. § 219.3 (agency "shall use the best available scientific information to inform the planning process" and "shall document how [that] information was used to inform the assessment").

Rocky Mountain Wild works to protect, connect, and restore wildlife and wildlands in the Southern Rocky Mountain region. With over 6000 members and supporters, the organization employs sound science, public education, grassroots organizing, policy implementation, and legal measures to achieve on-the-ground conservation results. For the last fifteen years, Rocky Mountain Wild has been actively engaged in safeguarding wild areas within the Rio Grande National Forest.

Defenders of Wildlife (Defenders) is a national non-profit conservation organization founded in 1947 focused on conserving and restoring native species and the habitat upon which they depend. Defenders has 1,200,000 members and supporters nationwide, include our 30,000 members and activists from Colorado.

The Wilderness Society (TWS) represents more than 500,000 members and supporters who share our mission to protect wilderness and inspire Americans to care for our wild places. Since our founding in 1935, TWS has worked closely with diverse interests who care about the future of our national forests. TWS provides scientific, economic, legal, and policy guidance to land managers, communities, local conservation groups, and state and federal decision-makers. In doing so, TWS hopes to ensure the best management of our public lands. Our members and supporters nationwide and, in particular, the 4,089 members and 14,753 supporters in Colorado are deeply interested in forest planning as it pertains to the conservation, restoration, and protection of wildlands, wildlife, water, recreation and the ability to enjoy public lands for inspiration and spiritual renewal.

III. Optimizing the Assessment

As a preliminary matter, we have some over-arching suggestions for optimizing the assessment to ensure it complies with the letter and intent of the 2012 planning rule and provides the information necessary for a successful plan revision. The assessment is designed to "evaluate existing information about relevant ecological, economic, and social conditions, trends, and sustainability and their relationship to the land management plan" and to provide the basis for the Forest Service's identification of the need to change existing plan direction.[4] To that end, the 2012 rule enumerates 15 topics that the assessment must address.[5] For each of those topics, we suggest that the Forest Service develop a series of questions that the assessment will strive to answer.[6] We believe that question-and-answer approach will best assist the agency in evaluating the extent to which current plan direction satisfies the substantive requirements of the 2012 rule and other relevant law and policy. The following sections of this letter propose relevant questions for each of the topics addressed in detail.

[4] 36 C.F.R. § 219.5(a)(1) & (2)(i).
[5] 36 C.F.R. § 219.6(b).
[6] *See, e.g.*, Nantahala and Pisgah National Forests Assessment (Sept. 20, 2013 draft), *available at* http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5436795.pdf (generally utilizing question and answer approach).

After developing the questions, the Forest Service should identify existing studies, reports, proposals, and other information that may be relevant, determine which sources of information constitute the best available science, and utilize that information to answer the questions. In doing so, the agency must "[d]ocument . . . how the best available scientific information was used to inform the assessment," including "[i]dentify[ing] what information was determined to be the best available scientific information, explain[ing] the basis for that determination, and explain[ing] how the information was applied to the issues considered."[7] In addition to recommending questions, this letter also strives to identify the best available scientific information and apply it to answer the relevant questions.

IV. Potential Need and Opportunity for Additional Designated Areas

The 2012 planning rule requires that an assessment evaluate "[e]xisting designated areas located in the plan area including wilderness and wild and scenic rivers ***and potential need and opportunity for additional designated areas***."[8] This evaluation is intended to inform the plan revision process, which in turn requires the Forest Service to determine whether to designate or recommend for designation any additional areas:

> The responsible official shall: . . . (v) Identify and evaluate lands that may be suitable for inclusion in the National Wilderness Preservation System and determine whether to recommend any such lands for wilderness designation. (vi) Identify the eligibility of rivers for inclusion in the National Wild and Scenic Rivers System . . . . (vii) Identify existing designated areas other than [Wilderness and Wild and Scenic Rivers] and determine whether to recommend any additional areas for designation. If the responsible official has the delegated authority to designate a new area or modify an existing area, then the responsible official may designate such area when approving the . . . plan revision.[9]

To comply with this mandatory duty, it is critical that the assessment effectively evaluate the potential need and opportunity for additional designated areas. Unfortunately, some early assessments under the 2012 planning rule have failed to do so.[10] To effectively evaluate the potential need and opportunity for additional designated areas, we recommend that the assessment identify and strive to answer the following questions:

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[7] 36 C.F.R. §§ 219.3, 219.6(a)(3).
[8] 36 C.F.R. § 219.6(b)(15) (emphasis added).
[9] 36 C.F.R. § 219.7(c)(2)(v)-(vii). The 2012 rule defines "designated area" as "[a]n area or feature identified and managed to maintain its unique special character or purpose." *Id.* § 219.19. The definition further explains that "[s]ome categories of designated areas may be designated only by statute and some categories may be established administratively in the land management planning process or by other administrative processes of the Federal executive branch." *Id.* (listing examples of statutorily and administratively designated areas).
[10] *See, e.g.*, Final Sierra National Forest Assessment at 199-221, *available at* http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5444580.pdf (describing existing designated areas, including their "existing conditions and future trends" and "contribution[s] . . . to "ecological, social or economic sustainability," but not evaluating potential need and opportunity for *additional* designated areas); Sequoia National Forest Assessment at 201-19 (Dec. 2013), *available at* http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5444840.pdf (same).

A. What areas of the forest outside of designated Wilderness have roadless character (both inventoried and un-inventoried)?
B. What ecosystem and habitat types exist across the forest, and what are their levels of protection within the forest and throughout the region? What types are least represented in designated areas?
C. What unique features, values, or resources exist across the forest – including but not limited to the examples listed below – and what is their current status of protection?
    - Botanical, geological, historical, cultural, paleontological, recreational, scenic, aquatic, or zoological resources
    - Climate refugia, migratory corridors, and other features that enhance species protection and habitat connectivity
D. Do existing Research Natural Areas satisfy the objectives listed in Forest Service Manual 4063.02?
E. What are the socio-economic factors relevant to protecting national forest lands through conservation designations (e.g., recreation trends, public sentiment, etc.)?

This list of recommended questions is non-exclusive and is intended to focus the assessment on the relevant substantive and procedural requirements of the 2012 rule, the corresponding directives contained in Forest Service Handbook (FSH) 1909.12, and other federal laws and policies. Each of the questions is addressed in more detail below. Collectively, the answers to the questions, as informed by the best available science, will demonstrate a potential need and opportunity for additional designated areas, including recommended wilderness, on the Rio Grande National Forest.

A. What areas of the forest outside of designated Wilderness have roadless character?

The Rio Grande National Forest currently encompasses 340,100 acres of designated Wilderness. The forest also has significant unprotected and undeveloped acreage that may be suitable for additional protection through the forest planning process. For example, the forest has 530,000 acres of Inventoried Roadless Areas (IRAs) identified under the 2001 Roadless Area Conservation Rule[11], and 518,600 acres identified under the 2012 Colorado Roadless Rule, 340,300 acres of which are in Upper Tier.[12]

As described in more detail below, this vast undeveloped acreage **presents a significant opportunity to designate or recommend for designation additional areas and to enhance the myriad ecological and social benefits associated with conservation of roadless lands**. A robust assessment of the need and opportunity to further protect these roadless lands through conservation designations is a critical prerequisite to satisfaction of the Forest Service's substantive obligations under the 2012 planning rule to provide for ecological integrity, species diversity, and social, economic, and ecological sustainability.[13]

[11] 66 Fed. Reg. 3244 (Jan. 12, 2001).
[12] 77 Fed. Reg. 39576 (July 3, 2012)
[13] *See* 36 C.F.R. §§ 219.8-219.9.

1. The Rio Grande National Forest presents cross-boundary opportunities to protect regionally significant roadless areas.

The Rio Grande National Forest has a number of Colorado Roadless Areas located contiguous to BLM roadless areas. These contiguous Forest Service/BLM roadless areas provide potential opportunities to protect larger roadless tracts that include lower and higher elevation lands and often provide conduits for wildlife from the highlands to the lowlands. Figure 1 is a map showing the location of Colorado Roadless Areas on the Rio Grande National Forest in relationship to Colorado Roadless Areas on the adjacent National Forests, adjacent/proximal BLM lands with wilderness characteristics, and Wilderness areas.[14] Contiguous to the Rio Grande's Colorado Roadless Areas are BLM unroaded areas near Saguache, along the west side of the Sangre de Cristo Mountains, and southwest of Monte Vista. Forest Service directives require inclusion of areas in the wilderness inventory where Forest Service unroaded acres are contiguous to another forest's unroaded acres or wilderness inventories of other federal ownership, regardless of their size.[15]

Enhancing these cross-boundary opportunities is the fact that the Rio Grande National Forest National Forest has regionally significant wild areas. In 2000, Aplet et al. applied an index to map "wildness" across the contiguous United States. The index was based on aggregated values for six attributes: solitude, remoteness, uncontrolled processes, natural composition, unaltered structure, and pollution. Although there are a number of wildness indices in the literature, Aplet's index in particular enables a consistent comparison of wildness values across a region and the country, and highlights larger landscapes with wildness values and the potential to connect them.

With respect to the region encompassing the Rio Grande National Forest, Aplet's index shows that the Rio Grande National Forest contains some of the wildest areas in Colorado and the surrounding region (see Figure 2). In addition, at a landscape scale, the lands within the Rio Grande National Forest are important pieces in a larger network of wild lands in southwest Colorado and northern New Mexico that includes Bureau of Land Management Wilderness Study Areas (WSA), designated wilderness areas, and US Fish and Wildlife Service Refuges.

In sum, with over half a million acres of roadless areas, some of which are contiguous or proximal to BLM roadless lands as well as roadless lands and Wilderness on the GMUG, San Isabel and the San Juan National Forest, the Rio Grande National Forest clearly has potential opportunity for additional designations including additional Wilderness areas. This opportunity is enhanced by the fact that the Rio Grande National Forest contains lands that are wild relative to other places regionally and nationally.

2. Establishing additional designated areas to conserve undeveloped lands will help address current ecological needs relevant to biodiversity, connectivity, and climate change adaptation.

[14] There are about 80 miles of RGNF lands connected to other National Forest lands that have a designation with greater administrative protection. In most instances these other designations are Colorado roadless lands not wilderness. See Table 1.

[15] FSH 1909.12, ch. 70, § 71.21(2) (wilderness inventory to include "areas contiguous to an existing wilderness, primitive areas, administratively recommended wilderness, or wilderness inventories of other Federal ownership").

Undeveloped natural lands provide numerous ecological benefits. They safeguard biodiversity, enhance ecosystem representation (see discussion below), facilitate connectivity (Loucks et al. 2003; USDA 2001; Crist and Wilmer 2002; Wilcove 1990; The Wilderness Society 2004; Strittholt and Dellasala 2001; DeVelice and Martin 2001), and provide high quality or undisturbed water, soil, and air resources (Anderson et al. 2012; Dellasalla et al. 2011). They also serve as ecological baselines to facilitate better understanding of our impacts to other landscapes (Arcese and Sinclair 1997).

Forest Service roadless lands, in particular, are heralded for their conservation values. Those values are described at length in the preamble of the Roadless Area Conservation Rule (RACR)[16] and in the Final Environmental Impact Statement (FEIS) for the RACR.[17] They include: high quality or undisturbed soil, water, and air; sources of public drinking water; diverse plant and animal communities; habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; primitive, semi-primitive non- motorized, and semi-primitive motorized classes of dispersed recreation; reference landscapes; natural appearing landscapes with high scenic quality; traditional cultural properties and sacred sites; and other locally identified unique characteristics (e.g., uncommon geological formations, unique wetland complexes, exceptional hunting and fishing opportunities).

Numerous articles in the scientific literature similarly recognize the contribution of roadless and undeveloped lands to biodiversity, connectivity, and conservation reserve networks. For example, Loucks et al. (2003) examined the potential contributions of roadless areas to the conservation of biodiversity, and found that more than 25% of IRAs are located in globally or regionally outstanding ecoregions[18] and that 77% of IRAs have the potential to conserve threatened, endangered, or imperiled species. Arcese and Sinclari (1997) highlighted the contribution that IRAs could make toward building a representative network of conservation reserves in the United States, finding that protecting those areas would expand eco-regional representation, increase the area of reserves at lower elevations, and increase the number of large, relatively undisturbed refugia for species. Crist and Wilmer (2002) looked at the

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[16] 66 Fed. Reg. at 3245-47.

[17] Final Environmental Impact Statement, Vol. 1, 3–3 to 3–7, *available at* http://www.fs.usda.gov/roaddocument/roadless/2001roadlessrule/finalruledocuments.

[18] Loucks et al utilize an ecosystem ranking system developed by Ricketts et al. (1999) found at Ricketts, T. H., E. Dinerstein, D. M. Olson, C. J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanaugh, P. Hedao, P. T. Hurley, K. M. Carney, R. Abell, and S. Walters. 1999. Terrestrial ecoregions of North America: a conservation assessment. Island Press, Washington, D.C., USA.

("Ricketts et al. (1999) classified the biological importance of each ecoregion based on species distribution, i.e., richness and endemism, rare ecological or evolutionary phenomena such as large-scale migrations or extraordinary adaptive radiations, and global rarity of habitat type, e.g., Mediterranean-climate scrub habitats. They used species distribution data for seven taxonomic groups: birds, mammals, butterflies, amphibians, reptiles, land snails, and vascular plants (Ricketts et al. 1999). Each category was divided into four rankings: globally outstanding, high, medium, and low. The rankings for each of the four categories were combined to assign an overall biological ranking to each ecoregion. Ecoregions whose biodiversity features were equaled or surpassed in only a few areas around the world were termed "globally outstanding." To earn this ranking, an ecoregion had to be designated "globally outstanding" for at least one category. The second-highest category, or continentally important ecoregions, were termed "regionally outstanding," followed by "bioregionally outstanding" and "nationally important" (Ricketts et al. 1999).")

ecological value of roadless lands in the Northern Rockies and found that protection of national forest roadless areas, when added to existing federal conservation lands in the study area, would: 1) increase the representation of virtually all land cover types on conservation lands at both the regional and ecosystem scales, some by more than 100%; 2) help protect rare, species-rich, and often-declining vegetation communities; and 3) connect conservation units to create bigger and more cohesive habitat "patches."

Roadless lands are also responsible for higher quality water and watersheds. Anderson et al. (2012) assessed the relationship of watershed condition and land management status, and found a strong spatial association between watershed health and protective designations. Dellasalla et al. (2011) found that undeveloped and roadless watersheds are important for supplying downstream users with high-quality drinking water, and that developing those watersheds comes at significant costs associated with declining water quality and availability. The authors recommend a light-touch ecological footprint to sustain healthy watersheds and the many other values that derive from roadless areas.

The Forest Service, National Park Service, and U.S. Fish and Wildlife Service recognize that protecting and connecting undeveloped areas is an important action agencies can take to enhance climate change adaptation. For example, the Forest Service National Roadmap for Responding to Climate Change (2011) establishes that increasing connectivity and reducing fragmentation are short- and long-term actions the agency should take to facilitate adaptation to climate change.[19] The National Park Service also identifies connectivity as a key factor for climate change adaptation, along with establishing "blocks of natural landscape large enough to be resilient to large-scale disturbances and long-term changes." The agency states that "[t]he success of adaptation strategies will be enhanced by taking a broad approach that identifies connections and barriers across the landscape. Networks of protected areas within a larger mixed landscape can provide the highest level of resilience to climate change."[20] Similarly, the Climate Adaptation Strategy adopted by a partnership of governmental agencies including the U.S. Fish and Wildlife Service calls for creating an ecologically-connected network of conservation areas. [21] The 2012

[19] Forest Service, FS-957b, *National Roadmap for Responding to Climate Change* at 26 (2011), *available at* http://www.fs.fed.us/climatechange/advisor/roadmap.html.

[20] National Park Service, Climate Change Adaptation, http://www.nps.gov/subjects/climatechange/adaptation.htm (last visited Dec. 23, 2014). *See also* National Park Service, *Climate Change Response Strategy* (2010), *available at* http://www.nature.nps.gov/climatechange/docs/NPS_CCRS.pdf (Objective 6.3 is to "Collaborate to develop cross-jurisdictional conservation plans to protect and restore connectivity and other landscape-scale components of resilience.").

[21] *See* National Fish, Wildlife and Plants Adaptation Partnership, *Climate Adaptation Strategy* at 55-59 (2012), *available at* http://www.wildlifeadaptationstrategy.gov/strategy.php. Relevant goals and strategies include:

> Goal 1: Conserve habitat to support healthy fish, wildlife, and plant populations and ecosystem functions in a changing climate.
>
> > Strategy 1.1: Identify areas for an ecologically-connected network of terrestrial, freshwater, coastal, and marine conservation areas that are likely to be resilient to climate change and to support a broad range of - fish, wildlife, and plants under changed conditions.
> >
> > Strategy 1.2: Secure appropriate conservation status on [high priority areas] to complete an ecologically-connected network of public and private conservation areas that will be resilient to climate change and support a broad range of species under changed conditions.
> >
> > Strategy 1.4: Conserve, restore, and as appropriate and practicable, establish new ecological connections among conservation areas to facilitate fish, wildlife, and plant migration, range shifts, and other transitions caused by climate change.

planning rule's substantive ecological sustainability provision sanctions this reserve design and landscape connectivity approach, requiring the Forest Service to formulate "plan components, including standards and guidelines, to maintain or restore [the] structure, function, composition, and connectivity" of terrestrial and aquatic ecosystems and watersheds, taking into account stressors such as climate change.[22]

B. What ecosystem and habitat types exist across the forest, and what are their levels of protection within the forest and throughout the region? What types are least represented in designated areas?

As described in more detail in Appendix 1, protection of diverse ecosystem and habitat types through wilderness and other designations is a cornerstone of regional, national, and international efforts to conserve biological diversity and ecological processes of natural ecosystems (Bertzky et al. 2012). For protected areas to conserve genetic, species, and community diversity – as well as the composition, structure, function, and evolutionary potential of natural systems – they must encompass the full variety of ecosystems (Olson & Dinerstein 1998; Margules & Pressey 2000). Indeed, protecting ecosystem diversity is a central purpose of forest planning under the 2012 planning rule:

> Plans will guide management of [National Forest System] land so that they are ecologically sustainable and contribute to social and economic sustainability; ***consist of ecosystems and watersheds with ecological integrity and diverse plant and animal communities***; and have the capacity to provide people and communities with ecosystem services and multiple uses that provide a range of social, economic, and ecological benefits for the present and into the future.[23]

To that end, a forest assessment's evaluation of the potential need and opportunity for additional designated areas should consider whether there are "specific land types or ecosystems present in the plan area that are not currently represented or minimally represented."[24] That analysis of ecosystem representation in turn will help inform the Forest Service's determination during the plan revision process whether to designate or recommend for designation additional areas.[25] It will also assist the agency in satisfying its substantive planning mandates to provide for ecological sustainability and integrity and "the diversity of plant and animal communities and the persistence of native species."[26]

To provide the agency with what we believe to be the best available science on this issue, we conducted an analysis of ecosystem representation in the National Wilderness Preservation System (NWPS) at the national- and forest-level scales (Appendix 1; Dietz et al. 2014 (in revision)). That analysis shows that the NWPS suffers from a significant under-representation of

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[22] 36 C.F.R. § 219.8(a)(1).
[23] 36 C.F.R. § 219.1(c) (emphasis added).
[24] FSH 1909.12, ch. 10, § 14 4c.
[25] *See, e.g.*, FSH 1909.12, ch. 70, § 72.1(4) (agency must "[e]valuate the degree to which [potential wilderness areas] may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value," which "may include[r]are plant or animal communities or rare ecosystems").
[26] 36 C.F.R. §§ 219.8-219.9; *see also id.* § 219.9(a)(2) (plans "must include plan components . . . to maintain or restore the diversity of ecosystems and habitat types").

many ecosystems. Relative to the Rio Grande National Forest, our analysis shows that a significant number of inventoried roadless areas on the Rio Grande National Forest contain high proportions of inadequately represented ecosystem types at both the forest-level and national scales (Appendix 1, Tables 1 & 2; Maps 2 & 3). We found that:

- Under-represented ecosystems (at both representation levels) cover over 50% of the acreage of 22 of the 53 inventoried roadless areas in the forest, and over 80% of 7 of the 53 areas. The ecosystem under-representation problem is particularly acute at the forest level, where severely under-represented ecosystem types (<5%) cover over 40% – and up to 71% – of the acreage of 10 of the 53 inventoried roadless areas.

- 20 of 31 ecosystems on the RGNF are under-represented at the forest level, and 21 of 31 are under-represented at the federal level. (Appendix 1, Table 3, Tabs 1 & 2; Map 3)

- 43% of the RGNF (788,000 acres) is comprised of under-represented ecosystem types. The leading under-represented systems at the forest level are:
    - Rocky Mountain Aspen Forest and Woodland (13.7% representation in Wilderness),
    - Southern Rocky Mountains Montane-Subalpine Grassland (3.4% representation in Wilderness),
    - Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (5.4% representation in Wilderness),
    - Southern Rocky Mountain Ponderosa Pine Woodland (1.0% representation in Wilderness), and
    - Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (3.5% representation in Wilderness).

- Of the 53 Colorado Roadless Areas (CRAs) on the RGNF, 22 have more than half of their acreage in under-represented ecosystems, and 7 have more than 80% of their acres in under-represented ecosystems at both the forest and federal levels.

The story is similar at the national scale, with a total of 21 inadequately represented ecosystem types covering over 41% and 742,000 acres of the Rio Grande (Appendix 1, Table 3, Tab 3; Map 2). Further, only 6% of these under-represented ecosystems are protected in wilderness nationally. Notably, two of the most prevalent ecosystems on the Rio Grande are under-represented both at the forest and national levels (Appendix 1, Table 3, Tabs 2 & 3). The Southern Rocky Mountain Montane-Subalpine Grassland covers over 191,000 acres of the forest, yet only 3.4% of the ecosystem is protected as wilderness. The Rocky Mountain Aspen Forest and Woodland spans 209,000 acres on the Rio Grande, only 28,000 of which are protected in the forest's wilderness.

C. What unique or special features, values, or resources exist across the forest, and what is their current status of protection?

The 2012 planning rule defines designated area as "[a]n area or feature identified and managed to maintain its unique special character or purpose."[27] Accordingly, to properly assess the need

[27] 36 C.F.R. § 219.19.

and opportunity for additional designated areas, the forest assessment must identify those areas and features with unique, special character and evaluate their current status of protection.

In identifying and assessing unique and outstanding areas and features, the Forest Service should take a broad and inclusive approach. The Forest Service Manual addressing special recreation designations describes *some* of the potential types of special character that may warrant protective designation: areas with "scenic, geological, botanical, zoological, paleontological, archaeological, or other special characteristics or unique values" should be "protect[ed] and manage[d] for public use and enjoyment [as] special recreation areas."[28] Those six categories, however, are in no way an exhaustive list of the types of special features, values, or resources the Forest Service should identify in the Assessment Report, and special recreation designations are just one of a slate of potential designations that the agency should consider during the plan revision process.[29] Thus, in addition to scenic, geological, botanical, zoological, paleontological, and archaeological resources, the Forest Service should consider historical and cultural (including tribal) resources, aquatic resources, other recreational or educational resources, and any other unique or special features, values, or resources across the forest.

The Forest Service's assessment of areas and features with unique, special character should also consider climate refugia, migratory corridors, and other features that enhance species protection and habitat connectivity. As described above, a robust, connected network of protected conservation lands is necessary to satisfy the 2012 planning rule's substantive ecological integrity, sustainability, and diversity mandates.[30] Particularly as climate change alters and makes more vulnerable ecological systems, habitats, and species composition and distribution, there is an acute need to conserve migratory corridors, replication and representation within protected areas, larger protected tracts, and more connections between them (Mawdsley et al, 2009). In this context, and given their numerous environmental and social benefits, the forest assessment should recognize the unique, special character of roadless and other undisturbed forest lands.

In identifying areas and features with unique special character, the Forest Service should make sure to assess information on biodiversity and important potential conservation areas (PCA) from the Colorado Natural Heritage Program, and on ecologically important places, including corridors, identified in the 2009 Ecological Assessment (Eco-Resolutions 2009). We have listed the PCAs on the Rio Grande National Forest in Table 4.

D. Do existing Research Natural Areas satisfy the objectives listed in Forest Service Manual 4063.02?

A Research Natural Area (RNA) is "[a] physical or biological unit in which current natural conditions are maintained insofar as possible . . . by allowing natural physical and biological

[28] Forest Service Manual 2372.02.
[29] *See* 36 C.F.R. § 219.7(c)(2)(vii) (broad, non-discretionary duty to "[i]dentify existing designated areas other than [Wilderness and Wild and Scenic Rivers]" and "determine whether to recommend any additional areas for designation"); *see also, e.g.*, FSH 1909.12, ch. 20, § 24 Exhibit 01 (providing a non-comprehensive list of "some types of designated areas that the Responsible Official may consider" during the forest plan revision).
[30] 36 C.F.R. §§ 219.8 – 219.9.

processes to prevail without human intervention."[31] RNAs should be "large enough to provide essentially unmodified conditions within their interiors . . . and to protect the ecological processes, features, and/or qualities for which the [RNAs] were established."[32] As Forest Manual 4063.1 explains, "[l]andscape-scale [RNAs] that incorporate several ecosystem elements are ideal, where feasible." Collectively, RNAs comprise "a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity."[33]

Forest Service Manual 4063.02 enumerates eight objectives for establishing RNAs:

- "Maintain a wide spectrum of high quality representative areas that represent the major forms of variability . . . that, in combination, form a national network of ecological areas for research, education, and maintenance of biological diversity"
- "Preserve and maintain genetic diversity . . . ."
- "Protect against human-caused environmental disruptions"
- "Serve as reference areas for the study of natural ecological processes including disturbance"
- "Provide onsite and extension educational activities"
- "Serve as a baseline area for measuring long-term ecological changes"
- "Serve as control areas for comparing results from manipulative research"
- "Monitor effects of resource management techniques and practices"

As described above and highlighted by these objectives, a robust, connected network of protected natural areas that represent the full spectrum of ecosystem and habitat types is critical to conserving biological diversity and enhancing climate change adaptation. Such a network is especially important for purposes of scientific observation and study in light of anticipated alternations in vegetation and species types and distributions related to climate change.

Accordingly, to properly assess the need and opportunity for additional RNAs, the forest assessment should evaluate whether the size, distribution, and representation of existing RNAs satisfy each of the objectives enumerated in Forest Service Manual 4063.02. In doing so, the Forest Service should pay particular attention to: the need for and adequacy of connectivity between existing RNAs; how or whether those RNAs fit into a larger network of protected lands or corridor; and whether the RNAs encompass entire small drainages[34], exist or could be extended to a landscape scale[35], and are large enough to continue to represent the identified ecosystem(s) even with anticipated climate change effects. In addition, the Forest Service should compare its RNA network to Colorado Natural Heritage Area Potential Conservation Areas (see Table 4) and biodiversity data to identify potential deficiencies, and share the information in the Forest Assessment.

[31] Forest Service Manual 4063.05.
[32] Forest Manual 4063.1.
[33] Forest Service Manual 4063.
[34] Forest Service Manual 4063.2 ("Where possible, select entire small drainages because they maintain interrelationships of terrestrial and aquatic systems.")
[35] Forest Manual 4063.1. ("Landscape-scale Research Natural Areas that incorporate several ecosystem elements are ideal, where feasible")

E. What are the socio-economic factors relevant to protecting national forest lands through conservation designations (e.g., recreation trends, public sentiment, etc.)?

In addition to their ecological values, areas protected through conservation-oriented designations, including wilderness, contribute to social and economic well-being. A proper assessment of the need and opportunity for additional designated areas must identify and evaluate these benefits. In particular, the assessment should consider recent trends in recreation, public opinion and values, and the economic contributions associated with wilderness and other conservation designations. A robust assessment of those benefits is a necessary prerequisite to satisfaction of the Forest Service's substantive planning mandate to provide for social and economic sustainability, including sustainable recreation, ecosystem services, and opportunities to connect people with nature.[36]

1. Public opinion shows a need for additional wilderness.

Surveys consistently show that Americans value wilderness and generally favor the designation of additional wilderness. For instance,

- In chapter 7 of Cordell's (2005) Multiple Values of Wilderness that addresses the social values of wilderness, Schuster et al. looked at survey results at the national, regional, and state levels and found that: (a) overall there is consensus across groups within the American population that there is not enough wilderness, regardless of how the data are stratified; (b) residents generally support designating more wilderness in their respective states; and (c) Americans are willing to make unspecified monetary tradeoffs to gain additional wilderness.

- As of 2006-2007, more than two-thirds of American citizens (67%) nationally supported the designation of additional wilderness in their home state (Cordell 2008b).[37]

- As of 2001, the majority of Americans felt that the current percentage of the National Forest System designated as wilderness was not enough (Scott 2003).[38]

- Over half of Americans (almost 51%) indicated there is not enough wilderness, while only 4% expressed the opinion that there is too much (Cordell 2008b).[39]

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[36] 36 C.F.R. § 219.8(b).

[37] When asked how they felt about designating more of the federal lands as wilderness in their home state, 67% of National Survey on Recreation and the Environment (NSRE) respondents indicated they somewhat or strongly favor more.

[38] Question: "Currently, 18% of the land in the United States' national forests is permanently protected from logging and other development. Do you think the U.S. has too much permanently protected areas in the national forests, not enough protected areas in the national forest, or the right amount of permanently protected areas in the national forests, or aren't you sure about that?" N=1,000 likely voters.

[39] NSRE respondents were asked their opinions about whether they saw the amount of federal land now designated as wilderness as too little, about right, or too much. Over half in 2006-2007 (almost 51%) indicated there is not enough wilderness, and 35% indicated the amount is about right. Only 4% expressed the opinion that there is already too much.

- Americans are willing to accept higher costs for electricity, gasoline, and other consumer products to have more wilderness lands designated and to have higher quality air over and near wilderness (Scott 2003).

At a regional level, we see that:

- 70% of west slope Colorado residents support efforts to protect additional deserving public lands as wilderness in or near the county where they live.[40]

- 71% agree wilderness-quality lands are more important for recreation, tourism, and wildlife than for energy development. Majority support was found across all geographical regions and party affiliations (85% Democrat support, 76% Independent support, and 52% Republican support).[41]

- 90% agree that wilderness areas were important economically for the hunting, fishing, and tourism they support.[42]

- 71% believe that wilderness areas should not be sacrificed for energy development, and that clean energy alternatives should be pursued instead. In a different question, only 33% of respondents agree that wilderness-quality lands are needed for domestic energy development.[43]

- 85% of Coloradoans report that Wilderness areas or open lands with little to no development and opportunity for solitude are moderately to very important to them, while 53% felt it was extremely important.[44]

- 90% of Coloradoans feel that Wilderness areas or open lands with little to no development and opportunity for solitude are a moderate to high priority for future investment, while 45% felt it was an essential priority.[45]

- 81% of Coloradoans feel that nature or wildlife viewing areas should be a moderate to high future investment priority in their local communities.[46]

- The results from the 2012 Colorado College State of the Rockies Conservation in the West poll found that Colorado voters across the political spectrum view Colorado's parks and public lands as essential to the state's economy. Of voters surveyed, 93 percent agreed that "Our national parks, forests, monuments, and wildlife areas are an essential

[40] See attached survey results of survey conducted by Talmey-Drake Research & Strategy, Inc., a public opinion and market research firm in Boulder, Colorado. (See Appendix 6).
[41] Ibid.
[42] Ibid.
[43] Ibid.
[44] Colorado Department of Parks and Wildlife, 2014. 2013 Outdoor Recreation Participation Public Survey Summary Report. Question 11. Available at http://cpw.state.co.us/Documents/Trails/SCORP/2013PublicSurveySummaryReport.pdf.
[45] Ibid. Question 12.
[46] Ibid. Question 13.

part of Colorado's economy." And 75% said that Colorado should maintain protections for land, air and water in the state rather than reduce them in an effort to create jobs as quickly as possible (Colorado College 2012).

Participation in outdoor, nature-based recreation is steady or on the rise.
Recreational surveys show that Americans are participating in increasing numbers in recreational pursuits that natural areas such as wilderness provide. According to Cordell (2008b), both the total number of Americans and the total number of days annually in which we participate in nature-based recreation have grown since 1994. For example, viewing, photographing, and studying nature (e.g., wildlife and birds), have grown strongly (see Table 2), while primitive camping and backpacking days increased 12% and 24%, respectively, between 2000 and 2008 (Cordell 2008b).

In addition, a significant percentage of Americans participate in outdoor recreation. For instance,

- Across the country, an estimated 35% of Americans, both urban and rural residents, participated in birding between 2004 and 2007 (Cordell 2008c).

- More than 90 million U.S. residents participated in some form of wildlife-related recreation in 2011. Participation is up 3% from five years earlier. The number of Americans who hunted or fished rose from 33.9 million in 2006 to 37.4 million in 2011 (USFWS 2011).

- Americans take between 16 and 35 million trips to wilderness each year on their own or with a guide to hike, backpack, camp, climb mountains, ride horses, ski, raft, canoe, take pictures, view wildlife, or stargaze (Cordell 2005).

Specific to Colorado and the Rio Grande National Forest,

- Coloradoans are outdoor recreation enthusiasts. In 2013, 90% of Coloradans reported participating in some form of outdoor recreation in Colorado in the previous year, about 66% reported recreating in the outdoors at least one day a week on average, and 60% said that they will either greatly increase or somewhat increase their participation in outdoor recreation over the next five years.[47]

- Wilderness-compatible activities are the most popular outdoor recreation pursuits of Coloradoans with hiking, walking, hiking/backpacking, picnicking, and fishing making up the four most popular outdoor recreation activities, as calculated by total statewide activity days, in each one of the state's regions. Tent camping is the most popular overnight accommodation.[48]

[47] Colorado Parks and Wildlife, *2013 Outdoor Recreation Participation Public Survey Summary Report*, Research, Planning and Policy Unit, June 2013. Available at https://cpw.state.co.us/Documents/Trails/SCORP/2013PublicSurveySummaryReport.pdf.
[48] Colorado Department of Parks and Wildlife, 2014. 2013 Outdoor Recreation Participation Public Survey Summary Report. Page 2. Available at http://cpw.state.co.us/Documents/Trails/SCORP/2013PublicSurveySummaryReport.pdf.

- Wilderness compatible activities are the most popular activities on the Rio Grande NF (see Table 3).[49]

2. Wilderness visitation is predicted to continue growing.

- The number of days Americans visited wilderness and other primitive areas increased 12% between 2000 and 2008. The number of participants visiting a wilderness area increased 3% in the same time period (Cordell 2008a).

- Bowker predicts that population growth in expanding cities in the West and Southwest in particular will result in increased use in wildernesses in the vicinity (Bowker et al. 2006).

- It can also be expected that population increases in the communities adjacent to national forests will occur because of their attractiveness in terms of the availability of quality outdoor recreation experiences, clean air and water, and a natural setting.[50]

3. Economic benefits of protected public lands.

Based on a wealth of existing, scientifically validated research, the general rule is that there is a neutral-to-positive relationship between the presence and extent of wilderness and other protected areas on one hand, and the economic performance of local economies and economic benefits available to nearby residents on the other (see Appendix 2). Here are just a few examples from this body of research:

- Protected lands such as Wilderness are vital economic assets to the western communities that are prospering the most.[51]

- From 1970 to 2010, western non-metro counties with more than 30% of the county's land base in federal protected status increased jobs by 345%. As the share of federal lands in protected status goes down, the rate of job growth declines as well. Non-metro counties with no protected federal land increased jobs by 83%.[52]

- Protected public lands can and do play an important role in stimulating local economic growth – especially when combined with access to markets and an educated workforce – and are associated with some of the fastest growing communities in the West (Rasker 2006; Rasker et al. 2009).

- Wilderness designation enhances nearby private property values (Phillips 2004).

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[49] USDA Forest Service, 2005. National Visitor Use Monitoring Report. Available at http://apps.fs.usda.gov/nrm/nvum/results/A02009.aspx/Round2.

[50] USDA Forest Service. 2005. Socio-Economic Assessment for the Apache-Sitgreaves National Forest. Available online at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_021473.pdf.

[51] "Prosperity in the 21st Century West: The Role of Protected Public Lands, Sonoran Institute (2004). http://www.sonoraninstitute.org/where-we-work/westwide-research-tools/economics.html

[52] Headwaters Economics (2012). "West Is Best: Protected Lands Promote Colorado Jobs and Higher Incomes". http://headwaterseconomics.org/land/west-is-best-value-of-public-lands-co.

- Wilderness and conservation lands are associated with rapid population, income, and employment growth relative to non-wilderness counties (Lorah and Southwick 2003; Lewis, Hunt and Plantinga 2002).

- There is no evidence of job losses associated with wilderness, or that counties more dependent on logging, mining, or oil and gas development suffered job losses as a result of wilderness designation in 250 non-urban counties in the Rocky Mountains (Duffy-Deno 1998).

For an easy-to-digest and comprehensive look at the economic situation in the San Luis Valley, we point you at the Headwaters Economics Economic Profile System Human Dimensions Toolkit (EPS-HDT). As explained on Headwaters Economics' website:

> EPS-HDT is a free, easy-to-use software application that runs in Excel, from your desktop, and produces detailed socioeconomic reports of communities, counties, states, and regions, including custom aggregations and comparisons. EPS-HDT uses published statistics from federal data sources, including the Bureau of Economic Analysis and Bureau of the Census, U.S. Department of Commerce; Bureau of Labor Statistics, U.S. Department of Labor; and others.

EPS-HDT can produce 14 separate reports for each county in the Rio Grande National Forest and for the region (six counties aggregated) on a variety of relevant topics such as long-term economic trends, demographics, amenities, land use, non-labor income, development and wildfire, and payments in lieu of taxes. We have included a few sample reports that we ran using this application in Appendix 3 to illustrate its utility. More information on the application as well as free downloads are available at http://headwaterseconomics.org/tools/eps-hdt.

In addition, the San Luis Valley Ecosystem Project is currently developing an economic snapshot of the region including the impact of the Rio Grande National Forest, and intends to submit it to the Forest Service as soon as it is completed.

V. Infrastructure

The 2012 planning rule requires forest assessments to address forest infrastructure, including "recreational facilities and transportation and utility corridors."[53] As the Forest Service directives governing the assessment recognize, "[i]nfrastructure within the plan area can have a substantial impact on social, cultural, economic, and ecological conditions both within the plan area and in the broader landscape."[54] Given the extensive and decaying nature of the Forest Service road system and its significant aggregate impacts on landscape connectivity, ecological integrity, water quality, species viability and diversity, and other forest resources and ecosystem services, a robust assessment of transportation infrastructure is necessary to ensure the forest plan revision complies with the relevant substantive provisions of the 2012 planning rule and other regulatory requirements. To provide necessary context for the Forest Service's assessment of transportation infrastructure, those legal obligations are described briefly below.

[53] 36 C.F.R. § 219.6(b)(11).
[54] FSH 1909.12, ch. 10, § 13.13.

To address the Forest Service's unsustainable and deteriorating road system, "subpart A" of the Travel Management Rule is designed to shrink the size of the system. It requires each forest to conduct "a science-based roads analysis," generally referred to as a "travel analysis process" or "TAP."[55] Based on that analysis, forests must "identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands."[56] Forests must then "identify the roads . . . that are no longer needed to meet forest resource management objectives and that, therefore, should be decommissioned or considered for other uses, such as for trails."[57] With forest plans determining the framework for integrated resource management, the plan revision is the appropriate place to ensure that the requirements of subpart A are satisfied and to establish direction for achieving a sustainable minimum road system.

The substantive ecological integrity and ecological and fiscal sustainability provisions of the 2012 planning rule complement and reinforce the requirements of subpart A of 36 CFR 212. For example, forest plans must include standards and guidelines that maintain or restore healthy aquatic and terrestrial ecosystems, watersheds, and riparian areas, and air, water, and soil quality, taking into account climate change and other stressors.[58] Plans also must implement national best management practices (BMPs) for water quality; ensure social and economic sustainability, including sustainable recreation and access and opportunities to connect people with nature; and provide for "[a]ppropriate placement and sustainable management of infrastructure."[59] As documented in more detail below and in the literature review attached as Appendix 4, the adverse environmental and fiscal impacts associated with existing transportation infrastructure (e.g., erosion, compaction, sedimentation and impairment of water quality, fragmentation of wildlife habitat, interference with feeding, breeding, and nesting, spread of invasive species) directly implicate these substantive requirements.

To provide the information necessary to satisfy the legal obligations described above, we recommend that the assessment identify and strive to answer the following questions, each of which is addressed in more detail below:

A. What infrastructure exists on the forest?
B. What is the physical condition of the existing infrastructure?
C. What is the annual maintenance revenue and cost, and what are the current and predicted maintenance needs and backlog over the life of the plan?
D. How climate resilient is the transportation system?

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[55] 36 C.F.R. § 212.5(b)(1); *see also* Memorandum from Joel Holtrop to Regional Foresters *et al.* re Travel Management, Implementation of 36 CFR, Part 212, Subpart A (Nov. 10, 2010); Memorandum from Leslie Weldon to Regional Foresters *et al.* re Travel Management, Implementation of 36 CFR, Part 212, Subpart A (Mar. 29, 2012); Memorandum from Leslie Weldon to Regional Foresters *et al.* re Travel Management Implementation (Dec. 17, 2013) (outlining expectations related to travel analysis reports).

[56] 36 C.F.R. § 212.5(b)(1) (further defining the minimum road system as that "determined to be needed [1] to meet resource and other management objectives adopted in the relevant land and resource management plan . . . , [2] to meet applicable statutory and regulatory requirements, [3] to reflect long-term funding expectations, [and 4] to ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance").

[57] 36 C.F.R. § 212.5(b)(2).

[58] 36 C.F.R. § 219.8(a)(1)-(3).

[59] 36 C.F.R. §§ 219.8(a)(4), 219.8(b), 219.10(a)(3).

E. What is the minimum road system pursuant to 36 C.F.R. Subpart A, and what is the deviation between the minimum road system and the current road system? Given that the forest has not yet fully complied with subpart A, what are the number, types, and locations of roads likely needed and not needed for future use, as identified in the travel analysis report?

F. Does the current transportation system provide sustainable access and opportunities to connect people with nature?

G. What effects does the transportation system have on the ecological integrity of aquatic and terrestrial systems? For example:

1. What are the motorized route densities across the forest, and where do they exceed accepted scientific thresholds for aquatic and terrestrial integrity?
2. What are the impacts of transportation infrastructure on watershed conditions across the forest, as identified by the "Roads and Trails" indicator of the Forest Service's Watershed Condition Framework and other information sources?
3. How many miles of roads are connected by direct surface flow to streams, and how many road/stream crossings exist?
4. What percent of the current transportation infrastructure system is meeting required BMPs for water quality, and what is the effectiveness of the BMPs?
5. Are there Clean Water Act section 303(d) impaired streams or stream segments on the forest where the cause of impairment is sediment and/or temperature attributable at least in part to roads?
6. How significantly is the transportation system contributing to the spread of invasive species?
7. How much is the current transportation system impairing species migration and ecological integrity at a landscape scale, and could modification of the system contribute to landscape-scale restoration?

For each question, the agency should identify the best available scientific studies and reports that document the relevant condition, costs, benefits, and needs of the transportation system.[60] Principal sources of information for the Rio Grande National Forest include, but are in no way limited to, the forest's 2004 Roads Analysis Report (RAP) and a 2009 report, *Ecologically-Based Travel Management Recommendations for the Rio Grande National Forest, Colorado*, which identifies ecological priority areas and makes corresponding travel management recommendations.[61] Given that the RAP is now over ten years old, the forest assessment should update information as necessary and include relevant information from the ongoing travel analysis process and corresponding report that will be completed later this year.

As described below, the best available scientific information shows that the over-sized and deteriorating transportation system on the Rio Grande National Forest has significant adverse

[60] *See* 36 C.F.R. § 219.3.

[61] Rio Grande National Forest, *Roads Analysis Report*, at 37 (2004), *available at* http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5167123.pdf; ECO-resolutions, LLC, *Ecologically-Based Travel Management Recommendations for the Rio Grande National Forest, Colorado* (May 2009).

ecological and fiscal impacts. This information highlights an acute need for the forest plan revision to comprehensively address and provide management direction aimed at making the road system considerably more sustainable – both ecologically and fiscally – and resilient to climate change stressors.

A. What infrastructure exists on the forest?

Understanding the baseline system of transportation infrastructure is a necessary first step in a robust assessment of forest infrastructure – and eventual compliance with the Forest Service's legal obligation to provide for a well-maintained system of needed roads that is fiscally and environmentally sustainable and provides for safe and consistent access for the utilization and protection of the forest. Accordingly, the forest assessment should first identify existing infrastructure.[62] Given their significant ecological impacts, it is critical that the assessment identify *all* motorized routes. This includes not just miles of Maintenance Level (ML) 1-5 system roads, but also motorized trails, and non-system and temporary roads. The assessment should also identify non-motorized trails, and should identify which routes are open to the public and which are reserved for permit or administrative use.

As reported in the 2004 RAP, the Rio Grande National Forest has 2,414 miles of "inventoried, classified National Forest System roads," 65% of which are open to motorized public use and 32% (771 miles) of which are managed and maintained for low-clearance passenger vehicle use (ML 3-5).[63] The remaining 1,643 miles are either closed (ML 1) or managed only for high-clearance vehicles (ML 2). The RAP states that the forest "does not have an accurate inventory of unclassified [primarily user-created] roads," which "are identified in the field during project analysis." The forest also has over 1,280 miles of trails, some of which permit motorized travel. The forest's ongoing travel analysis process should provide more up-to-date and complete information on existing transportation infrastructure. That information should be included in the forest assessment.

B. What is the physical condition of the existing infrastructure?

After identifying existing infrastructure, the forest assessment should evaluate the physical condition of that infrastructure.[64] The physical condition of forest roads has important implications for the fiscal and ecological sustainability of the system. Inadequately maintained roads are more likely to fail, causing corresponding damage to aquatic and other ecological systems, endangering public safety, and requiring additional funds to remediate damage and hazardous conditions. Particularly given the general state of disrepair of much of the National Forest road system and anticipated climate change stressors, understanding the baseline physical condition of the system is necessary to ensure the plan revision ultimately provides for an

[62] *See* FSH 1909.12, ch. 10, § 13.6(1) (Assessment "should identify and evaluate available information such as [t]he location and condition of infrastructure within the plan area . . . includ[ing] the forest road system [and] recreational infrastructure . . . . This information is for basic understanding of the role of infrastructure in the plan area . . . .").
[63] Rio Grande National Forest, *Roads Analysis Report*, at 18-20.
[64] *See* FSH 1909.12, ch. 10, § 13.6(1) (assessment "should identify and evaluate available information such as [t]he location *and condition* of infrastructure . . . includ[ing] the forest road system" (emphasis added)).

ecologically and fiscally sustainable transportation system.[65] Accordingly, the assessment should identify, for example, the percentage of the system that is: (1) maintained to standard annually; (2) in urgent need of work; (3) operating below objective maintenance level; and (4) with adequately performing BMPs in place.

The 2004 RAP for the Rio Grande National Forest does not address the physical condition of the forest road system in any detail. The RAP does, however, recognize "the link between [road] maintenance and resource protection" and categorize classified roads based on their financial risk:

> If basic annual road maintenance (e.g., drainage maintenance) is not performed, roads have an increased potential for loss of investment and environmental damage. The same is true for deferred maintenance, such as replacing major culverts in perennial streams at the end of their design life. A catastrophic drainage failure will have a direct negative impact on the associated watershed and aquatic health.[66]

To the extent it has not been superseded by more up-to-date information in the ongoing travel analysis process, the assessment should include the RAP information on the relative financial risks associated with each forest road. The assessment should also include any additional information on the physical condition of the forest's transportation infrastructure, including but not limited to monitoring data, travel analysis process information, and information submitted by the public. An example of the latter is information on the physical condition of certain routes contained in the 2009 ecological assessment designed to inform travel management planning.[67]

C. What is the annual maintenance revenue and cost, and what are the current and predicted maintenance needs and backlog over the life of the plan?

As described above, the Forest Service must provide for the fiscal sustainability of its transportation network. With the significant maintenance needs associated with the Forest Service's vast and decaying road system, understanding the maintenance budget for the system is a prerequisite to ensuring fiscal sustainability. Accordingly, Forest Service directives require that the assessment include "[i]nformation about the sustainability of the infrastructure, including planning unit's fiscal capability to maintain existing infrastructure and the current backlog of infrastructure maintenance."[68] More specifically, the assessment should identify annual maintenance revenue and cost, as well as the current and predicted maintenance backlog over the life of the plan.

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[65] *See* 36 C.F.R. § 219.1(g) (plan components generally must be "within . . . the fiscal capability of the unit"); *id.* § 219.8 (plans must provide for ecological, social, and economic sustainability); 36 C.F.R. § 212.5(b)(1) (minimum road system must "reflect long-term funding expectations" and "minimize[] adverse environmental impacts"); FSH 1909.12, ch. 20, § 23.23l (plan components for roads and trails infrastructure "must be within the fiscal capability of the planning unit").

[66] Rio Grande National Forest, *Roads Analysis Report*, at 103 & Appx. C.

[67] *E.g.*, ECO-resolutions, LLC, *Ecologically-Based Travel Management Recommendations for the Rio Grande National Forest, Colorado*, at 50-51 (describing "poor condition" of route # 786, which "has experienced severe erosion and degradation due to motorized use").

[68] FSH 1909.12, ch. 10, § 13.6(4).

Nationally, the National Forest road system suffers an extraordinary maintenance backlog of over $3 billion.[69] The story on the Rio Grande National Forest is similar. According to the 2004 RAP, the forest budget allocation for planning, construction, and maintenance of roads averaged $725,000 per year from 2000 to 2003, while "the annual cost to maintain the entire road system to standard is considerably higher than the amount allocated by Congress" and "the Forest is substantially under-funded for the size of the road system it manages."[70] The RAP's estimated funding needs total over $5 million in annual maintenance costs and over $134 million in deferred maintenance costs. Due to the funding shortfall, the RAP recognizes "a need to identify and prioritize the potential minimum road system necessary for access to and management of the National Forest" and to explore additional opportunities for reducing annual and deferred maintenance costs. The RAP also recognizes that, "even if funding was shifted from low value roads to higher value roads, the annual road maintenance funding for the [forest] is still significantly less than needed." Given that this information from the RAP is now over ten years old, the forest assessment should update its estimates of annual maintenance revenue and cost and deferred maintenance, as well as identify predicted maintenance backlog over the life of the plan.

Although we do not know of a report similar to the RAP for trails, we know that the Forest Service suffers from a serious trail maintenance deficit and backlog. In 2012, The US Government Accountability Office published a report in which it estimated the value of the Forest Service national trail maintenance backlog to be $314 million.[71] There was an additional $210 million deficit for the annual maintenance, capital improvements and operations estimated for trails. It was estimated that nationally only 25% of all trails meet agency standards.

D. How climate resilient is the transportation system?

Climate change generally intensifies the adverse impacts associated with roads. In particular, the warming climate is expected to lead to more extreme weather events, resulting in increased flood severity, more frequent landslides, altered hydrographs, and changes in erosion and sedimentation rates and delivery processes.[72] As the Council on Environmental Quality's recently released draft guidance on climate change recognizes,

> Climate change can increase the vulnerability of a resource, ecosystem, human community, or structure, which would then be more susceptible to climate change and other effects and result in a proposed action's effects being more environmentally damaging. For example, a proposed action may require water from a stream that has diminishing quantities of available water because of decreased snow pack in the mountains, or add heat to a water body that is exposed to increasing atmospheric temperatures. Such considerations are squarely within the realm of NEPA, informing decisions on whether to proceed with and how to

[69] USDA, Forest Service, National Forest System Statistics FY 2013, *available at* http://www.fs.fed.us/publications/statistics/nfs-brochure-2013.pdf.
[70] Rio Grande National Forest, *Roads Analysis Report*, at 22-23, 56, 107, 111-12.
[71] Government Accountability Office. 2013. Forest Service Trails: Long- and Short-Term Improvements Could Reduce Maintenance Backlog and Enhance System Sustainability. GAO-13-618: Published: Jun 27, 2013. Available at http://www.gao.gov/products/GAO-13-618.
[72] Appx. 4, Lit. Review at 9-14.

> design the proposed action so as to minimize impacts on the environment, as well as informing possible adaptation measures to address these impacts, ultimately enabling the selection of smarter, more resilient actions.[73]

Many national forest roads were not designed to current engineering standards (or, in some cases, any engineering standards), making them particularly vulnerable to climate-induced hydrologic shifts. That vulnerability is further exacerbated by the deteriorating physical condition of the system and significant maintenance backlog, as described above. Moreover, even those roads designed to current engineering standards and hydrologic conditions may fail under future weather scenarios, further intensifying adverse ecological impacts, public safety concerns, and maintenance needs.[74]

Given these stressors, the forest assessment should address the extent to which the existing transportation system is designed to accommodate projected hydrologic changes resulting from climate change. To the extent the system is not designed to accommodate projected climate changes, the assessment should describe implications of the status quo to sustainable access and ecological integrity of aquatic and terrestrial systems, and describe what changes are required to adapt the system.

While the Rio Grande National Forest's 2004 RAP does not expressly address climate resilience, it does suggest that forest infrastructure may not be designed to accommodate future climate changes and identifies opportunities for modifying infrastructure to address mass wasting and other types of roads-related resource damage that may be exacerbated by climate change.[75] For example, the RAP recognizes that "inadequate culvert sizes to accommodate peak flows, sediment loads, and woody debris" contribute to road-related mass wasting and affect hydrologic function at road-stream crossings. To mitigate these vulnerabilities, the RAP identifies opportunities to, for example, relocate roads outside of areas with high mass wasting potential and modify stream-crossing infrastructure, including culverts. Beyond the limited information contained in the RAP, the assessment should identify any other information addressing the extent to which the existing transportation system is designed to accommodate climate stressors and opportunities to adapt the system to be more resilient to those stressors.

E. Given that the forest has not yet fully complied with 36 CFR 212 subpart A, what are the number, types, and locations of roads likely needed and not needed for future use, as identified in the travel analysis report?

As described above, each national forest is required to identify "the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands."[76] With forest plans determining the framework for integrated resource management, the plan revision is the appropriate place to ensure that the forest has an identified

[73] Council on Environmental Quality, *Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts*, at 22 (Dec. 18, 2014), *available at* http://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa/ghg-guidance.
[74] USDA, Forest Service, *Water, Climate Change, and Forests: Watershed Stewardship for a Changing Climate*, PNW-GTR-812, at 72 (June 2010), *available at* http://www.fs.fed.us/pnw/pubs/pnw_gtr812.pdf.
[75] Rio Grande National Forest, *Roads Analysis Report*, at 30-32, 116-17.
[76] 36 C.F.R. § 212.5(b)(1).

minimum road system to carry out the revised plan's goals and objectives, and to provide direction for achieving that system. Accordingly, the assessment should identify the minimum road system pursuant to subpart A and the deviation between that system and the current road system. If the forest service has not yet determined the minimum road system, the assessment should state that the forest is not yet in compliance with subpart A and identify existing relevant information such as the roads identified as "likely not needed for future use" in the travel analysis report.[77]

Although the Rio Grande National Forest has not yet released its travel analysis process report, we understand that process is ongoing and will be complete by September 30, 2015. The forest assessment should include relevant information from the travel analysis process, including the number, types, and locations of roads needed and likely not needed for future use.

To the extent it has not been superseded by more up-to-date information in the travel analysis process, the assessment also should include information from the 2004 RAP categorizing each classified road as high or low value and high or low risk based on a number of factors (e.g., value for access needs and recreational use; risk to soil and water resources, imperiled aquatic species, wildlife, and budget).[78] This "Road Matrix" was intended to "help define the potential minimum road system." For example, roads identified as high value/high risk (407 miles) are priorities for capital improvements, while roads identified as low value/high risk (58 miles) and low value/low risk (692 miles) should be considered for decommissioning or reduced maintenance level. The remaining 1,256 miles identified as high value/low risk roads are considered the "ideal condition" and should be maintained to standard.

F. Does the current transportation system provide sustainable access and opportunities to connect people with nature?

Well-sited and maintained transportation infrastructure can provide important services to society, including access for the utilization, enjoyment, and protection of forest resources. To that end, the 2012 planning rule requires forest plans to provide for social and economic sustainability, including sustainable recreation and access, and integrated resource management for multiple use considering "[a]ppropriate placement and sustainable management of infrastructure, such as recreational facilities and transportation and utility corridors," and "[o]pportunities to connect people with nature."[79]

To comply with those mandates, the forest assessment should evaluate whether and how the current transportation system provides sustainable access.[80] Measures of sustainable access include the extent to which system routes: (1) are adequately managed and maintained; (2) are

[77] *See* Memorandum from Leslie Weldon to Regional Foresters *et al.* re Travel Management Implementation (Dec. 17, 2013) (directing that travel analysis reports identify on a list and on a map roads likely not needed for future use).
[78] Rio Grande National Forest, *Roads Analysis Report*, at 101-06 & Appx. C.
[79] 36 C.F.R. §§ 219.8(b), 219.10(a)(3) & (a)(10).
[80] *See* FSH 1909.12, ch. 10, §§ 13.4(1)(d)-(e), 13.6(7) (assessment "should identify and evaluate . . . [t]he infrastructure's contribution to social and economic sustainability," including "[t]he nature, extent, and condition of trails, roads, facilities, and other transportation . . . infrastructure to provide recreational access" and "[t]he opportunities within the plan area to foster greater connection between people and nature through education, experience, recreation, and stewardship").

sited - and designated for specific uses and time of year - so that they do not interfere with important conservation resources or cause unnecessary conflict with other uses; (3) fulfill the access needs identified in the revised plan, and (4) connect people to nature.

To the extent the information has not been superseded by more up-to-date information, the assessment should include relevant information from the 2004 RAP addressing the extent to which the road system on the Rio Grande National Forest provides sustainable access.[81] According to National Visitor Use Monitoring data from 2000, viewing scenery and wildlife, hiking or walking, and driving forest roads for pleasure were the most popular recreational activities among surveyed visitors to the Rio Grande National Forest. The RAP recognizes the importance of roads "to fulfill public recreational needs." In addition to recreational uses of the forest, the RAP recognizes the unique access needs of certain constituencies in the San Luis Valley, including descendants of original Spanish settlers, some of whom "choose to live in traditional ways and rely on the nearby public lands for wood for heating and cooking, and hunting and gathering to supplement their diets." While "[r]oads may facilitate some people's enjoyment of the area by providing for driving comfort, the amount and type of use, and any number of aesthetic attributes visible alongside the road," roads also "may deter from characteristics that are highly valued for some people's enjoyment and appreciation of an area."

Overall, the RAP found that the existing road system "provides the access needed for resource management and recreation use on the majority of the [forest]." The RAP also recognized, however, that "[r]oad maintenance funding shortfalls means not all annual road maintenance is occurring," which in turn affects the "frequency and pattern of use." The RAP's "Road Matrix" analysis, described above, incorporated a "Resource Management Value" for each road "based on the variety of land and resource management access provided by the road," with "[h]igh values [] assigned to roads that provided direct access to developed recreation sites or were key recreation access roads."[82]

G. What effects does the transportation system have on the ecological integrity of aquatic and terrestrial systems?

The 2012 planning rule requires that plans provide for the ecological integrity of aquatic and terrestrial ecosystems and watersheds, including maintaining or restoring their structure, function, composition, and connectivity, while taking into account factors such as climate change and other stressors, the broader landscape beyond the plan area, and opportunities for landscape-scale restoration.[83] To provide the information necessary to satisfy this substantive mandate, the forest assessment should evaluate impacts of the transportation system on the ecological integrity of the forest's aquatic and terrestrial systems.[84] The following questions are designed to assist the forest in that endeavor:

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[81] Rio Grande National Forest, *Roads Analysis Report*, at 4, 82-95, 103-04, 122-23, Appx. C.

[82] *See also, e.g.*, ECO-resolutions, LLC, *Ecologically-Based Travel Management Recommendations for the Rio Grande National Forest, Colorado*, at 2, 10-11 (site- and route-specific recommendations for travel management planning incorporate access and recreation needs while minimizing ecosystem impacts).

[83] 36 C.F.R. § 219.8(a)(1).

[84] *See* FSH 1909.12, ch. 10, § 13.6(6) (assessment "should identify and evaluate available information such as . . . [t]he impacts of infrastructure on ecological integrity and species diversity").

1. What are the motorized route densities across the forest, and where do they exceed accepted scientific thresholds for aquatic and terrestrial integrity?

The best available science shows that road density is one of the most important metrics of the ecological effects of roads on important watersheds, migratory corridors and other critical wildlife habitat, and other forest resources. Indeed, there is a direct correlation between road density and various markers for species abundance and viability, and adopting road density thresholds is one of the most effective strategies for achieving an ecologically sustainable road system.[85] Accordingly, Forest Service directives identify road density as one of the "[k]ey ecosystem characteristics [that] provide a mechanism for assessing status of ecosystem conditions regarding ecological integrity."[86] Because the ecological impacts associated with roads and motorized travel are not limited to open system roads, density thresholds should apply to all motorized forest routes, including closed, non-system, and temporary roads, and motorized trails.[87] Thus, the forest assessment should describe motorized route densities across the forest and identify where they exceed accepted scientific thresholds for aquatic and terrestrial integrity.

The Rio Grande National Forest RAP recognizes the direct correlation between high road density and adverse effects to resources including "fragmenting habitat for some species, degrading the quality of big game hunting, creating conflict between non-motorized and motorized users, [] affecting watershed health" and facilitating illegal motorized uses.[88] Accordingly, the RAP calculates road densities and identifies approximately one-half of the forest's 185 6th-level watersheds as having high road density of greater than one mile per square mile. The RAP used the road density and other information to, for example, classify "high priority" watersheds for additional analysis at a smaller scale; identify watersheds that "have a higher likelihood of impacting species mobility and contributing to population isolation;" and rate watershed and aquatic risks as part of the "Road Matrix" analysis. Recognizing the importance of "consider[ing] all levels and types of roads" in road density analyses, the RAP also suggests that the forest "[d]evelop a process for inventorying and managing both classified and unclassified roads" and "a strategy to inventory unclassified roads," focusing on the watersheds identified as high priority in the RAP. In addition to the road density information from the 2004 RAP, the assessment should include any route density information resulting from subsequent analyses or inventories.

The assessment also should include information and recommendations from the 2009 ecological assessment regarding the level of overall route density that should be permitted in areas of sensitive wildlife habitat.[89] The assessment's recommendations for ecologically-based travel management planning incorporate the route-density needs and sensitivities of focal species such as bighorn sheep, Canada lynx, elk, mule deer, pronghorn, and Rio Grande cutthroat trout. For example, the assessment utilizes best available science to recommend that overall route density

[85] Appx. 4, Lit. Review at 6-8 & Att. 2 (summarizing best available science on road density thresholds for fish and wildlife); *see also* USDA, Forest Service, *Watershed Condition Framework Technical Guide*, FS-978, at 27 (July 2011), *available at* http://www.fs.fed.us/publications/watershed/watershed_classification_guide.pdf.
[86] FSH 1909.12, ch. 10, § 12.13 & Exhibit 01.
[87] Appx. 4, Lit. Review Att. 2.
[88] Rio Grande National Forest, *Roads Analysis Report*, at 25, 28, 35-36, 43, 102, 115-16, 118-19, Appx. A-2 & C.
[89] ECO-resolutions, LLC, *Ecologically-Based Travel Management Recommendations for the Rio Grande National Forest, Colorado*, at 1, 6-7, 18, 22-27, 33, 41-45, 68, 74, 79, 84, 94-95.

be restricted to less than 0.4 miles per square mile in waterways occupied by Rio Grande cutthroat trout, and identifies areas where high route density conflicts with important ecological values such as wildlife migration corridors or winter range habitat.

2. What are the impacts of transportation infrastructure on watershed conditions across the forest, as identified by the "Roads and Trails" indicator of the Forest Service's Watershed Condition Framework and other information sources?

The Forest Service's Watershed Condition Framework characterizes the health and condition of national forest watersheds as Class 1: Properly Functioning, Class 2: Functioning at Risk, or Class 3: Impaired, based on a set of twelve condition indicators.[90] Indicator #6 is the condition of forest roads and trails and provides an important measure of the effects of the transportation system on the ecological integrity of aquatic systems. The indicator is based on four roads and trails- related attributes: open road density; road maintenance; proximity to water; and mass wasting. The map attached as Figure 3 depicts those conditions on the Rio Grande National Forest.[91] The map shows that the majority of the forest's watersheds are in fair condition/functioning at risk as a result of transportation infrastructure. Only a handful of watersheds in the more remote portions of the forest are functioning properly, while several watersheds are in poor condition as a result of roads and trails. The assessment should include this information, as well as any other information relevant to watershed conditions associated with transportation infrastructure. For example, to the extent it has not been superseded by more up-to-date information, the assessment should include the "Watersheds of Concern" identified during the 1996 forest plan revision. The 2009 ecological assessment utilized that information, among other data inputs, to formulate its ecologically-based recommendations for travel management planning.[92]

3. How many miles of roads are connected by direct surface flow to streams, and how many road/stream crossings exist?

As described above, the planning rule establishes a Forest Service obligation to provide for the ecological integrity of aquatic systems. In addition to route density (discussed above), scientifically credible, landscape-scale measures of risk to aquatic integrity include miles of road connected by direct surface flow to streams and the number of road/stream crossings by sub-watershed.[93,94] Accordingly, the assessment should report on these two metrics. The data related

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[90] USDA, Forest Service, *Watershed Condition Framework: A Framework for Assessing and Tracking Changes to Watershed Condition*, FS-977, at 9 (May 2011), *available at* http://www.fs.fed.us/publications/watershed/Watershed_Condition_Framework.pdf.

[91] The relevant data can be found at http://www.fs.fed.us/publications/watershed/excel_WCC_attribute_info.xlsx.

[92] *See* ECO-resolutions, LLC, *Ecologically-Based Travel Management Recommendations for the Rio Grande National Forest, Colorado*, at 10.

[93] *See* USDA, Forest Service, *Travel Analysis Process: A Guidebook, Pacific Southwest Region*, at E-11 to E-13 (2012); M. Gucinski *et al.*, *Forest Roads: A Synthesis of Scientific Information*, PNWGTR-509, at 33-35 (2000), *available at* http://www.fs.fed.us/pnw/pubs/gtr509.pdf; Appx. 4, Lit. Review at 4.

[94] This scientific concept is articulated in Region 2's Watershed Conservation Practices Handbook direct that requires the Forest Service to minimize "connected disturbed area", i. e., where runoff from roads and other manipulated areas reach streams." (Forest Service Handbook 2509.25, section 11.1.)

to system roads should be relatively easily retrieved through a GIS query. If necessary, road miles within 300 feet of streams and riparian areas can serve as a proxy for the former.[95]

The 2004 RAP evaluates how and where the road system on the Rio Grande National Forest is "hydrologically connected" to the stream system using several indicators.[96] First, the RAP identifies the density of road-stream crossings "to determine those watersheds where road-stream crossings pose the highest risk to local stream channels[,] water quality," and aquatic species migration. The RAP then "evaluate[s] the potential for migration barriers . . . by identifying those streams that contain Rio Grande cutthroat trout and have high road-stream crossing densities" and prioritizing them for site-specific project analysis. The RAP also calculates "[t]he ratios of road miles within 200 feet of a stream per square mile of watershed area." Finally, the RAP categorizes each road based on three factors – (1) the percentage of its total length within 200 feet of a stream; (2) the number of road crossings per mile; and (3) the percentage of its length within sensitive soils – to derive a rating of the road's relative hydrological connection. To the extent they have not been superseded by more up-to-date information, these indicators of hydrological connection should be included in the assessment, along with the direct-surface-flow and road/stream-crossing metrics described above.

To the degree that the Forest Service has information on non-system roads, the Forest Assessment should also attempt to describe the impacts to aquatic resources from non-system roads. These include temporary roads (which the Forest Service should be tracking), unauthorized roads, and legal roads under another's jurisdiction.

4. What percent of the current transportation infrastructure system is meeting required BMPs for water quality, and what is the effectiveness of the BMPs?

In addition to providing for the ecological integrity and protection of aquatic systems and water resources, the 2012 planning rule requires that plans implement national best management practices for water quality.[97] Given those requirements and the significant impacts of forest roads on water quality, the forest assessment should identify the percent of the current transportation system that is meeting relevant BMPs and report on the effectiveness of those BMPs.

5. Are there Clean Water Act section 303(d) impaired streams or stream segments on the forest where the cause of impairment is sediment and/or temperature attributable at least in part to roads?

Forest roads have significant impacts on water quality, particularly sediment loads and water temperatures.[98] In fact, roads contribute more sediment to streams than any other land management activity (Gucinski *et al.* 2000). Under section 303(d) of the Clean Water Act, states are required to identify "impaired waters" that are failing to meet applicable water quality standards and designated uses, and develop maximum amounts of pollutants ("total maximum

[95] The Watershed Condition Framework uses this approach. *See* USDA, Forest Service, *Watershed Condition Framework Technical Guide*, FS-978, at 26 (July 2011), *available at* http://www.fs.fed.us/publications/watershed/watershed_classification_guide.pdf.
[96] Rio Grande National Forest, *Roads Analysis Report*, at 31-34, 39-40, 102, 115-17, Appx. A-1 & A-2.
[97] 36 C.F.R. § 219.8(a)(4).
[98] Appx. 4, Lit. Review at 2-3.

daily loads") that those impaired waters can receive and still meet water quality standards.[99] Sediment is one of the primary causes of impairment for 303(d) listed waters.[100] Given the importance of water quality as a measure of ecosystem health and integrity, forest assessments should identify any 303(d) impaired streams or stream segments whose cause of impairment is sedimentation and/or temperature attributable at least in part to forest roads. This information is necessary to ensure that the plan revision ultimately "maintain[s] or restore[s] . . . water quality" and complies with the Clean Water Act.[101]

Colorado's list of 303(d) impaired waters is available on EPA's website.[102] Our review of those watersheds overlapping the Rio Grande National Forest did not reveal any 303(d) streams or stream segments whose cause of impairment is sediment and/or temperature that might be attributable to forest roads. The Forest's 2004 RAP also found that none of the 303(d) listed waters within the Rio Grande National Forest are impaired due to roads.[103] The assessment, however, should verify that that information is still accurate.

6. How significantly is the transportation system contributing to the spread of invasive species?

As part of its overarching ecosystem integrity goal, the 2012 planning rule specifically requires protection of "the persistence of native species."[104] The spread of invasive species, however, poses a primary threat to the persistence of native species and the overall integrity of aquatic and terrestrial ecosystems. Indeed, in 2004, then Chief Dale Bosworth identified invasive species as one of the four primary threats facing our national forests.[105] By facilitating increased human intrusion into sensitive areas and species dispersal, motorized routes are the primary mechanism for spreading invasive species – which the Forest Service estimates infest an additional 4,600 acres in the western United States each day.[106] Accordingly, the forest assessment should describe how, where, and to what degree the transportation system (system and non-system) is contributing to the spread of invasive species.

The 2004 Rio Grande National Forest RAP identifies forest roads as "a primary corridor for the transport and spread of exotic and noxious weeds . . . through direct transport via vehicles or indirectly by altering habitat and creating early seral, bare soil or patchy ground cover that favors

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[99] 33 U.S.C. § 1313(d).
[100] *See* EPA, *National Summary of Impaired Waters and TMDL Information*, http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.control?p_report_type=T#causes_303d.
[101] 219.8(a)(2)(iii).
[102] http://iaspub.epa.gov/tmdl/attains_watershed.control?p_state=CO&p_huc=13010002&p_cycle=2010&p_report_type=T
[103] Rio Grande National Forest, *Roads Analysis Report*, at 37.
[104] 36 C.F.R. § 219.9.
[105] http://www.fs.fed.us/projects/four-threats/. In announcing the Four Threats, Chief Bosworth stated, "Public lands—especially federal lands—have become the last refuge for endangered species—the last place where they can find the habitat they need to survive. If invasives take over, these imperiled animals and plants will have nowhere else to go." *See also* USDA Forest Service, *National Strategy and Implementation Plan for Invasive Species Management*, at 9 (2004), *available at* http://www.fs.fed.us/invasivespecies/documents/Final_National_Strategy_100804.pdf (describing strategies for controlling and managing the spread of invasive species).
[106] Forest Service video "Dangerous Travelers," mins. 2:07 & 3:57, *available at* http://www.fs.fed.us/invasivespecies/prevention/dangeroustravelers.shtml; *see also* Appx. 4, Lit. Review at 6, 11.

weedy species."[107] The RAP identifies Canada thistle, leafy spurge, Russian knapweed, ox-eye daisy, hoary cress, perennial pepper weed, yellow toadflax, and musk thistle as noxious weed species that have been established on the forest. The RAP also recognizes that forest roads can facilitate the spread of invasive aquatic species "at any location where the road system crosses a stream or wet area and sufficient habitat exists to support a species long enough for it to migrate to a more desirable habitat."

Other, more detailed analyses or information addressing the contribution of forest roads to the spread of invasive species may be available, and the forest assessment should identify that information. For example, a joint Forest Service/BLM 2008-2010 "Invasive Species Action Plan" for the Rio Grande National Forest and San Luis Valley Resource Area provided detailed schedules for road and trail invasive species inventories, with "[m]ajor emphasis areas" including "[b]ack country and motorized trail systems" and wilderness areas.[108] The assessment should include the results of those inventory efforts and any subsequent efforts to inventory, monitor, and control the spread of invasive species associated with forest transportation infrastructure.

7. How much is the current transportation system impairing species migration and ecological integrity at a landscape scale, and could modification of the system contribute to landscape-scale restoration?

As a warming climate alters species distribution and forces shifts in wildlife migration, landscape connectivity is increasingly critical to species survival and the ability of ecosystems to adapt.[109] Yet one of the most significant impacts of the forest transportation system is to fragment wildlife habitat (terrestrial and aquatic), thereby altering species distribution, interfering with life functions such as feeding, breeding, and nesting, and resulting in loss of biodiversity.[110]

Recognizing these threats, the 2012 planning rule requires that plan components "maintain or restore the structure, function, composition, and connectivity" of terrestrial, riparian, and aquatic ecosystems, taking into account climate change stressors and "opportunities for landscape scale restoration," and "maintain the diversity of plant and animal communities."[111] To provide the information necessary to address those substantive mandates during the plan revision process, the forest assessment should provide information on where and how the transportation system impedes landscape-scale fish or wildlife migration (e.g., where infrastructure such as culverts is impeding fish movement), and impairs terrestrial, riparian, or aquatic ecosystem integrity. Conversely, the assessment should also describe how modifications to the transportation system might provide opportunities for landscape-scale restoration. For instance, by removing unneeded routes in strategic locations (e.g., inventoried roadless areas, critical habitat, priority watersheds) and adequately storm-proofing needed routes (e.g., relocating roads away from water bodies, and

[107] Rio Grande National Forest, *Roads Analysis Report*, at 41, 52. We also note that the majority of weed treatment contracts for which data is available indicate that the treatment areas have been directly associated with roads.
[108] Forest Service & BLM, *Invasive Species Action Plan, Rio Grande National Forest and San Luis Valley Resource Area, FY 2008-2010*, at 2, 4-5, *available at* http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/invasivespecies/?cid=stelprdb5172596.
[109] Appx. 4, Lit. Review at 9-14; *see also supra* p. X (agency climate change strategies addressing connectivity).
[110] Appx. 4, Lit. Review at 4-6.
[111] 36 C.F.R. §§ 219.8(a)(1), 219.8(a)(1)(vi), 219.9.

resizing or removing culverts), the Forest Service can reduce landscape-scale fragmentation, better enable landscape-scale processes such as floods, protect and restore aquatic and terrestrial habitats and habitat connections, and increase resilience.[112]

The 2004 RAP for the Rio Grande National Forest does not include a detailed assessment of landscape-scale ecological effects. The RAP does, however, highlight a handful of connectivity issues.[113] For example, the RAP identifies roads within Canada lynx linkage areas, acknowledging the importance of landscape-scale connectivity for that species. The RAP also evaluates certain aquatic species migration barriers by identifying streams with Rio Grande cutthroat trout and high road-stream crossing densities, and identifies opportunities to remediate those migration barriers through modification of stream-crossing infrastructure including culverts. More broadly, the RAP acknowledges the landscape-scale, population isolation impacts of the road system, particularly on the portions of the forest with relatively high road density.

The 2009 ecological assessment conducted a landscape-level spatial analysis to identify ecologically important areas – based on wildlife habitat and watershed values – and make corresponding recommendations for modification of the forest's transportation system.[114] This information, along with any other information addressing landscape-scale ecological impacts and opportunities for restoration, should be included in the assessment.

Lastly, the BLM recently has been engaged in modeling the impacts of climate change on various species in the San Luis Valley, parts of the Rio Grande National Forest, and northern New Mexico as part of the Solar Regional Mitigation Strategy. The modeling work identifies important connectivity zones for specific species and predicted effects from climate change, among other topics. More information is available online at http://www.blm.gov/co/st/en/fo/slvfo/solar/solar_regional_mitigation.html and by contacting Joe Viera, Project Manager, BLM Colorado Renewable Energy Program at 719-852-6213 or at jvieira@blm.gov.

[112] Appx. 4, Lit. Review at 11.
[113] Rio Grande National Forest, *Roads Analysis Report*, at 39-40, 42-43, 49-50, Appx. D.
[114] ECO-resolutions, LLC, *Ecologically-Based Travel Management Recommendations for the Rio Grande National Forest, Colorado*, at 2, 6-7.

VI. Recreation

The 2012 planning rule requires forest assessments to address "[r]ecreation settings, opportunities, and access, and scenic character" as well as forest infrastructure, including "recreational facilities and transportation…..corridors."[115]As the planning directives recognize, this requires the Forest Service to identify and evaluate information about existing conditions (e.g., settings, opportunities, access, demands), trends, and sustainability in both the plan area and the broader landscape.[116]

The directives provide a very useful list of issues to assess related to settings, opportunities, ecological impacts, connections to nature, etc.[117] This information will be essential to inform the need for change and the development of plan components to meet the substantive requirements of the 2012 planning rule. In addition to the ecological integrity and diversity provisions at 219.8 and 219.9, the rule requires the plan to provide for "sustainable recreation"[118] considering appropriate placement of infrastructure such as recreational facilities, and opportunities to coordinate with neighboring landowners to link open spaces and connect people to nature. [119]

Because of the significant potential impact of motorized recreation on ecological integrity, biodiversity, and recreational conflict and sustainability, it is important that the Forest Service conduct a robust assessment of this issue in the assessment report. In particular, the Forest Service should evaluate whether the Rio Grande National Forest is fully in compliance with Executive Orders 11989 and 11644[120] and the Travel Management Rule at 36 CFR 212 Subparts B and C, which both guide the designation and management of off-road vehicle systems in the summer and winter.

The Executive Orders establish that off-road vehicle trails and areas must be located to:

(1) minimize damage to soil, watershed, vegetation, or other resources of the public lands;
(2) minimize harassment of wildlife or significant disruption of wildlife habitats; and
(3) minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands.[121]

The Executive Orders also include protective mechanisms designed to ensure that off-road vehicle designations are not impairing the protection of public lands. Specifically, they create a Forest Service duty to 1) periodically monitor the effects of off-road vehicle use, and based on the data amend or rescind the off-road vehicle designations[122]; and 2) to immediately close areas

[115] 36 CFR 219.6(b)(9) and (11)
[116] FSH 1909.12,13.4
[117] FSH 1909.12,13.4(1) and (2)
[118] 36 CFR 219.10(b)(1)(i). The planning rule defines sustainable recreation as "the set of recreation settings and opportunities on the National Forest System that is ecologically, economically, and socially sustainable for present and future generations." (36 C.F.R. § 219.19)
[119] 36 CFR 219.10(a)(3) and (4) and (10)
[120] Exec. Order No. 11,644, 37 Fed. Reg. 2877 (Feb. 8, 1972), *as amended by* Exec. Order No. 11,989, 42 Fed. Reg. 26,959 (May 24, 1977).
[121] *Id.* § 3(a).
[122] *Id.* § 8.

and trails to off-road vehicle use if the Forest Service determines that the use of off-road vehicles "will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat or cultural or historic resources of particular areas or trails of the public lands… until such time as he determines that such adverse effects have been eliminated and that measures have been implemented to prevent future recurrence."[123]

The Travel Management Rule requires that motorized travel occur only on a designated system of routes and areas in the summer and winter, respectively. In addition to echoing the Executive Orders' requirement to minimize damage when locating trails and areas, the rule also establishes two exceptions to the ban on cross-country driving in the summer time; motorized vehicles can travel a defined limited distance off specific route segments for the purposes of dispersed camping and game retrieval when specified on the map.[124] Forest Service policy instructs forests to use the exceptions sparingly.[125]

To ensure a robust assessment of recreation settings, opportunities, and access, the Forest Service in the assessment report should make sure to:

- Identify and evaluate information related to the issues listed in Forest Service Handbook 1909.12,13.4 (1) and (2); and
- Identify and evaluate information related to the compliance status with Executive Orders 11989 and 11644 and the Travel Management Rule at 36 CFR 212 Subparts B and C. In doing so, the Forest Service should explicitly evaluate a) whether and to what degree ORV trails and areas are designated to minimize impacts to forest resources and other existing and future recreational uses, b) whether exceptions to the ban on wheeled cross-country use are limited within a specific distance on specific route segments, and utilized sparingly, and c) the periodicity and results of the effects of off-road vehicle use.

In addition to all of the issues listed in the handbook, we recommend that the Forest Service also make sure to explicitly discuss the forest's recreational niche within the National Forest System and the broader landscape[126], current recreational settings (winter and summer) and their sustainability (e.g., have they changed since the current plan was finalized), current management of recreational special use permits for events and outfitting/guiding, identification and

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[123] *Id.* § 9.

[124] 212.51(b). ("In designating routes, the responsible official may include in the designation the limited use of motor vehicles within a specified distance of certain forest roads or trails where motor vehicle use is allowed, and if appropriate within specified time periods, solely for the purposes of dispersed camping or retrieval of a downed big game animal by an individual who has legally taken that animal."

[125] FSM 7703.11(4). This issue has been addressed in a recent appeal decision as well: "[A] broad designation allowing dispersed camping along all or most designated routes is not consistent with long-term objectives for travel management. Direction from the Chief of the Forest Service indicates that the allowance of dispersed camping by general designation along roads and trails should be used sparingly." (Reviewing Officer Recommendation, Sawtooth National Forest, Travel Plan Revision, Appeals #08-04-14-0035-A215, #08-04-14-0038-A215, and #08-04-14-0039-A215 at 17; *see also* accompanying Appeal Decision at 1, adopting recommendation and directing Sawtooth National Forest to modify decision ("Include designations for motor vehicle use for dispersed camping on the initial motor vehicle use map only to the extent that they reflect conditions where motor vehicle use for dispersed camping is practicable without causing unacceptable resource damage.").

[126] 36 C.F.R. § 219.7(f)(ii) ("Every plan must….[d]escribe the plan area's distinctive roles and contributions within the broader landscape.")

management of anthropogenic noise, and existing recreation-related plans, analyses, or studies for the Rio Grande National Forest and/or broader landscape. To that end, we point the Forest Service at the most recent State of Colorado Outdoor Recreation Report that provides useful information on public recreational desires and values[127], the information provided in Section IV(E)(1) and (2) of this letter related to recreation participation and preferences, and the information provided in Appendix 5 related to the Rio Grande's current recreational opportunities and niche.

Lastly, in addressing the issue of connecting people with nature[128], the Forest Service should identify and evaluate how people (both those from the area and those traveling from further away) connect to nature and how and to what degree forest infrastructure and current recreation management facilitate or impede people connecting to nature. This should include consideration of:

- Cross-jurisdictional provision and management of recreation settings, opportunities, and access,
- Use of gateway portals (e.g., visitor kiosks, center, or services as gateways to the forests),
- Need and capacity analysis for outfitting and guiding,
- Areas with unique and outstanding characteristics that merit special designation to enable visitation, interpretation, and protection,
- Coordination with public schools and educational providers,
- Stewardship activities and opportunities, and
- The use of multi-cultural outreach tools.

VII. Ecological Integrity and Wildlife

The 2012 Planning Rule supports the NFMA mandate that forest plans developed under the act must provide for the diversity of habitat and animals found on national forests.[129] There are three overarching substantive requirements in the planning rule that pertain to providing for diversity. Two are the requirements that ecosystem plan components maintain or restore 1) ecological integrity and 2) diversity of ecosystems and habitat types (see Question B, p. 43).[130] The third is a requirement that the combination of ecosystem and species-specific plan components provide ecological conditions necessary for at-risk species.[131]

The rule's approach to conservation planning relies upon the use of surrogate measures – or key characteristics – in assessments, planning and monitoring, to represent the condition of

[127] Colorado Department of Parks and Wildlife, 2014. 2013 Outdoor Recreation Participation Public Survey Summary Report. Question 11. Available at http://cpw.state.co.us/Documents/Trails/SCORP/2013PublicSurveySummaryReport.pdf.
[128] FSH 1909.12,13.4(1)(e) ("The opportunities within the plan area to foster greater connection between people and nature through education, experience, recreation, and stewardship")
[129] Section 6(g)(3)(B) of NFMA stipulates that regulations be written to specify guidelines for land management plans that would: "provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives…"
[130] 36 C.F.R. § 219.9(a).
[131] 36 C.F.R. § 219.9(b).

ecosystems, as well as the identification of at-risk species. Forest plans will identify key characteristics of ecosystem structure, function, composition, and connectivity.

The assessment should provide information within the following categories:

Rule Requirement	**Information Type**
Ecosystem and Habitat Type Diversity (219.(a)(2))	Key characteristics associated with terrestrial and aquatic ecosystem types Rare aquatic and terrestrial plan and animal communities Diversity of native tree species
Ecosystem Integrity (219.(a)(1))	Composition Structure Function Connectivity Species diversity Focal species
Species Persistence (219.9(b))	Ecological conditions[132] necessary to: 1. Contribute to recovery of each threatened and endangered species 2. Conserve each proposed and candidate species 3. Maintain a viable population of each species of conservation concern within the plan area

The assessment should consider the results of prior monitoring, and the assessment report should include a summary of what was learned from monitoring under the existing plan (such as Management Indicator Species reports), focusing on the effects of existing plan components.

The planning rule requires the Forest Service to identify and evaluate fifteen categories of existing information relevant to the plan area.[133] The requirements that relate most directly to diversity include the following subsections:

1. Terrestrial ecosystems, aquatic ecosystems, and watersheds;
3. System drivers, including dominant ecological processes, and stressors, and the ability of ecosystems to adapt to change; and,
5. Threatened, endangered, proposed and candidate species, and potential species of conservation concern.

[132] Amount, quality, distribution and connectivity of habitat should be included among these conditions. Ecological conditions include human structures (including roads) and uses as well as the biological habitat characteristics that may overlap with characteristics for ecosystem integrity.
[133] 36 C.F.R. § 219.6(b).

Though outlined as 15 discrete topics in the 2012 rule, we recommend that assessments integrate tasks 1, 3, and 5 because these serve as the basis for evaluating the ecological condition of the landscape.

The rule's two-tiered conservation approach (alternatively called the "ecosystem-species" or "coarse-fine" planning method) relies upon the use of surrogate measures, or key characteristics, to represent the condition of ecosystems, as well as the identification of at-risk species and evaluation of whether those species will be sustained through ecosystem-level plan components, or whether they require specific management attention in the form of species-level plan components.

While the planning rule addresses individual species at the end of the diversity section, it will improve the effectiveness of the coarse filter and the efficiency of the planning process to design the coarse filter with selected species in mind. Consequently, the first factor that should be considered for an assessment is target species for the forest plan. While the most common target species used by the Forest Service are economically valuable tree species, failure to give high priority to important animal and plant species will make it more difficult for plan components to meet requirements in the Planning Rule for those species. Specifically, the habitat and other ecological needs of some individual species should be an important consideration in defining ecosystems and selecting their key characteristics.

We have used the lynx (*Lynx canadensis*) and the Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*) as examples to demonstrate how information could be presented in the assessment in a way that links target species with the habitat conditions that likely affect viability.

A. What target species should be considered for selection?

Target species would be selected from among:

1. Federally threatened, endangered, proposed and candidate species
2. SCC identified pursuant to 219.9(b)
3. Focal species selected pursuant to 219.12(a)(5)(iii)
4. Species commonly enjoyed and used by the public selected pursuant to 219.10(a)(5)

We focus on 1-3.

1. Which federal endangered, threatened, proposed, and candidate species are relevant to the plan area and planning process?

Federally recognized species (endangered, threatened, proposed, candidate) must be identified through the coordination with Endangered Species Act (ESA) consulting agencies. Starting this process at the assessment stage will provide an opportunity for the consulting agencies to begin contributing information that may be used to design the proposed action. Early contributions to a new or revised plan by the consulting agencies should help streamline the ESA Section 7(a)(2) consultation process for the plan, and increase the likelihood of contributing to recovery of listed

species and avoiding listing of proposed and candidate species (see ESA Section 7(a)(1)).[134] These federally recognized species must be addressed by plan components if they "may be present" in the plan area[135] and should be included as target species.

Species	**Federal Designation under the ESA**
Southwestern Willow Flycatcher (*Empidonax traillii extimus*)	Endangered
Uncompahgre Fritillary Butterfly (*Boloria improba acrocnema*)	Endangered
New Mexican Jumping Mouse (Zapus hudsonius luteus)	Endangered
Gunnison's Sage Grouse (*Centrocercus minimus*)	Threatened
Mexican Spotted Owl (*Strix occidentalis lucida*)	Threatened
Canada Lynx (*Lynx canadensis*)	Threatened
Yellow-billed Cuckoo (*Coccyzus americanus*)	Threatened

Data from: USDA Forest Service Rocky Mountain Region. 2013. Rocky Mountain Region Endangered, Threatened, Proposed, and Candidate Species. Last updated: November 14, 2013. (Updated to reflect changes: January 2015)

2. Which species should be considered for designation as Species of Conservation Concern?

Identification of SCCs by the regional forester is a preliminary planning step. It consists of applying regulatory criteria to species in the plan area based on best available scientific information. It is appropriate and necessary for this determination to occur early in the assessment process. Selection of SCC may be revisited throughout the planning process as required by new information.

The regional forester should also include species listed as sensitive by the Forest Service. A sensitive species is a "plant or animal species identified by a regional forester for which population viability is a concern" due to significant current or predicted downward trends in population numbers or density or habitat capability.[136] If a sensitive species is known to occur in a plan area, it should therefore be identified as a species of conservation concern for that area.

For other species known to occur in a plan area, there may be concerns about the risk to persistence in that particular plan area. Planners should cast a wide net to ensure that all potential species at risk are at least considered for attention in the planning process.

NatureServe[137] has designed an independent process that reviews the extinction risk of species throughout their ranges and large regions based on factors addressing rarity, trends and threats. Species are "vulnerable" in this scheme if they are at moderate risk of extinction or elimination

[134] The Endangered Species Act: http://www.fws.gov/endangered/laws-policies/esa.html.
[135] 50 C.F.R. 402.12(c)(1), (d).
[136] FSM 2670.5.
[137] See http://explorer.natureserve.org/ranking.htm.

due to a restricted range, relatively few populations or occurrences, recent and widespread declines, or other factors.

To ensure a comprehensive protection of viability for all species in a plan area, plan components should provide necessary ecological conditions for species that are classified under the NatureServe system as critically imperiled, imperiled, or vulnerable globally or nationally (G/N/T 1-3). NatureServe S1 and S2 (state) rankings must be considered as well, for it stands to reason that a species imperiled at the state level would also suffer from viability concerns on Forest Service lands within that state.

There are many other sources of information about the vulnerability of species in a particular plan area that should also be considered. Existing information for potential SCC from any source (including indigenous knowledge[138] or other anecdotal information) should be provided to the responsible official or the regional forester and reviewed for relevance to this determination.

The regional forester should evaluate any suggested potential species against the criteria in upon request.[139] If the information about a species' abundance, distribution threats, trends or response to management indicates that the species may not continue to persist over the long term in the plan area with a sufficient distribution to be resilient, then the regional forester must select it as an SCC. If not, the regional forester must document the rationale for finding that a potential species does not meet the SCC criteria. FSH 1909.12 section 12.52b (4). Species considered as potential SCC but not meeting the criteria in may be selected as public interest species or focal species.

The analysis of potential SCC must be included in the assessment.[140] The regional forester must also document best science currently available and species information needs, which should be addressed in the monitoring program.[141]

Recommended Species of Conservation Concern, Fauna

Species Name	**R2 Sensitive Species**	**NatureServe Rank**	**Additional Justification**[142]
Nokomis Fritillary Butterfly (*Speyeria nokomis nokomis*)	Yes	G3, T1, S1	
Rio Grande Chub (*Gila Pandora*)	Yes	G3, S1	
Rio Grande Cutthroat Trout (*Oncorhynchus clarkii*	Yes	G4, T3, S3	long-term decline, occupies only 5-7% of historic range

[138] 36 C.F.R. § 219.4(a)(3).
[139] 36 C.F.R. § 219.9(c).
[140] 36 C.F.R. § 219.6(b)(5).
[141] 36 C.F.R. § 219.12(a)(4)(i).
[142] Data from NatureServe Explorer: http://explorer.natureserve.org/ranking.htm.

Species Name	R2 Sensitive Species	NatureServe Rank	Additional Justification[142]
virginalis)			
Rio Grande Sucker (*Pantosteus plebeius*)	Yes	G3G4, S1	Declining
Northern Leopard Frog (*Lithobates pipiens)*	Yes	G5, S3	declining; declining in the Rockies
Boreal Toad (Anaxyrus boreas)	Yes	G4, S1	
White-Tailed Ptarmigan (*Lagopus leucurus*)	Yes	G5, S4	particularly vulnerable to climate change, need snow
Black Swift (*Cypseloides niger*)	Yes	G4, S3B	
Boreal Owl (*Aegolius funereus*)	Yes	G5, S2	
Brewer's Sparrow (*Spizella breweri*)	Yes	G5, S4B	declining
Ferruginous Hawk (*Buteo regalis*)	Yes	G3B, S4N	experiencing habitat and prey loss
Flammulated Owl (*Otus flammeolus*)	Yes	G4, S4	declining, loss of mature forest habitat
Lewis's Woodpecker (*Melanerpes lewis*)	Yes	G4, S4	declining, loss of nesting sites (snags)
Loggerhead Shrike (*Lanius ludovicianus*)	Yes	G4, S3S4B	Declining
Northern Goshawk (*Accipiter gentilis*)	Yes	G5, S3	
Northern Harrier (*Circus cyaneus*)	Yes	G5, S3B	Declining
Rocky Mountain Bighorn Sheep (*Ovis canadensis canadensis*)	Yes	G4, T4, S4	declining, high threat impact
Gunnison's Prairie Dog (*Cynomys gunnisoni*, pop. 1)	Yes	G5, T2, S2	
American Marten (*Martes americana*)	Yes	G4, S3	
Townsend's Big-eared Bat (*Plecotus townsendii*)	Yes	G3G4, S2	Declining

Recommended Species of Conservation Concern, Flora

Species Name	**R2 Sensitive Species**	**NatureServe Rank (global, taxonomic, CO state)**	**CO Rare Plant List**
Arizona Willow *(Salix arizonica)*	Yes	G2G3, S1	
Black Canyon Gilia (*Gilia penstemonoides*)	Yes		Yes
Brandegee Milkvetch (*Astragalus brandegeei*)		G3G4, S1S2	Yes
Catseye (*Oreocarya pustulosa*)		G5, S1	
Colorado Larkspur (*Delphinium ramosum var. alpestre*)		G4, S2	Yes
Colorado Tansy-aster (*Machaeranthera coloradoensis*)	Yes	G3, T2, S3	Yes
Downy Indian-Paintbrush (*Castilleja puberula*)		G2G3, S2S3	
Dwarf Hawskbeard (*Askellia nana*)		G5, S2	
Gray's Peak Whitlow-grass (*Draba grayana*)	Yes	G2, S2	Yes
Gray's Townsend-daisy (*Townsendia glabella*)		G2, S2	
King’s Campion (*Gastrolychnis kingii*)		G2G4Q, S1	
Many-stemmed Spider-flower (*Cleome multicaulis*)		G2G3, S2S3	
Mountain Bladder Fern (*Cystopteris montana*)		G5, S1	Yes
Mountain Draba (*Draba rectifructa*)		G3G4, S2	Yes
Northern Moonwort (*Botrychium pinnatum*)		G4?, S1	
Pale Moonwart (*Botrychium pallidum*)		G3, S2	Yes
Philadelphia Fleabane (*Erigeron philadelphicus*)		G5, S1	
Plummer's Cliff Fern (*Woodsia plummerae*)		G5, S1	
Reflected Moonwart		G3, S3	Yes

Species Name	R2 Sensitive Species	NatureServe Rank (global, taxonomic, CO state)	CO Rare Plant List
(Botrychium echo)			
Ripley's Milkvetch (*Astragalus ripleyi*)	Yes	G3, S3	Yes
Rothrock Townsend-Daisy (*Townsendia rothrockii*)		G2G3, S2S3	Yes
Sageleaf Willow (*Salix candida*)	Yes	G5, S2	
Slender Rockbrake (*Cryptogramma stelleri*)		G5, S2	Yes
Smith's Whitlow-grass (*Draba smithii*)	Yes	G2, S2	Yes
Southern Rocky Mountain Cinquefoil (*Potentilla ambigens*)		G3, S1S2 (S2)	Yes
Stonecrop Gilia (*Aliciella sedifolia*)	Yes	G1, S1	Yes
Whitebrush Cottongrass (*Eriophorum altaicum* var. *neogaeum*)	Yes	G4?, T3T4, S3	Yes
Winding Mariposa Lily (*Calochortus flexuosus*)	Yes	G4, S2	
Yellow Lady's Slipper (*Cypripedium parviflorum*)	Yes	G5, S2	

3. Which species would best serve the Focal Species Role?

The rule only addresses focal species in conjunction with the plan monitoring program developed by the responsible official.[143] However, the purposes of focal species are to permit "inference to the integrity of the larger ecological system to which it belongs" and provide "meaningful information regarding the effectiveness of the plan in maintaining or restoring the ecological conditions to maintain the diversity of plant and animal communities in the plan area."[144] Therefore focal species should be part of the overall strategy for identifying species at risk and key ecological conditions, and the regional forester should play a role in identifying focal species as well as SCC.

[143] 36 C.F.R. § 219.12(a)(5)(iii).
[144] 36 C.F.R. § 219.19.

The 2012 rule also includes requirements for focal species. Focal species are employed in the plan monitoring program to evaluate the effectiveness of the forest plan in meeting the diversity requirements.[145] Effective monitoring may require that some SCCs be selected as focal species.

a. Beaver (*Castor canadensis*)

Beavers are considered keystone, or strongly interacting, species. Paine (1969) first described the keystone species idea in the scientific literature. While Paine (1969) did not explicitly define the term, Kotliar et al (1999: 178) provided the following interpretation: "species whose activities greatly influence the composition, integrity, and functioning of communities" that is generally incorporated into and expanded upon in more recent refinements. According to Power et al. (1996), keystone species must bear disproportionately large impacts on their ecological communities. Contemporary scientists are more likely to use the term "strongly interacting" than keystone to differentiate such species. Researchers have documented declines in biodiversity that correlate with declines in strongly interacting species (see Soulé et al. 2005). The concept has evolved into an ecosystem management application and conservation imperative. Soulé et al. (2005: 174) stated,

> It is essential, therefore, that conservation practitioners, whether governmental or nongovernmental, adopt an ecological view that ensures the persistence of interactive species at ecologically effective population densities and maximal spatial occurrence (Soulé et al. 2003). In particular, we believe that natural-resource policymakers and wildlands managers should determine whether the rarity or absence (Hughes et al. 2000) of a species in a region can be expected to trigger ecological degradation, including the disappearances of native species and other elements of biodiversity.

A technical conservation assessment of beavers prepared for the Rocky Mountain Region (Region Two) acknowledged the interactive role of the rodents in riparian systems (Boyle and Owens 2007). Studies have demonstrated the negative consequences of beaver losses as well as the ecosystem services beavers provide through their dam building (Naiman et al. 1994; Gurnell 1998; Wright et al. 2002; Butler and Malanson 2005; Westbrook et al. 2006; Stevens et al. 2007; Bartel et al. 2010; Westbrook et al. 2010). Miller et al. 2003 (188), citing Naiman et al. (1988) and Gurnell (1998), presented a long list of documented ecological impacts of beaver engineering,

> stabilization of stream flows; increased wetted surface area (i.e. benthic habitat); elevation of water tables causing changes in floodplain plant communities; creation of forest openings; creation of conditions favoring wildlife that depend upon ponds, pond edges, dead trees, or other new habitats created by beavers; enhancement or degradation of conditions for various species of fish; replacement of lotic invertebrate taxa (e.g., shredders and scrapers) by lentic forms (e.g., collectors and predators); increased invertebrate biomass; increased plankton productivity; reduced stream turbidity; increased nutrient availability; increased carbon turnover time; increased nitrogen fixation by microbes; increased aerobic

[145] 36 C.F.R. § 219.12(a)(5)(iii).

respiration; increased methane production; reduced spring and summer oxygen levels in beaver ponds; and increased ecosystem resistance to perturbations.

Additionally, the presence of beaver dams and the functional populations of beaver in suitable habitats contribute to resilience in the face of climate change (Bird et al. 2011).

Beaver ponds provide winter habitat for Rio Grande cutthroat trout (Pritchard and Cowley 2006) and breeding habitat for boreal toads (Keinath and McGee 2005), two Region Two sensitive species that occur in the Forest. The RGNF has participated in translocations of beaver from private land to the Forest (Ghormley, pers. comm., 2014).

b. Canada Lynx (*Lynx canadensis*)

The presence and persistence of lynx populations can help indicate the health of old growth montane forests and the integrity of movement corridors. Lynx prefer high-elevation habitats characterized by forests at a variety of succession stages that result from natural disturbance regimes, such as fire (Miller et al. 2003). In the Southern Rockies, habitat includes vegetative communities typified by Engelmann spruce (Picea engelmannii), lodgepole pine (Pinus contorta), aspen (Populus tremuloides), and subalpine fir (Abies lasiocarpa) (Koehler and Aubry 1994). Lynx primarily prey primarily on snowshoe hares and red squirrels (Tamiasciurus hudsonicus). Lynx populations need extensive patches of high quality habitat, given their large home ranges. Two lynx require about 40 square miles (McKelvey et al. 1999).

c. Rio Grande Cutthroat Trout (*Oncorhynchus clarkii virginalis*)

Cutthroat trout are indicators of mountain stream quality (Behnke 2002). They require cold, clear streams with stable temperatures and well-vegetated banks (Hickman and Raleigh 1982; Raleigh and Duff 1981; Miller et al. 2003) as well as distinctive habitats for spawning, juvenile rearing, and overwintering. They are vulnerable to threats such as over-fishing; habitat loss and degradation from logging, mining, and livestock grazing; the introduction of non-native fish; disease, and roads. The Rio Grande cutthroat trout was a former a Management Indicator Species for Region Two.

d. Brown creeper (*Certhia americana*)

Brown creepers are indicators of the sustainable management of late-seral forests (Hejl et al. 2002; Poulin et al. 2008; Poulin et al. 2010). In the Southern Rockies, they inhabit mixed conifer subalpine forests. They require snags or dying trees where they nest under peeling bark (Hejl et al. 2002). Scientists commonly employ brown creepers as focal species to study forest disturbance (see Imbeau et al. 1999; Farris et al. 2010; Poulin et al. 2010; Vogeler et al. 2013). Because they have large territories, Poulin et al. (2010) suggested they serve as umbrellas species for other mature old-growth specialists.

B. To what extent is the Forest maintaining or restoring the ecological integrity of terrestrial and aquatic ecosystems and watersheds?[146]

[146] As outlined in 219.8(a)(1).

A key step in the assessment process is to identify measurable attributes of ecosystem diversity, ecological integrity, and species persistence. An attribute refers to a measurable characteristic that serves as an indicator, such as overstory canopy closure, number of large dead trees, the degree of habitat fragmentation within an ecosystem or the distribution of a species. These same attributes would then be considered for development of plan components and the monitoring program.

The planning rule requires that plan components provide the ecological conditions to maintain the diversity of plant and animal communities and support the persistence of native species in the plan area.[147] The assessment must identify the ecological conditions that will be most relevant and useful for developing plan components for diversity.

The new planning rule adopts "a complementary ecosystem and species-specific approach to maintaining the diversity of plant and animal communities and the persistence of native species in the plan area."[148] The ecosystem or "coarse filter" approach requires plan components to maintain or restore the integrity of those ecosystems and watersheds in the forest plan area. The coarse filter approach is based on the assumption that ecological conditions similar to those under which native species have evolved would usually maintain the vast majority of species in an area.[149] Therefore, ecological integrity occurs when key ecosystem characteristics occur within the natural range of variation (NRV).[150]

1. What was the historic or natural condition of ecosystems and habitat types?

An ecosystem is considered to have integrity when its key attributes occur within the NRV. NRV can be thought of as a reference condition reflecting "natural" conditions. Those conditions can be estimated using information from historical reference ecosystems, or by other science-based methods. For example, some current forest ecosystems have deficits of old-growth trees, compared to historical abundances. The 2012 planning rule requires the Forest Service to identify the key characteristics of ecosystems and manage them in light of these reference conditions, for the purpose of sustaining ecosystems and wildlife. The FS directives suggest adapting NRV analyses from comparable Forest System units.[151] In this case, it may be appropriate to borrow from the BLM Tres Rios Field Office – San Juan National Forest Land and Resource Management Plan, which was developed in 2013. The Several additional sources include NRV information or reference conditions for the RGNF, Rio Grande Basin, or larger Southern Rockies Ecoregion.

- Romme et al. (2009) developed an extensive range of variability analysis for the South Central Highlands with historic conditions for key forested ecosystems of the RGNF and surrounding regions. The analysis includes an evaluation of current conditions.

[147] 36 C.F.R. § 219.9) Additionally, ecological conditions include "habitat and other influences on species and the environment," including structural developments and human uses. 219.19.
[148] 36 C.F.R. § 219.9.
[149] 77 Fed. Reg. at 21212 (April 9, 2012).
[150] 36 C.F.R. § 219.19.
[151] "The Interdisciplinary Team may adapt the natural range of variation analysis from another National Forest System unit for specific ecosystems that are shared and make adjustments to fit the local conditions" FSH1909.12, Ch. 10, 12.14a.

- Kittel et al. (1999) classified riparian plant associations in the Rio Grande Basin with associated reference conditions.

- Lemly et al. (2012) conducted an assessment of RGNF wetland conditions, which includes a detailed NRV characterization of wetland types. The report also includes an examination of stressors to Forest wetlands and an evaluation of current conditions.

- The Nature Conservancy's Southern Rocky Mountains: An Ecoregional Assessment and Conservation Blueprint (Neely et al. 2001), provides NRV information for compositional attributes. This assessment includes an extensive list of floral and faunal species within the ecoregion, including imperiled and focal species, and an evaluation of habitat threats.

- The Southern Rockies Wildlands Network Vision (Miller et al. 2003) is a source for reference condition information and includes information about connectivity attributes.

    a. Rio Grande Cutthroat Trout

The Rio Grande cutthroat trout (RGCT) historically ranged throughout 6,660 miles of streams in Colorado and New Mexico (Alves et al. 2008). Of that about 49.2% (3,278 miles) occurred in the Rio Grande Headwaters. For reference, about 54% of current occupied habitat occurs on the RGNF within the Rio Grande Headwaters. A detailed set of reference conditions for RGCT spawning and rearing habitat can be found in Alves et al. (2008: 91-93, Appendix B).

Pritchard and Cowley (2006) also described reference habitat conditions. Generally, RGCT need cold, clear perennial streams. Before EuroAmerican settlement, RGCT likely occurred in a diversity of fluvial habitats, including the Rio Grande mainstem and first-order streams. Streams unencumbered by dams and other human structures allowed for migration and movement to enable gene flow. Spawning and egg-laying habitats include gravels that are oxygenated by water flow and clear of fine sediment. Fry prefer shallow, slow-moving backwaters, margins, and side-channels with available vegetative cover of aquatic or overhanging plants. As juveniles grow, they move to higher velocity stream channels. Deep pools, such as those created by beaver dams or large downed trees, are important summer and overwinter habitat because they require less energy expenditure than higher-velocity waters. Pools also provide protection from high summer temperatures, winter ice, and land-based predators. Older trout prefer lower velocity riffles as well as pools. RGCT may use undercut streambanks and woody debris for refugia. Water temperature is a key habitat component (Pritchard and Cowley 2006). Suitable summer water temperatures are above 46.0^{o} F and below 73-76 ^{o} F, above which the fish begin to experience heat stress (Pritchard and Cowley 2006). Spawning occurs during high water flows during snowmelt recession (RGCT Conservation Team 2013a).

There are a few spatial scales of importance for management consideration. Home range size may be several hundred meters during the post-spawning period (Pritchard and Cowley 2006). At the landscape level, Harig and Fausch (2002) determined that watersheds larger than 5.7 miles^2 had a greater than 50% likelihood sustaining an abundant reintroduced population of RGCT. However, Harig and Fausch (2002) also proposed that stream-scale patches based on habitat attributes are important. Research by Cowley (2007) suggested that the minimal viable population size for RGCT is 2,750 fish, requiring 0.8 miles^2 of habitat. Hildebrand and Kershner

(2000) found that a minimum stream length of 5.0 miles is necessary to sustain fish populations with a high abundance and 17.3 miles for a low abundance population.

b. Lynx

Evidence supports that Canada lynx ("lynx") were once common residents of Colorado (Ruediger et al. 2000; Meaney 2002; Devineau et al. 2010; Shenk 2014). Despite significantly depressed numbers, the species persisted in Colorado up to and throughout the time period of the Colorado Division of Wildlife (now Colorado Parks and Wildlife - CPW) efforts to reestablish a viable population in the state, beginning in 1999. Data also indicate that lynx have continually inhabited the San Juan Mountains (Carney 1993).

Between 1999 and 2006, CPW reintroduced 218 lynx to the San Juan Mountains, including to areas of the Rio Grande National Forest (Devineau et al. 2010). Most transplanted lynx remained within the San Juans, and some found mates and reproduced.

Generally, Southern Rockies lynx habitat occurs in the upper montane and subalpine forests. In Colorado, lynx tend to occur at higher altitudes with greater snow cover than in more northern reaches of their range. According to Shenk (2008; see also Theobald and Shenk 2011), lynx prefer the following habitat types:

- Mature forests dominated by Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) with a 42-65% canopy cover and 15-20% of that characterized by tree canopies of conifer understory,
- Spruce-fir/aspen mixed forests, and
- Riparian and mixed riparian cover where willow dominated vegetative communities provide habitat for prey species, such as snowshoe hare, ptarmigan, grouse, and others.

Lynx also use lodgepole (*Pinus contorta*) pine forest areas, but to a lesser extent than spruce-fir (Squires et al. 2010).

Romme et al. (2009) provided an extensive NRV assessment of these ecosystems that is relevant to the plan area.

Lynx tend to avoid large canopy openings, given that snowshoe hares rarely occur in open areas (Mowat et al. 2000; Interagency Lynx Biology Team 2013). Snowshoe hares serve as the primary prey base for lynx, though recent research indicates that lynx will prey on other species when hare numbers are low (Roth et al. 2007; Krebs 2011).

Foraging habitat. Lynx prefer habitats at an average elevation of 10,400 ft for foraging and travel (Shenk 2006). They select patches dependent on foraging opportunities (Moen et al. 2008; Vashon et al. 2008; Fuller and Harrison 2010; Squires et al. 2010). Lynx abundance may be dependent on sufficient densities of snowshoe hare. The patchy distribution of hare habitat may be a limiting factor to their abundance in the Southern Rockies (Interagency Lynx Biology Team 2013). Zahratka and Shenk (2008) found that hare densities were greater in Engelmann spruce-subalpine fir forest, but they also use lodgepole pine. While Ivan (2011) found that snowshoe hare densities were greater in lodgepole stands with small trees, hare had a higher survival rate in

stands of spruce-fir. Other studies indicate the lagomorphs prefer dense spruce-fir forests at early successional stages and also use regenerating lodgepole forests that are 30-70 years old (Dolbeer and Clark 1975; Beauvais 1997; Berg et al. 2012). Lynx also prey on red squirrel (Tamiasciurus hudsonicus) in Colorado (Apps et al. 2000; Interagency Lynx Biology Team 2013). Forests with trees of different ages provide preferred year-round foraging habitat (Poole et al. 1996; Griffin and Mills 2004; Squires et al. 2010). Lynx use conifer forests with significant understory of shrubs and saplings and low limbed trees.

Denning habitat. In Colorado, lynx den in elevations that average 11,000 ft (Shenk 2006). Mothers maximize protection from predators, precipitation, and fluctuating temperatures by seeking denning cover with coarse, woody debris and dense horizontal cover (Boutros et al. 2007; Moen et al. 2008; Shenk 2008; Squires et al. 2010).

Winter habitat. Habitat consist of multistory stands of mature Engelmann spruce and subalpine fir with large diameter trees characterized by dense horizontal cover, where tree limbs reach snow level. Lynx tend to avoid openings, recent clearcuts, and regenerating patches of saplings in winter (Koehler et al. 2008; Maletzke et al. 2008; Squires et al. 2010).

Summer habitat. Summer habitat tends to be more diverse. Lynx frequent younger stands of regenerating Engelmann spruce and subalpine fir that include smaller diameter trees (Squires et al. 2010).

The Forest Service currently manages lynx habitat at a spatial scale equivalent to the approximate area of a female's home range, which is a science-based approach. This is codified in the 2008 Southern Rockies Lynx Amendment[152] ("Amendment #7") to the RGNF LRMP of 1996, which has designated Lynx Analysis Units (LAUs).[153] Ecosystem management to maintain a viable population of lynx in the RGNF requires a landscape-scale approach that addresses the habitat connectivity needs of the species (see Walpole et al. 2012; Squires et al. 2013) and consider dispersal distances. This spatial scale exceeds the jurisdictional boundaries of the Forest.

The 2004 RGNF RAP and the 2006 Linking Colorado's Landscape Project (available via http://rockymountainwild.org/srep/linking-colorados-landscapes) identified very high and high priority connections for lynx from RGNF lands to adjacent forests in numerous locations, including the North, Poncha, Slumgullion and Wolf Creek Pass areas. Additional priority lynx linkage areas were identified connecting RGNF lands to adjacent BLM lands.

2. What are the relevant drivers and stressors?

The planning rule requires that plan components provide the ecological conditions necessary for at-risk species. These ecological conditions necessary for at-risk species are more encompassing than the "dominant ecological conditions" used to evaluate integrity, which are limited to biological characteristics. "Ecological conditions" are more broadly defined to include all elements of the biological and physical environment that can affect the diversity of plant and

[152] http://www.fs.usda.gov/detail/r2/landmanagement/planning/?cid=stelprdb5356865.
[153] And also an amendment to the LRMPs of six other Colorado national forests within Region 2.

animal communities. They include human structures and uses as well as biological characteristics. See definition of "ecological conditions" at 36 CFR 219.19.

Looking solely at NRV for dominant biological characteristics ignores how other human factors can affect diversity. Roads and other human uses and structures may affect connectivity by reducing the ability of wildlife to reach habitat having the desired biological characteristics, and may reduce the security that would allow them to fully utilize those characteristics if they do reach the habitat. The assessment should identify stressors related to these conditions, including stressors from outside of the plan area that may affect a species.

The planning rule requires the assessment to identify and evaluate information regarding "the ability of terrestrial and aquatic ecosystems on the plan area to adapt to change."[154] The assessment must therefore consider possible future scenarios for so called "system drivers" – including climate change – and identify those most likely to occur based on the best available scientific information. That information would be incorporated into projections for ecosystem and species sustainability, so that the revised forest plan and plan components can address the vulnerability and sustainability of ecosystems and species under probable climate change scenarios.

a. Rio Grande Cutthroat Trout

RGCT riparian habitat has suffered from mining, logging, livestock grazing, water diversions, and road and trail development (Prichard and Cowley 2006). Grazing pressure decreases streambank stability due to riparian vegetation removal and trampling, which leads to stream widening, loss of deep pools, increased fine sediment loads, and extreme water temperature fluctuations due to the reduction of shade. The presence of livestock grazing in riparian habitat is correlated with reduced RGCT abundance. Timber harvesting eliminates sources of woody debris used for cover by RGCT. Large woody debris retains sediments and organic material, provides nutrients, and structures stream morphology. Clearcutting impacts stream hydrology and increases erosion, and thus, sedimentation. The construction and maintenance as well as poor maintenance of roads and trails also impacts riparian hydrology and increases erosion and sedimentation. Dysfunctional culverts under roads can serve as barriers to movement. Mining can cause water pollution and also results in hydrological changes and increases erosion. Climate change is warming temperatures, including water temperatures, and increasing the frequency and severity of droughts, which can lower water flow and render perennial waterways ephemeral (Isaak et al. 2012).

b. Lynx

Habitat fragmentation. Lynx need large, contiguous expanses of suitable habitat (McKelvey et al. 2000; Murray et al. 2008; Walpole et al. 2012; Squires et al 2013). Fragmentation by roads, developments, and the loss of sufficient forested regions hinders lynx movement and consequently gene flow through the RGNF and larger Southern Rockies population, which is small and relatively isolated from the rest of the global population. Sustaining a viable

[154] 219.6(b)(3).

population of lynx in the Southern Rockies will require cooperation between other public lands units, such as the San Juan National Forest, to maintain existing corridors.

Access to habitat by competitors and predators. Buskirk et al. (2002) suggested lynx starvation, a significant mortality factor, is linked to competition for prey by species such as mountain lions (*Puma concolor*), bobcats (*Lynx rufus*), coyotes (*Canis latrans*), and raptors. This may be especially true in the summer when deep snow is less prevalent.

Fire. Fire has shaped and continues to shape lynx habitat conditions on the RGNF. Fire creates and maintains forest successional diversity, which provides habitat for lynx and snowshoe hare (Fox 1978; Bailey et al. 1986; Quinn and Thompson 1987; Koehler and Brittell 1990; Poole et al. 1996; Slough and Mowat 1996). Snowshoe hare and thus lynx may not use burned areas for a few years (Fox 1978), but will return as vegetation regenerates. The presence of fallen dead trees can provide foraging habitat (Interagency Lynx Biology Team 2013). Maletzke (2004) observed lynx traveling in burned areas more often than harvested areas perhaps due to snags offering sufficient cover.

Bark beetle and other insect outbreaks. Periodic outbreaks of native insects that kill significant numbers of trees within the RGNF and larger Southern Rockies ecoregion are natural disturbance events that affect forest conditions. It is not completely clear how recent outbreaks of pine and spruce bark beetle in the Southern Rockies and consequent lodgepole pine and Engelmann spruce-fir mortality are impacting lynx habitat in relation to lynx population and distribution trends. Chan-McLeod (2012) and Saab et al. (2014) suggested that small mammals may benefit from tree mortality resulting from beetle outbreaks. Interagency Lynx Biology Team 2013: 53) stated the following,

> In lodgepole pine forests, a mountain pine beetle (*Dendroctonus ponderosae*) epidemic typically kills the entire overstory and results in a stand-replacing disturbance event. In Colorado, more than 2,428,113 ha (6,000,000 ac), a portion of which overlaps with lynx habitat, has been affected by the current beetle epidemic (USDA Forest Service 2011). Even-aged mature and "dry" lodgepole pine stands characteristically have depauperate understory vegetation and are not capable of supporting dense populations of snowshoe hares. On moist sites, regeneration of beetle-killed lodgepole pine stands is expected to be rapid, and the new stands will be dominated by re-sprouting aspen or by a new cohort of lodgepole pine. If these newly-established stands grow tall and dense enough to provide horizontal cover above the snow layer, they may produce excellent habitat for snowshoe hares and lynx for several decades, until the crowns again lift above the reach of snowshoe hares.

Silviculture practices. If designed and executed without regard to negative impacts to lynx, vegetation management activities may be the greatest threat to lynx (Thornton et al. 2012; Interagency Lynx Biology Team 2013).

Natural disturbance factors, such as fire, beetle-kill, and wind throw, can also create stand openings. However, the Interagency Lynx Biology Team (2013: 71-72) summarized ways that

harvest and natural disturbance are not equivalent in relation to maintaining lynx and snowshoe hare habitat:

> Timber harvest may differ from natural disturbances by:
> - Removing most standing biomass from the site, especially larger size classes of trees, and down logs, which alters microsite conditions and nutrient cycling;
> - Creating smaller, more dispersed patches and concentrating harvest at lower elevations in mountainous regions and on more nutrient rich soils, resulting in habitat fragmentation;
> - Causing soil disturbance and compaction by heavy equipment, which may result in increased water runoff and slower tree growth at the site; or
> - Giving a competitive advantage to commercially-valuable tree species and reducing the structural complexity of the forest through the application of harvest, planting, thinning, and herbicide treatments.

Applying silvicultural treatments to an area where maintaining or restoring lynx habitat is a goal may be challenging (Pelz et al. 2015). Bull et al. (2001) reported tree thinning and salvage harvesting that removes dead trees or woody debris alters forest structure and may reduce denning habitat. Snowshoe hares can be negatively affected by precommercial thinning of regenerating conifer stands, because the practice reduces tree and horizontal cover density and results in greater patch homogeneity (Griffin and Mills 2007). Hoving et al. (2004) found lynx avoided recent clearcuts and areas where partial harvesting has occurred. Creating openings by removing selected large trees can reduce lynx usage of an area (Squires et al. 2010). Reducing understory density preferred by snowshoe hares in mature forests limits lynx wintering habitat.

In the Central and Southern Rocky Mountains, harvesting high elevation Engelmann spruce and subalpine fir has increased since the 1950s with the decline of lower elevation ponderosa pine. A spruce bark beetle outbreak spurred a 1000% uptick in spruce-fir harvesting between 1949 and 1956 (Jacobs 2004). Openings created via clearcutting could exceed 124 ac. Alexander (1987) suggested regenerating harvested Engelmann spruce stands, via natural or artificial means, is challenging. Jacobs (2004) also noted that early efforts at spruce-fir regeneration often ended in failure, and recent methods are costly. The Interagency Lynx Biology Team (2013) stated that regenerating Engelmann spruce-subalpine forests in attempt to restore lynx habitat may not be appropriate due to these and other challenges.

Recreation. More winter recreation with associated development occurs within lynx habitat in Colorado than any other region in the global range of the Canada lynx (Interagency Lynx Biology Team 2013). Though scientists have recorded a few lynx at ski areas, lynx likely avoid developed ski areas (Interagency Lynx Biology Team 2013 citing J. Squires, personal communication 2012). Additionally, road and trail use from snowmobiles, snowshoeing, or cross-country skiing causes snow compaction and greater access to lynx competitors and predators to higher elevation areas. Snow compaction allows predators and competitors such as bobcats, mountain lions, and coyotes to gain access to higher elevation areas otherwise covered in deep, soft snow. Lynx lose an adaptive advantage—their ability to traverse areas with deep,

soft snow—in areas where forest uses that impact snow cover (Buskirk et al. 2000; Interagency Lynx Biology Team 2013).

Climate change. Warmer winters, earlier snowmelt in spring, and less snow cover are predicted for the Southern Rockies (Interagency Lynx Biology Team 2013). McKelvey et al. (2011) modeled the predicted decline of snow persistence to be 40% throughout the western US in the 21st century though large areas of snow cover would remain, including in high elevation areas of Colorado. Climate change is almost certainly already affecting lynx habitat and populations in ways that are predicted in future scenarios. The Interagency Lynx Biology Team (2013: 69) outlined the following effects of climate change:

> 1) potential upward shifts in elevation or latitudinal distribution of lynx and their prey; 2) changes in the periodicity or loss of snowshoe hare cycles in the north; 3) reductions in the amount of lynx habitat and associated lynx population size due to changes in precipitation, particularly snow suitability and persistence, and changes in the frequency and pattern of disturbance events (e.g., fire, hurricanes, insect outbreaks); 4) changes in demographic rates, such as survival and reproduction; and 5) changes in predator-prey relationships. In addition, it is possible that interactions between these variables may intensify their effects.

Droughts, insect outbreaks, and wildfire associated with climate change could quickly change the size, distribution, and composition of habitat (Lynx Biology Team 2013 citing Cohen and Miller 2001; McKenzie et al. 2004; Westerling 2006; Raffa et al. 2008), and this may already be occurring. See also Yan et al. (2013) and Row et al. (2014).

3. What are the current condition of ecosystems and habitat types?

The species composition and diversity aspects of ecological integrity should be addressed by identifying key ecological conditions for the species at risk identified above. The relationship between these key ecological conditions and changes in species populations should be documented so that it can be tested as a "relevant assumption" under the monitoring program.[155]

During the process of determining that a species is at risk in the plan area, the regional forester should compile information about the ecological conditions necessary for each species,[156] including ecosystem composition, structure, function and connectivity. These should include the most important habitat elements for a species, and should represent limiting factors or those being threatened by actions that may be influenced by plan components. The assessment should address species population distributions as key ecological conditions for species diversity.

It is necessary to consider human structures and uses in the assessment because they are included in the definition of ecological conditions. Identification of these ecological conditions is needed during the assessment to provide a basis for plan components that would manage human structures and uses. In most cases, it is likely that roads and their use (as noted above) will be

[155] 219.12(a)(2).
[156] 36 C.F.R. § 219.9(b).

the predominant direct human influence on ecological conditions and diversity in the plan area, so these would be good candidates for necessary ecological conditions.

Assessments of current ecosystem and habitat conditions in the Forest or the Rio Grande Basin or surrounding ecoregion include Neely et al. (2000), Miller et al. (2003), Romme et al. (2009), and Lemly (2011).

a. Rio Grande Cutthroat Trout

Pritchard and Cowley (2006) outlined present RGCT habitat conditions. The RGCT has been extirpated from main Rio Grande channel and larger waterways and is now restricted to small streams at high elevations. Higher elevation riparian habitats are less productive than those at lower elevations where more dead wood and decaying vegetation draws invertebrate prey. With the loss of much suitable habitat, fry have been forced into waterways with high fine sediment loads likely resulting in lower overwinter survival. Higher summer water temperatures may, in part, be blamed for constricting populations of RGCT to higher elevation streams. Dams, roads, and other structural water barriers; degraded stream segments; and the presence of non-native fish have cause RGCT populations to become isolated. Lack of connectivity and the loss of a metapopulation structure inhibit genetic heterogeneity and increases the risk of inbreeding depression (Prichard and Cowley 2006).

The introduction and persistence of non-native fish to RGCT habitat for more than a century is the primary threat to the species. Hybridization with rainbow trout (*Oncorhynchus mykiss*) and cutthroat trout subspecies (*O. clarkii* spp.) can reduce genetic fitness. Brown trout (*Salmo trutta*) and brook charr (*Salvelinus fontinalis*) compete with and predate upon RGCT.

Alves et al. (2008) conducted a RGCT status assessment in 2008 under the auspices of the Rio Grande Cutthroat Trout Conservation Team. About 54% of occupied habitat within the Rio Grande Headwaters occurs on the Rio Grande National Forest, with 41% occurring on private property and less than 6% divided among the National Park Service, Bureau of Land Management, and tribal and state lands. Alves et al. (2008) found that 10.6% of historically occupied habitat in the Rio Grande Headwaters was occupied at the time of the study. About 28% (844 stream miles) of historic habitat is no long considered suitable.

According to Alves et al. (2008), of the habitat recently occupied in the Headwaters, 51.5% of stream miles (180 miles) are in good to excellent condition, with 43.7% (152 stream miles) in fair condition and 3.7% (13 stream miles) in poor condition and the rest unknown. Records of non-native fish stocking exist for 16% (56 stream miles) of occupied habitat. However, non-native fish populations have expanded beyond stocked segments. In the Rio Grande Headwaters, 69.6% of RGCT occupied stream miles also have records of non-native trout presence. A significant number of populations are at moderate to high risk of genetic contamination due to hybridization. Researchers have observed that one population in the entire RGNF range has been infected by disease, and this population occurs in the Rio Grande Headwaters along 53 stream miles. Populations of RGCT are fragmented throughout the species range, including within the RGNF (Alves et al. 2008).

Haak and Williams (2011) characterized most RGCT populations in the RGNF as genetically pure but considered none to be resilient. They reported that potential effects of climate change, such as increased drought and/or fire, were relatively low in the Rio Grande Headwaters, given that most of the populations exist at high altitudes.

The increased severity and frequency of droughts due to climate change has resulted in lower abundance of RGCT populations, as happened during the 2002 drought (Isaak et al. 2012). Droughts are increasing in severity and frequency due to climate change. For the RGCT this has resulted in lower abundance during drought periods, such as in 2002, due to lower stream flows. Additionally, many scientists believe climate change is increasing the frequency and severity of wildfires (Westerling et al. 2006; Littell et al. 2009). While fires are natural disturbances of the RGNF landscape, the fragmented and isolated pattern of RGCT populations makes recovery from impacts of fire more difficult (Isaak et al. 2012).

b. Lynx

The RGNF LRMP of 1996 contained no plan components to provide management direction for lynx habitat on the Forest. On March 24, 2000, the Fish and Wildlife Service listed the Canada lynx as threatened under the Endangered Species Act.[157] On October 28, 2008, the Rocky Mountain Region of the Forest Service finalized the Southern Rockies Lynx Amendment[158] that now governs management of projects in lynx analysis units on seven national forests including the RGNF. Additionally, the Forest Service is a party to the revised Canada Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team 2013). To help answer the question above, the RGNF assessment should include the following, along with other relevant information:

- A synthesis of information collected by the RGNF regarding the conditions of lynx habitat. The Forest Plan Monitoring and Evaluation Report: Fiscal Year 2010 (Rio Grande National Forest 2011: 9) indicated that this information may be fragmented across various project documents: "Evaluation of habitat conditions across the Forest are primarily limited to support funding associated with timber sales, range allotment management plan revisions, and other project activities that provide an opportunity for both coarse- and fine-scale assessments."

- An updated assessment as to how lynx habitat has changed recently, as per Ghormley (2011: 3) Lynx Habitat Model and Mapping Criteria that stated, "This paper is intended to be an iterative document that will be updated on an annual basis and/or as needed to incorporate local changes to lynx habitat."

- Any recent data about snowshoe hare and other lynx prey densities.

- An evaluation of the extent to which RGNF projects have complied with Amendment #7 standards, guidelines, and monitoring requirements.

[157] 65 Federal Register 16052.
[158] http://www.fs.usda.gov/detail/r2/landmanagement/planning/?cid=stelprdb5356865.

- An evaluation of the extent to which Amendment #7 is meeting the criteria of ecological integrity outlined in the planning rule.

- An account of how well lynx habitat management by RGNF is conforming to recommendations in the Canada Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team 2013).

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