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Wyoming v. USDA: A Look Down the Road at Management of Inventoried Roadless Areas for Climate Change Mitigation and Adaptation

Elisabeth Long *

The 2001 Forest Service Roadless Area Conservation Rule (Roadless Rule) prohibits road construction, reconstruction, and timber harvest on approximately one-third of National Forest System lands. In 2011, the Tenth Circuit upheld the Roadless Rule in Wyoming v. USDA after a decade of litigation. Subsequently, in October 2012, the Supreme Court refused to take up challenges to the Tenth Circuit’s ruling. Given the Forest Service’s new focus on managing for climate change and the importance of Inventoried Roadless Areas (IRAs) protected by the Roadless Rule, this Note examines whether management for climate change adaptation and mitigation is feasible, necessary, and defensible in IRAs. As background, Parts I and II describe the history and terms of the Roadless Rule and the projected effects of climate change on forest ecosystems. This Note explains the benefits of purely passive management of IRAs in light of climate change effects and discusses arguments against active management in IRAs, but because the Rule explicitly allows some level of active management in IRAs, Part III summarizes the relevant scientific literature on climate change mitigation and adaptation strategies that may be extended to IRAs. Part IV examines the Rule’s language, the case law, and the Forest Service’s statutory framework to analyze the extent to which the Agency may implement active management in IRAs, including strategies that do not adhere to historical conditions. This Note concludes that: 1) if the Agency seeks to actively manage IRAs, it needs a comprehensive set of criteria for prioritizing roadless areas for climate change mitigation and adaptation.

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treatments, and 2) the Agency may benefit from modifying the Rule’s language if it deems that management outside of the historical range of variability is necessary.

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Roadless areas on public land are ecologically, economically, and socially valuable. They provide multiple benefits to humans, including opportunities for scientific research, sources of clean drinking water, and opportunities for dispersed recreation.1 Roadless areas are ecologically critical because they serve as buffers against the spread of invasive species, provide habitats for rare and endangered plant and animal species, and play a critical role in maintaining watershed health and productivity.2 However, in the last part of the twentieth century, development pressures associated with road construction, reconstruction, and timber harvest increasingly threatened the integrity of roadless areas on federal land.3 Roads cause adverse impacts to forest ecosystems and the species within those ecosystems, including: habitat fragmentation, soil erosion, stream sedimentation, increased invasion by nonnative species and resulting displacement of native vegetation, wildlife displacement, and habitat loss and degradation.4

Recognizing the threats to roadless areas from development, President Clinton directed the U.S. Department of Agriculture (USDA) Forest Service5 to

2. Roadless Rule, supra note 1, at 3245.
3. Id. at 3247 (“Promulgating this rule is necessary to protect the social and ecological values and characteristics of inventoried roadless areas from road construction and reconstruction and certain timber harvesting activities. Without immediate action, these development activities may adversely affect watershed values and ecosystem health in the short and long term, expand the road maintenance backlog which would increase the financial burden associated with road maintenance, and perpetuate public controversy and debate over the management of these areas . . . . Adoption of this final rule ensures that inventoried roadless areas will be managed in a way that sustains their values now and for future generations.”).
4. Wyoming v. USDA (Wyoming IV), 661 F.3d 1209, 1246 (10th Cir. 2011); see also Michele R. Crist et al., Assessing the Value of Roadless Areas in a Conservation Reserve Strategy: Biodiversity and Landscape Connectivity in the Northern Rockies, 42 J. APPLIED ECOLOGY 181, 182 (2005) (“Expanding road networks, human settlements, resource extraction and other encroachments on the landscape have increased the fragmentation and loss of natural areas. Such disturbances have isolated many protected areas, causing them to function as terrestrial ‘islands’ surrounded by a matrix of lower quality altered lands.”) (citations omitted); James R. Strittholt & Dominick A. DellaSala, Importance of Roadless Area in Biodiversity Conservation in Forested Ecosystems: Case Study of the Klamath-Siskiyou Ecoregion of the United States, 15 CONSERVATION BIOLOGY 1742, 1743 (2001) (discussing that roads cover about one percent of the land area in the lower forty-eight states, but the “road effect zone” causes negative ecological effects over a much greater area—more than 18 to 22 percent of the coterminous United States).
propose regulations that would protect certain roadless areas within the National Forest System (NFS). Following this directive, the Forest Service developed the Roadless Area Conservation Rule (“Roadless Rule”), which prohibits road construction, reconstruction, and timber harvesting throughout most NFS inventoried roadless areas (IRAs). The Roadless Rule therefore applies to a vast landscape: approximately 58.5 million acres of NFS lands, or two percent of the land base of the continental United States. Because the Rule restricts road construction and large-scale timber harvest within IRAs, its implementation will prevent habitat and resource degradation and fragmentation on one-third of NFS lands.

While ecologically beneficial, the Rule has been the subject of much controversy. Since the Forest Service promulgated the Roadless Rule in 2001, it has been the subject of at least nine lawsuits filed in district courts in Wyoming, Alaska, Idaho, Utah, North Dakota, and the District of Columbia. The Tenth Circuit’s decision in *Wyoming v. USDA (Wyoming IV)* put an end to a decade of litigation when it reversed a district court opinion that permanently enjoined the Rule. In its opinion, the court rejected Wyoming’s numerous challenges to the Rule and found that it did not violate the Wilderness Act, the Organic Act, the National Environmental Policy Act (NEPA), the Multiple-Use Sustained Yield Act (MUSYA), or the National Forest Management Act (NFMA). On October 1, 2012, the Supreme Court refused to take up challenges to the Tenth Circuit’s ruling. Hailed by conservation groups as a victory for conservation of forest ecosystems, the Supreme Court’s denial of *certiorari* means that the Roadless Rule as promulgated by the Forest Service in 2001 is here to stay for the foreseeable future.

6. “Specifically, I direct the Forest Service to develop, and propose for public comment, regulations to provide appropriate long-term protection for most or all of these currently inventoried ‘roadless’ areas, and to determine whether such protection is warranted for any smaller ‘roadless’ areas not yet inventoried.” Memorandum from President William J. Clinton to the Secretary of Agriculture (Oct. 13, 1999), available at http://www.gpo.gov/fdsys/pkg/WCPD-1999-10-18/pdf/WCPD-1999-10-18-Pg2023.pdf.

7. Roadless Rule, supra note 1, at 3244. See Part I.B, infra, for a comprehensive definition of and discussion on the history of IRAs.

8. Roadless Rule, supra note 1, at 3245.


10. 661 F.3d 1209 (10th Cir. 2011).

11. See id.

12. On October 1, 2012, the Supreme Court declined to grant two petitions for *certiorari* from the state of Wyoming and the Colorado Mining Association in *Wyoming v. USDA*, 133 S. Ct. 417 (2012) and *Colorado Mining Association v. USDA*, 133 S. Ct. 144 (2012).

13. Environmental groups described the Supreme Court’s decision as a validation “of one of America’s most important and popular land conservation policies.” *Supreme Court Denies Hearing on USDA’s “Roadless Rule,” ENVTL.-APPEALS COURT* (Oct. 1, 2012), http://environmentalappealscourt.blogspot.com/2012/10/supreme-court-denies-hearing-on-usdas.html.
The Roadless Rule’s preamble and the Agency’s analysis of the Rule acknowledge the myriad benefits of roadless areas and the threats posed by development. However, neither fully addresses the threat that climate change poses to forest ecosystems. Since the Forest Service analyzed the effects of the Rule in its 2000 final Environmental Impact Statement (EIS), there has been a proliferation of literature on the effects of climate change on forests. Scientists now better understand these effects, including changes in timing and amount of precipitation, species range shifts, extinctions, and temperature changes. Further complicating the problem, federal agencies have been “slow to integrate climate change as a factor” in project planning and implementation due to uncertainty about effects, insufficient local information, lack of budget and personnel, and “until recently, absence of a mandate to incorporate climate change in agency operations.” This changed in October 2009, when President Obama signed Executive Order 13514, which tasked the Interagency Climate Change Adaptation Task Force (Task Force) with recommending how federal efforts might best prepare the country for climate change. The Task Force’s 2010 report called on agencies to “demonstrate leadership on climate change adaptation,” and its 2011 report discussed five “key areas of federal adaptation progress.”


15. U.S. FOREST SERV., FINAL ENVIRONMENTAL IMPACT STATEMENT VOLUME 1, 3-44 FOREST SERVICE ROADLESS AREA CONSERVATION (2000) [hereinafter FEIS]. The National Environmental Policy Act (NEPA) requires agencies to prepare an EIS when proposing “major Federal actions significantly affecting the quality of the human environment.” 42 U.S.C. § 4332(2)(C) (2012). Congress enacted NEPA for two principal purposes: (1) to ensure that a federal agency will have detailed information on significant environmental impacts when it makes decisions; and (2) to guarantee that the relevant information is made available to the public. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 349 (1989). NEPA directs agencies to consider the potential effects of a proposed federal action before implementation, and although it prescribes an analysis process, it does not prescribe substantive results. Marsh v. Or. Natural Res. Council, 490 U.S. 360, 371 (1989); Robertson, 490 U.S. at 350. If adverse environmental effects of the proposed action are “adequately identified and evaluated, the agency is not constrained by NEPA from deciding that other values outweigh the environmental costs.” Robertson, 490 U.S. at 350.

16. In the eleven years after the agency promulgated the Rule, the number of climate change research publications approximately doubled. See Daniel A. Farber, Modeling Climate Change and Its Impacts: Law, Policy, and Science, 86 TEX. L. REV. 1655, 1659 (2008).


19. INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE, FEDERAL ACTIONS FOR A CLIMATE RESILIENT NATION, PROGRESS REPORT OF THE INTERAGENCY CLIMATE CHANGE
The Forest Service now recognizes that climate change presents a challenge to implementing its mission to “sustain the health, diversity, and productivity of the Nation’s forests and grasslands to meet the needs of present and future generations.” Former Forest Service Chief Abigail R. Kimbell characterized the Agency’s response to these challenges as “one of the most urgent tasks facing the Forest Service.” Likewise, in a statement before the U.S. Senate Subcommittee on Public Lands and Forests, Chief Tom Tidwell stated that:

Climate change is already altering our Nation’s forests in significant ways and those alterations are very likely to accelerate in the future, in some cases dramatically . . . . In the uncertain environment of climate change, risk management will become critical. This is managing ecosystems for resiliency to prepare uncertain future outcomes.

Therefore, the Agency now directs managers to consider climate change “in the delivery of [the Agency’s] overall mission.” To implement this mandate, guidance documents help managers consider climate change in both land management plan revisions and in planning individual projects. This guidance urges agency staff to demonstrate “[l]eadership in mitigating climate change adaptation.”

ADAPTATION TASK FORCE 1 (2011) [hereinafter CLIMATE CHANGE TASK FORCE 2011 PROGRESS REPORT]. The five “key areas of Federal adaptation progress” referenced in the text include: “Integrating Adaptation into Federal Government Planning and Activities”; “Building Resilience to Climate Change in Communities”; “Improving Accessibility and Coordination of Science for Decision Making”; “Developing Strategies to Safeguard Natural Resources in a Changing Climate”; and “Enhancing Efforts to Lead and Support International Adaptation.” Id. The Task Force includes senior representatives from more than twenty departments and agencies, and is co-chaired by the Council on Environmental Quality, the Office of Science and Technology Policy, and the National Oceanic and Atmospheric Administration. Id.

Id. at 6.


24. See id.; FOREST SERVICE PROJECT LEVEL CLIMATE CHANGE GUIDANCE, supra note 21. Each unit (i.e. national forest or grassland) of the National Forest System is guided by a Land and Resource Management Plan (“LRMP” or “Forest Plan”) that the agency developed pursuant to the National Forest Management Act (NFMA), discussed infra in Part I.E. Each LRMP designates allowable management actions in particular areas within the management unit. The FOREST SERVICE CLIMATE CHANGE IN LRMP REVISIONS GUIDANCE document, supra note 22, directs managers to consider climate change in LRMP Revisions.
change and adaptive management for unavoidable climate change [effects]” in furtherance of “proper land stewardship for our national forests and grasslands.” To aid in this goal, managers have access to literature on forest management for climate change mitigation and adaptation. While managers are mandated to consider climate change in planning individual projects and in Forest Plan revision under NFMA, it is unclear to what extent the Roadless Rule allows management for climate change mitigation and adaptation in IRAs.

Management practices (or lack thereof) on the approximately one-third of NFS lands protected by the Roadless Rule will become increasingly important as climate change progresses. Given the Agency’s new focus on managing for climate change, this Note examines whether management for climate change adaptation and mitigation in IRAs is feasible, necessary, and defensible. As background, Part I describes the history of the Roadless Rule, its terms, and the litigation stemming from its inception. Part II discusses the projected effects of climate change on forest ecosystems and discusses the benefits of purely passive management of IRAs in light of these effects. Because the Rule explicitly allows some level of active management in IRAs, Part III summarizes relevant scientific literature on management strategies for climate change mitigation and adaptation that may be extended to IRAs. Part III concludes with a discussion of the arguments against active management in IRAs. While some of the recommendations for climate change management involve realigning highly disturbed systems with conditions that may have never occurred within the historical range of variability, the language of the Rule is ambiguous as to whether such treatments are allowed in IRAs. Therefore, Part IV examines the Rule’s language, case law, and the Forest Service’s statutory framework to analyze the extent to which the Forest Service may implement active management in IRAs. This Note concludes that: 1) if the Agency seeks to actively manage in IRAs, it needs a comprehensive set of criteria for prioritizing roadless areas for climate change mitigation and adaptation treatments, and 2) the Agency may benefit from modifying the Rule’s language if it deems that management outside of the historical range of variability is necessary.

25. FOREST SERVICE CLIMATE CHANGE IN LRMP REVISIONS GUIDANCE, supra note 22, at 1.
26. For a discussion of this literature, see infra Parts II.B, III, and IV. For example, the Forest Service has a Climate Change Resource Center, “a reference Web site for resource managers and decision makers who need information and tools to address climate change in planning and project implementation.” Climate Change Resource Center: About Us, U.S. FOREST SERV., http://www.fs.fed.us/crc/aboutus.shtml (last visited June 4, 2013).
28. See, e.g., PETERSON ET AL., supra note 17. This new focus on forestry to mitigate and adapt to the effects of climate change is not limited to the Forest Service or to the United States. “Awareness of the need to incorporate climate change into resource management and planning increased globally in association with the Fourth Assessment by the Intergovernmental Panel on Climate Change (IPCC), and in western North America in association with well-publicized reports on regional climate and hydrologic trends.” Id. at 4 (internal citations omitted).
I. THE ROADLESS RULE: HISTORY, TERMS, AND LITIGATION

A. History of the Roadless Rule

The Forest Service has a long history of protecting wild lands from development.29 In addition to the Agency’s early efforts, Congress took a significant legislative step in 1964 when it passed the Wilderness Act.30 The Wilderness Act both established the National Wilderness Preservation System, consisting of federally owned and congressionally designated “wilderness areas,”31 and enacted a process by which Congress could designate wilderness areas.32 The Act also established requirements for the management and protection of wilderness areas, and prohibited certain activities in those areas.33 Section 1132(b) of the Act required the Forest Service to evaluate “primitive” areas34 located on NFS lands in order to aid Congress in determining the suitability of these lands for preservation as “wilderness.”35 The Forest Service completed the evaluation required by the Act, and Congress designated more

31. Id. § 1131. Under § 1131(c), a piece of undeveloped federal land is eligible for designation as a “wilderness area” if it has been: protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.
32. Id. § 1132.
33. Id. § 1133.
34. The Forest Service created wilderness units known as “primitive areas” between 1929 and 1939. Margaret Shulenberger, Construction and Application of Wilderness Act (16 U.S.C. §1131 et seq.) Providing for National Wilderness Preservation System, 14 A.L.R. FED. 508, § 2a (1973). Conditions in these areas “were to be kept primitive,” but low-impact uses were permitted. Id. The Agency designated approximately seventy-three primitive areas (spanning approximately 13 million acres), which were given stronger protection in 1939. Id. Pursuant to these regulations, the Forest Service began a process of reviewing each primitive area. Upon review, certain areas over 100,000 acres in size became known as “wilderness areas,” while smaller areas between 5,000–10,000 acres became known as “wild areas.” Id. The Wilderness Act of 1964 made the process of wilderness preservation “a congressional rather than an administrative function.” Id. The Act immediately incorporated all areas designated as “wild” or “wilderness” into the National Wilderness Preservation System; however, areas designated as “primitive” would not be included in the system until a review of each area was completed. Id. Likewise, the Act established a review process for certain “roadless areas” on federal lands. Id.
35. 16 U.S.C. § 1132(b); see also Wyoming II, 661 F.3d 1209, 1221 (10th Cir. 2011).
than 5 million acres of recommended primitive areas as wilderness. 36 Because the Secretary of Agriculture may also recommend lands outside primitive areas for wilderness designation, the Forest Service carried out several reviews of potentially suitable areas. 37 The agency initiated two studies, known as the Roadless Area Review and Evaluation projects (RARE I and RARE II), in the 1960s and 1970s in order to evaluate additional roadless areas greater than 5000 acres on NFS lands. 38 From 1967 to 1972, RARE I produced a nationwide inventory of NFS lands that the Agency deemed suitable for designation as “wilderness.” 39 In 1977, the Carter Administration replaced RARE I with RARE II. 40 Congress subsequently designated millions of acres of wilderness identified by the RARE inventories. 41

Until the mid-1990s, the Forest Service permitted road construction on a site-specific basis in some IRAs (then defined as “[u]ndeveloped areas typically exceeding 5,000 acres that met the minimum criteria for wilderness consideration under the Wilderness Act” and that were inventoried in RARE II or a subsequent assessment). 42 However, in response to shifts in public opinion and pressure from wilderness advocates, the agency reevaluated its road-management policy in the late 1990s. 43 In 1998, the Agency proposed a revision to the management of NFS road system development, use, maintenance, and funding, and solicited comment on the management and protection of IRAs. 44 Subsequently, the agency promulgated the “Interim Roadless Rule,” which placed an eighteen-month hold on road construction in

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38. Wyoming IV, 661 F.3d at 1221–22; see also H. Michael Anderson & Aliki Moncrief, America’s Unprotected Wilderness 76 DENV. U. L. REV. 413, 419 (1999). In addition to evaluating additional roadless areas greater than 5000 acres, RARE I also evaluated some smaller roadless areas adjacent to already designated wilderness or primitive areas. Myers & Hill, supra note 36, at 15-12.
39. Wyoming IV, 661 F.3d at 1221.
40. Myers & Hill, supra note 36, at 15-12 to 15-13. However, the Forest Service abandoned the RARE II inventory after the programmatic environmental impact statement (PEIS) for the RARE II process was held to violate NEPA, “largely due to the failure to analyze impacts to lands that would be released from wilderness study or designation.” Id. at 15-13.
41. Id. at 15-13. For a history of the RARE process, see Robert L. Glicksman, Traveling in Opposite Directions: Roadless Area Management Under the Clinton and Bush Administrations, 34 ENVTL. L. 1143 (2004).
42. Now, IRAs are defined as: “Areas identified in a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000, which are held at the National headquarters office of the Forest Service, or any subsequent update or revision of those maps.” Roadless Rule, supra note 1, at 3272.
most IRAs. 45

In October 1999, while the Interim Rule was still in effect, President Clinton ordered the Forest Service to develop “regulations to provide appropriate long-term protection for most or all . . . currently inventoried ‘roadless’ areas” on NFS land. 46 That same month, the Forest Service published a Notice of Intent (NOI) to prepare an EIS and initiate a rulemaking that would “propose the protection of remaining roadless areas within the National Forest System.” 47 In the NOI, the Forest Service stated its intent to promulgate a two-part rule: Part one would “immediately restrict” activities such as road construction in unroaded portions of IRAs, while part two would “establish national direction for managing [IRAs], and for determining whether and to what extent similar protections should be extended to uninventoried roadless areas.” 48

The Forest Service issued a draft EIS (DEIS) and proposed Roadless Rule in May 2000. 49 As described in the NOI, the proposed Rule encompassed both a “Prohibition Rule,” which would restrict road construction and reconstruction in IRAs, and a “Procedural Rule,” which required the forest planning process to identify additional roadless areas and determine whether these areas deserved protection under individual forest plans. 50 The DEIS considered one “no action” alternative and three action alternatives, all of which would implement varying degrees of prohibitions on road construction and timber harvest. 51 The DEIS designated Alternative 2, which prohibited road construction and

46. Memorandum from President William J. Clinton to the Secretary of Agriculture, supra note 6.
48. Id. at 56,307.
50. Wyoming IV, 661 F.3d 1209, 1223 (10th Cir. 2011).
51. The DEIS analyzed the following alternatives:

Alternative 1 – (No Action), analyzed a baseline under which “[n]o rule prohibiting activities in [IRAs] would be issued.”

Alternative 2 – (Proposed Action and Preferred Alternative), analyzed a scenario under which: “Road construction and reconstruction activities including temporary road construction would be prohibited in the unroaded portions of [IRAs].”

Alternative 3 – This alternative prohibited road construction and reconstruction in the “unroaded portions” of IRAs and prohibited timber harvest “except when specifically designated for stewardship purposes.”

Alternative 4 – This alternative prohibited road construction and reconstruction in the “unroaded portions” of IRAs and prohibited “[a]ll timber harvest activities . . . in the unroaded portions of [IRAs].”

DEIS, supra note 49, at S-7 to S-8.
reconstruction within unroaded portions of IRAs, but did not restrict timber harvest, as the Agency’s preferred alternative.52

In November 2000, the Forest Service issued its final EIS (FEIS) for the Roadless Rule, which included several changes to the proposed action made since the DEIS.53 The FEIS extended the Rule to encompass roadeed portions of IRAs (areas within IRA boundaries in which roads were constructed after the Agency designated the area as an IRA),54 and increased the total acreage of IRAs subject to the Rule from 54.3 million acres to 58.5 million acres.55 The FEIS also selected a new preferred alternative, components of which were previously analyzed in the DEIS; this alternative prohibited not only road construction and reconstruction but also most timber harvest.56 Finally, the FEIS eliminated the Procedural Rule, and instead elected to incorporate it into a separate set of forest planning regulations.57

B. The Final Roadless Rule: Terms, Restrictions, and Exceptions

After soliciting comments on the FEIS, the Forest Service issued the final Rule and Record of Decision (ROD) in January 2001.58 The Rule applies to the 58.5 million acres of IRAs identified in the FEIS. It prohibits road construction and reconstruction, and the cutting, sale, or removal of timber in IRAs, subject to limited exceptions.59 For example, there are several exceptions to the Rule’s broad prohibition on road construction and reconstruction.60 Under a “public health and safety” exception, roads may be constructed to address an “imminent threat” that would cause the “loss of life or property.”61 Likewise, road construction is permitted where necessary to address pollution or conduct restoration under certain statutes.62 Roads may also be constructed where

52.  Id. at S-7.
54.  FEIS, supra note 15, at xi (“Alternatives no longer would apply to the ‘unroaded portion of an inventoried roadless area,’ but to all NFS lands within an inventoried roadless area boundary.”). The DEIS estimated that approximately 2.8 million of the 58.5 million acres of IRAs had been roadeed since the areas were designated as inventoried roadless areas. Roadless Rule, supra note 1, at 3261. The final rule eliminated the “roadeed” vs. “unroaded” distinction and simply applied the Rule to the entire IRA boundary. Id.
55.   Wyoming IV, 661 F.3d at 1224; FEIS, supra note 15, at 2-5 to 2-8; see also U.S. FOREST SERV., TABLE OF CHANGES FROM PROPOSED TO FINAL RULE (Jan. 5, 2001).
57.  FEIS, supra note 15, at 1-16 (“[T]he Forest Service determined that the procedures contemplated in the Roadless Rule should be an explicit part of the plan revision process, and addressed them at 36 CFR § 219.9(b)(8) of the final Planning Regulations.”).
58.   Wyoming IV, 661 F.3d at 1225.
59.  Roadless Rule, supra note 1, at 3245, 3263–67; see also Wyoming IV, 661 F. 3d at 1225.
60.  See Roadless Rule, supra note 1, at 3272–73.
61.  Id. at 3272. Examples of “imminent threat[s]” include “flood, fire, or other catastrophic event.” Id.
62.  Roadless Rule, supra note 1, at 3272. These statutes include: the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); 42 U.S.C. §§ 9601–75 (2012),
necessary under existing law or “reserved or outstanding rights,”63 to prevent “irreparable resource damage,”64 to improve safety where an accident is likely or has occurred,65 or as part of an authorized Federal Aid Highway project.66 Finally, roads may be constructed where needed under existing or renewed mineral leases,67 or to access valid mining claims.68

The Rule also contains exceptions to the prohibition of timber cutting, sale, and removal in IRAs, because according to the Agency: “[S]cience-based forest management might require some level of vegetative management in inventoried roadless areas.”69 The Rule permits timber harvest where it improves “roadless area characteristics,”70 and is needed to: 1) “improve threatened, endangered, proposed, or sensitive species habitat,” or 2) “maintain or restore” forest ecosystems.71 According to the Rule’s preamble, timber harvest to improve habitat may proceed if “it is designed to maintain or help restore ecosystem composition or structure to conditions within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.”72 The Agency added this exemption in order to allow management for habitat to “support the diversity of native and desired non-native species.”73 For example, the preamble envisions harvest to “improve stand structure” for wildlife and permits harvest to reduce tree “encroachment into meadows or other natural openings.”74 Likewise, the

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63. Roadless Rule, supra note 1, at 3272.
64. Under this exemption, “[r]oad realignment may occur . . . only if the road is deemed essential for public or private access, natural resource management, or public health and safety.” Additionally, realignment is only permitted where regular maintenance will not suffice. Id.
65. Id.
66. Id. This exemption may be used only absent another “reasonable and prudent alternative.” Id.
67. Id. at 3272–73. However, roads constructed under this exemption must be “obliterated” at the end of the lease or the road’s useful life.
68. Id. at 3255.
69. Id. at 3258. Section 294.13(a) of the Roadless Rule states: “Timber may not be cut, sold, or removed in inventoried roadless areas of the National Forest System, except as provided in paragraph (b) of this section.” Id. at 3273.
70. The “roadless area characteristics” defined in section 294.11 include:
   (1) High quality or undisturbed soil, water, and air; (2) Sources of public drinking water; (3) Diversity of plant and animal communities; (4) Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; (5) Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation; (6) Reference landscapes; (7) Natural appearing landscapes with high scenic quality; (8) Traditional cultural properties and sacred sites; and (9) Other locally identified unique characteristics.
    Roadless Rule, supra note 1, at 3272.
71. Id. at 3273.
72. Id. at 3257.
73. Id.
74. Id. As discussed in infra notes 262–263, meadow encroachment by conifer species threatens biodiversity in sensitive meadow ecosystems. Climate change, and attendant reductions in snowpack further exacerbate this threat.
preamble states that small-diameter timber harvest to address “uncharacteristic wildfire effects” is allowed where it serves to “maintain or restore” forest ecosystem “composition and structure . . . within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.”75 For example, the Rule permits thinning of trees that “became established as the result of missed fire return intervals due to fire suppression.”76

However, timber harvest is “expected to be infrequent,”77 and the Rule’s preamble suggests that projects in IRAs should “focus” on removing small-diameter timber, rather than larger trees.78 The Rule does not define “infrequent” or explain how large a tree may be considered “small diameter.”79 Rather, the Agency encourages the site-specific consideration of how tree removal would affect future stand development and plant and animal communities.80 For example, the preamble describes several important factors in determining an upper diameter limit for tree harvest, including: moisture, elevation, site aspect, soil type, and how well proposed treatments would mimic natural disturbance regimes in “providing the habitat patches, connectivity, and structural diversity critical to maintaining biological diversity.”81

The Rule also allows harvest for personal or administrative use and timber cutting or removal where “incidental” to a “management activity not otherwise prohibited.”82 It does not revoke or modify any existing permit or contract that authorizes “occupancy and use” within IRAs.83 Likewise, holders of mineral

75. Roadless Rule, supra note 1, at 3258.
76. Id. The preamble states that thinning is allowed in order to address forest conditions that “greatly increase[] the likelihood of uncharacteristic wildfire effects” such as “uncharacteristic fire intensity and spread.” Id. The small-diameter trees referenced in the preamble may act as a “fire ladder,” or “fuels that provide vertical continuity between strata that allows fire to carry from surface fuels into the crowns of trees or shrubs with relative ease.” FIRE IN CALIFORNIA’S ECOSYSTEMS 581 (Neil G. Sugihara et al. eds., 2006).
77. Roadless Rule, supra note 1, at 3273.
78. Id. at 3257.
79. In Sierra Club v. Eubanks, 335 F. Supp. 2d 1070, 1080 (E.D. Cal. 2004), the court noted that “the provisions of the Roadless Rule fail to specifically define” the term “generally small diameter timber,” but found that it was “questionable” whether trees up to twenty-four inches in diameter qualified as small.
80. Roadless Rule, supra note 1, at 3257. For example, “small-diameter” may refer to a larger tree in certain parts of the Sierra Nevada versus the Rocky Mountains based on tree species composition and average diameters present in a stand.
81. Roadless Rule, supra note 1, at 3257.
82. Roadless Rule, supra note 1, at 3273. Under the personal use exemption, individuals may cut firewood or Christmas trees in certain portions of IRAs. Id. at 3258. Under the administrative use exemption, the Forest Service may remove trees to construct fences and footbridges, for example. See id. “Incidental” timber harvest may occur during trail construction or maintenance, for fire line construction around prescribed burns or for wildland fire suppression, or for other “authorized activities” in ski areas and utility corridors. Id. at 3273. Other activities allowed under this exemption include the removal of hazard trees that threaten public safety and the removal of trees necessary to complete property boundary surveys. Id. at 3258.
83. Id. at 3273. For example, permittees who operate a ski area in an IRA may construct roads and ski runs as described in an Agency-authorized ski area master plan. Id. Section 294.14(b) specifies:
leases are not prohibited from constructing roads in IRAs. Finally, the Rule allows timber harvest where roads were constructed and timber was harvested in an IRA prior to the passage of the Rule such that “[r]oadless characteristics have been substantially altered.” While this exemption allows harvest only within the “substantially altered” portion of the IRA, it does not specify what constitutes such an area.

C. Roadless Rule Litigation Creates a Decade of Uncertainty

Soon after entering the White House, the Bush administration suspended the start date of the Rule. The state of Wyoming first challenged the legality of Roadless Rule under several environmental statutes, including NEPA, NFMA, MUSYA, and the Wilderness Act, in the United States District Court for the District of Wyoming in 2001. In 2003, the court ruled in the state’s favor and permanently enjoined the Roadless Rule because it found that the Forest Service promulgated the Rule in violation of NEPA and the Wilderness Act. Several environmental groups appealed the decision.

However, the Forest Service did not join in the appeal because it was in the process of analyzing the State Petitions Rule, promulgated in 2005, which purported to replace the 2001 Rule. The State Petitions Rule allowed states to voluntarily petition in order to establish or adjust IRA management requirements within state borders. The Forest Service justified the new rulemaking as necessary to address the Rule’s “inflexible ‘one-size-fits-all’”
prescriptions to protect roadless area values.\textsuperscript{93} The agency declined to fully analyze the new rule under NEPA because it “neither prohibits nor requires any action that would fund, authorize, or carry out activities on [NFS] lands.”\textsuperscript{94} The Tenth Circuit dismissed the environmental groups’ appeal in the first \textit{Wyoming v. USDA} litigation as moot because the Forest Service adopted the State Petitions Rule in place of the 2001 Rule.\textsuperscript{95} Then the court vacated the 2003 district court decision and remanded the case to the district court to dismiss without prejudice.\textsuperscript{96}

Subsequently, several states and environmental groups challenged the State Petitions Rule in the Northern District of California.\textsuperscript{97} There, the court disagreed with the Agency’s conclusion, set aside the State Petitions Rule for violating NEPA and the Endangered Species Act,\textsuperscript{98} and reinstated the 2001 Rule.\textsuperscript{99} Wyoming again challenged the Rule in the District of Wyoming. For a second time, the Wyoming court found that the Roadless Rule violated the Wilderness Act and NEPA, and therefore issued a nationwide permanent injunction.\textsuperscript{100} With the 2001 Rule in force throughout the Ninth Circuit, but not the Tenth, the defendants\textsuperscript{101} appealed and set the stage for the Tenth Circuit’s 2011 holding.

Two states, Colorado and Idaho, are not subject to the 2001 Roadless Rule, but instead petitioned for management of IRAs under different rules devised by each state. After the Forest Service promulgated the State Petitions Rule, Colorado’s state legislature created a task force to make recommendations to the governor in support of the state’s petition for a roadless rule.\textsuperscript{102} However, because the California district court set aside the State Petitions Rule and reinstated the 2001 Roadless Rule prior to Colorado finalizing its petition, the state’s governor submitted its finalized petition to the Secretary of Agriculture pursuant to section 553(e) of the Administrative Procedure Act (APA).\textsuperscript{103} The Forest Service began a rulemaking for the

\textsuperscript{93} Id. at 25,656.
\textsuperscript{94} Id. at 25,660.
\textsuperscript{95} Wyoming v. USDA (\textit{Wyoming II}), 414 F.3d 1207, 1213 (10th Cir. 2005).
\textsuperscript{96} Id.
\textsuperscript{97} California \textit{ex rel.} Lockyer v. USDA, 459 F. Supp. 2d 874 (N.D. Cal. 2006), aff’d 575 F.3d 999 (9th Cir. 2009).
\textsuperscript{99} See Lockyer, 459 F. Supp. 2d at 919.
\textsuperscript{100} Wyoming v. USDA (\textit{Wyoming III}), 570 F. Supp. 2d 1309, 1355 (D. Wyo. 2008).
\textsuperscript{103} Section 553(e) of the Administrative Procedure Act (APA) allows any “interested person the right to petition [an agency] for the issuance, amendment, or repeal of a rule.” 5 U.S.C. § 553(e) (2012).
Colorado-specific rule in 2007, completed a final EIS in 2012, and published the final rule in 2012. Critics complain that the Colorado Rule “provides a lower level of protection for Colorado roadless lands than for virtually all other roadless forest lands in the nation.” In what may be a “first test for the Colorado Roadless Rule,” Earthjustice filed an administrative appeal in September 2012 challenging a coal mine expansion within an IRA in the Gunnison National Forest.

Idaho also developed a statewide roadless rule to govern IRAs within its borders. As in Colorado, Idaho’s governor resubmitted the state’s petition under section 553(e) of the APA after the 2006 ruling setting aside the State Petition Rule. The Idaho Rule has been in force since 2008. Like the Colorado Rule, it offers more flexibility for active forest management than the 2001 Rule. For example, the Regional Forester may approve temporary road construction or reconstruction in Idaho’s IRAs in order to “reduce hazardous fuel conditions outside a community protection zone” when one of several circumstances exist. Road construction and reconstruction in IRAs is also permitted in excess of the 2001 Rule’s allowances. Environmental organizations challenged the Idaho Rule under the ESA and NEPA; however, the court in Jayne v. Rey recently granted the federal defendants’ motion for summary judgment.
D. In Wyoming v. USDA, the Tenth Circuit Affirms the Agency’s Authority to Promulgate the Roadless Rule Under Its Broad Statutory Framework

In 2011, the Tenth Circuit ended a decade of litigation when it upheld the validity of the Roadless Rule in Wyoming v. USDA. The court rejected each of Wyoming’s challenges to the Rule and found that the Forest Service acted within its statutory authority under the Wilderness Act, the Organic Act, NEPA, MUYSA, and NFMA in promulgating the Rule. This Part briefly summarizes Wyoming’s claims, discusses the Tenth Circuit’s analysis and holdings, and summarizes the key statutes at issue in the case.

Wyoming first claimed that the Rule designated “de facto” administrative wilderness areas in “contravention of the process established” under the Wilderness Act.113 As discussed above in Part I.A, the Wilderness Act created the National Wilderness Preservation System and vested in Congress the exclusive power to designate “wilderness areas.”114 Citing certain similarities between wilderness areas and IRAs, Wyoming first claimed that the Forest Service violated the Wilderness Act when it “usurped Congress’[s] power regarding access to, and management of, public lands by a de facto designation of ‘wilderness.’”115 While the district court found this argument convincing, the Tenth Circuit agreed with the Agency’s contention that IRAs governed by the Rule are not de facto wilderness areas.116 The court found that IRAs and wilderness areas differ functionally and that the Wilderness Act is far broader in scope than the Roadless Rule.117 According to the court, several key activities are allowed in IRAs but not in wilderness, including: permanent structures and installations, various recreational activities, road maintenance, livestock grazing, and mineral development.118 The court found that these differences demonstrated that wilderness areas and IRAs “are not only distinct, but that the Wilderness Act is more restrictive and prohibitive than the Roadless Rule.”119

The court next turned to the question of whether the Agency “otherwise acted within its statutory authority” in enacting the Rule.120 Wyoming did not explicitly claim that the Agency promulgated the Rule in violation of the Organic Act,121 which established a “limited multiple-use mandate”122 for

113. Wyoming III, 570 F. Supp. 2d 1309, 1345 (D. Wyo. 2008); see also Wyoming IV, 661 F.3d 1209, 1227 (10th Cir. 2011).
114. Wilderness Act of 1964, 16 U.S.C. § 1131(a) (2012). “Indeed, Congress explicitly stated that ‘no Federal lands shall be designated as “wilderness areas” except as provided for in [the Wilderness Act] or by a subsequent Act.’” Wyoming IV, 661 F.3d at 1228 (citing 16 U.S.C. § 1131(a)).
115. Wyoming IV, 661 F.3d at 1229 (citing Wyoming III, 570 F. Supp. 2d at 1346).
116. Id.
117. Id. at 1230.
118. Id. at 1230–32.
119. Id. at 1233.
120. Id. at 1234.
National Forest management and granted the Forest Service “broad discretion to regulate the national forests, including for conservation purposes.” However, the court explored the extent to which the Act allowed the agency authority to enact rulemakings by looking to the Act’s history and to other courts’ interpretations. The Act directs the Forest Service to protect the nation’s forest reserves, secure “favorable conditions of water flows,” and “furnish a continuous supply of timber for the use and necessities of citizens.” This mandate “establishes an ongoing but productive tension.” Courts have interpreted the Organic Act as revealing “a clear intent of Congress to commit regulation of the national forests to the discretion of the Secretary,” and upheld this authority in a “variety” of circumstances. For example, in overturning the Idaho district court’s preliminary injunction enjoining the Roadless Rule, the Ninth Circuit in Kootenai Tribe of Idaho v. Veneman stated: “[T]he general rulemaking authority of the 1897 Organic Act is sufficient to support the Roadless Rule’s promulgation.” Like the Ninth Circuit, the Tenth Circuit found that the Act’s grant of “broad rulemaking authority” allowing the Agency “to regulate ‘occupancy and use’ of NFS lands and ‘to preserve the forests thereon from destruction,’” was “alone sufficient” to support the Agency’s Rule.

Next, the court considered Wyoming’s claim that the Agency promulgated the Roadless Rule in violation of its authority under the Multiple Use Sustained Yield Act (MUSYA) for three reasons: 1) the Rule impermissibly applies a “one size fits all approach” to IRAs that compels “identical treatment of those lands”; 2) “the rule ‘precludes administration of renewable resources for multiple use’”; and 3) “the rule ‘gives no consideration to various resources in

123. Wyoming IV, 661 F.3d at 1234 (citing United States v. Hymans, 463 F.2d 615, 617 (10th Cir. 1972)); see also Burlison v. United States, 533 F.3d 419, 435 (6th Cir. 2008) (“Congress has given the Forest Service broad power [under the Organic Act] to regulate Forest System land.” (quoting Duncan Energy Co. v. U.S. Forest Serv., 50 F.3d 584 (8th Cir. 1995)); Skranak v. Castenada, 425 F.3d 1213, 1217 (9th Cir. 2005) (“16 U.S.C. § 551 confers broad powers on the Forest Service to regulate roads for the good of the forests.”) (citing Clouser v. Espy, 42 F.3d 1522, 1538 (9th Cir. 1994)).
124. Wyoming IV, 661 F.3d at 1234–35.
125. 16 U.S.C. § 475. Additionally, the Act authorizes the Secretary of Agriculture to “make provisions for the protection against destruction by fire and depredations upon the public forests and national forests” in order “to regulate their occupancy and use and to preserve the forests thereon from destruction.” 16 U.S.C. § 551; see also McMichael v. United States, 355 F.2d 283 (9th Cir. 1965).
126. This tension may arise when certain interested parties highlight the provisions that direct forest and water protection, while others emphasize “the ‘supply of timber’ component.” JAMES BURCHFIELD & MARTIN NIE, UNIV. OF MONT. COLLEGE OF FORESTRY AND CONSERVATION, NATIONAL FORESTS POLICY ASSESSMENT REPORT TO MONTANA SENATOR JON TESTER 5 (2008).
127. See Mountain States Tel. & Tel. Co. v. United States, 499 F.2d 611, 614 (Cl. Cl. 1974).
129. Kootenai Tribe of Idaho v. Veneman, 313 F.3d 1094 (9th Cir. 2002).
130. Id. at 1117 n.20.
131. Wyoming IV, 661 F.3d 1209, 1235 (10th Cir. 2011) (citing Kootenai Tribe, 313 F.3d at 1117 n.20).
To answer Wyoming’s contentions and find that the Forest Service did not violate the Act, the court analyzed MUSYA’s purpose and the terms of the Roadless Rule. According to the court, MUSYA supplemented the Organic Act and “reaffirmed” the Agency’s “authority to manage national forests for a wide range of uses.” It directs the Forest Service to manage national forests for “multiple uses,” including “outdoor recreation, range, timber, watershed, and wildlife and fish purposes.” Under MUSYA, the Agency must “make the most judicious use” of forest land for “some or all of these resources,” but the Act acknowledges that “some land will be used for less than all” of the enumerated resources. MUSYA, therefore, gives the Agency “broad discretion” to manage NFS lands for a variety of purposes.

Based on this analysis, the Tenth Circuit held that “[u]nder MUSYA’s statutory scheme, which supplemented the broad authority granted in the Organic Act, Congress clearly authorized the Forest Service to regulate NFS lands for multiple uses, including those protected by the Rule, such as ‘outdoor recreation,’ ‘watershed,’ and ‘wildlife and fish purposes.’” The court disagreed with Wyoming’s first contention that the Rule applies a “one size fits all approach” to IRAs because the exceptions under the Rule allow the “Responsible Official” to permit road construction and timber harvest in IRAS “in a variety of different situations.” Further, the court found that the Rule does not preclude multiple use management but rather “fulfills” the agency’s mandate to manage for such uses.

133. Wyoming IV, 661 F.3d at 1266–67 (internal quotations omitted).
134. Id. at 1235.
135. MUSYA defines “multiple use” as:

The management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

136. Id. § 528.
137. Id. § 531(a).
138. Wyoming IV, 661 F.3d at 1235 (“As with the Organic Act, the provisions of MUSYA give the Forest Service broad discretion to regulate NFS lands for a wide variety of purposes.”).
139. Id.
140. Id. at 1267. The court further noted that “responsible officials may permit the cutting, removal, and sale of small diameter timber to occur within a particular IRA in order to ‘improve threatened, endangered, proposed, or sensitive species habitat’ of the areas or to ‘maintain or restore the characteristics of ecosystem composition and structure’ of the area.” Id. (citing Special Areas: Roadless Area Conservation, 56 Fed. Reg. 3244, 3272–73 (Jan. 12, 2001) (codified at 36 C.F.R. § 294.13(b)(1)(i)–(ii)).
141. Wyoming IV, 661 F.3d at 1268.
broad discretion to determine the proper mix of uses” permitted throughout NFS lands, the court found that the Rule need “not permit all uses specifically identified in MUSYA—namely, ‘timber’ purposes.”142 Additionally, the court countered Wyoming’s contention that “multiple use cannot be seriously contemplated when access to forests is effectively cut off by the roads prohibition” by citing the approximately 386,000 miles of existing roads on NFS lands through which “these multiple uses will be permitted to continue.”143 Finally, the court rejected Wyoming’s third claim that the Agency failed to “give due consideration” to the resources in particular IRAs144 because a review of the administrative record demonstrated that the Agency assessed the value of the various resources throughout IRAs, including timber, recreation, wilderness, watershed, and wildlife and fish.145

Wyoming next reasserted its claim, upon which the district court declined to rule, that the Roadless Rule violates the National Forest Management Act (NFMA).146 Specifically, Wyoming claimed that the Rule: 1) violated NFMA’s “one integrated plan” requirement; 2) violated individual forest plans by redesignating 9 million acres of NFS lands as “unsuitable for commercial timber production”; 3) failed to comply with NFMA’s comment period requirement; and 4) “generally violate[d] NFMA’s mandate that national forests should be governed by individual forest plans, rather than a national land management prescription.”147

NFMA, passed in 1976 in response to “high profile conflicts” over National Forest management,148 is “primarily concerned with planning.”149 It requires the agency to develop, maintain, and revise “land and resource management plans” (LRMPs) for each management unit (i.e. National Forest or National Grassland) within the National Forest System.150 The LRMP is to function as “one integrated plan for each unit of the National Forest System.”151 NFMA established both substantive and procedural requirements for the Agency’s development and implementation of LRMPs.152 For example,
it prescribes that each forest plan must comply with MUSYA’s multiple-use mandate. The Act also prescribes clear-cutting guidelines and timber harvest restrictions, and the statute’s “biodiversity mandate” directs the agency to “provide for the diversity of plant and animal communities.”

The Tenth Circuit struck down Wyoming’s NFMA claim without considering each sub-claim because it found that NFMA did not apply given that the Rule was promulgated pursuant to the Agency’s “general rulemaking authority” under the Organic Act and MUSYA. The court found that NFMA established a localized planning process without taking away from the Agency’s authority under MUSYA and the Organic Act to “issue a broad nationwide conservation rule.” NFMA was inapplicable because it pertains to planning for specific administrative units, whereas the Rule applies to IRAs across the nation. According to the Tenth Circuit, although NFMA requires the Agency to participate in “localized forest planning,” it is “permitted to rely on its rulemaking authority under the Organic Act and MUSYA to resolve issues of broad, even nationwide, applicability—such as protection of IRAs.” Further, the court noted other decisions that supported its holding.

153. Id. § 1604(e)(1).
154. Id. § 1604(g)(3)(E). NFMA further provides for public review and prescribes a three-month comment period prior to final LRMP development and revision. Id. § 1604(d).
155. Id. § 1604(g)(3)(B); see also Nell Green Nylen, Note, To Achieve Biodiversity Goals, the New Forest Service Planning Rule Needs Effective Mandates for Best Available Science and Adaptive Management, 38 ECOLOGY L.Q. 241, 244 (2011) (describing NFMA’s “biodiversity mandate”).
156. Wyoming IV, 661 F.3d 1209, 1270–72 (10th Cir. 2011).
157. Id. As the court further noted, Congress did not intend to curtail the Forest Service’s broad rulemaking authority under § 551, it is assumed that it would have at least referenced that provision in some manner. Congress did not do so in NFMA or its legislative history. It is clear that Congress considered the Organic Act in promulgating NFMA—which is evidenced by the fact that NFMA § 13 expressly repealed a separate provision of the Organic Act—but chose not to limit or even reference 16 U.S.C. § 551 in the NFMA.
158. Id. (citations omitted).
159. Id.; see also Am. Hosp. Ass’n v. NLRB, 499 U.S. 606, 612 (1991) (“[E]ven if a statutory scheme requires individualized determinations, the decisionmaker has the authority to rely on rulemaking to resolve certain issues of general applicability unless Congress clearly expresses an intent to withhold that authority.”).
160. Wyoming IV, 661 F.3d at 1271. The Tenth Circuit noted that the Wyoming district court held in Wyoming Timber Industry Association v. U.S. Forest Service that the Agency need not abide by NFMA in implementing the Interim Roadless Rule (the 2001 Rule’s precursor) because the Agency “had the right to proceed via rulemaking in lieu of forest plan modification.” Wyoming IV, 661 F.3d at 1271 (citing 80 F. Supp. 2d 1245, 1260 (D. Wyo. 2000)). Additionally, the Ninth Circuit reached the same conclusion in Kootenai Tribe of Idaho v. Veneman where it reviewed a challenge to the Roadless Rule, stating that although “[t]here is some practical force in the contention that the Roadless Rule will override local forest-by-forest planning with regard to its intended scope,” there is “nothing in [NFMA], which establishes procedures and standards for National Forest System land and resource plans, [that] precludes national action on a conservation issue within the power of the Forest Service.” 313 F.3d 1094, 1117 n.20 (9th. Cir. 2002).
II. CLIMATE CHANGE EFFECTS ON AMERICAN FOREST ECOSYSTEMS REQUIRE NEW MANAGEMENT APPROACHES.

Climate change is already affecting forest ecosystems, and will continue to do so. Forest Service scientists acknowledge that climate change effects “challenge” the agency’s ability to implement its mission to sustain the health, diversity, and productivity of NFS lands.\(^{161}\) While the Agency already manages endlessly dynamic ecosystems, climate change will amplify and compound “existing stressors” on forests systems including invasive species, fire, pathogens, disease, insects, pollution, and floods.\(^{162}\) Other changes, including variations in the timing, amount, and type (i.e. snow vs. rain) of precipitation; altered stream flows; prolonged drought; more extreme weather events; and shifting wildlife and plant species ranges, will create a “kaleidoscope of new patterns and trends” and require new management strategies.\(^{163}\)

A. Climate Change Will Dramatically Affect Forest Ecosystems.

There is consensus that climate change will cause temperatures to rise.\(^{164}\) The most recent Intergovernmental Panel on Climate Change (IPCC) report predicted global temperatures to rise between 2 and 4.5 degrees (°) Celsius (C) by 2100.\(^{165}\) However, temperature changes across U.S. federal lands will not be uniform.\(^{166}\) All climate models predict temperatures to rise in the western United States by 2100, and most models predict higher average winter temperatures.\(^{167}\) Temperatures in the Pacific Northwest are predicted to increase between 0.5 and 2.5°C by 2020, and between 1.5 and 3.2°C by

\(^{161}\) Peterson et al., supra note 17, at 1.

\(^{162}\) Id. In particular, this section highlights predictions for the western United States, where the vast majority of IRAs are located. In general, there are “far more public forests in the West than in the East.” Blake Hudson, Fail-Safe Federalism and Climate Change: The Case of U.S. and Canadian Forest Policy, 44 CONN. L. REV. 925, 965 (2012).

\(^{163}\) Peterson et al., supra note 17, at 1.

\(^{164}\) Intergovernmental Panel on Climate Change, Working Group 1, Fourth Assessment Report, Climate Change 2007: The Physical Science Basis 91 (Susan Solomon et al. eds., 2007), available at http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg1_report_the_physical_science_basis.htm; see also Farber, supra note 16, at 1663 (discussing IPCC estimates).

\(^{165}\) Intergovernmental Panel on Climate Change, supra note 164, at 65 (“Analysis of models together with constraints from observations suggest that the equilibrium climate sensitivity is likely to be in the range 2°C to 4.5°C, with a best estimate value of about 3°C. It is very unlikely to be less than 1.5°C.”).


Likewise, temperatures in California’s Sierra Nevada are projected to rise between 1.7 and 5.8°C by 2100. Fewer frost days and warmer winter and spring temperatures are predicted for the southwestern United States. Scientists predict summer temperatures to rise more than winter temperatures across the Colorado Plateau, where annual temperatures are predicted to rise up to 5.4°C by 2100. Similarly, temperatures in different subregions of the Intermountain West are projected to increase between 2 and 5°C.

Changes in the timing, amount, and nature of precipitation are predicted to accompany increased temperatures. Annual mean precipitation is likely to increase in the Northeast but decrease in the Southwest. While models predict drier conditions in the Southwest, the Pacific Northwest will experience wetter winters. Scientists are predicting less snowpack throughout the Sierra Nevada and the Cascades, despite increases in overall precipitation. Future declines in snowpack will compound those that have already occurred throughout the West, and particularly in the Intermountain West, since the 1950s. Other alarming changes have begun: climate change is credited with up to 60 percent changes in river flows and snowpack in the West over the past fifty years. These changes are predicted to impair water quality and quantity.

Regional declines in precipitation will increase the severity and frequency of wildfires. Warmer and drier conditions lead to increased moisture stress in trees and forest vegetation, which in turn results in earlier and longer fire

168. Id. at 6 (citing P.W. Mote et al., Preparing for Climactic Change: the Water, Salmon, and Forests of the Pacific Northwest, 61 CLIMATE CHANGE 45 (2003)).


171. Id. (citing G. Garfin et al. Downscaling Climate Projection in Topographically Diverse Landscapes of the Colorado Plateau in the Arid Southwestern United States, in THE COLORADO PLATEAU IV 21-44 (C. Van Riper et al. eds., 2010)).

172. Id. at 7 (citing J.C. Chambers & M. Pellant, Climate Change Impacts on Northwestern and Intermountain United States Rangelands, 30 RANGELANDS 29 (2008)).

173. See, e.g., Glicksman, supra note 166, at 839.

174. Id.

175. KLEJUNAS, supra note 167, at 6.


177. KLEJUNAS, supra note 167, at 7.


seasons. \(^1\) Fewer months of snow cover will allow more time for vegetation and forest fuels to dry during increasingly warm summers. \(^2\) Climate effects are compounded by decades of fire suppression, which allowed increased tree densities on NFS lands. Together, these forces have caused both the acreages burned by fire and suppression costs to rise dramatically since 2000. \(^3\) These patterns are expected to continue throughout the next century. \(^4\) More frequent fires may cause an increase in greenhouse gas emissions and the number of “bad air days.” \(^5\) Additionally, increased fire activity may “overshadow” other effects of climate change on species distribution as “fire will become the major vector for vegetation change.” \(^6\)

Climate change will also have dramatic effects on biological resources, including wildlife, tree, plant, and aquatic species. There is evidence that drought conditions in the Intermountain West and Southwest are already affecting pinyon-juniper woodlands in Arizona, shrub communities in the Colorado Plateau, amphibian species in Yellowstone National Park, and aquatic habitat in the Chugach National Forest. \(^7\) Researchers predict Western droughts will reduce forage quality in certain rangelands managed by the Forest Service. \(^8\) Perhaps more alarming, climate change may cause extinction of certain ecosystems all together, including alpine tundra, California chaparral, and blue oak woodlands. \(^9\) Certain public lands, including Bandelier National

\(^{181}\) See FRAP, supra note 169, at 254. California experienced its three largest fire years since 1950 between 2000 and 2010. This increase is attributed to “warmer spring and summer temperatures, reduced snowpack and earlier spring snowmelt, as well as increased frequency of Santa Ana conditions.” Id.

\(^{182}\) See BURCHFIELD & NIE, supra note 126, at 11.

\(^{183}\) See id. at 10. In fact, large fires have become “so extensive that they forced the creation of a new size category of large fires exceeding 250,000 acres.” Id. Some statistics from the 2007 fire season demonstrate the “magnitude of the wildfire issue”:

Wildfire acres reported to National Interagency Coordination Center (NICC): 9.32 million

Federal cost for fire suppression for the 2007 calendar year: $1.8 billion

Approximate number of total wildfires: 85,000

Number of “significant” fires (>100 acres) reported to NICC: 1,284

Id.

\(^{184}\) For example, one 2009 study estimates that the area burned by wildfire in Northern California will increase 100 percent by 2085. A.L. WESTERLING ET AL., CALIFORNIA CLIMATE CHANGE CENTER, CLIMATE CHANGE, GROWTH, AND CALIFORNIA WILDFIRE IX (2009).


\(^{186}\) Eryn Gable, Researchers Examine Global Warming’s Effects on Wyoming Rangelands, E&E LAND LETTER (Sept. 18, 2008), http://www.enews.net/Landletter/2008/09/18/2/.

\(^{187}\) Glicksman, supra note 166, at 842–43 (citing U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-07-863, CLIMATE CHANGE: AGENCIES SHOULD DEVELOP GUIDANCE FOR ADDRESSING THE EFFECTS ON FEDERAL LAND AND WATER RESOURCES 26 (2007)).
Monument and Mesa Verde National Park, are at risk of altogether losing their forests. Many species of vegetation, including tree species, will likely respond to climate change by migrating northward and to higher altitudes, and studies predict that species with restricted ranges will be most vulnerable. Species loss and a variety of new assemblages will occur with climate-caused alterations in wildlife and plant community composition and “mismatches in life history events (e.g. migration and blooming).”

Changes in temperature and precipitation will also alter distributions of tree pathogens and diseases. Climate directly influences host susceptibility and pathogen survival and spread. “Overwintering survival” of tree pathogens and diseases is projected to increase with the warming climate because many tree pathogens are “limited” by low winter temperatures. Therefore, climate change will cause increased disease severity, range expansion, and shifts.

Similarly, climate change will affect the abundance of forest insects and their impact on forest ecosystems. Temperature and precipitation shifts directly impact insect reproduction, survival, and spread; alter host defenses and susceptibility to attack; and indirectly impact ecological relationships by causing changes in abundance of competitors, parasites, and predators. Climate change is already credited with increasing insect infestations and further exacerbating the fuel-loading problem created by fire suppression.

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190. Glicksman, supra note 166, at 842; see also Stephen Saunders et al., Losing Ground: Western National Parks Endangered by Climate Disruption, 24 GEORGE WRIGHT F. 41, 48 (2007) (“Sudden, widespread, climate-driven loss of forests is now occurring in the American Southwest, where semiarid conditions make even the hardy trees that can survive there susceptible to drought.”).

191. FRAP, supra note 169, at 255. Alpine forests and related plant communities are especially vulnerable to climate change. Id. (“With projected temperature increases, their habitat range is likely to be compressed with little room to expand.”). Under a variety of modeled scenarios, alpine and subalpine vegetation cover declined with longer growing seasons and warmer temperatures, and grasslands encroached on woodlands and shrublands. Id.

192. INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE, supra note 19, at 20.

193. KLEIJUNAS, supra note 167, at 7 (“Climate influences the survival and spread of pathogens as well as the susceptibility of their hosts. Climate change could alter stages and rates of development of the pathogen, modify host resistance, and lead to changes in the physiology of host-pathogen interactions.”).

194. Id.

195. Id.

196. Id. For example, the incidence of Armillaria Root Disease, which decays wood in the roots, lower boles, and stumps of dead or living trees, is projected to increase. This may reduce the available area that can support Douglas fir, an important ecosystem component, in the Pacific Northwest. Id. at 39–41.


198. See W.A. Kurz et al., Mountain Pine Beetle and Forest Carbon Feedback to Climate Change, 452 NATURE 987 (2008); see also Glicksman, supra note 166, at 843 n. 45 (“Warmer temperatures also may produce more severe thunderstorms with increased frequency of lightning.”) (citing NAT’L WILDLIFE FED’N, INCREASED RISK OF CATASTROPHIC WILDFIRES: GLOBAL WARMING’S WAKE-UP CALL FOR THE WESTERN UNITED STATES 2 (2008)).
Scientists blame climate change for the mountain pine beetle outbreak that has killed hundreds of thousands of acres of trees throughout the United States and Canada. Warmer winters associated with climate change are thought to have perpetuated the outbreak because warmer weather decreases generation time and winter mortality, resulting in “exponential population growth and major range extension.” 199 Beetle attack and the introduced pathogen white pine blister rust have severely affected whitebark pine, which provides a critical food supply for species including the grizzly bear.200

Climate change will also have implications for carbon storage in forests. Forests sequester carbon and help mitigate the effects of climate change by offsetting CO₂ emissions.201 Globally, terrestrial ecosystems remove approximately 3 billion tons of anthropogenic carbon per year.202 Current estimates show that California forests operate as a net carbon sink of approximately five million metric tons of CO₂.203 However, if current forest management practices persist through 2100, California’s forest carbon stores are predicted to increase over the next four to six decades, and then decrease to 1990 levels by 2100 due to tree mortality associated with wildfire, insects, and disease.204 Similarly, “a recent increase in wildfire and insect outbreaks in Canadian forests has driven those systems from a net CO₂ sink (before 2000) to a CO₂ source expected to continue for at least the next two to three decades.”205 These statistics suggest that forest management must play an important role in mitigating carbon emissions.

**B. Benefits Would Flow from Passive Management of IRAs in a Changing Climate.**

While the Roadless Rule allows some level of active management, a purely passive management206 approach in IRAs would have many benefits. Even without climate change, the Roadless Rule’s restrictions on road construction and timber harvest are ecologically beneficial because “[e]xtensive road networks . . . and large areas of eroded and compacted soils can cause watersheds to have low resilience even under a quasi-static climate.”207 Given

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199. MANAGING FORESTS FOR CLIMATE CHANGE, supra note 197, at 13.
200. BURCHFIELD & NIE, supra note 126, at 12.
201. See, e.g., BURCHFIELD & NIE, supra note 126, at 8 (“Forest ecosystems, as major consumers of carbon dioxide and storehouses of carbon, will have a significant role in broad scale efforts to reduce impacts of greenhouse gases on climate.”).
203. FRAP, supra note 169, at 259. This figure accounts for both removals and emissions. Id.
204. Id.
205. Canadell & Raupach, supra note 202, at 1456.
206. Passive approaches allow forest ecosystems to evolve on their own with little human intervention. For example, forest designation as wilderness represents a passive approach to management.
207. PETERSON ET AL., supra note 17, at 74–75.
the projected effects of climate change, passive management of IRAs offers even more advantages. 208

Passively managed forests are less altered and present a lower fire hazard than intensively managed forests for three reasons: 1) timber harvest can “increase fuel loads and reduce a forest’s resilience to fire”; 2) roadless areas “have been less influenced by fire suppression than intensively managed lands”; 3) road access to forest lands increases “the risk of human-caused wildfire ignitions.” 209 Likewise, the majority of areas at risk for insect outbreak are in roaded landscapes. 210 Because roadless areas are less disturbed by roads and logging, many IRAs are a lower priority for active management to reduce such risks. Therefore, the Roadless Rule may also indirectly benefit other NFS lands by allowing more funds to go toward the Agency’s road maintenance backlog to repair roads that are causing resource damage. 211 This is an important benefit because climate change effects may require money to be spent on management activities and fire suppression near inhabited areas.

Roadless areas particularly benefit watershed health. One report found that “[r]oadless areas may have their greatest value in terms of protecting watersheds that can maintain high water quality and predictable flows throughout the years.” 212 Road construction damages water quality by increasing sedimentation, and existing roads concentrate and reroute water flow during times of precipitation, thereby affecting subsurface water availability by decreasing the amount of porous land available for water absorption. 213 An estimated 60 million Americans get their water from sources in National Forests, and these forests are critical for water storage, circulation of water vapor to the atmosphere, and regulation of timing and amount of water yield. 214 Because the Rule protects nearly one-third of NFS lands from development, it will protect and enhance supplies of clean drinking water, which may become scarcer because of climate change’s effects on temperature

208. DOMINICK A. DELLA SALA, JIM FURNISH, & ERIC STENKAMP, EARTHJUSTICE, HOPE IN AN ERA OF CLIMATE CHANGE: ROADLESS AREAS IN NATIONAL FORESTS 5 (2011) (“Along with official wilderness areas, national parks, and national wildlife refuges, roadless areas in national forests house much of the country’s last intact forests—and offer hope in a world facing climate change.”).


211. Roadless Rule, supra note 1, at 3246.

212. DELLASALA ET AL., supra note 208, at 6 (citing SCOTT BLACK ET AL., INSECTS AND ROADLESS FORESTS: A SCIENTIFIC REVIEW OF CAUSES, CONSEQUENCES, AND MANAGEMENT ALTERNATIVES (2010)).


214. BURCHFIELD & NIE, supra note 126, at 11.
and precipitation in much of the West.\textsuperscript{215}

The Rule’s restrictions also benefit fish.\textsuperscript{216} As climate change affects water temperature and dissolved oxygen levels, fish populations will increasingly depend on habitat in roadless areas.\textsuperscript{217} Indeed, Colorado’s native cutthroat trout already rely on intact habitat in roadless areas for survival.\textsuperscript{218}

Because roadless areas function as “biological strongholds” to protect threatened and endangered plant and animal species, they will become progressively important as species migrations and extinctions associated with climate change increase.\textsuperscript{219} Roadless areas are home to diverse species, and 77 percent of IRAs have the potential to conserve imperiled species.\textsuperscript{220} These areas provide a “refuge (or population source area) from which wildlife can build more stable population densities.”\textsuperscript{221} In addition, conservation biologists note that protection of IRAs is incredibly important because these areas comprise low- and mid-elevation habitats, whereas wilderness areas are predominantly located at higher elevations.\textsuperscript{222} As climate change creates conditions inhospitable to particular species, migration corridors across a range of elevations will become vital because species will generally migrate north and upward in elevation.\textsuperscript{223} Likewise, roadless areas serve as “bulwarks” against the spread of invasive species, which will be increasingly important in a changing climate.\textsuperscript{224} Because intact habitat prevents spread of invasives,\textsuperscript{225}

\textsuperscript{215} See Roadless Rule, supra note 1, at 3245–47 (“[E]ven with today’s improved design standards for road construction and timber harvest, these activities can still result in adverse effects to watersheds. These effects include pollution, changes to water temperatures and nutrient cycles, and increased sediment from storm or runoff events that exceed road design standards.”).

\textsuperscript{216} See, e.g., CHRIS FRISSELL & GARY CARNEFIX, THE GEOGRAPHY OF FRESHWATER HABITAT CONSERVATION: ROADLESS AREAS AND CRITICAL WATERSHEDS FOR NATIVE TROUT 1, PROCEEDINGS OF THE WILD TROUT IX SYMPOSIUM (2007) (“Scientists and fish and wildlife managers across the West recognize that native fish and high-quality waters are often positively associated with watersheds having low overall road density and large proportions of roadless area.”).

\textsuperscript{217} Ashley D. Ficke, Christopher A. Myrick, & Lara J. Hansen, Potential Impacts of Global Change on Freshwater Fisheries, 17 REVIEWS FISH BIOLOGY & FISHERIES 581, 581 (2007).

\textsuperscript{218} DELLA SALA ET AL., supra note 208, at 8 (citing KEITH CURLEY & DAVID PETERSEN, TROUT UNLIMITED, WHERE THE WILD LANDS ARE: COLORADO—THE IMPORTANCE OF ROADLESS AREAS TO COLORADO’S FISH, WILDLIFE, HUNTING & ANGLING (2006)).

\textsuperscript{219} See Roadless Rule, supra note 1, at 3245.

\textsuperscript{220} C. Loucks et al., USDA Forest Service Roadless Areas: Potential Biodiversity Conservation Reserves, 7 CONSERVATION ECOLOGY, No. 2, 2003, at 5.

\textsuperscript{221} DELLA SALA ET AL., supra note 208, at 7 (citing Robert L. DeVelice & Jon R. Martin, Assessing the Extent to Which Roadless Areas Complement the Conservation of Biological Diversity, 11 ECOLOGICAL APPLICATIONS 1008 (2001)).

\textsuperscript{222} Stritholt & Della Sala, supra note 4, at 1748–49; see also Loucks et al., supra note 220, at 5 (discussing DeVelice and Martin’s 2001 study finding “that IRAs could potentially expand ecoregional representation, increase the area of reserves at lower elevations, an increase the size of conservation areas to provide refuge for wide-ranging species”).

\textsuperscript{223} See Fian-Reto Walther et al., Ecological Responses to Recent Climate Change, 416 NATURE 389, 390 (2002).

\textsuperscript{224} Roadless Rule, supra note 1, at 3245.

\textsuperscript{225} See, e.g., M.L. Cadenasso & S.T.A. Pickett, Effect of Edge Structure on the Flux of Species into Forest Interiors, 15 CONSERVATION BIOLOGY 91, 91 (2001) (demonstrating that a forest “edge with
IRAs are more likely to support ecosystem health and biodiversity.226 Finally, given the Rule’s restriction on large-scale timber harvesting, IRAs have the potential to serve as carbon sinks and mitigate increasing CO₂ emissions. The Roadless Rule limits deforestation and human-caused forest degradation and contributes greatly to preserving the estimated 445 million tons of sequestered carbon in IRAs.227 Passive management of IRAs will allow older forests (more than 100 years old) to persist, which are “particularly effective at storing carbon.”228 The Rule’s limitation on timber harvest will prevent carbon release and may promote enhanced storage.229 Limitation of CO₂ emissions from deforestation associated with logging and road construction has additional benefits because “climate change is greatly adding to human-induced pressures” on species by “modifying habitats and increasing the prevalence of threats” from fire, insects, and pathogens.230

III. CLIMATE CHANGE EFFECTS MAY PROMPT THE CALL FOR MANAGEMENT BY ADAPTATION AND MITIGATION IN IRAS.

The nature and pace of climate change in forest ecosystems will be unprecedented.231 The Forest Service will need to respond to these changes throughout NFS lands in order to fulfill its mission. In light of projected climate

intact vegetation can function as a physical barrier to seed dispersal” and that “the structure of vegetation on edges can influence the function of edges as barriers to seed flux into the forest interior”).

226. See Roadless Rule, supra note 1, at 3245.


228. Id. The authors also note that:

Udall and Bates used simulation models to estimate that intact forests can sequester 25 to 80 times as much carbon dioxide as logged areas. Smithwick estimated that “managed forests in temperate regions may contain as little as 30% of the living tree biomass and 70% of the soil biomass of soil carbon found in old-growth temperate forests.” Brisbin echoed the idea, stating that “old-growth forests [have been] found to store nearly three times more carbon than” tree plantations that have replaced them. This is because old-growth forests continue to accumulate carbon as they age. Many studies are now finding that even mature forests increase in biomass (living plant material). Trees and other plants continue to grow in older forests and sequester carbon; when they die, much of their carbon goes into the soil. Thus forests up to 800 years old are still carbon sinks (or living carbon sponges) and vital allies in combating climate change.

Id. (citations omitted).

229. Id. (“When old forests are cut down, as much as 40 percent of their stored carbon is released into the atmosphere from burning or decay of slash and from transport and manufacture of wood products . . . . Recapturing carbon stored in the original intact forests would take more than 200 years.”) (citing Heather Keith, Brendan G. Mackey & David B. Lindenmayer, Re-evaluation of Forest Biomass Carbon Stocks and Lessons from the World’s Most Carbon Dense Forests, 106 PROC. NAT’L ACADEMY OF SCI. U.S.A. 11,635 (2009)).

230. MANAGING FORESTS FOR CLIMATE CHANGE, supra note 197, at 15.

231. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, supra note 164.
change effects, scientists, land managers, and commentators have proposed several recommendations for the management of public lands that could be expanded to roadless areas. These recommendations fall into two categories of basic strategic responses to climate change: mitigation and adaptation.232

Given climate change effects, there will be great benefits from passive management of IRAs protected by the Rule, even beyond those initially analyzed in the Forest Service’s FEIS. However, further passive management strategies may be appropriate in IRAs for climate change adaptation and mitigation. For example, changes in forage quality and quantity associated with precipitation shifts may require grazing restrictions in IRAs. Climate change will also require active management on NFS lands. The Rule explicitly allows some level of active management in IRAs, and managers may utilize some of the Rule’s flexibility to implement management strategies for climate change mitigation and adaptation in IRAs. While a complete review of proposed climate change management strategies is beyond the scope of this Note, this Part explores the types of treatments that might be proposed in IRAs for climate change mitigation and adaptation. It also questions the extent to which active management in IRAs is appropriate and desirable. Part IV then examines the types of active management legally permissible given the Rule’s language and the Agency’s statutory framework.

A. Management Strategies for Climate Change Adaptation Potentially Applicable in IRAs

Absent human interaction, forest ecosystems will adapt to climate change on their own.233 However, active forest management strategies234 for climate change adaptation may be appropriate where inaction would allow changes that exceed a socially acceptable level.235 For example, society may consider the

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232. Some entities recommend more than two strategic responses (mitigation and adaptation) for forest management in the face of climate change. For example, the Oregon Forest Resource Institute recommends three responses: mitigation, adaptation, and conservation. BURCHFIELD AND NIE, supra note 126, at 8. This Note discusses forest conservation and preservation strategies under the “mitigation” heading. It is important to discuss both mitigation and adaptation because, as Professor Holly Doremus suggests, “Controlling greenhouse gas emissions is essential, but it is not enough. We must also think about climate adaptation.” Holly Doremus, Adapting to Climate Change with Law that Bends Without Breaking, 2 SAN DIEGO J. CLIMATE & ENERGY L. 45, 46 (2010).

233. Id. at 74–75 (“Even if its rhythms have been drastically changed by human impacts to the planet, nature which remains autonomous will develop its own strategies for responding to human encroachment.”).

234. Active management involves attaining designed objectives using cultural operations and forestry practices including tree planting, tree thinning, grazing, weed control, erosion control, fire suppression or prescribed fire, and other activities for improving resource objectives.

235. David L. Spittlehouse & Robert B. Stewart, Adaptation to Climate Change in Forest Management, 4 B.C. J. OF ECOSYSTEMS & MGMT. 1, 2 (2003) (“Although forest ecosystems will adapt autonomously, their importance to society means that we may wish to influence the direction and timing of this adaptation at some locations. In other cases, society will have to adjust to whatever change brings.”).
cost of species extinctions, noxious weed invasion, or irreparable habitat alteration to be too high to forgo active management. The IPCC defines climate change adaptation as the “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.” There are various formulations of strategies to adapt to climate change. This Part discusses four broad management strategies—“resistance, resilience, response, and realignment”—that federal land managers may use to facilitate adaptation of forest ecosystems to climate change.

1. Response and Resilience: Management to Retain Historical Conditions

Management for resistance involves actions that improve the ability of species and ecosystems to “maintain a relatively constant state” despite climate change disturbances and stressors. While this strategy may “seem counter to working with change,” resistance may be especially important where resources of high ecological value, such as endangered species, are increasingly vulnerable to climate change’s direct or indirect effects. Similarly, resilient ecosystems “recover quickly after a disturbance.” The goal of managing for resilience is to enhance the ability of ecosystems to “withstand or absorb increasing effects without irreversible changes” to processes or functions.


237. See PETERSON ET AL., supra note 17. Throughout Parts III and IV, I adopt the categorization of adaptive approaches used by Peterson, et al., because Agency scientists from the geographic areas where IRAs are most prevalent developed this framework of climate change adaptation for Forest Service managers. The Peterson et al. publication, which “contains science-based principles, processes, and tools necessary to assist with developing adaptation options for national forest lands,” was developed by the WestWide Climate Initiative, a collaboration of the Pacific Northwest, Pacific Southwest, and Rocky Mountain Research Stations of the U.S. Forest Service, with assistance from the Northern and Southern Research Stations. Id. at i. The authors prescribe a four-step process for forest managers to facilitate climate change adaptation on NFS lands:

1) become aware of basic climate change science and integrate that understanding with knowledge of local resource conditions and issues (review),

2) evaluate sensitivity of natural resources to climate change (rank),

3) develop and implement options for adapting resources to climate change (resolve),

4) monitor the effectiveness of on-the-ground management (observe) and adjust as needed.

Id. at ii.

238. Reed F. Noss, Beyond Kyoto: Forest Management in a Time of Rapid Climate Change, 15 CONSERVATION BIOLOGY 578, 580 (2001). Peterson et al. define climate change resistance as the ability of ecosystems to “resist forces of climate change and maintain values and ecosystem services in their present or desired states and conditions.”

239. Id. at 71 (citing C. Folke et al., Regime Shifts, Resilience, and Biodiversity in Ecosystem Management, 35 ANN. REV. ECOLOGY, EVOLUTION, & SYSTEMATICS 557 (2004); L.J. HANSEN ET AL., BUYING TIME: A USER’S MANUAL FOR BUILDING RESISTANCE AND RESILIENCE TO
Resistance and resilience strategies explicitly aim to keep ecosystems within a historical range of variability, despite climate change effects. These strategies involve both passive and active management and may be most appropriate where societal values dictate that change is unacceptable. Management for climate change resistance and resilience may take various forms. For example, managers may construct fuel breaks around endangered or otherwise vulnerable plant species in order to lessen the likelihood of extinction from “climate-aggravated wildfire”; combat insect-caused tree mortality with preventative treatments (e.g. prescribed burning or thinning to reduce drought stress); or implement an aggressive invasive species monitoring and removal program. Treatments that promote resilience all seek to reduce “species or system vulnerability to acute or chronic stress.”

Two of the most important stressors that will accompany climate change in the West include drought and increasingly intense wildfires. In some forests, “lower stand densities may be necessary in a warmer climate to achieve the same level of reduced intertree competition as was achieved in the past.” In addition, existing stand-density problems caused by decades of wildfire suppression compound climate-change effects. In 2000, a national effort to map fire risk on public lands determined that forest density and fuel loading on approximately two-thirds of NFS land is outside of the historic range of variability. Briefly, the historic range of variability is a method to understand the dynamic nature of ecosystems; the processes that sustain and change ecosystems; the current state of the ecosystem in relationship to the past; and the possible ranges of conditions that are feasible to maintain. Once the historic range of variability is established for an area, it can be compared to existing vegetative conditions to determine departures. These departures can be used to aid resource managers in planning of their treatments.

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CLIMATE CHANGE IN NATURAL SYSTEMS (2003)). The term also has different definitions in a variety of forest management contexts. For example, in an ecological context, a resilient forest ecosystem might refer to one that “regenerates and restores its former vegetation structure, composition, and function after wildfire.” Id. at 74. Other examples of resilient systems include wildlife species that “retain viable populations despite climate-induced habitat degradation; and watersheds that retain erosion control, adequate water supply, and fish habitat despite floods, fires, insect epidemics, or spread of exotic plant species.” Id.

242. See infra Part IV for a discussion of ecosystem management within the historic range of variability. Briefly,

243. PETERSON ET AL., supra note 17, at 71.

244. Id. at 75. This objective is met by treatments that “focus on maintaining, reconnecting, and reestablishing ecosystem processes and functions” in order to “[r]educe existing pressures on species from sources other than climate change.” Id. at 69.

245. Id. at 76.

246. According to the U.S. General Accounting Office, “[t]he most extensive and serious problem related to health of national forests in the interior West is the overaccumulation of vegetation, which has caused an increasing number of large, intense, uncontrollable and catastrophically destructive wildfires.” GENERAL ACCOUNTING OFFICE, GAO/RCED-99-65, WESTERN NATIONAL FORESTS: A COHESIVE STRATEGY IS NEEDED TO ADDRESS CATASTROPHIC WILDFIRE THREATS 3 (1999).
variability.\textsuperscript{247} Stand density reduction minimizes water stress, fire hazard, and certain types of insect outbreaks by reducing competition for water and increasing tree vigor.\textsuperscript{248} Therefore, prescribed fire or small-diameter thinning are two management strategies that may be key resilience strategies in some IRAs.\textsuperscript{249}

Prescribed fire use is an important management strategy to reduce forest densities. According to researchers, “[t]he Forest Service should treat roadless areas primarily by reintroducing fire, both natural and prescribed” because “[r]estoration of ecological processes is key to ecosystem integrity and biological diversity, particularly in unroaded areas.”\textsuperscript{250} In addition to reducing fuel densities and promoting climate resilience, prescribed fire has other benefits in a changing climate, including: restoration of healthy “wildland fire regimes” in fire-adapted ecosystems, “reduc[ed] fire severity and rate of spread,” decreased pest outbreaks, and wildlife habitat creation.\textsuperscript{251} In order to promote climate change resistance, managers may also conduct fuel reduction treatments around certain populations of plant species or ecologically valuable riparian areas in order to prevent high-intensity fire from causing habitat loss.\textsuperscript{252} Finally, resiliency “benefits could flow from allowing some naturally ignited fires to burn in roadless areas under specific conditions.”\textsuperscript{253}

While the Roadless Rule provides “sufficient agency discretion” for restoration-based thinning where such treatments are needed prior to fire reintroduction,\textsuperscript{254} the literature largely suggests that prescribed fire should preferentially be utilized in IRAs over mechanical treatments. According to the Roadless Rule DEIS, only about 8 million out of the 58.5 million acres of IRAs present a “high fire risk that may require non-commodity-based thinning—the thinning of small trees.”\textsuperscript{255} If managers choose to utilize mechanical thinning, it is critical that these treatments be tailored site-specifically. For example, treatments may not be appropriate in remote, high-elevation forests characterized by infrequent high severity fire; however, they may be beneficial in ponderosa pine and dry mixed-conifer forests that historically burned at

\textsuperscript{247} U.S. FOREST SERV., PROTECTING PEOPLE AND SUSTAINING RESOURCES IN FIRE-ADAPTED ECOSYSTEMS: A COHESIVE STRATEGY, FOREST SERVICE MANAGEMENT RESPONSE TO GENERAL ACCOUNTING OFFICE REPORT GAO/RCED-99-65 42 (2000).
\textsuperscript{248} PETERSON ET AL., supra note 17, at 75.
\textsuperscript{249} Reed F. Noss et al., Managing Fire-Prone Forests in the Western United States, 4 FRONTIERS ECOLOGY & ENV’T 481, 483 (2006) (“Restoration of such forests (“[i.e.] guiding their composition, structure, and function to a condition within the historical range of variability is often desirable . . . and can involve active techniques such as thinning of small trees and prescribed burning or passive management such as allowing natural fires to burn and removing livestock.”).
\textsuperscript{250} DellaSala & Frost, supra note 209, at 17 (citations omitted).
\textsuperscript{251} Id.
\textsuperscript{252} PETERSON ET AL., supra note 17, at 71.
\textsuperscript{253} DellaSala & Frost, supra note 209, at 17.
\textsuperscript{254} DELLASALA ET AL., supra note 208, at 9.
\textsuperscript{255} Id. (citing DEIS, supra note 49, at 2-24).
frequent and regular intervals.\textsuperscript{256} Because IRAs comprise a range of elevation classes,\textsuperscript{257} managers must apply the best available science for their particular regions when developing adaptation prescriptions. Further, mechanical fuel treatments are inappropriate in many IRAs where steep conditions mean “timber harvest and road construction would result in irretrievable loss of soil productivity and other watershed values.”\textsuperscript{258}

Maintenance and promotion of biodiversity is key to resilience of forest ecosystems because genetic diversity “allows species to adapt continuously to evolving environmental conditions.”\textsuperscript{259} While simply leaving IRAs untreated would benefit wildlife species because untreated refugia offer habitat heterogeneity,\textsuperscript{260} the Roadless Rule also allows for active management to “improve threatened, endangered, proposed, or sensitive species habitat.”\textsuperscript{261} For example, the Agency may implement prescribed fire treatments in order to enhance fire-dependent plant species populations, maintain native species populations, and prevent conifer encroachment into ecologically diverse alpine meadows.\textsuperscript{262} Managers may also implement non-timber based habitat enhancement projects to benefit wildlife species. Active treatments to preserve

\textsuperscript{256} Noss et al., supra note 249, at 482. While decades of “[f]ire exclusion has had minimal effect on most forests characterized by high severity fire,” human activities have “dramatically modified the fuel structure” in ponderosa pine and dry mixed-conifer forests. “These forests therefore changed from relatively open stands with low fuel loadings to dense stands that can carry crown fires.” Id. at 482–83. In the Rocky Mountain states, research indicates that there is a “solid ecological basis” for mechanical thinning and tree removal, or thinning, piling, and burning for restoration and fire-mitigation purposes “in the low-elevation, dry Ponderosa pine forests that typically characterize the [Wildland Urban Interface].” BURCHFIELD & NIE, supra note 126, at 19. However, studies show that mechanical fuel treatments may be inappropriate throughout the region in “higher elevation fire regimes or zones that receive more moisture.” Id. (citing T.T. Schoennagel, T. Veblen, & W.H. Romme, The Interaction of Fire, Fuels, and Climate Across Rocky Mountain Forests, 54 BIOSCIENCE 661 (2004)).

\textsuperscript{257} See, e.g., Stritchoth & DellaSala, supra note 4, at 1748–49 (“When compared to wilderness, roadless areas captured much more of the low- and medium-elevation classes (<1525m) . . . . Roadless areas did proportionally better than designated wilderness at representing low and medium elevations.”).

\textsuperscript{258} DellaSala & Frost, supra note 209, at 16 (citations omitted).

\textsuperscript{259} See, e.g., MANAGING FORESTS FOR CLIMATE CHANGE, supra note 197, at 14. Biodiversity allows species adaptation, maintenance of “the potential for selection and improvement to meet future needs and changing end-use requirements, and to support ecosystem functions. However, inadequate information and knowledge is generally an obstacle in identifying issues, needs and priorities for action in conservation of biodiversity in the context of climate change, at national and global levels.” Id.

\textsuperscript{260} DAVID S. PILLIOD ET AL., U.S. FOREST SERV., RMRS-GTR-173, WILDLIFE AND INVERTEBRATE RESPONSE TO FUEL REDUCTION TREATMENTS IN DRY CONIFEROUS FORESTS OF THE WESTERN UNITED STATES: A SYNTHESIS 1 (2006) (“Management activities that consider the retention of habitat structures (such as snags, down wood, and refugia of untreated stands) may increase habitat heterogeneity and may benefit the greatest number of species in the long run.”).

\textsuperscript{261} See Roadless Rule, supra note 1, at 3273.

\textsuperscript{262} Tree invasions into high-elevation meadows have been documented throughout the Northern Hemisphere. These “invasions are often associated with large-scale changes in climate or disturbance regimes.” Harold S.J. Zald et al., Climatic, Landform, Microtopographic, and Overstory Canopy Controls of Tree Invasion in a Subalpine Meadow Landscape, Oregon Cascades, USA, 27 LANDSCAPE ECOLOGY 1197, 1197 (2012). A study in Oregon’s Cascade Range found that the “[p]roportion of meadow occupied by trees increased from 8% in 1950 to 35% in 2007.” Id.
ecologically diverse landscapes may be especially important where topography and unstable soils prevent the movement of unique species to higher elevations. 263 In such areas, managers may implement an aggressive program of invasive species removal. The Forest Service estimates that roadless areas directly or indirectly affect more than 65 percent 264 of designated “sensitive species.” 265 Because IRAs contain relatively intact habitat, monitoring for invasives in IRAs may become important in order to enable a rapid response to aggressively target and prevent weed spread into increasingly rare habitat for threatened, endangered, sensitive, and protected species. 266 

Because climate change is projected to negatively impact water quality and quantity in some areas, the Agency may choose to manage for resistance in IRAs by restoring eroded areas after disturbances, especially in areas where flooding is expected to increase. 267 Managing to resist erosion and landslides may be critical within roaded portions of IRAs, because roads are one of the largest sources of sedimentation.

Likewise, the modification or restriction of livestock grazing in IRAs is a key resistance and resilience strategy not addressed by the Roadless Rule that would benefit watershed, wildlife, and other resources in IRAs. Despite the Agency’s choice to permit current levels of grazing under the Roadless Rule, the Rule’s preamble discusses the negative contributions of grazing on wildfire “frequency, size and severity” and “vegetative structure, density and composition.” 268 Further, studies show that Western forest ecosystems have been as damaged by livestock grazing as fire suppression and logging. 269

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263. According to the Harold Zald, author of the study referenced supra note 262, “There’s some suggestion that alpine meadows may simply move higher up on the mountain in the face of changing climate”; however, “in many cases slopes become too steep, and poor-quality, unstable soils are unable to harbor much plant life.” Mountain Meadows Dwindling in the Pacific Northwest, Oregon State University (Nov. 2, 2012), http://oregonstate.edu/ua/ncs/archives/2012/nov/mountain-meadows-dwindling-pacific-northwest.

264. See Roadless Rule, supra note 1, at 3245 (“This percentage is composed of birds (82%), amphibians (84%), mammals (81%), plants (72%), fish (56%), reptiles (49%), and invertebrates (36%).”).

265. The Forest Service manages the conservation of habitat for approximately 3500 “sensitive” species, which are “species that need special management to maintain and improve their status on National Forests and Grasslands, and prevent a need to list them under the Endangered Species Act.” Watershed, Fish, Wildlife, Air & Rare Plants, Threatened, Endangered & Sensitive Species, TES Program Summary, U.S. Forest Service, http://www.fs.fed.us/biology/tes/index.html (last updated Mar. 6, 2013).

266. Peterson et al., supra note 17, at 71–72.

267. Spittlehouse & Stewart, supra note 235, at 10 (“Biological and climate changes have implications for forest operations. Increased winter precipitation could affect water management in forests. An increased risk of sediment transport to streams could degrade water quality and fish spawning habitat.”); see also Peterson et al., supra note 17, at 69.

268. Roadless Rule, supra note 1, at 3250, 3258 (discussing how uncharacteristic wildfire effects “have been caused primarily by past wildfire suppression, and past timber harvesting and grazing practices”).

269. See, e.g., A. Joy Belsky & Dana M. Blumenthal, Effects of Livestock Grazing on Stand Dynamics and Soils in Upland Forests of the Interior West, 11 Conservation Biology 315, 315
Climate-caused alterations in the timing and nature of precipitation may shift or shorten grazing season, and grazing may become altogether inappropriate in certain meadows threatened by invasive species or new climate patterns. While politically unpopular, climate change may require grazing restrictions in IRAs that are home to threatened, endangered, or imperiled species.270

Both resistance and resilience will become more difficult as climate pressures increase and may only prove successful in the short term, before climate change effects accumulate or management priorities change. Because changes may “exceed physical and biological thresholds” and result in undesirable outcomes including species mortality or extinctions, it is important for managers to have approaches that accommodate, rather than resist, change.271

2. Response and Realignment: Management for the Future

Climate change may require responsive management strategies that work “directly with climate-induced changes to assist transitions to future states.”272 These strategies may be necessary where forests that existed under historic “baseline” are no longer adapted to climatic patterns anticipated in the next century.273 For example, the West’s old-growth forests, which established under colder climates of the “Little Ice Age” between 1600 and 1850, are not likely “appropriate examples of forests that will be adapted to drought anticipated for the 21st century.”274 Where forests have been “significantly

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(1996). For example, livestock grazing has contributed to unhealthy forest densities across the West by: (1) reducing the biomass and density of understory grasses and sedges, which otherwise outcompete conifer seedlings and prevent dense tree recruitment, and (2) reducing the abundance of fine fuels, which formerly carried low-intensity fires throughout forests.” Id.

270. See Loucks et al., supra note 220 (discussing the presence of endangered species in IRAs).


272. Peterson et al. term these strategies “response” and “realignment.” These techniques “enable ecosystem processes and functions (including conditions that may or may not have existed in the past) to persist through a changing climate.” Peterson et al., supra note 17, at ii.


274. Peterson et al., supra note 17, at 79; see also A. Barbati et al., Assessing and Promoting Old-Growthiness of Forest Stands: Lessons from Research in Italy, 146 Plant Biosystems 167, 172 (2011) (“Vegetation at any point in time is a legacy of climatic conditions decades or centuries in the past.”) (citations omitted); Constance I. Millar & Wallace B. Woolfenden, The Role of Climate Change in Interpreting Historical Variability, 9 Ecological Applications 1207, 1207 (1999) (“Many historical studies focus on ‘presettlement’ periods, which usually fall within the Little Ice Age. Thus it should be assumed that ecosystems inferred for these historical periods responded to different climates than those at present, and management implications should be adjusted accordingly.”); William H. Romme et al., Setting the Stage: Theoretical and Conceptual Background of Historical Range of Variation, in Historical Environmental Variation in Conservation and Natural Resource...
disturbed and are far outside historical ranges of variation . . . realignment or entrainment with current and expected future conditions rather than restoration to historical pre-disturbance conditions may be a preferred choice.”

Examples of management tactics that respond to climate change and realign ecosystems include: assisted migration, a strategy where species are moved from their current native ranges to ranges “projected to be favorable future habitat”; reforestation with novel species mixes and planting genotypes more adapted to projected future conditions than current conditions; and enhancing plant and animal migration corridors.

One example of responsive management comes from joint management efforts by the Bureau of Land Management (BLM) and the Forest Service at the San Juan Public Lands Center, which covers over 2.5 million acres in Southwestern Colorado. There, the agencies manage a region where the temperature has increased approximately 1.5 degrees Fahrenheit since the 1970s. As a result, snowmelt is occurring earlier in the spring, and more severe spring floods and lower summer stream levels are projected. Between 2010 and 2011, the partner agencies developed a drought vulnerability model, carbon storage map, alpine monitoring program, and created projections of future temperatures and precipitation patterns for the management unit. The agencies will use this new information to help land managers respond to climate change by planting different tree species that are better adapted to fire, drought, and pests. Information like that gathered by the San Juan Public Lands Center may be important to “plan for higher-elevation insect and disease outbreaks, anticipate forest mortality events and altered fire regimes, or accommodate loss of species’ populations on warm range margins.”

However, as one study warns, expanding seed zone sizes or relaxing genetic transfer rules “is experimental by design [and] should be undertaken...”

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275.  Millar et al., supra note 271, at 2148.
276.  Peterson et al., supra note 17, at 75.
278.  Interagency Climate Change Adaptation Task Force, supra note 19, at 6 (citing U.S. Global Change Research Program, Global Climate Change Impacts in the U.S. (2009)).
279.  Id.
280.  Id.
281.  Id.
282.  Millar et al., supra note 271, at 2147.
Assisted migration is a responsive management strategy that has received recent attention in both the scientific and legal literature. It is defined as “intentional movement of an organism to an area in which its species has never existed” for the purpose of avoiding extinctions and other harms to ecological health associated with escalating climate change. An example of assisted migration in a forestry context might include actions by a reforestation forester to plant genotypes of species adapted to “expected new climate conditions” after wildfire rather than present conditions. For example, based on climate conditions, that forester might plant trees at a higher elevation that come from a lower elevation seed zone. Biologists may also propose the relocation of a climate-threatened species to new habitat in order to enable its persistence.

Forest Service managers may build upon the Roadless Rule’s restrictions to facilitate responsive management by designating migration corridors that cover a range of elevations. IRAs comprise more low- and mid-elevation habitat than wilderness areas, which are mainly located at higher elevations. Because IRAs are often adjacent to wilderness or other protected areas, the Rule will allow Agency biologists to begin to manage important migration corridors to facilitate species movement spurred by climate change. As part of a more aggressive climate change response strategy, the Agency may choose to expand, designate, and protect more lands to create “connected landscapes.” Scientists also discuss the possibility of responding to climate change by “anticipating events outside of the range of conditions that have occurred in recent history” and experimenting with refugia. One study finds that if refugia can be identified, “they could be considered sites for long-term retention of plants or for establishment of new forests.”

283. Id. at 2148. According to Millar et al., this type of adaptive management “requires careful documentation of treatments, seed sources, and outplanting locations to learn from both failures and successes.” Id.


285. MANAGING FORESTS FOR CLIMATE CHANGE, supra note 197, at 11 (emphasis added).


287. Strittholt & DellaSala, supra note 4, at 1748–49; see also Loucks et al., supra note 220, at 4.

288. See Millar et al., supra note 271, at 2148; see also Noss, supra note 238, 583–84 (discussing the importance of connectivity).

289. Millar et al., supra note 271, at 2149. Millar et al. define refugia as environments that are "more buffered against climate change and short-term disturbances than others.” Id.

290. Examples of potential refugia include highly heterogeneous “microclimates in mountainous regions,” and:

unusual and nutritionally extreme soil types (e.g. acid podsol, ultramafic, limestone) [which] have been noted for their long persistence of species and genetic diversity, resistance to invasive species, and long-lasting community physiognomy compared to adjacent fertile soils. During historical periods of rapid climate change and widespread population
B. Management Strategies for Climate Change Mitigation Potentially Applicable in IRAs

In the context of this Note, climate change mitigation refers to active or passive forest management aimed at: 1) reducing greenhouse gas (GHG) emissions; and 2) activities aimed at sequestering carbon to offset GHG emissions elsewhere. There may be considerable overlap between management activities that mitigate the effects of climate change and those that adapt forest ecosystems to the effects of climate change. Indeed, many authors favor integrative approaches that combine the two in “complementary ways.”

Sustainably managed forests play a critical role in mitigating the effects of climate change, and this role will only become more important as climate change progresses. Forests contribute greatly to carbon sequestration by terrestrial ecosystems, which absorb approximately 30 percent of CO$_2$ emissions from anthropogenic sources including deforestation and burning of fossil fuels. While forest management “has a huge potential” to contribute to climate change mitigation at regional to global scales, “[e]valuating and determining best choices . . . are hampered by considerable uncertainty and difficulty in analyzing net carbon balances.”

1. Management to Reduce GHG Emissions

In a changing climate, it is imperative to minimize human-caused land use changes that reduce forest cover and release carbon. The Roadless Rule’s prohibition on road construction and large-scale timber harvest largely protects IRAs from such human-caused changes. A mitigation strategy may also include placing additional land under a protected area status that prevents large-scale timber harvest and forest degradation. A recent report found that climate change will require significant reductions in grazing on public land, including its outright elimination in certain places. Grazing and trampling reduce the capacity of soils to sequester carbon, and contribute to climate change effects through various processes. While the Roadless Rule explicitly declined to alter grazing in IRAs, a robust mitigation and adaptation strategy would include grazing restrictions or outright elimination. Sensitive IRAs may be an

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extirpation, refugial populations have persisted on unusual local sites that avoided extremes of regional climate impacts or the effects of large disturbance.

Id.

291. See id. at 2146.

292. Canadell & Raupach, supra note 202, at 1456. Forest ecosystems have a tremendous ability to sink carbon; globally these ecosystems store more than double the amount of carbon that exists in the atmosphere. Id.

293. Millar et al., supra note 271, at 2149.


295. Id. at 480.
appropriate place to start.

GHGs are also emitted from natural disturbances including fire, pests, diseases, and windthrow. Indeed, “[w]ildfire and extensive forest mortality as a result of insect and disease are primary sources of unintentional carbon emissions from forests in the western United States.” Such disturbances are projected to increase due to climate change and increased forest densities from decades of fire suppression. Because fire exclusion has proven unsuccessful and ecologically detrimental, studies recommend stand density reductions to lessen the risk of carbon emissions associated with widespread high-intensity fire. These reductions may be accomplished with prescribed burning, small-diameter thinning, or both. As discussed in Part III.A.1, stand density reduction may also have adaptive benefits; however, it is essential that managers design site-specific treatments based on forest type. Additionally, in remote or rugged terrain, like that found in many IRAs, naturally ignited fires may be managed within desired parameters (sometimes called “wildland fire use”). Inevitably, some carbon will be released from any of these management strategies. However, they may avoid the release of much greater quantities of carbon.

2. Management for Carbon Sequestration

There is global interest in carbon sequestration by forests because it is a “relatively inexpensive means of addressing climate change immediately.” Of course, any strategy that involves carbon sequestration by forests “carries the risk that carbon stores may return to the atmosphere by disturbances such as fire and insect outbreaks . . . .” However, certain forestry practices may increase carbon sequestration, including reforestation, forest restoration, and modification of forest management practices.

If IRAs become part of a climate change mitigation strategy, post-disturbance reforestation may be appropriate in areas of IRAs where planting crew access is largely available without the need for new roads. Reforestation represents an important mitigation strategy, and a planted temperate-zone forest

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296. MANAGING FORESTS FOR CLIMATE CHANGE, supra note 197, at 10.
298. See id.
300. See Millar et al., supra note 271, at 2149; Brandon M. Collins & Scott L. Stephens, Managing Natural Wildfires in Sierra Nevada Wilderness Areas, 5 FRONTIERS ECOLOGY & ENV’T 523 (2007).
301. See Millar et al., supra note 271, at 2149.
302. MANAGING FORESTS FOR CLIMATE CHANGE, supra note 197, at 6.
303. Canadell & Raupach, supra note 202, at 1456.
304. MANAGING FORESTS FOR CLIMATE CHANGE, supra note 197, at 6.
can sequester approximately four tons of carbon per hectare per year.\textsuperscript{305} However, studies show that “uniform forest conditions are best avoided, as they are vulnerable to mortality from insects, disease, and fire.”\textsuperscript{306} Therefore, mitigation may be linked with adaptation to increase genetic diversity. Silviculturists may choose to plant a mix of trees bred from genotypes currently present in the area to be reforested with trees bred from lower elevation genetic stock.\textsuperscript{307} Additionally, if temperatures are expected to increase and insect attacks to worsen, managers may plant a mix of pest-resistant or drought-tolerant tree species post-disturbance. Managers may also implement silvicultural treatments to “increase the carbon density of existing forests.”\textsuperscript{308} Because mature stands sequester more carbon, reintroduction of fire and small-diameter thinning may have carbon sequestration benefits by reducing resource competition, and allowing stands to persist through fire.\textsuperscript{309}

\textbf{C. Arguments Against Active Management in IRAs}

While forest management for climate change mitigation and adaptation may provide benefits, there are several arguments against active management in roadless areas. As discussed in Part II.B, purely passive management of IRAs would provide climate change benefits. Therefore, it might be best to forgo management in roadless areas and spend scarce budgets on mitigation and adaptation efforts, like prescribed burning and thinning, “where they are needed most—the already degraded, fire-prone roaded areas.”\textsuperscript{310} Such a strategy would “help shift public and agency attention to roaded landscapes that can be restored and/or provide other multiple uses.”\textsuperscript{311} This approach is in line with studies that show there is less of a need for restoration treatments in IRAs.\textsuperscript{312} However, if, for example, active management in roadless areas becomes the only way to save an imperiled species from extinction, value judgments may dictate that it is more important to fund management in IRAs than on other NFS lands.

There are also knowledge-based arguments against active management in IRAs. Even apart from climate change uncertainties, some ecologists urge that general knowledge deficits caution against active management, which is “itself subject to the same hazardous consequences as the short-sighted actions it was
intended to correct.” For example, ecologist William Baker writes that “extensive manipulative restoration action using either prescribed disturbances or mechanical means . . . may only produce undesirable alteration.” In this vein, skeptics of assisted migration draw on the history of intentional introductions of species by land managers and cite ecological concerns, including the possibility to “erode biodiversity, disrupt ecosystems, and contribute to extinctions at receiving sites.” In light of climate change, these knowledge-based concerns are amplified. Professor Holly Doremus argues that “[l]eaving some places where nature, rather than humanity, determines the details of the response to climate change is only sensible,” given that our lack of knowledge “about how the biota will respond to climatic alterations” means that “[o]ur active management choices . . . might easily be wrong.” IRAs may very well be appropriate places to allow nature to take its own course in responding to climate change. Concerns over unknown treatment effects are particularly well founded where management may affect the ability of IRAs to be designated as wilderness in the future. Wilderness advocates may therefore argue against active management for climate change mitigation and adaptation in IRAs where treatments may affect their suitability for congressional designation as wilderness.

Where management strategies for climate change response and realignment are largely experimental, they may be inappropriate for use in IRAs without substantial justification and built-in monitoring. Because “it’s hard to talk about making an ecosystem resilient if one doesn’t know what it

314. See id. at 379 (citing William L. Baker, The Landscape Ecology of Large Disturbances in the Design and Management of Nature Reserves, in ENVIRONMENTAL POLICY AND BIODIVERSITY 75, 92 (1994)).
315. Camacho, supra note 284, at 185. Examples of species introductions gone awry include: “the introduction of the kudzu vine (Pueraria lobata) for erosion control in the southeastern United States, and the cane toad (Bufo marinus) to control growth of the cane beetle (Dermolepida albomarginata) in Australia.” Id. at 185–86. For a broader discussion of the risks of assisted migration, see Jillian M. Mueller & Jessica J. Hellmann, An Assessment of Invasion Risk from Assisted Migration, 22 CONSERVATION BIOLOGY 562 (2008).
316. Doremus, supra note 232, at 75.
317. See, e.g., Sierra Club v. Wagner, 555 F.3d 21, 30 (1st Cir. 2009). In Sierra Club v. Wagner, plaintiff environmental groups alleged that the Forest Service failed to consider whether timber harvesting in an IRA would “disqualify any of the land involved from future recommended designation for wilderness protection that Congress may afford.” Id. at 30. The court found that the Agency’s NEPA document properly analyzed the proposed project’s impact on wilderness designation and the impact of the Roadless Rule. Id. The court also agreed with the Forest Service’s contention that “harvesting does not automatically preclude wilderness designation,” citing the Agency’s handbook:

The Forest Service has recognized in its own handbook the difference between Eastern and Western forests, with Easter land with up to 20 percent of a given area harvested for timber still eligible for wilderness designation. FSH 1909.12 ch. 71.12 (2005). Land is eligible in the west for wilderness designation only in “areas where logging and prior road construction are not evident.” FSH 1909.12 ch. 71.1, 71.11 (2005).

Id. at 30 n.7.
takes to kill it in the first place,” monitoring the effects of climate change within and outside IRAs is critical for effective and appropriate mitigation and adaptation strategies. A well designed, fully funded, and implemented monitoring program would “not only improve the science of forest management, but also build trust in the agency and reduce some types of science-based political conflict.” However, there is a “history of unfunded monitoring programs and monitoring-related line items are often the first cut by decision makers.” Therefore, absent monitoring funds and infrastructure, active management in sensitive IRAs may be inappropriate and ecologically damaging.

Additionally, manipulation to help mitigate or adapt to the effects of climate change “simply may not work.” For example, it may be futile to preserve all species in IRAs or other protected areas because “even the largest nature reserves, if left alone, will probably suffer major die-offs of species, accounting for a majority of birds and large mammals in a few hundred or a few thousand years.” Climate change may also cause habitats to disappear despite all human efforts, rendering active management useless.

“Beyond the lack of scientific data is a fundamental philosophical problem: To preserve public wildlife during a time of significant climate change, managers will have to do things that run counter to the current ethic of ‘natural preservation.’” The federal system of protecting certain designated lands (e.g. IRAs or wilderness) is premised on the objective of keeping processes natural, uncontrolled, and wild. Therefore, because climate change adaptation for response and realignment is oriented toward anticipating future effects and facilitating transitions to new states, it is “incongruous with the prevalent conservation objective that seeks to preserve or restore preexisting resources.” Likewise, critics of intensive management strategies like assisted migration raise ethical concerns over “the hubris of playing God.” In answer

319. See, e.g., BURCHFIELD & NIE, supra note 126, at 12 (“Monitoring programs should be prioritized and adequately funded in the future . . . . Monitoring is a key component of any adaptive approach and there is widespread agreement that more of it should be done by the agency and multi-party teams.”).
320. Id. at 14.
321. Id.
322. See McCloskey, supra note 313, at 380.
323. See id.
324. Smith & Gow, supra note 318.
325. Camacho, supra note 284, at 211.
326. Id. According to Professor Camacho, active management to convert biological communities into something “more compatible with new climatic conditions” “necessarily conflicts with [a] recognized goal of natural resource management and law that focuses on preventing or minimizing human interference with, or manipulation of, unenhanced natural processes and areas.” Id. at 211–12.
327. Id. at 215. However, proponents argue that “any attempts to safeguard notions of wild and uncontrolled natural systems are belated and artificial in a world in which climate change was caused by human alterations of the environment.” Id. at 211.
to such arguments, Professor Alejandro Camacho urges that “contemporary natural resource law’s fidelity to historic baselines, protecting existing biota, and shielding nature from human activity is increasingly untenable, particularly in light of climate change.”

Distrust of agencies and a perceived lack of agency accountability may spur arguments that active management is inappropriate in IRAs despite climate change. Some commentators argue that the “lack of clear, uniform standards” governing Forest Service decision making leads the Agency to “submit to the persistent pressures of local commodity interests.” Others criticize the Agency for its “empty rhetoric, flawed policies, and non-existent science” in the face of climate change. These fears may prompt opposition to any level of active management in IRAs. Finally, not all active management in IRAs, or other protected areas like wilderness, is clearly lawful. The lack of clarity over allowable types of active management in IRAs may both chill Agency proposals for management in IRAs and encourage litigation to set the boundaries of acceptable management practices in IRAs.

IV. TO WHAT EXTENT DOES THE ROADLESS RULE ALLOW ACTIVE MANAGEMENT FOR CLIMATE CHANGE MITIGATION AND ADAPTATION IN IRAS?

The Roadless Rule explicitly allows some level of active management in IRAs, and the Tenth Circuit’s analysis of Wyoming’s “de facto” wilderness claim emphasized that there are fewer limitations on management in IRAs than in wilderness areas. However, neither the Rule nor the case law fully define the extent to which the Agency may actively manage IRA land. Given that the Rule only limits management activities that involve road construction and large-scale timber harvest, are non-timber-based anticipatory management actions, such as assisted migration, legally defensible in IRAs? Given the language of the Rule and its preamble, is the Agency limited to using small-diameter timber management to restore stands back to baseline conditions within the “historic range of variability” (HRV)? Or may it manage for stand densities in IRAs that are lower than the historic baseline’s average if climate change requires?

The concept of managing forest ecosystems within the HRV came of age several decades ago as the “logical extension” of two ecological insights: 1) that “terrestrial ecosystems are dynamic entities at timescales of years to decades or more” and 2) that “Euro-American” management practices have altered ecosystem properties and function. Under this paradigm, the goal of

328. Id. at 171.
331. See Roadless Rule, supra note 1, at 3258.
332. Jackson, supra note 273, at 93.
management is to restore ecosystems to an environmental baseline consisting of pre-European settlement conditions. This baseline is generally fixed in time “immediately preceding Euro-American” intervention and presumably represents a “natural” state. Forest managers use HRV as a “management target, assuming that by restoring and maintaining historical conditions they are maximizing chances of maintaining ecosystems (their goods, services, amenity values, and biodiversity) sustainably into the future.”

Given minimal Agency management of IRAs, the Roadless Rule’s broad prohibitions on road construction and reconstruction and timber harvest will yield myriad benefits in a changing climate. While there are valid arguments


The concepts of reference conditions and the range of natural variability are central to forest management practices being developed under the rubric of ecosystem management. Reference conditions are usually considered the range of historical variability in forest structures and processes at the time of European settlement. Perspectives that emphasize the management of forests within their historical range of variability evolved from an understanding of what presettlement conditions were, and how and why contemporary conditions deviate from them. Presumably, management for presettlement conditions will maintain important evolutionary and functional linkages between species and reduce the risk of unexpected ecological outcomes such as species extinction. Identification of reference conditions is therefore an essential step in implementing ecosystem management. Moreover, reference conditions represent a framework for evaluating current ecosystem structures and processes and for designing restoration treatments to change current conditions if they fall outside their historic range of variability. In cases where contemporary forest conditions are outside their range of historic variability, the presettlement reference can also be used to identify restoration goals and to develop restoration treatments.

Id. at 3–4 (citations omitted); see also Robert B. Keiter, The Law of Fire: Reshaping Public Land Policy in an Era of Ecology and Litigation, 36 ENVTL. L. 301, 319 (2006) (“Moreover, considerable disagreement persists over how much woody material should be removed in restoring forest health; some advocate extensive tree removals to recreate the open forest settings of the pre-settlement era, while others see such extensive intervention as unnecessary, unsightly, and counterproductive.”).

334. Jackson, supra note 273, at 93 (internal citation omitted). The concept of ‘managing within the HRV is Eurocentric and scholars acknowledge that Native Americans had “diverse and often profound influence” on ecosystems across the North American continent. Gregory J. Nowacki et al., Native Americans, Ecosystem Development, and Historical Range of Variation, in HISTORICAL ENVIRONMENTAL VARIATION IN CONSERVATION AND NATURAL RESOURCE MANAGEMENT 79 (2012) (“Native Americans affected ecosystem development in enumerable ways, including hunting, gathering, fishing, agriculture, arboriculture (active planting and dissemination of desired woody species), wood gathering, village and trail construction, and habitat manipulation. Fire was used for many of the aforementioned activities, ultimately being the tool of choice to manage landscapes for many socioeconomic benefits.”) (citations omitted). For a discussion of other major critiques of the HRV concept, see Peter B. Landres et al., Overview of the Use of Natural Variability Concepts in Managing Ecological Systems, 9 ECOLOGICAL APPLICATIONS 1179, 1183–84 (1999).

335. Millar et al., supra note 271, at 2145. The hope is that management within the HRV “will maintain important evolutionary and functional linkages between species and reduce the risk of unexpected ecological outcomes such as species extinction.” Taylor, supra note 333, at 4. Under traditional HRV objectives, managers prescribe restoration goals to return ecosystem processes, composition, and structure to prior states after “ecosystems have been disturbed beyond historical ranges of natural variability.” PETERSON ET AL., supra note 17, at 75. These restoration goals are typically described as the “[c]onditions of the project area before disturbance.” Id.
that active management is inappropriate or undesirable in IRAs, it is plausible that the unprecedented nature and pace of change in forest ecosystems will require active management in IRAs for realignment of “disrupted systems to present and future conditions” rather than restoration to past conditions within the HRV.\(^{336}\) Therefore, this Part explores: 1) whether the Agency may engage in non-timber-based management (e.g. assisted migration) for conditions that have never “naturally” existed in IRAs and 2) whether the Rule affords Agency managers flexibility to manage small-diameter timber outside of the HRV in order to mitigate or adapt to climate change. To answer these questions, this Part analyzes the Roadless Rule’s language, draws on the Tenth Circuit’s analysis of the Forest Service’s statutory framework, and discusses the standard of deference applied by courts to an agency’s interpretation of its own rulemaking.

A. The Roadless Rule’s Language Suggests that the Agency Has Some Flexibility to Manage for Climate Change Mitigation and Adaptation.

The Roadless Rule does not restrict non-timber-based management in IRAs that does not require road construction or reconstruction, and it explicitly allows small-diameter timber management with a goal of maintaining or restoring ecosystems. The Rule states that the Agency may cut and remove “generally small diameter timber” to either 1) “improve” wildlife habitat or 2) “maintain or restore” the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.\(^{337}\) This allowance is subject to the requirement that it will “maintain or improve” at least one “roadless area characteristic” such as “diversity of plant and animal communities” or species habitat.\(^{338}\) This language is echoed in the Agency’s responses to comments in the Rule’s preamble. The Agency’s response on “Uncharacteristic Wildfire Effects” discusses that the Rule allows small-diameter timber harvesting and “other fuel management techniques” to “help maintain ecosystem composition and structure within its historic range of variability at the landscape scale.”\(^{339}\) Likewise, the response on “Wildlife Habitat Management” contemplates management, including tree cutting, for

\(^{336}\) Peterson et al., supra note 17, at 78. Where “departure from historic conditions” becomes the “new normal” under climate change, “[w]e must learn to manage free of the mooring of historical conditions, rather than obsess over returning to them.” Doremus, supra note 232, at 77–78. Where climate change will cause significant departures from historical conditions, “historical and predisturbance conditions may be inappropriate targets for restoration.” Peterson et al., supra note 17, at 78.

\(^{337}\) Roadless Rule, supra note 1, at 3273 (codified at 36 C.F.R. § 294.13) (emphasis added).

\(^{338}\) Id. at 3272–73 (codified at 36 C.F.R. § 294.13). For a list of the nine “roadless area characteristics,” see supra note 70.

\(^{339}\) Roadless Rule, supra note 1, at 3258 (emphasis added).
wildlife habitat improvement as long as it is designed to “maintain or help restore ecosystem composition or structure to conditions within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.”

Additionally, while the Rule allows active management, it explains that it is “expected to be infrequent.”

The Rule’s language, therefore, explicitly allows all of the climate change adaptation activities discussed under the “resistance and resilience” heading in Part III.A.1 that involve small-diameter timber harvest. The express goal of resistance is to “maintain a relatively constant state” despite climate stressors, while the goal of managing for resilience is to enhance the ability of ecosystems to withstand climate effects without “irreversible changes” to important processes and functions. Likewise, small-diameter timber harvest for resilience and resistance may maintain or improve species diversity, habitat, or other resource values in the face of climate change. Therefore, resistance and resilience fall under the Rule’s allowance of active management to “maintain or restore the characteristics of ecosystem composition and structure.”

Furthermore, some of the Agency’s examples of allowable management discussed in the preamble are precisely those discussed in the scientific literature on managing for climate change resistance and resilience. For example, the preamble states that small-diameter thinning and “other fuel management techniques,” which surely includes prescribed burning, are allowed for stand restoration. Both may increase resistance, enhance resilience to wildfire and other disturbances, and contribute to climate change mitigation through carbon sequestration and prevention of large-scale emissions associated with uncharacteristically intense wildfire. The Rule’s preamble does discuss that forests in IRAs at “moderate and high risk” from uncharacteristic wildfire would be given a low priority for treatment unless there was an “imminent threat to public safety, private property, water quality, or threatened and endangered species.” However, it is feasible that “imminent threats” from climate change that jeopardize species persistence or ecosystem processes could be used to justify active management in IRAs.

Additionally, the Roadless Rule does not explicitly limit non-timber-based climate change mitigation and adaptation. As long as road construction or reconstruction is unnecessary, managers may implement prescribed fire treatments, habitat enhancement projects, monitor and remove invasive species, and restore eroded areas after disturbances. While the Roadless Rule does not restrict current grazing levels, the Rule does not prevent the agency from limiting grazing to promote climate change adaptation and mitigation.

340. Id. at 3257 (emphasis added).

341. For example, section 294.13(b) states, “The cutting, sale, or removal of timber in these areas is expected to be infrequent.” Id. at 3273 (emphasis added).

342. Noss, supra note 238, at 580; Peterson et al., supra note 17, at ii; see also notes 238–241.

343. Roadless Rule, supra note 1, at 3273 (emphasis added).

344. Id. at 3268.
Likewise, the Rule does not explicitly prohibit non-timber-based adaptation approaches, like assisted migration, which seek to manage toward future conditions outside of the HRV. Ostensibly, the Rule allows replanting post-disturbance with tree stock genetically adapted to future conditions, assisted migration to preserve climate-threatened species outside of their natural ranges, and placing more land under protected area statuses to provide migration corridors. However, litigants may challenge Agency decisions to implement treatments that would create “unnatural” conditions in IRAs.

B. Borderline Cases: Does the Roadless Rule Allow Small-Diameter Timber Management for Conditions Outside of the HRV? Is Assisted Migration Legally Defensible in IRAs?

The language of the Roadless Rule explicitly allows small-diameter timber removal to restore stands to historic conditions. However, it is unclear whether it allows flexibility to manage for future conditions that never existed in the pre-settlement baseline. The use of the HRV as a management objective is problematic because climate change effects may require management for conditions that never existed in the past. Likewise, there is a question whether non-timber-related management for future conditions, such as assisted migration, is legally defensible in IRAs. The following hypothetical case explores these issues.

1. A Hypothetical Case

A Forest Service Interdisciplinary Team (IDT) on the Warming and Drying National Forest proposes a project in an IRA with a purpose and need of mitigating and adapting to climate change. This proposal is based on the results of a climate change assessment for the forest which predicts: less total precipitation, earlier snow melt, warmer temperatures, an increase in climate-related disturbances (including uncharacteristically intense stand-replacing fire in an area adapted to low- to medium-intensity fire at ten- to fifteen-year intervals), and a steep, climate-caused decline in the population of a native shrub relied upon by local wildlife populations. The project has a purpose and need to mitigate and adapt to the effects of climate change by: 1) creating stand resiliency to climate change-induced drought, wildfire, and insect attack (adaptation); 2) responding to climate change effects by promoting the native shrub species’ persistence (adaptation); 3) reducing the potential for carbon emissions associated with stand-replacing wildfire (mitigation); and 4) enhancing the ability of the remaining trees to sequester carbon by reducing resource competition (mitigation). The proposed alternative would treat 7500 accessible acres in an IRA with a combination of mechanical thinning where accessible (the IRA is partially roaded), and hand thinning; both treatments would be followed by prescribed fire. Based on the climate change assessment’s projections, the IDT recommends thinning generally small-
diameter timber (up to fifteen inches) to a stand- stocking level 20 percent lower than the average pre- settlement baseline. Finally, the alternative proposes to assist migration of the shrub species to more favorable higher elevation habitat (1000 to 2000 feet). The IDT analyzes the project under NEPA in an EIS, which it puts out for public comment. The Forest Service selects the proposed alternative despite public comment that the Roadless Rule does not allow management outside of the historical range of variability and that active management is inappropriate in IRAs. After an unsuccessful administrative appeal, a citizen group files suit against the Agency alleging that the proposed activities violate the Roadless Rule, and that the Agency’s statutory framework does not allow management for climate change mitigation and adaptation.

2. Would a Court Defer to the Agency’s Interpretation of Its Own Rulemaking?

There is little case law on what types of management actions are allowed under the Roadless Rule in IRAs, and none where a court has addressed the issue whether and to what extent the Forest Service can manage for climate change adaptation and mitigation in IRAs. However, under “one of the most venerable doctrines in administrative law,” courts must give substantial deference to an agency’s interpretation of its own rule. The Supreme Court has found that “deference is even more clearly in order” where the issue is interpretation of an Agency’s administrative regulation rather than statutory construction. Review of agency interpretations of rulemakings may involve the same methods used to interpret statutes, including the rule’s language, Agency explanations, and administrative intent.

In this hypothetical case, a court would likely first look at the Rule’s stated purpose: “to provide, within the context of multiple-use management, lasting

345. In all likelihood, the citizen group would also allege fact-specific NEPA violations, the discussion of which is beyond the scope of this Note.

346. Much of the case law discussing the legality of Forest Service management actions in IRAs involves challenges to the Agency’s NEPA analyses. See, e.g., Sierra Club v. Wagner, 555 F.3d 21 (1st Cir. 2009) (described supra note 317); Lands Council v. Martin, 529 F.3d 1219, 1231–32 (9th Cir. 2008) (holding that a roadless area analysis in an EIS was insufficient under NEPA where it failed to discuss the effects of proposed logging on the roadless character of two roadless areas). Others deal with the definition of “generally small diameter” trees. See Sierra Club v. Eubanks, 335 F. Supp. 2d 1070 (E.D. Cal. 2004) (finding that environmental groups showed a probability of success on the merits of their claim that a project in an IRA violated the Roadless Rule where the project proposed to harvest trees up to twenty-four inches in diameter despite the Agency’s own characterization in the Sierra Nevada Framework FEIS (which applied to the Forest Plan, and in turn, to the project at issue) that trees between twelve to twenty-four inches in diameter are “large”).

347. CHARLES ALAN WRIGHT & CHARLES H. KOCH, JUDICIAL REVIEW OF ADMINISTRATIVE ACTION, REVIEW OF INTERPRETATIONS, FEDERAL PRACTICE AND PROCEDURE § 8353. The Supreme Court has repeatedly affirmed “that an agency’s construction of its own regulations is entitled to substantial deference.” Martin v. Occupational Safety and Health Review Comm’n, 499 U.S. 144, 150 (1991); see also Udall v. Tallman, 380 U.S. 1, 16–17 (1965).


349. WRIGHT & KOCH, supra note 347.
protection for inventoried roadless areas within the National Forest System.”

This purpose supports the Agency’s ability to manage for future conditions if an activity can be shown to promote multiple uses and provide protection for species or ecosystem processes in the face of climate change. Both assisted migration and small-diameter timber management to meet projected future conditions may be permissible under the Rule’s purpose because they promote multiple uses and could be shown to enable persistence of roadless area characteristics.

Next, a court would look at the Rule’s language and the Agency’s explanations in the preamble. The Rule neither limits non-timber-based management nor addresses the question whether the Agency may implement small-diameter timber harvest that reduces stand density below average historical levels. However, it appears to allow some flexibility when it specifies that the Agency may remove small-diameter timber to “maintain or improve” roadless area characteristics. Treatments may be justified if the Agency can show that climate change will require assisted migration or lower tree densities in order to “maintain” roadless area characteristics like habitat and diversity of plant and animal communities. Similarly, the language throughout the remainder of the Rule specifies that the purpose of timber harvest must be to “improve” wildlife habitat or “maintain or restore characteristics of ecosystem composition and structure.” Therefore, a court may defer to the Agency’s well-supported determination that treatments are necessary to meet these objectives. However, it bears noting that treatments justified on the basis that they maintain roadless area characteristics like “diversity of plant and animal communities” and species habitat may damage other characteristics like “high quality or undisturbed soil, water, and air.” Therefore, the Agency would need to support the need for such treatments with adequate documentation.

Finally, while the preamble uses language that appears to limit small-diameter timber removal treatments in IRAs to those that “maintain ecosystem composition and structure within its historic range of variability at the landscape scale,” a court may not find the preamble to have the same

350. Roadless Rule, supra note 1, at 3272.
351. Roadless Rule, supra note 1, at 3273. Of course, it could be argued that even very low stand densities are within the historic range of variability. For example, stand density in a proposed treatment unit may have been very low after a medium-to-high-intensity fire. However, the concept of restoration to a historical baseline (or within the HRV) would be essentially meaningless if such an interpretation were followed.
352. See Roadless Rule, supra note 1, at 3272.
353. Id. at 3258 (emphasis added). The language in the response to comments on “Wildlife Habitat Management” in the preamble to the Roadless Rule appears similarly restrictive. There, the Agency states that the Rule allows management, including tree cutting, for wildlife habitat improvement as long as it is designed to “maintain or help restore ecosystem composition or structure to conditions within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.” Id. at 3257 (emphasis added).
Ultimately, a court may find that it is ambiguous what types of climate change management actions are allowed by the Rule’s language. This may be particularly true where climate change effects make it impossible to “maintain or restore” forest ecosystems within the historic range of variability, or where it is unclear whether “natural disturbance regimes” exist in a climatic period characterized by rapid change. However, a court may defer to the Agency’s interpretation that the Roadless Rule allows management to facilitate transitions to new conditions, especially because it could not have foreseen certain effects when it promulgated the Rule. In one case on point, the district court in Hogback Basin Preservation Association v. U.S. Forest Service deferred to the Agency’s determination that a seven-acre parking lot was not a “road” under the Roadless Rule. While noting that the Agency decision to permit multiple-use recreation in an IRA created “confusion,” the Hogback court looked to Auer v. Robbins to find that “the Forest Service’s interpretation of its own regulation is entitled deference.” In Auer, the Court directed that where language in a regulation is ambiguous, an agency’s interpretation of its own regulation is “controlling unless ‘plainly erroneous or inconsistent with the regulation.’” Likewise, a court in the above hypothetical situation may defer to the Agency’s interpretation that the Roadless Rule allows a broad range of treatments for climate change mitigation and adaptation. Furthermore, the Supreme Court has found that where “complex or changing circumstances call[] upon the agency’s unique expertise and policymaking prerogatives, [the Court] presume[s] that the power authoritatively to interpret its own regulations is a component of the agency’s delegated lawmaking powers.” Climate

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354. Wakkary v. Holder, 558 F.3d 1049, 1057–58 n.4 (9th Cir. 2009) (“We note, in this connection, that prefatory language to a regulation, although often informative, does not have the same binding force as do the regulations themselves.”); see also Martin v. Am. Cyanamid Co., 5 F.3d 140, 145 (6th Cir. 1993) (“The preamble to a regulation may be consulted in determining the administrative construction and meaning of the regulation.”).

355. The Roadless Rule’s preamble does not expand on the phrases “natural disturbance regimes of the current climatic period” and few commentators have discussed the impact of this language. However, one blogger wrote the following:

Now many of you may be thinking “this clause is confusing, how could we tell what might be ‘natural’ under the ‘current climatic period’ which we know to be, in and of itself, unnatural?” Not only that, but we would need to know the ‘range of variability’ for this current unnatural climatic period. Warning: thinking too hard about this exception may make your head hurt.


357. Id. at 1148.

358. Auer v. Robbins, 519 U.S. 452, 461 (1997). The Court will uphold an Agency’s interpretation where it “reflect[s] the agency’s fair and considered judgment on the matter in question.” Id. at 462.

359. Martin, 499 U.S. at 151.
change effects certainly present complex and changing circumstances, and a
Court may find that the Forest Service’s unique expertise allows it to interpret
its own Rule to include management to facilitate a transition to future
conditions.

3. The Forest Service’s Statutory Framework Allows for Climate Change
Management Flexibility.

As discussed in Wyoming v. USDA, the Forest Service has wide latitude
under its statutory framework to determine management objectives on NFS
lands. While commentators may criticize the breadth of the Agency’s statutory
framework, this broad authority also allows management to adapt to new
conditions, like those caused by climate change. A court would likely find that
the Forest Service’s statutory framework allows it to manage for a wide range
of climate change mitigation and adaptation purposes in IRAs, even those that
would take ecosystems toward desired future conditions that never existed in
the historical baseline.

The Tenth Circuit’s discussion of the differences between IRAs and
wilderness areas is instructive because it highlights the fact that the Forest
Service has more flexibility to manage for climate change mitigation and
adaptation in IRAs than in wilderness. According to Professor Camacho,
wilderness areas are the “least likely of federal lands to be accepted venues for
assisted migration” because they must be managed to preserve their “natural
conditions and wild character.” Therefore, if an agency wanted to assist
migration in a wilderness area, it would need to “make the improbable
determination that introducing a new non-native species is consistent with
preserving wilderness character and natural conditions.”

However, the Roadless Rule does not necessarily require this
determination because the preamble specifies that the Agency may “manage for
the full range of habitat types needed to support the diversity of native and
desired non-native species.” Therefore, there is some support in the Rule for
allowing assisted migration in IRAs. Likewise, there is support for small-
diameter timber management outside of the HRV where it is necessary to
support species diversity in IRAs. However, the Roadless Rule litigation also
suggests that further restrictions imposed in IRAs for climate change mitigation
and adaptation may again prompt claims of “de facto” wilderness creation.
For example, if the Agency seeks to restrict or otherwise limit grazing in IRAs

360. Camacho, supra note 284, at 198.
361. Id. at 199.
362. Roadless Rule, supra note 1, at 3257 (emphasis added); see Camacho, supra note 284, at 192
(citing Julie Lurman Joly & Nell Fuller, Advising Noah: A Legal Analysis of Assisted Migration, 39
ENVT. LAW REP. 10,413, 10,419 (2009), which discusses the “USFS’s longstanding historical
acceptance of certain ‘desired’ non-native species in national forests”).
363. See, e.g., Wyoming III, 570 F. Supp. 2d 1309, 1345 (D. Wyo. 2008); see also Wyoming IV,
661 F.3d 1209, 1227 (10th Cir. 2011).
in response to climate change, litigants may renew claims similar to those brought before the Tenth Circuit. Similarly, environmental groups would scrutinize proposals for active management in IRAs, even those with the objective to adapt to or mitigate climate change.

Scholars have acknowledged that the Organic Act’s broad mandates generally allow the Agency to manage to mitigate and adapt to climate change.364 While the Organic Act was enacted over a century ago, it remains important today because it gives the Agency authority to address new problems like roadless area protection and climate change mitigation and adaptation.365 The Wyoming court’s discussion of the Organic Act is instructive in the climate change context. There, the Tenth Circuit found that the Act confers on the Agency broad discretion to regulate NFS lands for “conservation purposes,” which presumably should be the basis for any active management proposal in IRAs.366 The Organic Act also directed the Agency to protect the nation’s forest reserves and “identified a foundational purpose for federally protected forests as locations to protect and enhance water supplies, reduce flooding and secure favorable conditions of water flow.”367 Because climate change will affect these foundational purposes, the Agency has discretion under the Organic Act to preserve NFS lands from climate change effects. Like the Tenth Circuit found Organic Act “alone sufficient” to support the Roadless Rule,368 a court would likely find that the Act also supports the Agency’s discretion to employ certain treatments in IRAs to mitigate and adapt to the effects of climate change.

Similarly, MUSYA is of continuing importance in a changing climate because it empowers the Forest Service to change its management approach in response to new conditions. For example, MUSYA requires “periodic adjustments in use to conform to changing needs and conditions.”369 It could therefore be used to support the Agency’s use of management prescriptions to meet new needs associated with climate change.370 MUSYA directs the Forest Service to manage national forests for multiple uses including “outdoor recreation, range, timber, watershed, and wildlife and fish purposes,” all of which are threatened by climate change.371 Therefore, it could be argued that agency management activities in IRAs that promote or protect some or all of these uses fulfill the Act’s direction that the Agency “mak[e] the most judicious

364. See Glicksman, supra note 166, at 856 (discussing how the Organic Act gives the Forest Service “sufficient authority to begin addressing climate change in some ways.”).
365. See id.
366. Wyoming IV, 661 F.3d at 1234 (citations omitted).
367. BURCHFIELD & NIE, supra note 126, at 11–12.
368. Wyoming IV, 661 F.3d at 1235 (“Indeed, the Forest Service cited this authority in the final Roadless Rule.”) (citing Kootenai Tribe of Idaho v. Veneman, 313 F.3d 1094, 1117 n.20 (2002)).
369. Glicksman, supra note 166, at 857.
370. Wyoming IV, 661 F.3d at 1235.
use” of NFS land for “some or all of these resources.” As the Tenth Circuit used MUSYA’s provisions to uphold the Roadless Rule, the Act, which “breath[e]s discretion at every pore,” could similarly be used to uphold management actions for climate change mitigation and adaptation in IRAs.

Neither does NFMA impede the Agency’s ability to manage for climate change mitigation and adaptation in IRAs, although individual projects would need to comply with each unit’s Forest Plan. Rather, NFMA’s “biodiversity mandate,” which directs the Agency to “provide for the diversity of plant and animal communities,” supports management with a purpose of perpetuating diverse forest communities despite climate change effects. Through the forest planning process governed by NFMA, individual national forest and grassland managers may approve and prescribe management actions in IRAs for climate change mitigation and adaptation. For example, a particular national forest might approve adaptation techniques for climate change resistance, resilience, response, and realignment in a forest plan that listed climate change-caused triggers and designated potential adaptation responses to address effects.

C. Recommendations

Given principles of judicial deference to an agency’s interpretation of its own rulemaking and the Forest Service’s broad statutory framework, courts may uphold the Agency’s ability to manage for climate change adaptation or mitigation in IRAs. Of course, each challenge will be fact-specific and outcomes will depend heavily on the Agency’s justification for management actions and effects analysis. If the Forest Service finds it necessary to manage for future conditions in IRAs but fears project-by-project litigation, the Agency may benefit from modifying the language of the Rule to explicitly allow for such management. In light of climate change effects, the Agency should also consider the fundamental validity and utility of managing to maintain and restore conditions within the historical range of variability. Likewise, it should consider changing prescriptions for restoration of historical conditions in future rulemakings, Forest Plans, and guidance documents to prescriptions that allow treatments to meet the future challenges of climate change.

Finally, if the Agency is to pursue management for climate change mitigation and adaptation in IRAs, land managers need a comprehensive set of criteria for prioritizing roadless areas for such treatments. DellaSalla and Frost suggest several criteria that should be used for prioritizing prescribed fire in roadless areas. Similar criteria should be developed for implementing a full range of climate change mitigation and adaptation treatments. Several general

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372. 16 U.S.C. § 531(a). MUSYA acknowledges that “some land will be used for less than all” of the resources listed in the statute. Id.
373. Strickland v. Morton, 519 F.3d 467, 469 (9th Cir. 1975).
374. 16 U.S.C. § 1606(g)(3)(B); see also supra note 155.
375. See DellaSala & Frost, supra note 209, at 17.
principles may apply across management approaches. For example, if a treatment or species introduction is experimental in nature, managers should ask whether it can first be implemented in already altered or degraded land outside of an IRA. Additionally, areas within IRAs should be considered and ranked for their suitability for active management. The propriety of treatments in IRAs should be carefully considered though landscape-scale assessments of climate change adaptation needs and mitigation possibilities.

CONCLUSION

Roadless areas “offer hope that future generations will be able to marvel in their magnificence, and . . . are a form of ‘insurance’ to reduce the consequences of climate change . . . .”376 The Tenth Circuit’s decision to uphold the Roadless Rule in *Wyoming v. USDA* is critical in a changing climate because the Rule protects a vast land base from development, prevents habitat fragmentation and the spread of invasive species, and protects water quality and yield. However, climate change effects still threaten species dependent on IRAs and endanger critical ecosystem processes and functions. As Part IV explains, the Rule’s prohibition on road construction, reconstruction, and large-scale timber harvest leaves the Agency with some management flexibility. However, while a court may defer to the Forest Service’s well-documented determination that management to meet future conditions outside of the HRV is necessary, the Rule does not unambiguously allow such management. As climate change effects make such management desirable, the Agency would benefit from modifying the language of the Rule. And in light of new climate realities and the Agency’s focus on management for climate change, it should consider a shift in future rulemakings and Forest Plans away from management prescriptions for historical conditions, and toward new prescriptions consistent with meeting the challenges of climate change.

There are good reasons for exploring options for climate change adaptation and mitigation in IRAs; however, there are also concerns that caution against such management. Ultimately, the choice whether to manage in IRAs will require a scientifically informed value judgment. Because “[s]aving species in such a quickly changing environment may not allow for policy meetings, comment periods, revised management plans and alternative implementation strategies,” the time for discussion on the extent to which active management should be employed in IRAs is now.377

376.  DellaSala et al., *supra* note 208, at 10.

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