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Gila National Forest

Land Management Plan

Catron, Grant, Hidalgo, and Sierra Counties, New Mexico

For More Information Contact:
Forest Supervisor
Gila National Forest
3005 E. Camino del Bosque,
Silver City, New Mexico 88061

Forest Planner, National Environmental Policy Act Coordinator,
or Natural Resources and Planning Staff Officer
3005 E. Camino del Bosque, Silver City, New Mexico 88061
Phone: 575-388-8280
Email: gilaplan@fs.fed.us
Website: http://go.usa.gov/h88k

Cover photo: Smokey sunset from Signal Peak Fire Lookout by Michael Ruggiero

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Lead Agency:	**USDA Forest Service**
Cooperating Agencies:	**New Mexico Department of Agriculture, New Mexico Department of Game and Fish, and San Francisco Soil and Water Conservation District**
Responsible Official:	**Camille Howes, Forest Supervisor** 3005 E. Camino del Bosque Silver City, NM 88061
For Information Contact:	**Lisa Mizuno, Environmental Coordinator** 3005 E. Camino del Bosque Silver City, NM 88061 575-388-8267

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Chapter 1. Introduction

This land management plan, or forest plan, guides the Gila National Forest in fulfilling its stewardship responsibilities to best meet the current and future needs of the American people. This plan provides the vision, strategy, and constraints that guide integrated resource management, provide for ecological sustainability, and contribute to socioeconomic sustainability on the Gila National Forest and the broader landscape.

Purpose of a Forest Plan

There are three levels of planning for National Forest System lands. The first and broadest level of planning occurs at the national level through the United Stated Department of Agriculture Forest Service Strategic Plan. This is a 5-year plan that allows public transparency of the agency's goals, objectives, and accomplishments.

The second level of planning occurs at the level of the national forest and grassland administrative units through forest plans. Every national forest and grassland is required to have a forest plan by the National Forest Management Act of 1976, consistent with the provisions in the Act, the most current planning regulations, and agency policy direction. The Regional Forester approved the original Gila National Forest Plan in 1986. The 1986 plan was written following the guidance in the 1982 forest planning regulations and was amended 11 times to adjust for situations in specific projects or to reflect changes in economic, social, and ecological conditions, scientific information, and agency and public understanding. This plan revision follows the 2012 Planning Rule (36 Code of Federal Regulations [CFR] 219) and the associated 2015 agency directives (Forest Service Manual 1920 and Forest Service Handbook 1909.12).

This forest plan contains information and guidance for the third level of planning and decision making, which occurs at the project or activity level. All projects and activities must be consistent with the forest plan. With the direction laid out in this plan, it is anticipated that management can better adapt to changing conditions and achieve the vision for the Gila National Forest. It does not compel any agency action or guarantee specific outcomes. It does not list specific projects or prioritize the program of work, although it can inform priorities based on the direction it provides. An accompanying monitoring plan provides the feedback necessary to evaluate management effectiveness and identify future needs to change plan direction.

A forest plan guides and constrains Forest Service personnel, not the public. Any constraint on the public must be imposed by law, regulation, or through an order issued under 36 CFR part 261, subpart B. In addition to forest plans, management of National Forest System lands is guided and constrained by laws, regulations, and the policies, practices, and procedures that are in the Forest Service Directive System, which are not required to be repeated in the forest plan.

Content of a Forest Plan

Organization

Chapter 1. Introduction describes the organizational structure of the plan, key concepts and content, the purpose and need to change the plan, project consistency, implementation, and transitioning from the 1986 plan.

Chapter 2. Forestwide Plan Content includes desired conditions, objectives, standards, guidelines, and management approaches that apply forestwide. It is split into four sections: Plan Management Approaches, Ecological Sustainability and Biodiversity, Community and Tribal Relationships, and Multiple Uses and Social, Cultural and Economic Sustainability.

Chapter 3. Management Areas includes desired conditions, objectives, standards, guidelines, and management approaches applicable to specific areas in addition to or different from those provided forestwide. This chapter is divided into two sections: designated and other management areas. Designated areas are those established by legislative statute, but some categories may be established through the federal executive branch in an administrative process separate from the plan. Other management areas are established administratively by the plan. Forestwide plan direction applies in these areas, but where there are differences between the direction for the general forest area and the designated or management area, the most restrictive direction must be followed.

Chapter 4. Timber Suitability and Estimated Vegetation Management Practices identifies the suitable timber base, estimates the kinds of cutting practices and acres to be treated, and forecasts associated harvest volumes. Actual practices and harvest volumes will be determined by site-specific conditions, designed to promote movement toward the plan's desired conditions and in compliance with all relevant plan standards and guidelines.

Chapter 5. Monitoring Program outlines the monitoring and evaluation of plan implementation. This program will be used to assess progress toward achieving desired conditions and objectives, and to evaluate how well the plan is being implemented.

Appendix A. Proposed and Possible Management Actions describes how the plan meets the requirements in the planning rule and agency directives for proposed and possible management actions.

Appendix B. Maps contains visual depictions of management areas, desired recreation opportunity spectrum settings and scenic integrity objectives.

Appendix C. Focal Species Selection Process and Rationale.

Appendix D. Relevant Laws, Regulations, and Policy.

Plan Components

Desired conditions, objectives, standards, guidelines, and suitability of lands are the six required plan components. Plan components should provide a strategic and practical management framework, reflect the forest's distinctive roles and contributions, and be applicable to its resources and related issues. Plan components do not need to reiterate or re-state existing law, regulation, or policy. Plan components were developed collaboratively with input from diverse stakeholders with a broad range of perspectives and expertise. The interdisciplinary team designated by the Forest Supervisor refined the final form and organization of the plan with the goal to maximize utility, clarity, and integration. The following paragraphs provide more detail on the six required plan components and their function in the plan.

Desired conditions describe the social, economic, and ecological aspirations for the forest toward which management is directed. They are not commitments or final decisions allowing specific projects or activities; rather they guide the development of projects and activities. They

must be described in terms that are specific enough to allow a determination of progress toward their achievement. Projects and activities are designed to maintain or move toward desired conditions over the long term to be consistent with the plan. In some cases, desired conditions may already be achieved, while in other cases they may only be achievable over hundreds of years.

Objectives describe how management intends to move toward desired conditions. Objectives are concise, measurable, and time-specific statements of a desired rate of progress toward a desired condition or conditions and are based on reasonably foreseeable budgets. Objectives are established for the work considered most important to address the needs for change and achieve desired conditions. They also provide a way to measure or evaluate accomplishments. It is important to recognize that objectives were developed based on historical and expected budgets and professional experience with implementing various programs and activities. It is possible that objectives could be exceeded or not be met based on factors including, but not limited to, changes in budget and staffing, planning efficiencies, and partner contributions. The basis upon which objectives were developed is described in an introductory section to chapter 2.

Standards are mandatory constraints on project and activity decision-making, established to help achieve or maintain desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements. No deviation from a standard is authorized without a plan amendment.

Guidelines are constraints on project and activity decision-making and are established for the same reasons as standards. However, a guideline allows for departure from its terms, so long as the original intent of the guideline is met. Deviation from a guideline must be specified in the decision document with the supporting rationale. When deviation from the guideline does not meet the original intent, a plan amendment is required.

Suitability of lands identifies specific areas that can support various multiple uses or activities based on the desired conditions applicable to those lands. Suitability also identifies areas that cannot support those uses or activities based on the applicable desired conditions. The suitability of lands need not be identified for every use or activity; however, every plan must identify those lands that are suitable and not suitable for timber production. This plan fulfills the timber production suitability requirement and addresses other uses and activities through standards and guidelines.

Glenwood Ranger District. Photo by Sandy Taylor

Management Areas

Every plan must have management areas or geographic areas or both. Management areas are established based on purpose. Geographic areas are established based on place. The plan may identify statutorily and administratively designated areas and areas that are recommended, proposed or eligible for designation as management or geographic areas. Examples of statutorily designated areas include national scenic trails, inventoried roadless areas, wilderness areas, and wilderness study areas. Examples of administratively designated areas include research natural areas and scenic byways. This plan includes designated areas under the management area concept. Not all management areas established by the plan have a formal legislative or administrative designation process outside the land management planning process. Wildland-urban interface and utility corridors are examples of these types of management areas.

Desired conditions for management areas describe what management wants or needs to achieve for specific areas that are not necessarily covered by forestwide desired conditions. Where a need was identified, objectives, standards, and guidelines specific to the area are included to support maintenance and movement toward these specific desired conditions.

Other Content

The plan is also required to describe the distinctive roles and contributions of the forest, describe proposed and possible management actions, identify priority watersheds, and include a monitoring program.

Distinctive roles and contributions, included in this chapter of the plan is a description of the forest's distinctive contributions to the local area, region, and nation, and the roles for which the forest is best suited, considering the agency's mission and capabilities.

Proposed and possible actions and how this plan meets intent of transparency, the requirements of the 2012 Planning Rule and Forest Service directives are discussed in appendix A. This is informational only. These are not commitments or proposals as defined the National Environmental Policy Act or the Council on Environmental Quality.

Priority watersheds are identified using the Forest Service national watershed condition framework as discussed in chapter 2 of the plan in the Watersheds section. These priorities may change over the life of the plan as essential projects are completed, to concentrate restoration in other areas.

Plan monitoring tests assumptions, tracks changes, and measures management effectiveness and progress toward achieving and maintaining desired conditions and objectives. The plan monitoring program is included as chapter 5 of the plan.

Background information is useful for context. The plan includes background information, explanatory narrative, management approaches, glossaries, and references. This content is not required but promotes shared understanding.

Explanatory narrative may be part of the background information or management approaches, but sometimes it is needed to clarify something about a standard or guideline. When this is necessary, footnotes are used. A superscript number identifier is used for footnotes.

Management approaches facilitate transparency about the plan and how outcomes would likely be delivered. They can describe program priorities, emphasis or focus, principal strategies, recent

trends performance risks, partnership opportunities, program demands, or potential processes such as analysis, assessment, inventory, project planning, or monitoring. Management approaches are not management direction and should not create unrealistic expectations regarding the delivery of programs. Again, these are not commitments or proposals as defined the National Environmental Policy Act or the Council on Environmental Quality.

Glossaries are provided for each subsection in chapter 2 and for each of the other chapters to eliminate the need to navigate to a main glossary at the end of the document. Some sections or chapters may not have glossaries if technical language could be reasonably avoided.

References are provided using a similar approach as the glossaries for ease of use and a more direct linkage between the plan content and the science that supports it. Subsections that do not draw on published literature do not have references.

Foundational Concepts

This plan relies on several foundational concepts and frameworks that are used to describe plan direction. Some of these concepts are not specifically referred to anywhere else in the plan, but they set the tone and are therefore important to consider during implementation.

Adaptive management is a system of management practices based on clearly identified intended outcomes and monitoring to determine if management actions are meeting those outcomes. If needed, it facilitates management changes that will best ensure that those outcomes are met or re-evaluated. Adaptive management stems from the recognition that knowledge about natural resource systems is sometimes uncertain, particularly for dynamic issues such as weather events, climate change, and other disturbances that are not easily predicted.

"All lands" is the concept that ecosystems and watersheds transcend land ownership boundaries, and therefore, effective management requires cooperation and collaboration among the Forest Service, other land managing agencies, federally recognized Tribes and Pueblos, and private landowners. This plan was developed using an approach that considers the broader landscape and the Gila National Forest's ecological, social, and economic role within that landscape.

At-risk species are either federally recognized threatened, endangered, proposed, and candidate species or species of conservation concern. Species of conservation concern are species other than federally recognized species known to occur on the Gila National Forest for which the Regional Forester has determined that the best available scientific information indicates a substantial concern about the species' capability to persist over the long term. At-risk species habitat and compatible multiple uses will be managed in a way that provides for species persistence. For many of these species, essential ecological conditions can be provided through plan components for habitat elements such as vegetation communities, soils, and watersheds. These are referred to as coarse-filter plan components. For other at-risk species, more species-specific plan components may be necessary. These are referred to as fine-filter plan components and include things like timing restrictions. The upland vegetation community and riparian and aquatic ecosystems background information sections include a list of associated at-risk species. The at-risk species list can and will likely be changed based on new scientific information over the life of the plan without a plan amendment.

Climate change adaptation is adjustments in natural or human systems in response to actual or expected climatic factors, or their effects, which moderates harm or exploits beneficial opportunities. This adaptation includes initiatives and measures to reduce the vulnerability of

natural and human systems against actual or expected climate change effects. Adaptation strategies can be classified along a continuum or spectrum of resistance to climate-related stressors, resilience to climate-related stressors, or transitions in response to changes. This Resistance-Resilience-Transition classification of climate adaptation actions is described in greater detail later in this section, and the plan management approach Change and Uncertainty.

Ecological integrity is the quality or condition of an ecosystem or watershed when its dominant characteristics occur within the historical (or natural) range of variation, or other reference condition, and can withstand and recover from most disturbances imposed by natural environmental dynamics or human influence.

Ecological response units are vegetation types based on groupings of terrestrial ecological units with similar potential natural vegetation and historical fire regimes. The ecological response unit framework is used by the U.S. Forest Service Southwestern Region to facilitate landscape-scale analysis and planning. See Ecological Sustainability and Biodiversity, Ecological Classification subheading in chapter 2.

Ecosystem services are products and processes in functional ecosystems and watersheds that people enjoy or from which they benefit. By the convention established in the scientific literature, they are grouped into four broad categories:

> **Supporting** services are those that are necessary to produce other ecosystem services such as soil formation, nutrient cycling, pollination, and seed dispersal.
>
> **Regulating** services are the benefits people obtain from the regulation of ecosystem and watershed processes such as carbon storage and climate regulation; water filtration, purification, and storage; flood and erosion control; and disease regulation.
>
> **Provisioning** services are the products people obtain from ecosystems and watersheds such as clean air, fresh water, energy, food, fuel, forage, wood products or fiber, and minerals.
>
> **Cultural** ecosystem services are non-material benefits people obtain from ecosystems and watersheds such as educational, aesthetic, spiritual and cultural heritage values, recreation experiences, and tourism opportunities.

Historical (or natural) range of variation references past conditions, disturbance regimes (such as windthrow, insect infestations, disease outbreaks, and fire regimes) and other ecological processes that provide important context and guidance relevant to the environments and habitats in which native ecosystems and species evolved.

Integrated resource management is multiple-use management that recognizes the interdependence of ecological, social, and economic systems.

Integration recognizes and identifies key relationships between various resources and management activities. Forest plan components are integrated to address a variety of ecological and human needs. For example, desired conditions for ponderosa pine incorporate habitat needs for a variety of species, the scenic components that visitors desire, and the forest products that contribute to local economies.

Mitigation is a management response that reduces, minimizes, or eliminates the negative effects of a particular activity or circumstance. For example, best management practices like drainage features on a system road that reduce erosion and sediment delivery to streams. Reducing the environmental effects of the energy, vehicles, and water used and waste generated by daily business operations mitigates climate change.

Resilience is a word that has evolved multiple meanings. The classic definition of the word as used by the restoration science community, the 2012 Planning Rule, and final agency directives is: "the ability of an ecosystem (or watershed) and its component parts to absorb, or recover from the effects of disturbances through preservation, restoration or improvement of its essential structures, functions and redundancy of ecological patterns across the landscape" (Forest Service Handbook 1909.12 zero code). Resilience is also a term that has been used as part of classification schemes describing climate adaptation actions and when used in this context, has another meaning (St. Laurent et al. 2021). When resilience is used in an adaptation context it is capitalized to differentiate its use from the restoration context. This distinction is important for precision and clarity to promote transparency and shared understanding.

Resistance-Resilience-Transition describes the continuum of climate change adaptation strategies that management can direct actions toward (Chazdon et al. 2021 and St. Laurent et al. 2021). The Resistance end of the continuum describes strategies to resist change. At the Resilience level, it describes actions that enhance the capacity of the natural or human system to return to current or future desired conditions. Resilience strategies may have much in common with Resistance strategies in that they generally aim to limit change, but they also acknowledge that some changes may be inevitable or beneficial. The intent of Resilience strategies is to recover past or current structures, functions (Chazdon et al. 2021 and St. Laurent et al. 2021), and opportunities. The Transition end of the continuum describes management that allows projected changes without actively trying to shape them, and management actions that drive or accelerate the shift toward projected conditions. The intent of Transition strategies is to promote establishment of new structures, functions, (Chazdon et al. 2021 and St. Laurent et al. 2021), and opportunities.

Restoration is a word with two meanings. Ecological restoration is the process of assisting the recovery of a degraded or damaged system. Ecosystem and watershed restoration focus on reestablishing the composition, structure, pattern, and processes necessary to facilitate terrestrial and aquatic ecosystems sustainability, resilience, and health under current and future conditions (36 CFR 219.19). Functional restoration focuses on the underlying processes that may be degraded, regardless of structural conditions. Functionally restored systems may have a different structure and composition than the historical, reference condition. In contrast with ecological restoration that tends to seek the historical reference condition, functional restoration focuses on the dynamic processes that drive structural and compositional patterns. The long-term goal is to restore the interactions between function and structure; however, it may be that the system will look very different than the reference condition in terms of structure and function because some threshold has been crossed or environmental drivers, such as climate, that influenced structure and compositional development have changed (FSH 1909.19 zero code).

Sustainable operations are systems, processes, practices, and procedures necessary to conduct the daily business of managing the forest that meet the current needs and preserve the ability to meet future needs. This includes a focus on energy, fleet, waste, and water.

Sustainability is the ability of a resource to meet the needs of the present generation without compromising the use of that resource by future generations. It embodies the principles and legal mandates of multiple use and sustained yield. Ecological sustainability refers to the capability of ecosystems to maintain ecological integrity. Economic sustainability refers to the capability of society to produce and consume or otherwise benefit from goods and services, including contributions to jobs and market and nonmarket benefits. Social sustainability refers to the capability of society to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another and support vibrant communities. Sustainability is not a stationary target or static condition, rather it is a dynamic target that changes in response to other drivers and stressors of ecosystems, watersheds, markets, and communities. Ecological or socioeconomic aspects of sustainability are not independent from one another. While there may be short-term benefit, there is no socioeconomic sustainability outside of what is ecologically sustainable.

Best Available Scientific Information

The best available scientific information has been used to inform the planning process. In the context of best available scientific information, available means that the information currently exists in a form useful for the planning process without further data collection, modification, or validation. Analysis or interpretation may be needed to place it in the appropriate context. The planning record documents how the best available scientific information was determined to be accurate, reliable, and relevant to the ecological, social, and economic issues being considered.

Implementation of a Forest Plan

The plan is implemented by project-level planning and decision making. Project planning translates the forest plan's desired conditions and objectives into proposals that identify specific actions, design features, and project-level monitoring. Project proposals and alternatives are developed to address site- and activity-specific needs developed locally with input from experts and stakeholders and considering the most current and relevant information. Project decisions are made following public participation and environmental analysis. Consistency with law, regulation, policy, plan direction, and the potential effects on desired conditions at multiple scales are important considerations in the decision-making process.

Consistency

Consistency with desired conditions and objectives is established when the project:

1. Maintains or makes progress toward attaining one or more plan desired conditions, objectives, or both;
2. Has no effect or only a negligible adverse effect on the maintenance or attainment of applicable desired conditions, objectives or both; or
3. Does not eliminate the opportunity to maintain or achieve any of the applicable desired conditions, objectives, or both over the long term, even if the project or an activity authorized by the project would have an adverse short-term effect on one or more desired conditions, objectives, or both.

The project decision document should include a specific finding that the project is consistent with the plan's desired conditions and objectives, and briefly explain the basis for that finding. In providing this explanation, the decision document does not need to explicitly address every

desired condition and objective set forth in the plan. Rather, a general explanation is all that is needed, so long as the consistency finding is made based on a consideration of one of the three factors noted above. When a categorical exclusion applies and there is no project decision document or project record is not required, the responsible official must ensure the project is consistent with the plan's desired conditions and objectives.

Consistency with standards is established when the project or activity is designed in exact accord with the standard. The project documentation should confirm that the project or activity is designed in exact accord with all applicable plan standards, which should be confirmed through project documentation for those projects requiring documentation. The responsible official can make a single finding of consistency rather than needing to make a separate finding for each applicable standard.

Consistency with guidelines is established when the project or activity is designed in exact accord with the guideline or varies from the guideline but is as effective in meeting the intent of the guideline to maintain or attain relevant desired conditions and objectives. The project documentation should briefly explain how the project or activity is consistent with the guideline or its intent. The responsible official can make a single finding of consistency when the project or activity is in exact accord rather than needing to make a separate finding for each applicable guideline. When the project varies from applicable guidelines, the project documentation should explain how the project design is as effective in meeting the intent of the guideline.

Consistency with suitability of lands determinations for timber production is established when a project with the purpose of timber production occurs in an area identified as suitable. Timber harvest for the purpose of moving toward desired conditions for vegetation may occur in areas identified as not suited for production only if: (1) the area was not removed from suitability for legal reasons (for example, designated wilderness) and (2) the project adheres to plan direction in the Timber, Forest, and Botanical Products section of the plan, which is designed to comply with the National Forest Management Act of 1976.

The project documentation should confirm that the project or activity conforms with the conditions described above. For all timber projects, the documentation must show affirmative and specific findings of meeting applicable standards and guidelines to demonstrate legal and regulatory compliance. If there is clearcutting, there must be an explanation as to why in each situation it is the optimum method to use. Further, the soil and watershed effects analysis must find that these resources will not be irreversibly damaged.

Where a proposed project or activity would not be consistent with a plan component, the responsible official has the following options:

1. Modify the proposed project or activity to make it consistent with the applicable plan components;
2. Reject the proposal or terminate the project or activity;
3. Amend the plan so that the project or activity will be consistent with the plan as amended; or
4. Amend the plan at the same time the project or activity is approved so that the project or activity will be consistent with the plan as amended. This amendment may be limited to apply only to that project or activity.

Transition

This forest plan provides direction and guidance for future projects, plans, and assessments. We do not expect this new direction to be used to reevaluate or change decisions made under the previously existing forest plan. We anticipate a smooth and gradual transition to the new forest plan. As new project decisions, contracts, permits, renewals, and other activities are considered, we expect conformance to the new plan direction as described in the previous section.

Interrelationships between Plan Components

This forest plan is not an assemblage of program plans with unique plan components for every resource. Rather, resource plan components are viewed as a whole and are combined to meet planning requirements. To effectively manage toward desired conditions, project planners and decision-makers must ensure they use the entire plan and not just the plan components listed for the project or activity. For example, proposals to authorize or reauthorize prescribed fire cannot look only at the desired conditions, objectives, standards, and guidelines under the Wildland Fire and Fuels Management heading in the plan. These proposals must also look at the plan components for all potentially affected resources and uses.

To ensure a project is consistent with the plan, design and implementation should consider setting, management area overlaps, and guidance for resources or conditions that may be present in the area. It should also consider potential conflicts with other authorized projects and activities. Project design should be consistent with the direction contained in Chapter 2 Forestwide Plan Content unless superseded by more specific direction in Chapter 3. Management Areas.

Adaptive Management and Monitoring

Forest planning is a continuous process that includes (1) assessment; (2) plan development, amendment, and revision; and (3) monitoring. The intent of this framework is to support adaptive management. An adaptive forest plan recognizes there is always uncertainty about the future of ecological, social, and economic systems and the timing and cause of change. Given the guarantee of uncertainty and change, the plan's monitoring program must be capable of detecting change and, with the support of research, narrowing the contributing causes to those that plan direction can address. Monitoring, with the support of research, may also detect when conditions have exceeded what was anticipated in this iteration of the planning process and identify a broader need for change in public land management planning.

Public Participation

Public involvement, a point of strong emphasis in the 2012 Planning Rule, has been invaluable throughout the plan revision process (see appendix C to the final environmental impact statement for documentation). In revising the plan, we sought to leverage opportunities to engage diverse stakeholders including individual community members, youth and underserved communities, private landowners, federally recognized Tribes and Pueblos, federal and State agencies, local governments, elected officials, cooperating agencies, and non-governmental agencies. During plan implementation, Gila National Forest leadership and staff will continue to build upon existing relationships and forge new ones. We hope that this revised plan will empower a more strategic use of collective resources to take care of the Gila National Forest that we are all connected to and invested in.

Setting the Stage

A Description of the Gila National Forest

Located in southwestern New Mexico, the Gila National Forest covers about 3.3 million acres. This includes the Apache National Forest lands east of the Arizona-New Mexico state line administered by the Gila National Forest.[1] The forest is divided into six ranger districts: Quemado, Reserve, Glenwood, Silver City, Wilderness, and Black Range. These ranger districts are located within portions of Catron, Grant, Hidalgo, and Sierra Counties (see figure 1).

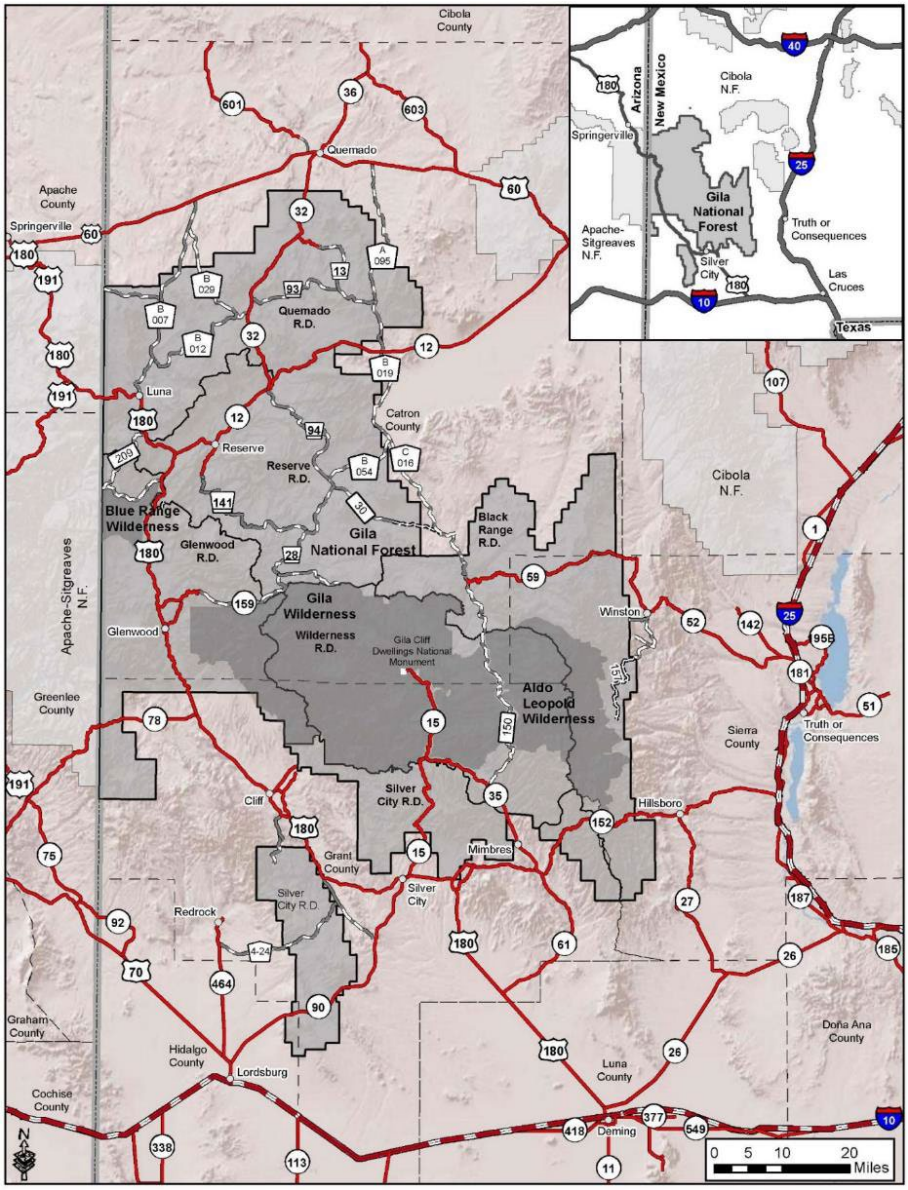

Figure 1. Location of the Gila National Forest

[1] In 1974, the administration and management of the Apache National Forest was divided between the now Apache-Sitgreaves National Forests and the Gila National Forest at the state line to reduce the complexities and costs of managing under the laws and regulations of two different states.

Ecological Context

The forest spans a physical geographic transition zone characterized by volcanic fields of various ages, calderas, high sedimentary plateaus capped with lava, and rugged uplifted mountain ranges dissected by predominantly narrow but occasionally broad river valleys. For the most part, climate across the plan and context areas is characterized as semiarid and warm, with low annual precipitation and a high number of sunny days. Past precipitation and temperature of the region has varied sharply at time scales ranging from annual to multi-decadal. Climate also varies by elevation, topography, and aspect. North-facing slopes tend to be cooler and wetter than south-facing slopes due to differences in solar radiation. Topographic features such as mountain ranges influence wind patterns that carry air masses with different temperatures and moisture content. Mountain ranges can force approaching air masses to move upward quickly, resulting in cooling and precipitation.

The climate is influenced by both the higher elevation Chihuahuan Desert, where precipitation occurs more often during the summer, and the lower elevation Sonoran Desert where precipitation occurs during both summer and winter months. There are generally two principal periods of precipitation. The summer monsoon season typically occurs July through August. Rainfall during this time is characterized by convective, high-intensity, short-duration storms. These are usually small storms, averaging an estimated 5 square miles. Late in the monsoon season and continuing into October, the area can experience high-intensity, longer duration storms of cyclonic origin associated with hurricanes in the Gulf of Mexico and Pacific Ocean. These do not occur with the same regularity of the monsoon rains.

The second principal period of precipitation typically occurs from December through February when easterly storm tracks originating from the Pacific Ocean cross over the Gila National Forest, allowing for widespread precipitation. This precipitation usually falls as snow in the higher elevations. The snowpack at these higher elevations generally develops continuously over this period but melts over a much shorter time span. In years when there is an El Niño event, winter precipitation tends to be higher than normal. In La Niña years, drier than normal conditions exist from late summer and into the winter.

In the arid and semi-arid southwestern United States, every drop of water is precious. The Gila National Forest includes 12 mountain ranges that have been recognized as regionally important groundwater recharge areas. These mountain ranges also form the headwaters of more than 1,000 miles of streams that flow all or most of the year and support riparian and aquatic habitats.

With elevations ranging from 4,160 to 10,770 feet, the forest supports 14 distinct upland vegetation types ranging from spruce-fir forests and montane-subalpine grasslands at the highest elevations to savannah woodlands and semi-desert grasslands at the lower elevations. Riparian types range from woody to herbaceous and are not always associated with permanent surface water. The forest supports high levels of biodiversity, including many species that are rare or occur nowhere else. At the time this document was prepared, there were more than a dozen federally listed species and almost 60 species of conservation concern, most of which are riparian-dependent or aquatic. This fact further illustrates the importance of water and the connectivity of water to riparian and aquatic habitats.

The Gila National Forest is a frequent-fire landscape. Fire plays a variable and important ecological role in all the forest’s ecosystems, and the native biodiversity evolved with fire.

Despite Gila National Forest's long legacy of innovation and leadership in restoring fire to the landscape, there is still a fire deficit on the landscape.

Social, Cultural and Economic Context

The forest has a rich cultural history with archaeological resources reflecting more than 12,000 years of human presence, including some of the best-preserved Mogollon and Mimbres sites in existence. The Mogollon and Apache tribes, as well as Spaniards, Mexicans, ranchers, prospectors, and miners all contributed to the story of the Gila National Forest, including individuals such as Mangas Coloradas, Geronimo, Aldo Leopold, and Ben Lilly.

The Gila National Forest is a relatively remote forest surrounded by many small towns, communities, and people who rely upon the forest to provide resources and uses important to their social and cultural traditions, way of life, and economic well-being. Ranching cultures and traditions are deeply rooted in the area. Many households rely on firewood collected from the forest as their sole source of heat. Small local mills depend on the timber that forest management projects produce. Other plant products including Christmas trees, transplants, pinyon nuts, medicinal herbs, and hops harvested from the forest support local livelihoods and traditions. Like many places throughout the arid and semi-arid western United States, water strongly influences human uses and connections to the land, and water rights and uses are allocated and administered by the state. The streams and rivers that flow through the forest, including the Gila and San Francisco Rivers, provide for important ecosystem services and multiple uses both within and outside the forest's administrative boundaries.

Because of its size, remoteness, climate, light visitation, and relatively sparse population of the surrounding area, the Gila National Forest provides a wide range of year-round backcountry recreational opportunities. Vast backcountry and wilderness areas provide ample opportunities to find solitude while hiking, backpacking, camping, horseback riding, hunting, fishing, picnicking, and wildlife viewing. The Gila Wilderness, the first designated wilderness area in the nation, is a national and international destination. The Aldo Leopold and Blue Range Wilderness Areas provide additional high-quality wilderness experiences. During periods of higher flow, floating or paddling the Gila and San Francisco Rivers is a recreational activity gaining popularity. Local community members place high value on the forest's trail system, within and outside wilderness areas. Over the last decade, wildfires have caused high tree mortality along many popular trails, impacting scenic views and public safety. Continental Divide National Scenic Trail draws both locals and visitors from around the world. Many through-hikers resupply in local communities. There are ample opportunities for motorized recreation in both backcountry and front country settings, which many residents and visitors value. While not extensive, there are also opportunities for developed recreation. Many visitors enjoy picnicking and hiking at the Catwalk recreation area's elevated trail system and "star parties" at the Cosmic Campground International Dark Sky Sanctuary.

Assessment Summary

The Gila National Forest's 2017 final assessment report provided information about ecological, social, and economic condition; trends; and risks to sustainability in the first phase of revision. The next several sections highlight the main points of the assessment report.

Ecological

Past and current management actions, inactions, and a changing climate have contributed to ecosystem and watershed departure from what is known about the historical range of variation. For example, past fire suppression and historical overgrazing contributed to altered fire regimes and other ecological processes. Legacy issues associated with past management remain evident in many places. These issues include woody vegetation encroaching into grasslands, infilling of forest and woodland openings, increased tree densities within forest and woodland patches, altered distributions of vegetation structural states and species composition, and impaired soil conditions. While current management has generally improved conditions across most of the forest, some ecosystems or ecosystem characteristics remain departed from what is known about the historical range of variability that supported resilient and sustainable ecological systems.

Climate change is an ongoing and growing threat to the forest's biodiversity. While long-term trends in precipitation are not evident, there is a strong signal in the temperature data that the climate is changing. Since the mid-1990s, average annual temperatures have not dropped below the period of record average. Streamflow is also shifting, with gauge data demonstrating earlier and shorter peak snowmelt runoff, drying trends, changes in the variability of flow, all consistent with climate change projections (USDA Forest Service 2017a).

Social, Cultural and Economic

Risks to ecological sustainability pose real and direct threats to social, cultural, and economic sustainability. The ability of the Gila National Forest to contribute sustainably to the social and economic welfare of local communities will be largely dependent on the success of forest management's adaptation approaches to future climate, and the capacity and capability of its future landscape. The downward trends in budget and staffing levels continue to limit management's ability to keep up with the demand for forest resources and uses and represents a significant threat to forest management's ability to implement ecological restoration and adaptation in a timely manner (USDA Forest Service 2017a).

Needs for Change Summary

The final assessment report also served as the basis for identifying 54 individual needs for change in management direction to address risks to sustainability, upon which this plan is based. The following sections give an overview of those needs for change.

Plan-Wide

Today, we have greater scientific understanding and improved methods and technologies than in 1986 when the original forest plan was finalized. There is a need to update the plan and monitoring program to reflect those advances and address issues like climate change that were not on the radar screen in 1986. Further, the way the original plan was structured was overly complex. Streamlining could benefit implementation.

Successful implementation also requires good working relationships between leadership, staff, and stakeholders. Leadership and staff have not always capitalized on partners who are willing to help or recognized emerging opportunities. They have also struggled to reach all stakeholders. The plan needs to promote relationships, collaboration, shared stewardship, and management approaches that create ecological and socioeconomic co-benefits. The plan also needs to emphasize conservation education as it relates to the agency's multiple-use sustained-yield mission, and help managers recognize and act upon opportunities to connect youth and underserved populations with nature and their public lands (USDA Forest Service 2017b).

Ecological

The plan needs to promote the adaptive capacity and resilience of the forest's ecosystems and watersheds by restoring the structure, composition, and function of native vegetation communities. It also needs to accelerate restoration, remain within reasonably foreseeable budgets, and provide the flexibility for management to choose the best restoration tool or combination of tools, which will vary across the landscape based on site conditions. Plan direction for integrated pest management needs to be strengthened to support this. Beyond restoring the vegetation community components, the plan needs to maintain or improve habitat connectivity and native biodiversity. It also needs to better address soil, watershed, riparian, and aquatic resources while continuing to support compatible multiple uses (USDA Forest Service 2017b).

Social, Cultural, and Economic

In addition to the plan-wide changes needed relative to relationships, the plan needs to reflect economic and noneconomic importance that places and uses hold for tribes and local communities. The plan needs to support the adaptive capacity and resilience of socioeconomic systems by continuing to provide for public access and multiple uses. The plan should encourage industry innovations and emphasize opportunities that create ecological benefit, budget efficiencies, and socioeconomic contributions. The plan also needs to provide enough flexibility for adaptive multiple-use management, recognizing that sustainable practices will change with environmental conditions. To comply with planning regulations, the plan needs to update the suitability of lands for timber production, and planning frameworks for recreation opportunities and scenery management (USDA Forest Service 2017b).

The Vision

The original forest plan was difficult to read and had become a checklist to see whether we could do something. We do not want this plan to be used in the same manner as the original plan. We want this plan to drive what we do. People who care about the Gila National Forest have invested a lot of time and effort working with leadership and staff to build this plan. We know that change is the only constant, and the plan has the flexibility to adapt. We hope that what is put forth in this section will empower future leadership with an understanding of the local issues, relationships, and working agreements so that they can meet the challenges ahead. This vision is about honoring people and places, history, and hope for the future, all of which have deep roots in this forest plan.

We envision our community of stakeholders connected to each other and to a healthy, functioning landscape where high-quality backcountry recreational experiences abound and traditional uses continue to have both ecological and socioeconomic benefit.

Community Relationships

We need each other to rise to future challenges. The plan revision process has brought new energy and possibilities for strengthening existing and forging new productive relationships. We carry this momentum forward and build trust by making the plan revision model for public engagement and collaboration a standard operating procedure. We use collaborative education and outreach efforts to bring youth, underserved populations, and "the silent middle" into the conversation.

We envision contributing to a community that recognizes the future is something we can build together, rather than something that happens to us. We are united in our connection to the land even though our individual connections are unique. We celebrate and find strength in our differences because "none of us are as smart as all of us." We seek win-win scenarios and know that, together, we will find the innovative solutions and the resources to implement them.

Healthy Functioning Landscape

Fire is a natural ecological process that helped shape and sustain the national forest's plant and animal communities, watersheds, and hydrology before the fire suppression era began. Now, fire is both the primary restoration tool and a threat to these systems. It is the primary restoration tool when fuel and weather conditions support the intensity, severity, frequency, and patch sizes that sustain ecosystem and watershed health. Conversely, fire is a threat when fuel and weather conditions do not support desired fire behavior.

Shifting weather patterns have resulted in more days of the year being considered extreme fire weather days and this trend is expected to continue. With this trend comes an increased urgency to address unhealthy landscape conditions. The restoration science community has called upon managers to provide for more mixed severity fire because it is the most cost-effective method to restore ecosystem health, function, and resilience in frequent-fire landscapes. While fire is the answer, it is not a precise tool, adds complexity, and comes with risk. In areas where risk can be balanced, fire is the preferred tool. In areas around sensitive values at risk where precision is needed, management should first look to pretreat the landscape with different forms of tree cutting or smaller prescribed fires to reduce the potential for negative impacts.

We envision a bold future in which ecosystems and watersheds thrive and disturbance events do not alter the long-term ability of the land to capture, store, and deliver the water that supports natural and human systems on forest and downstream. There is broad community support for, and shared understanding of, the restoration need, and the urgency with which we strive to meet it.

Backcountry Recreation

Outdoor recreation contributes to tourism and the economies of local communities. It also contributes to the physical, mental, and spiritual health of individuals and the bonds between family and friends. The forest is known for large, mostly contiguous wilderness areas and provides exceptional opportunities for solitude and primitive or unconfined recreation. It is home to the country's first designated wilderness area, the Gila Wilderness, and the Aldo Leopold and Blue Range Wildernesses. There are also many miles of backcountry roads that provide access, opportunities for motorized recreation and dispersed camping. The forest provides for a wide range of undeveloped, backcountry experiences. The trail system is central to many of these. We received an outpouring of public comments about the importance of the trail system. Based on this, the trail system is the focus area for the recreation program. While opportunities for unique front country experiences and developed recreation exist and more may arise in the future, they should not detract from the backcountry focus and the trail system.

We envision a sustainable trail system that provides access and facilitates high-quality backcountry experiences. Leadership advances this vision by supporting a year-round trail crew, involving the public in sustainable recreation planning, and leveraging partnerships and volunteers to help with trail maintenance.

Traditional Uses

Fuelwood harvest has been an important use of the forest for centuries and continues to be culturally significant to local and traditional communities. Firewood remains the sole source of heat for many homes, in part because it is more economical than propane, natural gas, and electricity. Gathering firewood is a cultural tradition, and often a family event.

We envision a future in which fuelwood harvest is sustained as a culturally and economically important use of the forest. Leadership advances this vision by opening appropriate new areas specifically for fuelwood collection, providing gathering opportunities as restoration activities generate fuelwood products, and leveraging opportunities to contribute to industry innovations by using commercial fuelwood harvest as a management tool.

Timber Harvest, like fuelwood harvest, has been an economically and culturally important traditional use for a long time. It is also a restoration tool that can help return the natural role of fire to the landscape. As of the date of this plan, there are two mills on the north end of the forest (Reserve and Luna, New Mexico), with a couple of smaller, more mobile operators on the south end of the forest. Because of the economics of haul distances, including weight limits on county roads, low-value product, market conditions, and the large expanse of the national forest, there will always be challenges. However, they will not be insurmountable with collaboration and cooperation between Gila National Forest managers, State Forestry, and local governments.

We envision a future in which local operators thrive, industry innovation is enhanced, new markets emerge, and sustainable timber harvest contributes to rural prosperity and ecological restoration. Leadership advances this vision through partnerships and strategic placement of climate-informed vegetation treatments that include timber sales.

Livestock Grazing is an economically and culturally important traditional use valued by local communities and has been for generations. Like timber harvest, livestock grazing has its share of challenges, because forage and water availability change with environmental conditions. Adaptive management is the cornerstone of sustainable livestock grazing, providing managers with the flexibility and information needed to respond to changing conditions. Successful adaptive management hinges on good relationships, communication, and monitoring.

We envision a future in which livestock grazing is sustained as a culturally and economically important use of the national forest, forage is plentiful, and producers are prosperous. Leadership advances this vision by (1) restoring productive rangelands; (2) encouraging collaborative monitoring to support adaptive management; and (3) strategically selecting vacant allotments to serve as forage reserves, or swing allotments that provide flexibility to support permittees during times of drought and other environmental disturbances.

Hunting and fishing are important activities for the people of New Mexico. Many people in rural areas and small towns in southwestern New Mexico continue this traditional practice, which provides food, bonding opportunities between parents and children, and can be used to teach children about nature and natural lands. Hunting has also emerged as a popular recreational activity that can involve larger groups, off-highway vehicles, and hunting camps. The Gila National Forest is known for its high-quality hunts, especially elk, which attract hunters from all over the country. Many hunters return annually. The popularity of hunting has given rise to a community of commercial outfitters and guides that contribute to local and state economies.

We envision a future in which hunting and fishing are sustained as culturally and economically important uses of the forest and enhanced by collaborative restoration of high-quality, connected terrestrial and aquatic habitat.

Cochise Adder's-mouth orchid - *Tamayorkis porphyria,* Pinos Altos range. Photo by Andrew Tree.

Distinctive Roles and Contributions

The Gila National Forest has many roles and provides many important contributions to the local area, state, region, and nation, as described previously under the Ecological Context and Social, Cultural and Economic Context subheadings and subsequently in the plan's vision. Those that make the forest stand out from other national forests are described here (Forest Service Handbook 1909.12 Chapter 20 Section 22.32). These are biodiversity, cultural heritage, dark skies, fire management leadership, and high-quality wilderness recreation opportunities.

- The forest has one of the highest diversity of species in the region, with more than 2,300 species[2] and high rates of endemism. Endemic species occur only within the Gila National Forest, sometimes isolated to a single drainage. It also hosts some of the strongest remaining populations of rare species in the region and, at the time this document was prepared, supports more than a dozen federally listed species and almost 60 species of conservation concern. More than half of these species are riparian or aquatic ecosystem dependent.
- The forest's cultural heritage resources are extensive, reflecting more than 12,000 years of human presence and featuring some of the best-preserved Mogollon and Mimbres sites in existence.
- The forest has one of only 15 certified international dark sky sanctuaries in the world and the first on National Forest System lands.
- As one of the first national forests to use fire as a forest management tool for ecological benefits, the Gila National Forest is nationally known as a place of fire management innovation and leadership. The forest's fire management program consistently leads the region in accomplishments.
- The Gila National Forest is home to the Gila Wilderness, the country's first designated wilderness area and an international destination. Along with the Aldo Leopold and Blue Range Wildernesses, the forest's large, mostly contiguous wilderness areas provide unparalleled opportunities for solitude and primitive or unconfined recreation.

References

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[2] Based on Forest Service data, Vander Lee and others estimate 11 amphibians, 301 birds, 24 fish, 16 insects, 93 mammals, 57 reptiles, 21 snails and 51 plants (https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5300090.pdf). The authors acknowledge this is an underestimate of the forest's biodiversity, and it is. The herbarium at Western New Mexico University (https://gilaflora.com) currently documents more than 1,300 species of trees, shrubs, grasses, forbs, ferns, mosses, liverworts, lichens, and algae, and estimates there are at least another 400 plant species that are not in the collection. Although documentation for insect species is generally lacking, there are certainly more species of insects. Local citizen scientist Ron Parry's website on Southwestern Moths (https://southwesternmoths.com) alone documents more than 500 moth species in and around the forest.

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Photos clockwise from upper left: Young Gambel's quail by Vicktoriea Thomas; *Basidiomycetes* by Elizabeth Sorells; Indian paintbrush on North Star Mesa by Dalue Mize

Chapter 2. Forestwide Plan Content

Introduction

This chapter contains desired conditions, objectives, guidelines, standards, and management approaches that are applicable to ecosystems, watersheds, activities, and uses across the entire forest. It begins with management approaches on themes that thread through the entire plan or apply broadly. These are followed by plan direction and other content for ecological sustainability and biodiversity; community relationships and multiple uses; and social, cultural, and economic sustainability. Despite the plan's structure, it is important to recognize that resources and uses are interdependent and impact each other in complex ways. It is critical that the plan be considered as a whole and not as a compilation of individual resource or program area guidance.

Abbreviations

Sometimes it is necessary to refer to plan components in management approaches. The following abbreviations are used to identify plan components and limit length. The various scales referred to are relevant to plan direction for ecological sustainability and biodiversity. These concepts are introduced and explained later in those sections where they are used. A lower case "s" following any of these abbreviations in the plan's text indicates plural.

DC – desired condition
LS-DC – landscape-scale desired condition
MS-DC – mid-scale desired condition
FS-DC – fine-scale desired condition
WS-DC – watershed-scale desired condition
O – objective
S – standard
G – guideline

Objective Development

The 2012 Planning Rule requires plans to be within the forest's anticipated budgets. While recent legislation has significantly increased the funding available for forest management in the near term, there remains uncertainty about future budgets. This plan addresses these issues with objectives for upland vegetation communities that are intentionally broad and flexible. They include a wide range of acres expected to be treated each decade. The low end of the range represents what forest leadership and staff are confident can be accomplished with congressionally allocated dollars only, under "normal" budget years like those prior to 2020. No acres accomplished with partner dollars are included, to demonstrate the plan is within the fiscal capacity of the national forest. This decision was made under the philosophy that partnerships cannot be taken for granted. Competition for partner dollars is high, and their availability can vary widely based on numerous factors. It is expected that management will treat at least the low end of the range specified in each objective. It is hoped that far more work will be accomplished.

The high end of the range in the vegetation community objectives is intended to serve three purposes. First, it serves as an approximation of the ecological treatment need, as it was

calculated based on the historical average fire rotation interval of each ecological response unit. Secondly, it is intended to raise awareness of how much fire historically occurred on the landscape. Lastly, the high end of the range serves as a cap on how many acres can be treated and is intended to be a reminder that other factors must be considered, like workforce capacity, industry capacity, and social tolerance for smoke. There is no expectation that management will be able to reach the high end of the range, but there is an expectation that before it is exceeded, management would need to review current and desired future conditions.

The upland vegetation objectives also specify a range of acceptable treatment tools but do not specify how many acres may be treated with each tool. These tools include prescribed fire, naturally ignited wildfire, and mechanical treatments. This provides the flexibility to select the tool that best fits the site, circumstances, and resources available. It is expected that all these tools will be used. However, it is expected that more acres will be treated with prescribed and naturally ignited wildfire for two reasons. First, the cost per acre is lower, which will allow more acres to be treated. Secondly, mechanical treatments may mimic some of the ecological outcomes of fire and may facilitate the restoration of fire to the landscape, but they cannot replace an ecological process.

The other objectives in the plan are also flexible. Most establish a minimum target based on what has been accomplished in the decade leading up to plan revision. They also allow for as much to be done as there is funding and capacity to do. It is hoped, and in some cases is it likely, that much more than the minimum will be accomplished.

Gila sunset by Stephanie Snyder

Plan Management Approaches

Change and Uncertainty

Change and uncertainty are not new to land management, or any other aspect of the human experience. While climate has always undergone change over time, there is sizeable body of science that suggests the extent, magnitude, and rate of change now occurring may prove to be unprecedented within the context of the last 2 million years (IPCC 2007). By 2090, the climatic factors most important to the identity of the Gila National Forest's ecosystems and species assemblages are projected to be well outside the range of variability known to support them (McDowell et al. 2015, Triepke 2017). This could mean a profoundly different Gila National Forest than the one we know today (McDowell et al. 2015, Triepke 2017, Parks et al. 2018). The intent of this management approach is to:

1. Increase shared understanding of our vulnerabilities;
2. Identify plan components and other content that address climate-related threats;
3. Increase awareness of how the forest plan fits in with other regional and national agency plans, programs, and initiatives that address climate-related threats; and
4. Provide transparency about the performance risks posed by climate change and the framework established for addressing these risks.

Vulnerability

Vulnerability assessments describe the degree to which a human or natural system is susceptible to and unable to cope with the adverse effects of climate change. Vulnerability assessments have not been completed for all resources or for individual species. The agency's Southwestern Region's Climate Change Vulnerability Assessment predicts the relative likelihood of a climate-driven vegetation type conversion (Triepke 2015). An example of a vegetation type conversion is a forested system becoming a shrubland system. The following map (figure 2) displays the vulnerability assessment's results for the Gila National Forest and adjacent lands under other jurisdictions and ownerships.

The agency's Southwestern Region Aquatic-Riparian Climate Change Vulnerability Assessment was completed and made available for use in 2021 and updated in 2023 (Wahlberg et al. 2023). It is also summarized by watershed, providing a composite vulnerability rating for all streams in each 6th level watershed (see Ecological Sustainability and Biodiversity Background and Description Spatial Scales). Vulnerability assessments for specific streams are not provided. The following map (figure 3) displays the results for the Gila National Forest and adjacent lands under other jurisdictions and ownerships.

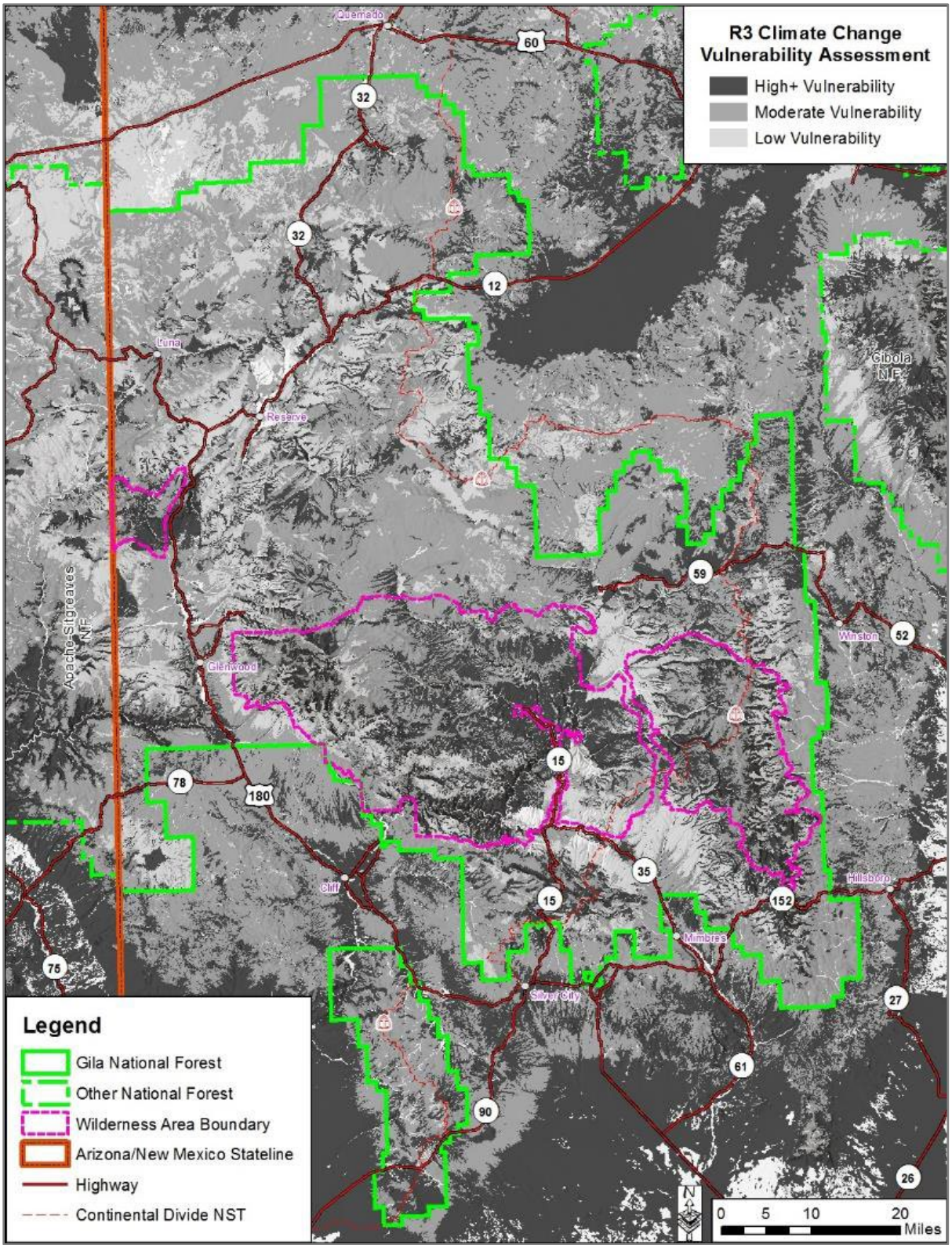

Figure 2. Relative climate change vulnerabilities across the Gila National Forest

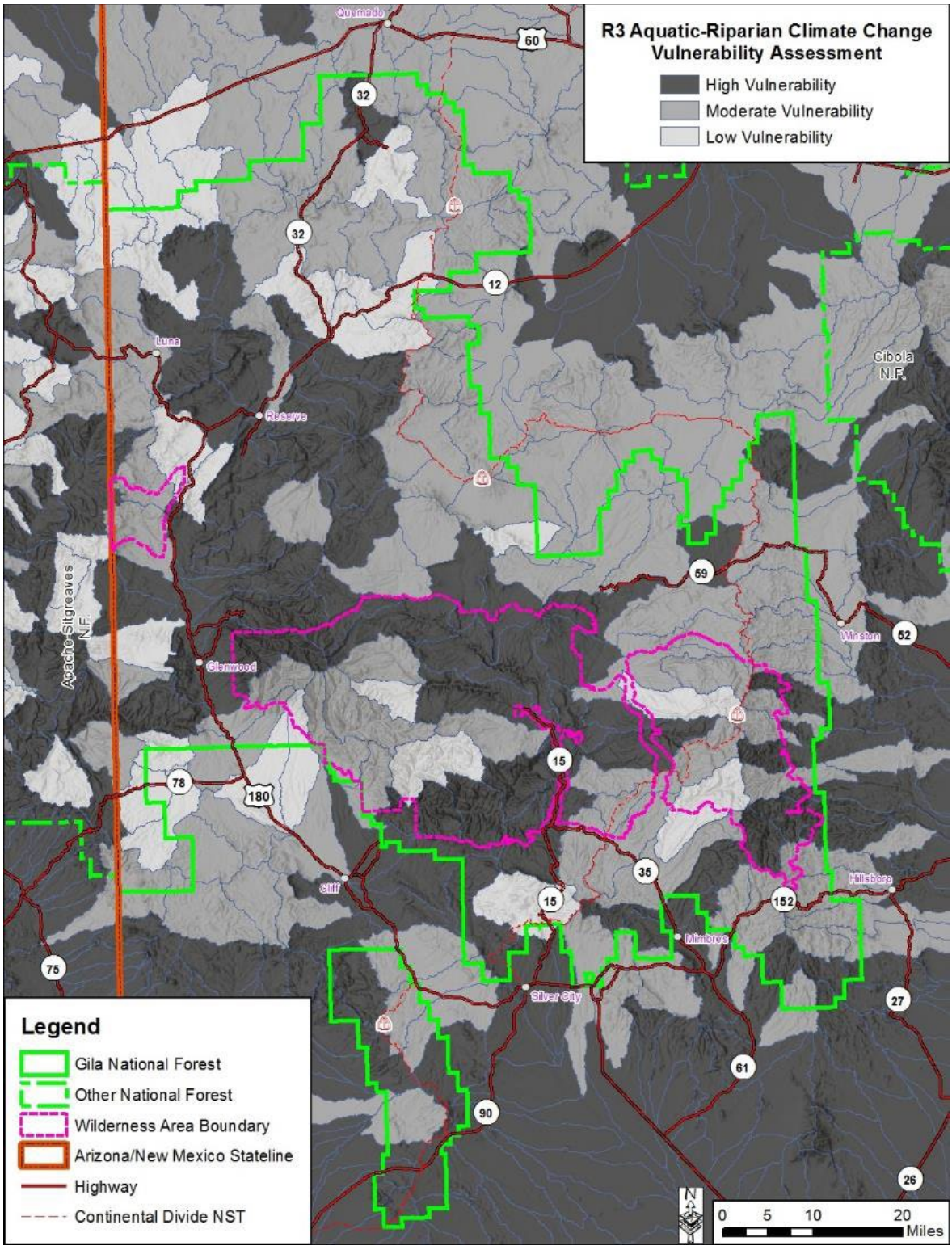

Figure 3. Relative vulnerability of aquatic and riparian ecosystems across the Gila National Forest

The recently published Socioeconomic Vulnerability to Ecological Changes in the Southwest: An All-Lands Assessment evaluated vulnerability at the county level including timber, range, and surface water sectors (Borchers et al. 2021). Of the four counties within which the Gila National Forest is located, Catron County is least likely to see climate-driven ecological changes and has the least socioeconomic adaptive capacity to respond to change. Grant County is more likely to see climate-driven ecological changes and has a similar socioeconomic adaptive capacity except for the area around Hurley, Bayard, and over to the Mimbres Valley. These communities have far less adaptive capacity than the rest of the county. Sierra County is most likely to see ecological changes, with Hidalgo County somewhat less likely. Both counties have substantially higher socioeconomic adaptive capacity than Catron or Grant (Borchers et al. 2021).

The anticipated life of this forest plan spans what many in the scientific community are calling the last window of opportunity to make a difference in terms of the speed and degree of climate-driven changes and prepare for what is now some level of unavoidable change. While there remains uncertainty (Triepke 2017, Triepke 2015, Wahlberg et al. 2023) as to what the future holds for ecosystems, watersheds, species, ecosystem services, multiple uses, and ways of life the forest sustains or contributes to, there is a greater sense of urgency to act. Management decisions made over the life of this plan have the potential to influence the trajectory of the landscape and its component species, including humans. Adaptation strategies and actions rooted in science, environmental justice, and equity, shaped by scenario planning and inclusive decision-making, and supported by strong collaborative relationships, will facilitate the best possible outcomes.

Adaptation

Adaptation is a form of risk management. Adaptation strategies are how management responds to threats posed by climate change. In a risk-based framework, vulnerability informs the choice of strategy. These strategies are described along the Resistance-Resilience-Transition continuum (R-R-T) (see also Chapter 1, Content of a Forest Plan, Foundational Concepts), in the sense described by Chazdon and others (2021) and St. Laurent and others (2021).

The Resistance end of the continuum describes strategies to resist change. At the Resilience level, it describes strategies that enhance the capacity of the natural or human system to return to current or future desired conditions. Resilience strategies may have much in common with Resistance strategies in that they generally aim to limit change, but they also acknowledge that some changes may be inevitable or beneficial. The intent of Resilience strategies is to recover past or current structures, functions (St. Laurent et al. 2021), and opportunities. The Transition end of the continuum describes management that allow projected changes without actively trying to shape them, and management actions that drive or accelerate the shift toward projected conditions. The intent of Transition strategies is to promote establishment of new structures, functions (St. Laurent et al. 2021) and opportunities more aligned with future climate. The plan-level approach to adaptation is described in the following subsections, including specific reference to related plan components and other management approaches.

As a form of risk management, the selection of adaptation strategies and options involve navigating tradeoffs. We will benefit from the awareness that Resistance and Resilience strategies will likely involve less risk initially but accrue risk over time as climate change progresses. Transition strategies will likely involve greater risk initially but reduce risk to critical ecosystem values and services over the long term as compared to Resistance and Resilience strategies.

The Adaptation subsection of this management approach is broken up under subheadings for natural and human systems. This is intended to be a helpful organization of the material for navigation purposes. Natural and human systems are coupled, inextricably connected in a dynamic and two-directional relationship. Understanding this relationship, the patterns and processes that knit nature and humans together, and the feedbacks and synergies that can be created through those interactions is key to navigating the challenges ahead (Liu et al. 2021).

Natural Systems

The plan supports adaptation by incorporating the options listed below along the R-R-T continuum. The options are adapted from publications and online tools developed by the Northern Institute of Applied Climate Science (Swanston et al. 2016). The institute is a science delivery collaborative between the Forest Service, universities, and forest industries. Adaptation options are identified by bolded type, linked to the portions of the continuum they support (Swanston et al. 2016), and then described. The link to the continuum is indicated:

R-R-T = supports the full continuum

R-R-T = supports Resistance-Resilience end of the continuum; may relate to Transition under some circumstances

R = supports Resistance end of the continuum

R-**R** = supports Resilience; may relate to Resistance under some circumstances

R-T = supports Resilience; may relate to Transition under some circumstances

T = supports Transition end of the continuum

In general, Resistance and Resilience strategies are most appropriately applied to areas with low vulnerability to climate change. Transition strategies are appropriately considered at the project level when working in areas of moderate or higher vulnerability. However, there may be values within moderate and higher vulnerabilities that warrant Resistance or Resilience approaches. In these cases, management should anticipate relatively higher levels of complexity and maintenance. The Regional Climate Change Adaptation Strategy (USDA FS 2023a or most recent version) provides additional guidance and a workflow process for climate-informed project development.

1. Sustain fundamental ecosystem and watershed functions (R-R-T)

Soil provides a fundamental ecosystem and watershed function by capturing and slowly releasing precipitation to plants, surface waterbodies and groundwater storage. Precipitation is expected to come in fewer, but more intense storms. Minimizing the extent of bare soil and maintaining or improving soil properties that enhance water capture was always important and is now more so. Likewise, maintaining soil quality and nutrient cycling have been part of sustainable forest and rangeland management for many years, but are even more important now as it increases resistance and resilience to new conditions. The primary plan direction providing for these adaptations are the desired conditions, objectives, standards, and guidelines found in the Soils section; Minerals DCs1, 2 and 4, Ss1-6, and Gs2, 5-11, 14 and 15; Roads DCs4-6, O1, Ss1 and 2, and Gs1, 3, 5 and 6; Sustainable Recreation DCs11, 12 and 14-16, Ss3 and 4, Gs5, 12, 13, 15, and 16; Timber, Forest, and Botanical Products DCs1a and b, Ss3, 4 and 6, and G6; All Upland Ecological Response Units Ss1-5; and Livestock Grazing DC3, O1, Ss1 and 2, and Gs1 and 3-7.

Surface water flow is also expected to shift in response to changes in precipitation timing and intensity, with more days of low or no flow in streams, springs, and seeps and less dependable water available in stock ponds and reservoirs. Maintaining or restoring the connectivity of floodplains, channel form and function, channel complexity, and riparian and wetland vegetation communities helps prepare these systems for the additional stress and may reduce channel instability, erosion, sedimentation, and degradation of aquatic habitat. The primary plan direction providing for these adaptations are the desired conditions, objectives, standards, and guidelines in the soils, watersheds, and riparian and aquatic ecosystem sections; Minerals DCs1 and 4, Ss1-6, and Gs2, 5-11, 14 and 15; Roads DCs4 and 5, O1, Ss1 and 2, and Gs1-3, 5 and 6; Sustainable Recreation DCs11, 12 and 14-16, Ss3 and 4, Gs5, 12, 13, 15, and 16; Timber, Forest, and Botanical Products DCs1a and b, Ss3, 4 and 6, and G6; All Upland Ecological Response Units Ss1-5; and Livestock Grazing DC3, O1, Ss1-3, and Gs1 and 3-7.

Competition for resources between plants is an ecological and evolutionary process that determines which species persist and dominate under a specific set of environmental conditions. Climate change will affect many of these competitive relationships. Climate change is also increasing the length of fire seasons and the number of days of extreme fire weather. As described in chapter 1 of the plan in the assessment summary, tree densities are higher than they were historically in many locations across the forest. This is a climate change issue in terms of competition for resources and for wildfire threat. Reducing tree density has been identified as an adaptation option on the basis that it reduces competition and water stress, supports lower intensity fire, and may increase streamflow. However, there is conflicting science.

While there is broad consensus in the scientific literature that thinning to restore forest and fuel structure is a sound management practice that can mitigate the effects of climate change on fire regimes, insects, and disease, there is conflicting science related to its ability to reduce water stress, especially in the southwestern United States (Gottfried et al. 2008, Bradford and Bell 2016, Kerhoulas et al. 2013, Moreno et al. 2016). With respect to streamflow, relatively small and short-lived increases may occur until vegetation rebounds (Ffolliott and Gottfried 2012, Gottfried et al. 2008). Some evidence suggests that in the Southwest most of the increase is likely to be realized in the winter months and may lead to drier conditions during the summer months as increases in streamflow are offset by decreases in soil moisture. This may increase ecosystem vulnerability to anticipated hydrologic conditions and extremes (Moreno et al. 2016).

In practice, where reducing tree density falls within the R-R-T continuum depends on site-specific circumstances. There will often be tradeoffs between the risk of high-intensity fire with its associated undesirable post-fire effects, and the risk of accelerating drying of a site because of lower tree density. There are science and analytical tools that can help inform where on the landscape treatments are likely to be most effective (for example Krofcheck et al. 2017b, Collins et al. 2013), and more are likely to be developed or refined. The plan supports adaptation by establishing a range of desired conditions for tree density and fire regimes based on the scientific literature supporting the historical or natural range of variation. Related plan content sections titled Ranges of Values are included to describe how treatments can use landscape features and soils information to help create a diversity of conditions within treatment areas. Plan objectives for vegetation treatments provide the flexibility to reduce tree densities using a variety of tools where it is appropriate.

2. Maintain and enhance water quality (R-R-T)

Water quality may also decline because of climate-driven changes. Management focused on sustaining fundamental ecosystem and watershed functions will benefit water quality, but additional management to avoid increased temperature impairments and reduced habitat quality for aquatic species may be needed. Plan content for water quality, soils, watersheds, and riparian and aquatic ecosystems supports this adaptation but does not prescribe specific practices. It provides the flexibility to address temperature impairments based on site-specific circumstances, because what may be an adaptation in one system may be a maladaptation in another. For example, beaver dams may be beneficial along many miles of streams (Jordan and Fairfax 2022), but beaver dams in places where cold groundwater is discharging into the stream may need to be removed to promote lower water temperatures for longer distances downstream (Swanston et al. 2016). This should be a project-level consideration when beaver dam analogs are being sited. When beaver reintroduction to a specific system is identified as appropriate, coordination with the New Mexico Department of Game and Fish will be needed. Collaboration with the New Mexico Environment Department Surface Water Quality Bureau has been and will continue to be instrumental in identifying, designing, and implementing restoration projects that maintain or enhance water quality.

3. Maintain and enhance species and habitat structural diversity over a range of sites and conditions (R-**R)**

A diversity of conditions on the landscape can act as ecological “insurance,” given its links with resilience (Virah-Sawmy et al. 2009, Moritz et al. 2013, Levine et al. 2016), biodiversity conservation (Ackerly et al. 2010, Ashcroft et al. 2009, Keppel et al. 2012), and ecosystem function and service delivery (Frainer et al. 2017). The agency already works to increase species and structural diversity. As an adaptation option, these efforts receive additional focus. Maintaining or restoring vegetation communities that contain a diversity of plant species with an array of life history traits, tree age and size classes, shrub heights, tree and shrub density, canopy cover and number of canopy layers, snags, coarse woody debris, and patch sizes is a Resilience strategy, and may be a Resistance strategy in some circumstances.

All these compositional and structural elements are part of the desired conditions for vegetation communities, which in turn support a diversity of wildlife species. Of particular importance to this adaptation strategy is the retention of healthy large and old trees, snags, and coarse woody debris as described in the desired conditions for vegetation communities. These old-growth structural elements are biological legacies that may play a defining role in species persistence or

the establishment of new populations (Swanston et al. 2016). They may also survive over periods of time when conditions do not support seedling establishment. However, retaining all large or old trees on every site through diameter caps will not align with sustaining old-growth components over time and may prevent desired conditions from being achieved. Diameter caps have been demonstrated to lead to *less* structural diversity (Triepke et al. 2011).

The desired conditions for vegetation communities are supported by subsections titled Ranges of Values that describe variable-density treatments. Desired conditions for vegetation communities are also supported by the management approach titled Restoration of Natural Fire Regimes in the Wildland Fire and Fuels section of the plan. This management approach discusses the importance of irregular fire return intervals to support the development of age class diversity. Standard forestry practices also support these desired conditions. Uneven-aged cutting prescriptions are both ecologically appropriate for most southwestern vegetation types in most cases and serve as an adaptation strategy because it distributes risk across age classes (Borchers et al. 2021, Clark et al. 2016). However, sometimes there is a need for even-aged cutting prescriptions as an intermediate step in achieving the uneven-aged desired conditions such as for insect infestations or disease outbreaks. The plan provides appropriate flexibility to ultimately move toward desired conditions. This is achieved primarily through Timber, Forest, and Botanical Products S1, 5 and 6, and G3-5.

Riparian and aquatic ecosystem biodiversity and habitat structural diversity are provided for by plan components for those ecosystems and the watersheds and soils that support them. Species diversity across upland and riparian and aquatic ecosystems are provided for by All Upland Ecological Response Units LS-DCs 7 and 8, and plan components in the Wildlife, Fish, and Plant section of the plan. More information on how the plan supports maintenance of biodiversity can be found in chapter 3 of the environmental impact statement and appendix G to that document.

4. Reduce the risk and long-term impacts of severe disturbances (R-R-T**)**

Climate change is expected to amplify disturbance regimes, particularly wildfire. Fire and thinning to create a more open forest structure; reduce surface fuels, ladder fuels, and crown closure; and to increase height-to-live crown can reduce the threat of high-intensity, stand-replacement fire. Prescribed fire and naturally ignited wildfire are the primary tools when and where conditions support acceptable fire effects. Strategic placement of mechanical thinning treatments where conditions do not support acceptable fire effects will facilitate long-term movement toward desired conditions. Vegetation treatment objectives provide the flexibility to choose the most appropriate tool or tools for the site and conditions. Projects in proximity to urban interface values will benefit by evaluating the fire threat and incorporating fuel breaks into the project design. This is something fire managers already do, but as an adaptation option, it receives more emphasis. Fuel break design might consider that the most effective location of a fuel break may not be within the urban interface itself and should accommodate extreme fire weather (what is currently considered the 95th percentile). While the plan prioritizes urban interface values in the interface itself with Wildland-Urban Interface S1, project-level analysis would still evaluate the tradeoffs between protecting communities and habitat conditions and connectivity when choosing this adaptation, especially when conditions require fuel breaks be located outside the urban interface.

5. Reduce the impact of biological stressors (R-R-T)

Insects, disease, invasive species, and herbivory may respond to and amplify the effects of climate change. Under a multiple-use sustained-yield mandate, the agency has always worked to maintain the ability of the land to resist these stressors. As an adaptation option, these efforts receive additional emphasis. With respect to insects and disease, site- and pest-specific factors can be incorporated into the thinning treatments designed for the previously discussed adaptation purposes. These considerations would include the tree or shrub density at which species are especially susceptible to the pest or disease agent, and timing of thinning based on the age at which species are especially susceptible to the pest or disease agent. Maintaining or enhancing species and structural diversity across the landscape is also beneficial for this adaptation approach. The plan supports this with Timber, Forest, and Botanical Products S5 and G4 and the flexibility provided for sanitation harvest in S6. Pesticides may be necessary in heavily infested areas, which like all activities implementing the forest plan, would require a project-level public engagement effort, alternatives, and environmental analysis. The effectiveness of this adaptation will benefit from monitoring data and predictive models that anticipate the arrival of pests and disease agents. Such information is already available through national risk maps created by the Forest Service. Getting ahead of insect infestations and disease outbreaks will reduce the potential need for pesticide use.

Similarly, the plan's emphasis on early detection and rapid response for invasive and noxious species will reduce the potential need for the use of pesticides. Climate change is expected to favor non-native species (Morecroft et al. 2012, Rudnick et al. 2012), increasing the need for coordination across jurisdiction and ownership boundaries. The plan supports early detection and rapid response and integrated pest management with content found in the Non-Native Invasive Species section. This includes desired conditions for plant and animal communities dominated by native species (DC1) and awareness of invasive and noxious species issues (DC2), and objectives for inventory and treatment of noxious weeds and non-native aquatic species (O1-4). It also includes 24 standards and 7 guidelines that require decontamination procedures and other measures to prevent the introduction and establishment of invasive species, support selection of the appropriate treatment, and provide the initial constraints for the use of chemical treatments. Additional constraints may be necessary when the site conditions, pest, treatment options, and non-target species concerns are known.

Climate change also has the potential to impact both the forage and browse resources and the wildlife populations and permitted livestock that depend on it. Adaptations for livestock grazing are discussed under the Human Systems heading later in this management approach. Different wildlife species are likely to respond to climate-driven changes differently. Some populations may increase, others may decrease. Adaptation approaches that address both plant and animal species will be needed. In some cases, it may be necessary to use physical barriers to prevent animals from feeding in certain areas. Aspen stands may be one example. Alternately, vegetation management practices that promote abundant regeneration of multiple browse species may be appropriate on some sites. In all cases, the relationship and collaborative efforts with the New Mexico Department of Game and Fish will be paramount to determining sustainable populations of game animals such as elk and deer. The desired conditions and restoration objectives for vegetation communities and the desired conditions and objectives in the Wildlife, Fish, and Plants section of the plan provides the flexibility to choose the appropriate adaptation action that addresses the site- and species-specific concerns.

6. Promote upland and aquatic habitat connectivity (R-T)

Habitat connectivity is the degree to which the landscape supports or impedes the movement of species. Enhancing habitat connectivity is one of the most advocated strategies to assist species survival based on the assumption that it will allow species to adapt their ranges. Some scientists and practitioners are beginning to raise questions about whether this is a viable adaptation option (for example, Rudnick et al. 2012). Connectivity designs based on current habitat patterns are likely to fall short for many species and even the most well-designed connectivity plan may fail for those species whose dispersal rates do not keep pace with the rate of climate change. Connectivity can also facilitate vegetation type conversions and the expansion of non-native, invasive, noxious, or less desirable native species (Iwaniec et al. 2021, Morecroft et al. 2012, Rudnick et al. 2012).

Many important ecological processes cannot occur without connectivity, including pollination, gene flow, predator-prey relationships, and nutrient flow (Tenggardjaja 2021). Changes in temperature and precipitation are likely to disrupt connectivity by altering such things as when and where food and suitable breeding areas are available (Millmann 2021). Climate-altered disturbance regimes can favor non-native species and create barriers to movement for some species (Jones-Farrand 2021). The connectivity of riparian and aquatic habitats and the security of dependent species are likely to be disproportionately impacted due to changes in precipitation patterns and higher temperatures.

The forest is already recognized as part of a secured, resilient, and connected network of lands across the region (Anderson et al. 2016) for many native species, with no distinct area of concentrated movement that would indicate a clear movement corridor (Anderson et al. 2016). Rather, the entire forest has connectivity value (Belote et al. 2016 and Theobald et al. 2020; data from which can be viewed on the Forest Service Climate Risk Viewer webpage https://storymaps.arcgis.com/collections/87744e6b06c74e82916b9b11da218d28). The greatest immediate challenges to local connectedness are fences and the paved, two-lane highways, all of which have relatively low traffic volume. U.S. Highways around Silver City have the highest traffic volume. The state's Wildlife Corridor Action Plan identifies the Silver City area as the second largest hotspot for wildlife-vehicle collisions (Cramer et al. 2022). This is discussed in the management approach titled Wildlife Corridor Action Plan in the Wildlife, Fish, and Plants section and the Roads and Relationships management approach in the Roads section of the forest plan. Wildlife, Fish, and Plants G5 and Livestock Grazing S2 require fences and range infrastructure to include wildlife-friendly design features for escape, access, and connectivity.

The greatest challenge for connectivity as climate change progresses is to maintain or enhance what we have. The adaptation options previously discussed, and the plan direction that enables or supports those adaptations, will contribute to the maintenance and enhancement of connectivity. Further, standards and guidelines for infrastructure systems that facilitate species movements or minimize impediments to movement will benefit connectivity. The primary plan components providing for these adaptations are Riparian and Aquatic Ecosystems S4 and 5, G1 and 2; Wildlife, Fish, and Plants DCs 5, 6 and 7, S1 and G4 and 5; Roads G2-4; Facilities G2 and 3; Sustainable Recreation G7; and Livestock Grazing S3 and 4, and G1.

The other adaptation strategy for preserving or enhancing connectivity is reliant on working with other landowners and jurisdictions. As defined by The Nature Conservancy, National Forest System lands and any other officially recognized designations within National Forest System lands are considered secured and contribute to the resilient connected network (Anderson et al. 2016). Therefore, initiatives to protect land as a climate adaptation are appropriately focused on unsecured lands. There are only two ways for forest management to engage in these adaptation efforts. The first is through prioritizing land adjustments, if opportunities present themselves, as described in a management approach of that name in the Lands section of the plan. The second is to support conservation agreements or short-term habitat restoration agreements that are initiated by landowners. The plan supports this work most directly with DC7 in the Wildlife, Fish, and Plants section.

7. Promote the creation and maintenance of refugia (R)

Refugia are places where a population of organisms can survive through a period of unfavorable environmental conditions. Many climate studies use coarse, idealized climate data to predict how species may respond to increasing temperatures. These predictions may over or underestimate species vulnerability because they don't consider topographic exposure or regional weather patterns (Ashcroft et al. 2009). These two factors may be the basis for a better, local understanding of climatic threats to species' persistence given sufficient understanding of each species' requirements. The Climate Change Vulnerability Assessment provides a first approximation of where refugia are likely to be located, that is, areas of low vulnerability. However, it may miss smaller areas that could serve as critical refugia for some species. Recent studies out of the Pacific Northwest suggest riparian corridors with "large temperature gradients, high canopy cover, large relative width, low exposure to solar radiation, and low levels of human modification" are more likely to serve refugial function (Krosby et al. 2018).

Given that the Gila National Forest is a frequent-fire landscape, mapping of climatic refugia must consider somewhat conflicting science on the related concept of fire refugia. Fire refugia are places that are "minimally-impacted by fire and provide critical habitats for fire-sensitive species and seed sources for post-fire regeneration." Although this topic is little studied, those studies that have been conducted demonstrate that areas that have filled this role previously may be more likely to experience stand-replacement fire in subsequent wildfires (Rodman et al. 2023, Kolden et al. 2017, Krawchuk et al. 2016). This suggests that mechanical treatments may be necessary to maintain some refugial areas. This could make potential refugia that exist in areas that prohibit the use of mechanized equipment, such as designated wilderness, more vulnerable than where there are not prohibitions on treatment methods. This is also consistent with the idea that refugia are transient on the landscape and are more of a "slow lane" (Morelli et al. 2020), rather than a "lock box" for today's biodiversity as some might hope. This does not make refugia less important, it just increases complexity.

The plan supports the creation and maintenance of refugia through this management approach; the desired conditions for vegetation communities and wildlife, fish, and plant species; and in future fine-scale refugia mapping. However, responses to climate change will be species-specific. Refugial areas may not accommodate the full suite of species present in the ecosystem that currently occurs on site and may accommodate native species that are not currently present on the site.

At-risk species and rare or endemic species that are not considered officially at-risk will likely require the most management intervention. The plan provides for at-risk species as described in appendix G to the final environmental impact statement and through the implementation of approved recovery plans for federally listed species (Wildlife, Fish, and Plants S4). However, the lack of specific, evidence-based information about the requirements of many rare and endemic species is an immediate challenge. The plan recognizes that rising to this challenge will require forest leadership and staff to coordinate and collaborate with the New Mexico Forestry Division's Rare Plant Program, New Mexico Rare Plant Technical Counsil, New Mexico Native Plant Society and Gila Native Plant Society, universities, and other stakeholders in the Wildlife, Fish, and Plants management approach titled Restoration, Adaptation, and Relationships.

8. Facilitate community adjustments through species transitions (T)

Forest leadership and staff recognize that Transition strategies, especially this option and option 9, will likely be the most challenging, most collaborative adaptation work of all. They will require public support, multi-jurisdictional coordination, and many partners and volunteers. It may even require international coordination, as Michalak and others indicate (2018). The refugia concept also has its place as a Transition option. They can serve as "stepping stones" or destinations for assisted or unassisted migration or assisted translocation of populations and species (Morelli et al. 2020) if they are proactively identified or established. However, recent work by Parks and others suggests the current protected area network, which includes all lands managed on multiple use-sustained yield principles, is unlikely to be successful without human intervention (2023). Unassisted migration refers to species or populations moving to other locations on their own. Assisted migration or translocation refers to that movement being directed and accelerated by management. Range expansion is another term that is being used for species transitions.

The plan also supports this Transition option through the desired conditions for vegetation. These desired conditions provide the framework and the flexibility to favor or restore native species that are expected to be best adapted to future climate on specific sites. For example, tree cutting prescriptions and planting can favor the more drought-tolerant species on appropriate sites. Favoring species and genetics with wider moisture and temperature tolerances is another approach. Planting a variety of native species in the understory can increase species richness, encourage new mixes of native species, and provide more options for future management (Swanston et al. 2016).

There are science-based decision support frameworks already available to help navigate Transition adaptation options and more will likely emerge over time (in the sense of Brodie and others 2021). For example, the Rocky Mountain Research Station recently released the Climate-Smart Restoration Tool, which helps managers match seeds with current and projected environmental conditions (https://www.fs.usda.gov/rmrs/tools/climate-smart-restoration-tool). The Superior National Forest was the first national forest to develop an assisted migration plan, which was released in 2023 (USDA FS 2023b). Their plan and implementation guide (USDA FS 2023c) may serve as a model for the rest of the nation.

Initial guidelines for reintroductions and conservation translocations are also available for consideration (ICUN 2013). These guidelines anticipate a need for translocation as a conservation intervention but emphasize the need to consider every alternative and understand the risks and uncertainties before choosing this option.

9. Realign following severe disturbance (T)

Planting trees in areas deforested by severe disturbances, such as stand-replacement fire, is another forestry practice that can be an adaptation and mitigation strategy. However, it is unlikely to be successful on all sites. Therefore Timber, Forest, and Botanical Products G7 directs staff to consider the reforestation potential of the site before investing resources in planting trees. Reforestation potential is a soil survey interpretation of site data. Where reforestation potential is lower, resources may be better invested in reducing the risk and long-term impacts of severe disturbances. Agency climate-smart reforestation guidelines will also be a useful tool for selecting and prioritizing the best adaptation approach in these situations, which may include assisted migration or range expansion. The Earth Systems Lab at the University of New Mexico is actively working on research to support reforestation programs and activities, including study sites within the Gila National Forest. Future publications coming out of the Earth Systems Lab may be particularly useful when considered along with the reforestation potential interpretation.

Human Systems

Recreation

People often come to the Gila National Forest to escape the summer heat and find water-based recreation. Rising temperatures could contribute to already increasing visitation rates. More extreme precipitation events could affect recreation facilities and other infrastructure located near water features, especially streams and rivers prone to flooding. When watersheds experience large areas of stand-replacement fire and moderate or high soil burn severity, the effects of these extreme events are further amplified. Adaptations that build resilience in the recreation program, the infrastructure that supports it, and the socioeconomic contributions it provides to local economies include:

1. Manage recreation opportunities to address the impacts of expected conditions

Recreation facilities in stream corridors will likely experience more extreme flooding events at one point in the season, and low or no flow other points in the season. This will impact water-based recreation opportunities, visitor experiences, and human life and safety. The plan prohibits construction of new campgrounds in flood-prone areas and requires more than one way to get in and out of the campground in case of emergency (Sustainable Recreation S2). Existing developed campgrounds that are in flood-prone areas and those that have been identified as difficult to evacuate in case of emergencies are likely to be prioritized replacement in a safer location (Developed Recreation and Relationships management approach in Sustainable Recreation section) and decommissioned. The plan also requires new developed trailheads and other recreation facilities to be located away from flood-prone areas (Sustainable Recreation G7).

Temporary area closures that facilitate public safety during fire incidents or other management activities that ultimately reduce fire intensity may negatively impact recreation opportunities and experiences in the short term. But these adaptation actions will benefit recreation over the long term by reducing the area susceptible to high-intensity wildfire and those post-fire effects that impact recreation opportunities and experiences over much longer timeframes.

2. Account for and communicate risks to human well-being

Outdoor recreation provides many health and cultural benefits that are threatened by climate change. Human health and safety hazards such as wildfire, flooding, hazard trees, heat-induced

illnesses like dehydration and heat stroke, and others are predicted to increase. While the adaptation actions for natural systems and those actions aimed at mitigating climate change specifically target the hazards themselves, the intent of this strategy is to reduce human exposure to climate-exacerbated hazards. Providing public information and participating in collaborative education and outreach efforts is something the agency already does, but as a response to climate change, this work takes on additional importance. The plan provides this emphasis with the Public Information, Outreach and Education management approach in the Sustainable Recreation section.

Transportation and Facilities Infrastructure

The plan supports adaptation strategies for the forest's transportation network. Considering the watershed summary of the Climate Change Vulnerability Assessment could inform the selection of priority watersheds through the Watershed Condition Framework (Potyondy et al. 2011). Through the creation of watershed restoration action plans that are developed for priority watersheds, essential projects are identified. Those essential projects may be informed by a risk assessment of the transportation system as it relates to climate-exacerbated threats such as flooding and wildfire. They can include adaptation options such as those described in appendix C to the U.S. Forest Service Transportation Resiliency Guidebook (Rasmussen et al. 2018). Options would be selected through the project-specific stakeholder engagement and environmental analysis process as required by the plan (Community Relationships G1) and the National Environmental Policy Act. The plan further supports the network's adaptation to predicted future conditions with Roads DC6 and O1, S2, and Gs1 and 3-6. However, it is unlikely that the resources to address all vulnerabilities proactively will be available. Staff and stakeholders should anticipate needs to respond to impacts. Facilities would benefit from a similar approach to maintain and achieve desired conditions.

Wildland-Urban Interface

Vegetation management in the urban interface, on both sides of the forest boundary has always been important, but never more so than now. Wildland Fire and Fuels Management DC4 and Wildland-Urban Interface DC6 demonstrate the plan's commitment to creating shared understanding related to the issues of wildland fire, its intersection with human systems, and how climate change is amplifying the risk to urban interface values, including health and safety. The plan addresses these amplified risks with the whole of plan content in the Wildland Fire and Fuels Management and Wildland-Urban Interface sections.

Water Uses

In the already water-limited Southwest, climate-driven reductions in water availability and water quality are not only a major threat to natural systems but are also pressing socioeconomic and political issues. Maintaining fundamental ecosystem and watershed functions, as previously discussed, will help maintain the most favorable conditions of flow possible, even as flows inevitably decrease. Water rights and uses within the forest sustain beneficial uses defined by the state of New Mexico and enable the agency to fulfill its multiple-use sustained-yield mission and contribute to local economies. The plan's Conservation and Relationships management approach in the Water Uses section discusses supporting the state's water plan and conservation goals, and the importance of seizing opportunities to partner on conservation plans. Plan objectives for livestock grazing (O1) and Wildlife, Fish, and Plants (O1) may include water projects to support sustainability. Nevertheless, forest staff, permittees, and visitors should expect more frequent, longer-duration water shortages that impact operations and the amenities and experiences the

forest can provide. More specific discussion of how the plan supports an adaptive response to drought for livestock grazing can be found in management approaches in that section.

Wood Product Industries

Over the life of this plan, the contributions the forest can make to local economies through the wood product industries will grow if industry can capitalize on small-diameter wood and woody biomass for bioenergy production, biochar for agricultural use and mine reclamation, and other innovations that may emerge. The plan aims to supply a diversity of wood products to a sustainably scaled industry (Timber, Forest, and Botanical Products DC2). Given what is unknown or uncertain about how climate change will progress, how quickly we can implement the adaptation strategies for natural systems, and how effective those strategies ultimately prove to be, forest staff and industry should anticipate that sustainability could be a moving target over the life of the plan and beyond.

Mitigation

In a climate change context, mitigation refers to approaches that reduce or stabilize the levels of greenhouse gases to slow the rate and degree of climate change. The plan supports mitigation through ecosystem carbon management and alignment with the agency's ongoing Sustainable Business Operations initiative.

Carbon Management

Ecosystems are naturally both a source and a sink for greenhouse gases, particularly carbon-based greenhouse gases. Although the body of science surrounding ecosystem carbon management is relatively limited compared to other forest management topics, it is actively expanding. At present, the science suggests that at least in ponderosa pine systems or similar dry forest types, restoration treatments that include both thinning and prescribed fire are the best way to maintain the forest as a net carbon sink under future climatic conditions (Hurteau 2017, Hurteau et al. 2016, Liang et al. 2018, Krofcheck et al. 2017a). Thinning alone has not been demonstrated as effective in terms of mitigating or stabilizing carbon-based greenhouse gas emissions (Liang et al. 2018). In moister forest types where the fire disturbance regime and carbon dynamics are different, the same treatment may lead to long-term declines in carbon storage capacity (Liang et al. 2018), necessitating project-level consideration of tradeoffs.

While mechanical harvest may not stabilize emissions without fire, there are carbon benefits to harvest that fire does not provide. Carbon is only released into the atmosphere by combustion or decomposition. Fire immediately releases carbon into the atmosphere, even as it stabilizes emissions at longer timescales. Harvest does not immediately release carbon into the atmosphere, it just relocates it off-site. When converted to lumber, this carbon can remain sequestered as buildings, furniture, and other useful items for many decades. Other wood products may have shorter lifespans, but still defer emissions. The plan supports maintaining the forest as a net carbon sink through the restoration objectives for vegetation communities. It provides the flexibility to choose the most appropriate tool or tools for that work based on site-specific circumstances.

Sustainable Operations

The agency is committed to efficiently using energy and reducing consumption of resources in daily operations. This work was accelerated after the 2005 Energy Policy Act and a series of Executive orders triggered the creation of the Sustainable Operations program. As of 2022, the

Southwestern Regional Office is working on a 2030 NetZero Sustainable Operations Strategy to help implement the target of having a neutral ecological footprint by 2030. The Gila National Forest has and will continue to make progress toward improving energy efficiency and shifting to renewable energy; reducing water consumption in Forest Service buildings, grounds, and related facilities; increasing sustainability performance of purchased goods and services; improving transportation and travel practices; and minimizing waste generation and reducing landfill use. For example, over the last few years, forest staff have proposed, secured funding for, and installed xeriscaping, light-emitting diode (LED) and motion-activated lighting replacements, low-flow toilets, and insulation. Forest staff have also established a battery recycling program and are repurposing paper that has been printed on one side and is still good on the other by making notebooks and scratch pads instead of purchasing these items. Gila National Forest staff will continue to work toward having a neutral ecological footprint by 2030 while maintaining compliance with subsequent acts of Congress and Executive orders.

Monitoring

As with any adaptive management framework, monitoring is critical to success. It is perhaps even more critical with climate change adaptation because the mid- and long-term outcomes of management actions may be unpredictable. While the science predicting how climatic conditions will shift across the globe is substantial, what is known about how species will respond is small in comparison. The 2012 Planning Rule requires that the plan's monitoring program include at least one question and indicator to determine whether there are measurable changes on the plan area resulting from climate change and other stressors. This question may relate to other monitoring questions and indicators required by the planning rule, or to interacting stressors that could be amplifying each other. For example, trees subjected to extended drought stress are less resilient to insect infestations, leading to larger, more severe infestations and resulting in more extensive tree mortality. The plan's monitoring program exceeds the planning rule requirements including many questions and indicators that, when evaluated alone, or in concert with one another, can provide robust information about how climate change is progressing and how well the plan's adaptation strategies are working.

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Ecosystem Services

As described in chapter 1 under the Foundational Concepts heading, ecosystem services are the benefits nature provides to people. We recognize that everyone who cares about the Gila National Forest has their own unique experience with the forest and places different levels of importance on each of the ecosystem services the forest provides. From our community conversations over the course of plan revision, every ecosystem service the forest can provide was identified by someone as key to their relationship with the forest. It is human nature to want more of the things that are most important to us, and less of the things that matter less to us as individuals. While the forest produces many ecosystem services simultaneously, it is generally not possible for management to maximize all of them at the same time. The resulting tradeoffs can be a source of conflict and a barrier to achieving the vision and desired conditions for community relationships. Progress will depend on the willingness of all parties to come to the table focused on finding solutions.

Social science research suggests that without an explicit recognition and understanding of the differences between an individual's valuation of ecosystem services, efforts to find those "win-win" solutions can be more challenging (King et al. 2015). That recognition and understanding is then, the first step toward a solution. While everyone's values are unique, a scientific analysis of input gathered from our community conversations provides a foundation from which we can continue to learn about the values that define us, those that differentiate us from each other, and those we share (Armatás et al. 2017). One of the observable patterns in the data is that those who place high value on provisioning ecosystem services like wood products and livestock grazing, tend to place low value on supporting and regulating services like biodiversity and carbon absorption. They often identify land use restrictions and woody encroachment into grasslands as threats to their highly valued services. Likewise, those who place high value on supporting and regulating services tend to place low value on provisioning services, are not concerned about land use restrictions, and see streamflow alterations and diversions, unmanaged grazing, and declining Forest Service budgets as threats to their highly valued services (Armatás et al. 2017). Others assigned high value to motorized recreation, driving for pleasure, and solitude, quiet, and a clear night sky. They identified the amount, condition, and access to roads and trails as a threat to their highly valued services. Still others were focused on water quantity and livestock grazing, rating services provided by wilderness and motorized recreation lowest. This group was more likely to view extended drought, woody encroachment into grasslands, land use restrictions, and streamflow alterations and diversions as threats to their highly valued services.

Regardless of what each of us wants or does not want, there is a limit to the production of any single ecosystem service based on environmental factors that are beyond our ability to adjust. For example, management can make legal, efficient use of water, but cannot make it rain. Management researchers recommend defining and separating this maximum production level from our valuation of ecosystem services as the second step to identifying the optimal solution (King et al. 2015). This type of approach is not dissimilar to the way Gila National Forest leadership and staff have approached public engagement in the past. Future project-level planning efforts may benefit from an ecosystem services orientation and a public engagement process that incorporates explicit, social science-based methods for alternative development such as the one presented by Cavendar-Bares and others (King et al. 2015).

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Relationships

Relationships are a major theme within this plan and will be a determining factor in its successful implementation. More than 30 management approaches throughout the plan describe opportunities to forge, build, and maintain good working relationships with federal, state, and tribal governments, local governments, non-governmental organizations, volunteers, and others who care about the forest. This management approach is intended to set the tone for the plan's relationship focus and describe some best practices for successful partnerships that could be applied to all the opportunities identified in plan management approaches and opportunities that have not yet emerged. These best practices are adapted from Brian O'Neill, a mentor and role model for leaders of federal agencies regarding partnerships and civic engagement (USDI NPS 2013).

1. Be proactive. Determine that partnership is the best way to accomplish a body of work and then seek out those partners that might best be able to help. If the partner does not exist, look for opportunities to create it.
2. Make the partnerships win-win. Each partner may not benefit equally, but each must realize a value-added benefit.
3. Adopt a shared vision. The vision should evolve from the full engagement of all partners. Successful partnerships demonstrate a culture of full engagement from the beginning that leads to collective enthusiasm and achieving results.
4. Good intentions and a handshake are not enough. Negotiate a formal written agreement. In a busy world, clearly written intent, roles, processes, schedules, and accountability procedures guide performance and follow through. Update or amend to keep it current.
5. Ensure good communication. Success depends on the structure, frequency, and quality of communication between partners. Even the best partnerships do not carry their own momentum for long without a structure for touching base to stay on task and on schedule. The primary executive of each partner entity must demonstrate leadership and stay involved to the extent that executive level interest is reenforced, and policy direction provided on a sustained basis.
6. Ensure the partnership is owned by the whole organization. Full success depends on buy-in. If the partnership is not understood or accepted by all leadership and staff, it will be difficult to sustain over time. Build a sense of team and partnership culture so that everyone understands the importance and value added by working collaboratively.

7. Maintain an environment of trust. Trust is an essential ingredient. It must be demonstrated and earned day by day. A single betrayal can be costly and make it hard to regain the same level of trust. Trust-eroding behaviors include independent action by one partner that has not been shared with the others; grandstanding at the expense of another partner; not honoring one's word, commitment, or confidentiality; publicly speaking ill of a partner; creating suspicion in terms of one's motives; or acting in any way contrary to the best interests of the overall partnership. You must trust to be trusted.
8. Leave ego and control at the door. Partnerships are about shared power, shared vision, and shared responsibility. That said, it does not mean giving up control, influence, or autonomy. It is a delicate balance between maintaining one's own identity and adding value to a collective effort.
9. Understand each partner's mission and organizational culture. Every organization has its own culture that is built over time, based on its mission, practices, people, governing values, traditions, and institutional history. The most successful partnerships recognize and value their differences and find ways to integrate them into a workable overarching partnership culture.
10. Each entity brings special capabilities, unique authorities, and different flexibilities that can further the work of the partnership. Use them.
11. Find ways through the red tape. The more entities in a relationship the more likely legal, policy, attitudinal, and cultural challenges will be part of doing business. Acknowledge and address these realities up front and take satisfaction in resolving them. Be creative. Be persistent. Convert stumbling blocks to steppingstones.
12. Value due process and earned, versus instant, gratification. Good partnerships take a steady investment of time and energy to build and develop. Everyone wants early successes but it's important to be willing to forgo premature success to achieve larger, more important long-term gains. Remember "Go slow to go fast" or "If you want to go fast, go alone. If you want to go far, go together."
13. Strive for excellence. Partnerships gain stature and reputation based on the quality of the work accomplished. Build an early reputation for excellence and sustain that reputation. This will be an important factor in how others view your partnership and what doors will be opened to you. People and potential funders want to associate with important work and a reputation for excellence.
14. Diversify your funding sources. Success depends on the human and financial resources the partnership can garner. There are many examples where partnerships were jeopardized because they were too dependent on one or too few sources of financial support. Develop and periodically update a comprehensive business plan that addresses both near- and longer-term public and private funding sources, and earned as well as contributed funds that will give the partnership staying power and adaptability.
15. Constantly seek out and adopt best practices. The best practitioners are those who are a sponge for new ideas and always on the lookout for innovation and creativity that can be adapted to their partnership. Overcoming resistance to change is one of the major challenges to partnership success. Establish a work environment in which reasoned risk taking and creativity are encouraged and rewarded. Leaders should act with the courage to support experimentation and risk taking and run interference when necessary. Be resourceful. Work

together to identify and engage the abundant human talent residing in most communities to participate in and assist the partnership.

16. Always be courteous and diplomatic. It builds trust. There is no room for disrespectful behavior. A useful partnering technique is for partners to define all behaviors that are crucial to sustaining good relationships and then ensure that accountability measures are in place to reenforce their ongoing practice.
17. Honor your commitments. It builds trust. When work does not get accomplished, it suggests that the work was not important to the individual or organization. Follow up and follow through.
18. Celebrate success. It is a mistake not to take time to formally and frequently celebrate successes. Look for every opportunity. It helps motivate and spur people to new challenges. Many people pitch in on partnerships because they believe in the cause and because it is enjoyable. Celebrating success milestones helps keep everybody's "fun-quotient" high, builds a sense of accomplishment, and adds momentum.
19. Respect the right to disagree, act on a consensus basis. There are times and circumstances where honest differences will surface, reluctance to act is deeply held, or where compelling reasons are presented on why an action cannot be supported. Respect this with adequate dialogue and understand the basis of the concerns. Homework well done should eliminate most of these differences before they become contentious. There is too much good where commonality of support can be achieved for these situations to erode the core working relationship.
20. Network and build relationships. This is the core competency in partnership work. People sell ideas to others. People lend support because people ask them to. Partnerships are about people working together and reaching out to others to gain emotional engagement.
21. Put things in place to reenforce the partnership—a clear vision, dedicated and skilled people, a rewards and recognition program, incentives that stimulate desired partnership activity, sustained management support and involvement, operational funds, and a clear understanding and shared ownership of the partnership arrangements. The seriousness with which they are addressed will determine the degree of success that can be achieved.

Reference

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Vegetation Management Tools

Vegetation management tools help maintain, move toward, and achieve desired conditions. These tools may include manual, mechanical, prescribed fire, wildfire, biological and chemical treatments. Manual methods include using hand-held equipment like axes, chainsaws, or shovels. Mechanical methods include heavy equipment such as masticators, backhoes, skidders, bulldozers, et cetera. Prescribed fire and naturally ignited wildfire are restoration tools when they occur under specific weather and fuel conditions. Biological methods include the use of insects or other organisms that target non-native vegetation species and are usually themselves non-native. However, biological methods could also include restoring keystone species, such as beaver, to systems where they were present historically. Chemical methods include the use of pesticides, which is a general term that is inclusive of herbicides, piscicides, insecticides, rodenticides, and fungicides.

Forest leadership, staff, and stakeholders recognize that there are tradeoffs associated with each tool or combination of tools, under the circumstances specific to a particular project. Although there will not always be consensus or agreement on their use, having diverse and inclusive public engagement opportunities beginning early in the project planning and development process (Community Relationships G1) will be the foundation of any "win-win" scenario. Public engagement is discussed in greater detail in management approaches under the Community and Tribal Relationships heading later in this chapter.

Appropriate use of herbicide can contribute to sustainability in four ways. (1) It can extend the life of treatments in the wildland-urban interface. (2) It can reduce the response of re-sprouting native species that tend to increase in density after thinning treatments, thereby preserving native species composition, vegetation structure, and in some cases, fire regimes. By doing so, (3) it can reduce the cumulative effects of maintenance treatments to soil and watershed conditions. However, chemical restoration tools are often controversial and there is both strong support for and opposition to their application. (4) It is also a critical tool, and in some cases the only effective tool, to manage non-native noxious weeds.

Herbicide use on saltcedar in riparian corridors is an example of an instance where there has been broad support for pesticide use. However, there are other sites and circumstances where pesticides, especially herbicide, will likely be needed in the future. Each pesticide's label laws,[3] the Clean Water Act, and this plan provide the initial sideboards for that use in the Non-Native Invasive Species section of the plan and S5 under the All Ecological Response Units heading. Additional or more restrictive sideboards for some application scenarios may be identified, as appropriate, during future public engagement processes and in consultation with the U.S. Fish and Wildlife Service. Piscicides, which are chemicals that kill fish, are only used to remove non-native fish prior to restoring native species. While there is no immediate need for insecticides, fungicides, or rodenticides and no plan direction guiding their use, it is possible that a need to use them could arise in the future. For example, rodenticide may be needed in areas where seedlings or saplings are planted for reforestation. In this case, all sideboards beyond those established by law would have to be developed as part of a proposal to use them, which would mostly likely require a public engagement process and could require consultation with the U.S. Fish and Wildlife Service.

[3] Every pesticide, including herbicides, have product labels that are legally enforceable. All include a statement: "It is a violation of federal law to use this product in a manner inconsistent with its labeling." In other words, the label is the law.

Biological tools have a high potential to produce unintended or undesirable consequences. Depending on the biological agent (grazing animal, insect, microorganism, et cetera), there are varying degrees of risk and likelihood of impacting non-target plant and animal species; therefore, biological methods would be a last resort.

Forest leadership and staff remain open to new technology and new ways of using existing tools, given that they are based on relevant peer-reviewed science. In the absence of such science, experimental applications on small acreages may be pursued if they are consistent with foundational scientific understanding such as physics, plant function, and animal behavior. Testing these methods should include standard scientific study design features such as controls and provide for statistical analysis of outcomes.

Military Training Flights

Plan revision coincided with an Air Force proposal to conduct training flights over the forest and its surrounding communities. Many community members submitted comments on the forest plan requesting that more be done to prevent this proposal from going forward, and potential future proposals like it, because of air and water quality, wildlife, wilderness, and wildfire related concerns. While the Forest Service has no jurisdiction over airspace, Gila National Forest leadership and staff can continue to collaborate with the Federal Aviation Administration, airport administrations, military and government agencies, and other manned and unmanned aircraft operators to minimize disturbances caused by aircraft as situations emerge.

Ecological Sustainability and Biodiversity

Background and Description

This subsection provides the necessary background to provide a frame of reference for understanding ecological plan content, including ecological classification systems, and the spatial scales to which plan content is structured.

Ecological Classification

The plan components developed for upland vegetation communities are based on ecological response units. The ecological response unit framework is a landscape mapping system and a tool for organizing planning, analysis, monitoring, and research of some ecological features. Ecological response units account for the current ecological understanding of southwestern systems in the underlying classification concepts and map data, both of which represent the best available science. They are periodically updated with new mapping and references on vegetation, disturbance, and other characteristics. Interdisciplinary field verification of the ecological response unit map is recommended during project development and implementation, both to provide project level accuracy and to inform future updates to the ecological response unit map.

Desired conditions are not tied to one version of an ecosystem map. To develop climate-informed project proposals and alternatives, this field verification would include consideration of ecological and socioeconomic vulnerability. The Regional Climate Adaptation Strategy (USDA FS 2023 or most recent version) provides strategic, landscape-level guidance and a stepwise workbook process to help project teams select adaptation options, desired conditions, and tactics. Tactical, site level, guidance to help assess stress, adaptive capacity and tactics will also be available (USDA FS 2023).

Spatial representation of ecological response units (the ecological response unit map)[4] is derived from a combination of Terrestrial Ecological Unit Inventory map unit delineations (terrestrial ecological units) and data derived from satellite imagery. A terrestrial ecological unit is composed of one or more subunits, referred to as components, with each being described by its dominant climatic regime, geology, soil type, potential natural vegetation, elevational range, topographic characteristics, and a subset of landscape processes. Potential natural vegetation is a vegetation classification system and an ecological concept referring to the late successional vegetation that would be expected under the constraints of the physical environment in the absence of human intervention or high-severity disturbance. The historical potential natural vegetation concepts of climax vegetation are not reflected in the plan's desired conditions and have long been dismissed as management targets in favor of understanding the dynamics, diversity and potential ecosystem services of a given vegetation type as illustrated in the 2012 Planning Rule and agency directives. However, the concept remains valuable for understanding basic land capability (Somodi et al. 2012).

[4] Spatial data available at https://www.fs.usda.gov/detailfull/r3/landmanagement/gis/?cid=stelprdb5201889&width=full. The ecological response unit spatial dataset is a region-wide product and the current version is posted. The terrestrial ecological unit dataset is a forest-specific product. Note that there can be a delay between when spatial data products are updated and when they are posted to this web address. Tabular Terrestrial Ecological Unit Inventory information is currently available in Access database format by request. The final manuscript is also available upon request.

Spatial Scales

Desired conditions for upland vegetation (ecological response units) are presented at three spatial scales: landscape scale, mid-scale, and fine scale. Desired conditions for riparian and aquatic ecosystems are presented at two spatial scales: watershed scale and fine scale. Watershed desired conditions use only the watershed scale. Other natural resource topic areas do not specify a scale for desired conditions; rather those desired conditions are applicable at all scales.

The landscape scale for upland vegetation describes the "big picture" of desired conditions. The watershed scale for riparian and aquatic ecosystems serves to address habitat connectivity. Descriptions at the mid- and fine scales provide additional detail necessary for guiding future projects and activities. Projects of any size should consider desired conditions at all scales and the relationships between them across the forest. These scales are further described in the next two subsections.

Forest, Woodland, Shrubland, and Grassland Spatial Scales

A landscape area is composed of mid-scale units (figure 4). Likewise, the mid-scale is composed of fine scale units. Variability in biophysical conditions such as elevations, slopes, topographic position, aspects, soils, plant communities, and disturbance processes are typically greatest at the landscape scale, and generally decrease at the mid- and fine scales. However, variability for other characteristics (for example, tree density, fuel loading, et cetera) is greatest at the fine scale, and generally decreases at the mid- and landscape scales.

The range of acres defining each scale is different between forest and woodland ecological response units, and shrubland and grassland ecological response units. For forests and woodland, the landscape scale is defined as 1,000 to 10,000 acres or more, mid-scale 10 to 1,000 acres, and the fine scale is less than 10 acres. For shrublands and grasslands, the landscape scale is defined as 1,000 to 10,000 acres or more, the mid-scale 100 to 1,000 acres, and the fine scale is less than 100 acres. Mid- and fine scales are defined differently between forests and woodlands, and grasslands and shrublands because there is more structural diversity across smaller distances in forest and woodland settings than there is in grasslands and shrublands. Figure 4 (excerpted from work by Reynolds and others (2013)) provides an illustrated example for forests and woodlands.

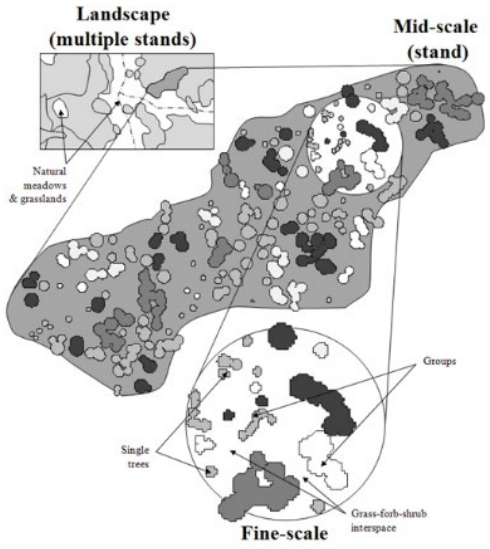

Figure 4. Spatial scales for forest, woodland, shrubland, and grassland ecological response units

Riparian, Wetland, Aquatic Ecosystem, and Watershed Spatial Scales

Watersheds are defined by the topographic extent of an area that drains to a single point in a stream or river system. They are cataloged using a uniform hierarchical system developed by the United States Geological Society (USGS). The United States is divided and subdivided into successively smaller "hydrologic units." There are six levels of hydrologic units: region (1st level), subregion (2nd level), basin (3rd level), subbasin (4th level or hydrologic unit code 8), watershed (5th level or hydrologic unit code 10), and subwatershed (6th level or hydrologic unit code 12) (USGS 1999). The word "watershed" is therefore both a general term, and a specific categorical term depending on the context in which it is used. Watershed-scale plan direction and other content applies to 4th, 5th, and 6th level watersheds, with progress toward desired conditions being measured at the 6th level watershed.

The fine scale is defined by the riparian management zone (see Riparian and Aquatic Ecosystems) associated with a stream reach, ecological response unit polygon, or point feature such as a spring or seep. A stream reach applies to systems associated within a stream corridor. A reach is a length of stream between two points. These "start" and "end" points mark a change of some kind that is relevant to conditions or management. They usually represent natural geologic or topographic features, such as a change in valley or channel shape or configuration, or may be a management feature, such as a grazing allotment or pasture boundary. The ecological response unit polygon applies to riparian, wetland, and aquatic ecosystems in upland positions that are large enough to be delineated at the ecological response unit scale. The riparian management zone alone defines the fine scale for systems associated with springs, seeps, and non-riverine wetlands too small to be captured at the scale of the ecological response unit map (point features). An illustrated example of the watershed and fine-scale units is provided in figure 5.

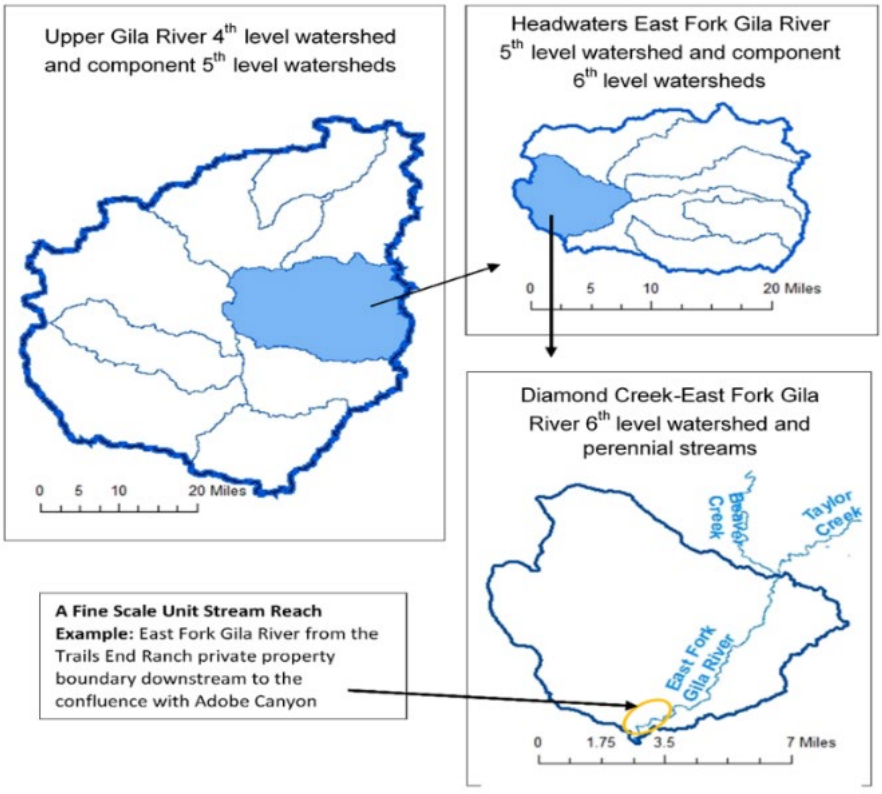

Figure 5. Watershed and fine-scale units

Photos from top to bottom, left to right: Gila by Dana Brejakova; Gila National Forest lookout tower view (USDA Forest Service photo); view of Gila Wilderness during Whitewater Baldy Complex from lookout tower (USDA Forest Service photo); snow on New Mexico State Highway 15 near Pinos Altos by Michael Ruggiero; Mixed Conifer with Aspen in Aldo Leopold Wilderness; view of Whitewater Canyon after the 2013 post-fire flood events from Whitewater Mesa. Multiple ecological response units are visible. (USDA Forest Service photo)

All Upland Ecological Response Units

Background Information

The Gila National Forest contains five forest, four woodland, one shrubland, and three grassland ecological response units that make up approximately 98 percent of its lands and provide many ecosystem services. Plant biodiversity supports and reflects the biodiversity in animal life that has co-evolved over time. Habitat for wildlife is an important supporting role of vegetation communities. The genetic variation inherent in biodiversity provides for resilience through adaptive responses to an ever-changing environment, including long-term climatic variability.

Vegetation is an influential driver of soil formation and plants' unique ability to create food from the energy of the sun through the process of photosynthesis is the foundational support for nutrient cycling. Vegetation also mitigates floods as it moderates the passage of water across landscapes and assists in holding soils in place so they can provide water filtration. Without soil, which is retained in part by the interlocking roots of many plants, clean water would be unattainable in the natural environment. Through transpiration, plants contribute to water cycling by pulling water up from the ground and releasing it into the air; this moisture contributes significantly to the Southwest's summer monsoon storms. Plants provide breathable air as they take in carbon dioxide and release oxygen as a byproduct of their respiratory process. Vegetation also provides shade that can mitigate increases in ambient temperature, which is significant for the sustainability of many organisms, including other plants. It also provides forage, traditional foods and medicines, timber, firewood and other wood products, and opportunities for recreation, education, and research.

Landscape-scale Desired Conditions (1,000 to 10,000+ acres)

1. Natural disturbances (for example, insects, disease, wind, and fire), and human activities that mimic the effects of natural disturbances, maintain fully functioning ecosystems and native vegetation communities that contain the full range of characteristic components, processes, and conditions.
2. The adaptive capacity of the native vegetation communities to disturbances of varying frequency, extent, and severity, including long-term drought and climatic variability is high, with adaptive capacity measured by the area where structure, composition, process, function, and connectivity are restored and maintained.
3. The characteristic full range of natural variability in composition, structure, and pattern, reflective of each individual ecological response unit, topographic characteristics, and soil properties are expressed (see terrestrial ecological unit).
    a. Overstory and understory plant species composition are each at least 66 percent similar to site potential as measured by each particular terrestrial ecological unit but can vary considerably at fine- and mid-scales owing to a diversity of seral conditions.
    b. All seral states are present. The relative proportions of seral states are at least 66 percent similar to the reference proportions as described in the most recent Region 3 Seral State Proportion Supplement[5].
    c. The amount, distribution and connectivity of old-growth forest conditions contribute to the overall ecological integrity of ecosystems and watersheds and are maintained and

[5] See also the Old Growth and Seral State Diversity management approach in this section.

improved relative to the existing condition over time, recognizing that old-growth forest conditions are dynamic in nature and shift on the landscape over time because of succession and disturbance.

4. Transition zones or ecotones between riparian areas, forest, woodlands, shrublands, and grasslands are present. Transition zones shift in time and space due to climatic variability and natural disturbances such as fire.
5. Organic ground cover (leaf litter, needle cast, coarse woody debris, nonvascular plants and biological crusts, and basal area) and vegetative canopy cover provide effective protection of soil, contribute to moisture retention and infiltration, nutrient cycling, plant and animal diversity, and ecosystem function.
6. Above- and below-ground carbon stocks represent reference conditions for a given ecological response unit, but are transitory and adaptive with site potential, characteristic disturbances, and long-term trends in climate. Carbon stored in old-growth conditions contributes to the long-term storage, stability, and resiliency of forest carbon across the National Forest System.
7. Ecological conditions support habitat quality, distribution, abundance, and connectivity to self-sustaining populations of all native and desirable non-native plant and animal species that are healthy, well distributed, and genetically diverse, including federally listed species, species of conservation concern, and rare and endemic species. Conditions provide for life history requirements, predator-prey interactions, and natural population fluctuations of all species within the capability of the landscape.
8. Habitat availability, configuration, and connectivity allow wildlife populations to adjust their movements (seasonal migration, foraging, et cetera) in response to long-term trends in climate and human land use. Populations of rare and endemic species that rely wholly on ecological response units with high or very high vulnerabilities are known, and conservation measures are in place.

Standards

1. Terrestrial Ecological Unit Inventory information (or similar ecological inventory information) will be used to inform restoration treatment design and implementation.
2. On soils derived from volcanic sediment (Datil soils), ground-based mechanical thinning treatments will be limited to slopes less than 15 percent rise unless site-specific analysis determines fire behavior poses a greater risk to watershed or urban interface values. Pushing or chaining (see glossary at the end of this section) will not be authorized on these soils regardless of slope gradient. Fire incident management is exempted from this standard. Suppression rehabilitation activities will include any additional measures identified by the Resource Advisor or watershed program staff.
3. On soils with little to no soil development and those on erosional landforms, ground-based mechanical thinning treatments will be limited to slopes less than 25 percent rise unless site-specific analysis determines fire behavior poses a greater risk to watershed or urban interface values. Mastication or plucking is preferred over pushing or chaining. Pushing or chaining will not be authorized on these soils where slope gradients are greater than 15 percent. Fire incident management is exempted from this standard. Suppression rehabilitation activities will include any additional measures identified by the Resource Advisor or watershed program staff.

4. On soil types not addressed by previous standards, ground-based mechanical thinning treatments will be limited to 40 percent rise. Timber harvest on steeper slopes is restricted to aerial technologies and appropriate cable systems unless site-specific analysis determines that fire behavior poses a greater risk to watershed or urban interface values and the technology[6] is available to do so safely and without long-term adverse effects. Mastication or plucking is preferred over pushing or chaining. Pushing or chaining will not be authorized on these soils where slope gradients are greater than 15 percent. Fire incident management is exempted from this standard. Suppression rehabilitation activities will include any additional measures identified by the Resource Advisor or watershed program staff.
5. Herbicides will only be authorized on native species where the appropriate National Environmental Policy Act analysis demonstrates it would support movement toward or maintenance of desired conditions for vegetation communities or the urban interface. Baseline standards and guideline for herbicide use can be found in the Non-Native Invasive Species section of the plan.

   In granting an exception, the responsible official must include the rationale in a decision document.

Guidelines

1. Vegetation treatments should be designed to recruit under-represented seral states and thereby promote continuous recruitment of old-growth characteristics across the landscape over time
2. Adequacy determinations (36 Code of Federal Regulations 1909.15 Chapter 10 Section 18) of existing decisions should be considered as the first option before pursuing other National Environmental Policy Act processes to promote efficiency. Guidance on appropriate use of these reviews can be found in Forest Service Handbook 1909.15 Chapter 10 Section 18.
3. Vegetation management activities should maintain or enhance existing old growth to promote the long-term persistence of old-growth forest conditions within the plan area except where needed to mitigate wildfire risk in the wildland-urban interface.

Management Approaches

Adaptation, Restoration, and Relationships

We look for opportunities to work collaboratively with federal, state, and tribal governments, local governments, non-governmental organizations, volunteers, and individuals with a diversity of perspectives to accomplish shared restoration and adaptation objectives. Forest management recognizes that local wood product industries are important to accomplishing these objectives, and that there can be co-benefits for ecological integrity and sustainability, local economies, and ways of life.

Ranges of Values and Application of Science

Desired conditions for many vegetation characteristics include values or ranges of values at the mid-scale. Most of these values are informed by the historical range of variability documented in the published literature as summarized by Forest Service Southwestern Regional Office staff (USDA FS 2018). Coarse woody debris values are based on calculations that balance tradeoffs

[6] This technology includes specialized ground-based equipment and cut to length harvesting systems that have recently become available, as well as other advancements that may be developed in the future.

between fire intensity, site productivity, and wildlife habitat requirements (Reynolds et al. 2013, Graham et al. 1994, Brown et al. 2003). These ranges of values are averages established by a minimum value and a maximum value. In the case of tree basal area, which is being used to describe tree density in forested ecological response units, the minimum and maximum values are themselves, averages (studies cited in Reynolds et al. 2013).

While average or median values, or ranges of average values may be useful for coarse assessments or broad-scale reporting purposes, these values are not to be interpreted as explicit or implicit management targets (Safford et al. 2012, Allen et al. 2002). Where a range of values is provided, the full range is desired. According to North and others, average conditions were historically rare in active-fire landscapes due to variable fuels, topography, and fire behavior interactions (North et al. 2009). Instead, the management approach is to provide for the full range of historical variability within a vegetation type (Weins et al. 2012) using topographic characteristics, soils (including parent material), and fire behavior as a guide (Safford et al. 2012, North et al. 2009, Agee 1993, Schoennagel et al. 2004, Korb et al. 2013, Rodman et al. 2017, Swanson et al. 1998, Lynderson and North 2012, Kane et al. 2015). Topographic characteristics include landform, elevation, slope steepness, slope position, aspect, and valley width. All these topographic characteristics interact and influence site microclimate, fire behavior, vegetation, and soils.

Additional information regarding what is known about the full range of historical variability, the state of the science and information intended to help implement this management approach is provided in the individual ecological response unit sections under the heading Related Plan Content.

It may also be appropriate to manage for values outside the historical range of variability, for some characteristics, in some circumstances. For example, desired conditions in the wildland-urban interface include lower densities of vegetation and coarse woody debris to reduce fire related risks to human life and property. Areas where desired conditions specific to purpose or location apply are identified in Chapter 3–Designated and Management Area Plan Direction.

Seral State Diversity

The relative amount of each ecological response unit in a developmental state is referred to as seral state proportion, or seral state diversity. In forested types, each developmental or seral state is defined by a dominant tree size class, degree of canopy closure, and number of canopy layers (see also appendix E to the plan's final EIS). Dominance is determined by tree size class representing at least 60 percent of the of the area. Size classes are seedlings and saplings under 5 inches in diameter at breast height, small trees between 5 and 10 inches in diameter, medium to large trees between 10 and 20 inches in diameter, and very large trees over 20 inches in diameter. Canopy cover below 10 percent would be considered a non-tree dominated early developmental state, such as might be found after stand-replacement fire. Canopy cover between 10 and 30 percent would be considered open canopy forest or woodland conditions. Canopy cover over 30 percent, and up to complete canopy closure, would be considered closed canopy conditions. Stands of trees with one to two canopy layers are considered single-story. Stands of trees with three or more canopy layers are considered multi-storied. Woodland types do not include the storiedness descriptor.

The following tables display what is currently known about the reference, or historical condition and the desired conditions, and there are a couple important considerations about the

presentation of the data that warrant discussion. First, it is important to realize that this view of both the reference or historical condition and the desired condition is just a snapshot in time. Actual conditions have and will continue to vary over time and across the landscape, but management would be directed toward desired conditions. That is why desired condition 3b (above) uses a similarity index as a measure of plan compliance. Secondly, desired conditions may vary from what is known about reference or historical conditions. Reference or historical conditions are generally described in The Nature Conservancy's Southwest Forest Assessment Project reports. Desired conditions were defined based on this information, and refined based on analysis of additional data and the ecological conditions we currently understand as necessary to support the recovery of federally listed species, specifically the Mexican spotted owl. More information about the science supporting the reference or historical conditions depicted here can be found in the R3 Seral State Proportion Supplement.

Table 1. Reference and desired conditions for Spruce-Fir Forest seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
grass, forb, shrub, residual and regenerating trees	grass, forb, shrub; less than 10% tree cover		9%
	aspen and mixed deciduous; all size classes, cover classes and storiedness		9%
	seedlings, saplings and small trees, closed canopy, all storiedness, and seedlings, saplings and small trees, open canopy, all storiedness	21%	21%
young forest with regeneration	medium to large trees closed canopy, all storiedness and medium to large trees, open canopy, all storiedness	33%	15%
mature, old forest with regeneration	very large trees, closed, single story and very large trees, closed canopy, multi-storied	46%	46%

Table 2. Reference and desired conditions for Mixed Conifer with Aspen seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
grass, forb, shrub, aspen or oak ramets, residual and regenerating trees	grass, forb, shrub; 10-40% tree cover	1%	7%
	aspen and mixed deciduous; all size classes, >40% tree cover dominated by aspen or oak, conifer understory	21%	21%
	seedlings, saplings and small trees, open and closed canopy, all storiedness	29%	18%
	seedlings, saplings and small trees, open canopy, all storiedness	included in the 29% above	included in the 14% below
young forest with regeneration	medium to large trees closed canopy, all storiedness	included in the 29% above	
	medium to large trees, open canopy, all storiedness		14%
mature, old forest with regeneration	very large trees, closed, single story	49%	40%
	very large trees, closed canopy, multi-storied		*

* Note: higher proportions can be expected for associations with longer stand-replacement intervals

Table 3. Reference and desired conditions for Mixed Conifer Frequent Fire seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
early development, all structures; needed	grass, forb, shrub	included in value below	included in value below
to sustain 25% late development, closed canopy conditions for Mexican spotted owl habitat	seedlings and saplings, open and closed canopy, all storiedness	20%	9%
mid-development, open; needed as above	small trees, open canopy, all storiedness	10%	3%
mid-development, closed; needed as above	small trees, closed canopy, all storiedness	5%	3%
uneven-aged forest, open	medium to very large trees, open canopy, all storiedness	60%	60%
late development, closed; indicative of Mexican spotted owl habitat and occasional even-aged dynamics that occurred in the reference condition	medium to very large trees, closed canopy, all storiedness	5%	25%

Table 4. Reference and desired conditions for Ponderosa Pine Forest (Gambel oak subtype) seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
early development, all structures;	grass, forb, shrub	included in value below	included in value below
indicative of occasional even-aged stand dynamics and the development of Mexican spotted owl habitat	seedlings and saplings, open and closed canopy, all storiedness	0%	2%
young forest, open; indicative of conditions above	small trees, open canopy, all storiedness	0%	2%
young forest, open; indicative of conditions above	small trees, closed canopy, all storiedness	0%	2%
contemporary condition; can occur in the wildland-urban interface	medium to very large trees, open canopy, single story	0%	situational
mid-aged to mature, old forest, closed;	medium to very large trees, closed canopy, all storiedness	0%	15%
conditions indicative of occasional even-aged stand dynamics and Mexican spotted owl habitat	medium to very large trees, open canopy, multi-storied	100%	79%

Table 5. Reference and desired conditions for Ponderosa Pine Forest (bunchgrass subtype) seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
early development, all structures;	grass, forb, shrub	included in value below	included in value below
indicative of occasional even-aged stand dynamics and the development of northern goshawk habitat	seedlings and saplings, open and closed canopy, all storiedness	0%	1%
young forest, open; indicative of conditions above	small trees, open canopy, all storiedness	0%	1%
young forest, open; indicative of conditions above	small trees, closed canopy, all storiedness	0%	1%
contemporary condition; can occur in the wildland-urban interface	medium to very large trees, open canopy, single story	0%	situational
mid-aged to mature, old forest, closed;	medium to very large trees, closed canopy, all storiedness	0%	3%
conditions indicative of occasional even-aged stand dynamics and Mexican spotted owl habitat	medium to very large trees, open canopy, multi-storied	100%	94%

Table 6. Reference and desired conditions for Ponderosa Pine-Evergreen Oak seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
early development	grass, forb, shrub, seedling, sapling	4%	4%
re-sprouter dominated	seedling and sapling, all canopy classes, all storiedness	5%	5%
young forest, closed; indicative of conditions of even-aged stand dynamics and development of Mexican spotted owl habitat	small trees, closed canopy, all storiedness	3%	13%
young forest, open	small trees, open canopy, all storiedness	24%	3%
mature, old forest, open	medium to very large trees, open canopy, all storiedness	60%	60%
mature, old forest, closed; indicative of Mexican spotted owl habitat	medium to very large trees, closed canopy, all storiedness	4%	15%

Table 7. Reference and desired conditions for Madrean Pinyon-Oak Woodland seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
early development	grass, forb, shrub, seedling, sapling	4%	4%
re-sprouter dominated	seedling and sapling, open canopy, and seedling and sapling, closed canopy	5%	5%
young woodland open; conditions indicative of even-aged stand dynamics and the development of Mexican spotted owl habitat	small trees, open canopy	24%	13%
young forest, open	small trees, closed canopy	3%	60%
mid-development to mature, old woodland open	medium to very large trees, open canopy	60%	15%
mid-development to mature, old woodland closed; indicative of Mexican spotted owl habitat	medium to very large trees, closed canopy	4%	15%

Table 8. Reference and desired conditions for Pinyon-Juniper Woodland seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
early development	grass, forb, shrub, seedling, sapling	10%	10%
mid-development	seedling and sapling, open and closed canopy; small trees, open canopy	5%	5%
	small trees, closed canopy	15%	15%
mature and old woodland, open	medium to very large trees, open canopy	10%	10%
mature and old woodland, closed	medium to very large trees, closed canopy	60%	60%

Table 9. Reference and desired conditions for Pinyon-Juniper Grass and Juniper Grass Woodlands seral state diversity

Reference Condition			Desired Condition
General Description	**State Description**	**Historic Mean Composition**	**Desired Mean Composition**
early development	grass, forb, shrub, seedling, sapling	5%	5%
mid-development	seedling and sapling, open and closed canopy; small trees, open canopy	25%	25%
	small trees, closed canopy	10%	10%
mature and old woodland, open	medium to very large trees, open canopy	50%	50%
mature and old woodland, closed	medium to very large trees, closed canopy	10%	10%

Guideline 1 in this section directs management to recruit underrepresented states during project design and implementation. Seral state proportions are mapped using satellite data.

It is critical that project-level work include field validation of existing conditions. To develop climate-informed project proposals and alternatives, this field verification would include consideration of ecological and socioeconomic vulnerability. The Regional Climate Adaptation Strategy (USDA FS 2023 or most recent version) provides strategic, landscape-level guidance and a stepwise workbook process to help project teams select adaptation options, desired conditions, and tactics. Desired conditions are not tied to one version of an ecosystem map. Tactical, site level, guidance to help assess stress, adaptive capacity and tactics will also be available (USDA FS 2023). Monitoring will also help validate whether our projects are having the impacts we expect, which is to move toward the plan's desired conditions for seral state diversity, including old growth, and biodiversity.

Old Growth

Forests and woodlands are dynamic systems that change over time. The Forest Service has a mandate to identify conditions that are sustainable in both today and tomorrow's climate, including mature and old-growth conditions. Old-growth components include structural complexity, like multiple canopy layers, downed logs, standing snags, and old trees, which may or may not be large depending on site conditions. Seral state diversity encompasses all stages of forest and woodland development and there is a relationship between seral state and old trees, but that relationship is not necessarily one-to-one. This means that that old trees and other old-growth components can occur in a variety of seral states.

Glossary

Basal area is the area covered by tree trunks and stems of shrubs, forbs, and grass species where they meet the ground.

Biological crusts are a community of organisms living on the surface of soils. They occur primarily in arid and semi-arid ecosystems and can be composed of cyanobacteria, green and brown algae, and microfungi, mosses and lichens. Bacteria, liverworts, and fungi can also be components.

Chaining is a method of reducing woody vegetation density using a chain secured between two pieces of heavy machinery to knock over and uproot trees.

Endemic species are those that occur only in a certain area. In this context, the term is used to describe species that exist only on the Gila National Forest, or only in New Mexico, and are found nowhere else in the world.

Life history requirements are those environmental and habitat conditions needed to allow an organism to develop from birth or germination, reproduce, and survive to its natural death.

Mastication refers to grinding, shredding, or chopping of individual trees, in place, with heavy machinery equipped with a specialized attachment.

Nonvascular plants lack specialized tissues to conduct water and nutrients throughout the plant. They include mosses, liverworts, hornworts, and some algae.

Parent material is a soil science term that describes both the primary origin of the matter from which the soil is formed, either geologic or organic, and its last mode of transport. Parent materials on the Gila National Forest are geologic in nature and are dominated by volcanic and sedimentary rock types. Modes of transport include flowing water (alluvium), wind (eolian), gravity (colluvium), and standing water in lakes (lacustrine). If the material was not transported after its original deposition, it is referred to as residuum. It is important because it strongly influences the soil characteristics and properties that directly affect site potential and response to disturbance.

Plucking refers to pulling individual trees out of the ground with heavy machinery.

Pushing refers to knocking over and uprooting individual trees with heavy machinery.

Site potential is a term used to describe the characteristic ecological conditions in the latest successional state, resulting from interactions among climate, soil, and vegetation.

Vegetation succession is the process of change in the composition and structure of a community over time in response to natural growth, death, and disturbance. In the Southwest, time scales between early and late successional states can be on the order of decades in grassland ecosystems but are more often hundreds of years in forest and woodland ecosystems. Seral states are conceptualized, point in time snapshots of the successional process defined by a dominant canopy cover, size, and age class. Seral conditions (composition and structure) within the same ecological response unit can vary between and within seral states depending on climate, soil, and time since disturbance. Topographic characteristics, as they influence microclimate and disturbance patterns, can also lead to a diversity of conditions between and within seral states.

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Forested Ecological Response Units

Spruce-Fir Forest

Background Information

The Spruce-Fir Forest occurs on the coldest, wettest, and highest elevation sites in the forest, generally 9,000 feet and above, along a variety of slope gradients including gentle to very steep mountain slopes. Most of this ecological response unit is located within the Gila (approximately 79 percent) and Aldo Leopold (approximately 3 percent) Wildernesses. Late successional forests at the lower elevations of the range are usually dominated by Engelmann spruce, white fir, and occasionally blue spruce. Corkbark fir is a subdominant late-successional species with quaking aspen, Douglas-fir, white fir, and southwestern white pine occurring as common early to mid-seral tree species. At the upper elevations, dominant tree species are Engelmann spruce and corkbark fir, with aspen typically being incidental, but it may occasionally be co-dominant as an early to mid-seral species. Rocky Mountain maple, currants, whortleberry, snowberry, ferns, sedges and a variety of other native perennial shrubs, and forbs are commonly found in the understory. Lichens and non-vascular plants such as mosses and liverworts, are also important components.

This vegetation type provides habitat used by the Mexican spotted owl and Mexican gray wolf, both of which are federally listed, and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include the marsh slug snail, nitocris fritillary butterfly, tiger moth, western bumble bee, Goodding's onion, heartleaf groundsel, Hess's fleabane, Mogollon death camas, and Mogollon Mountain lousewort.

Spruce-Fir Forest occupies approximately 1 percent of the Gila National Forest.[7] Although it is rare, both in the forest and in the broader landscape,[8] it has substantial ecological value in terms of overall biodiversity. Forest management has a greater influence on ecological integrity and sustainability because it is more common within the forest than the broader landscape.

Landscape-scale Desired Conditions (1,000 acres to 10,000+ acres)

1. The Spruce-Fir Forest vegetation community is a mosaic of structural and seral states ranging from young trees through old and is composed of multiple species. The landscape arrangement is an assemblage of variably sized and aged groups and patches of trees and other vegetation.
    a. Patch sizes vary but are mostly in the hundreds of acres, with very infrequent disturbances creating patch sizes in the thousands of acres.
2. Tree canopies are typically more closed than in Mixed Conifer with Aspen. Overstory canopy cover varies with seral state and time since disturbance, topographic characteristics, and soil properties, often approaching complete canopy closure in mid- to late seral states (see terrestrial ecological unit).

[7] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel Oak Shrubland; while Gambel Oak Shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer when this document was prepared.
[8] The broader landscape refers to the context area defined on page 18 of the final assessment report.

3. Old growth occurs over large, continuous areas. Old-growth components include old trees, standing dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old growth shifts on the landscape over time because of natural growth, death, and disturbance.
4. The Spruce-Fir Forest is composed predominantly of vigorous trees, but declining trees provide snags; top-killed, lightning- and fire-scarred trees; downed logs (greater than 12 inches diameter at mid-point, greater than 8 feet long) and coarse woody debris (greater than 3 inches diameter). Snags and coarse woody debris are well distributed. The number of snags and amount of coarse woody debris vary by site productivity, seral state, and disturbance history.
    a. Snags greater than 18 inches diameter at breast height have an average range between 5 to more than 30 per acre. Snag density in general (8 inches diameter at breast height and greater) averages 20 per acre with a range of 13 to 30. Average snag density increases with successional stage with less in early stages and more in late stages.
    b. Average coarse woody debris, including downed logs, varies from five to 30 tons per acre in early seral states; 30 to 40 tons per acre in mid-seral states; and 40 tons per acre or greater for late-seral states.
5. An understory of native grasses, forbs, and shrubs is typically present, with basal area, canopy cover, and species composition varying with seral state, degree of canopy closure, and terrestrial ecological unit.
6. In the lower Spruce-Fir Forest subtype, mixed-severity fires (fire regime group III) occur infrequently. In the upper spruce-fir subtype, high-severity fires (fire regime IV and V) occur very infrequently. Patches created by stand-replacement fire typically do not exceed 1,000 acres.

Mid-scale Desired Conditions (10 to 1,000 acres)

1. The size and number of tree groups and patches vary depending on disturbance history, topographic characteristics, and soil properties (see terrestrial ecological unit). There may also be small disturbances resulting in groups and patches of tens of acres or less. Grass, forb, and shrub interspaces created by disturbance may involve single trees or comprise up to 100 percent of the mid-scale area following infrequent, high-severity disturbances. Aspen is occasionally present in large patches.
2. Average tree densities range from 20 to 250 square feet of basal area or greater per acre depending on time since disturbance, seral states of the groups and patches, topographic characteristics, and soil properties.
3. The understory consists of native shrubs, perennial grasses and sedges, forbs, mosses, and other non-vascular plants with basal area ranging from less than 1 percent to 20 percent, depending on soil properties (see terrestrial ecological unit), seral state, and degree of canopy closure.
4. Forest conditions in goshawk post-fledging family areas are like general forest conditions except these forests typically contain at least 10 percent greater basal area than goshawk foraging areas and the general forest. Nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas.

Fine-scale Desired Conditions (less than 10 acres)

1. Mid- to old-age trees grow tightly together with interlocking crowns. Trees are generally of the same height (single story) and age in early group or patch development but may be multi-storied in late development. Small gaps are present because of localized disturbances such as wind throw, insects, or disease.
2. Organic ground cover and herbaceous vegetation provide protection for soil, moisture infiltration, and contribute to plant diversity and ecosystem function.

Objective

1. Treat at least 250 and no more than 23,779 acres per decade using a combination of naturally ignited wildfire and prescribed fire methods to maintain or move toward desired conditions.

Management Approach

Adaptation

The Spruce-Fir Forest has the highest vulnerability to climate change with the least amount of uncertainty (Triepke 2017). The 2012 Whitewater Baldy Complex and 2013 Silver fires resulted in significant losses of late seral states in the Spruce-Fir Forest, but there is evidence that suggests this was likely not uncharacteristic; rather it was outside of recent human experience (Margolis et al. 2011, Schoennagel et al. 2004). Given its vulnerability, there remains a cause for concern. Since these fires, annual pre-season landscape risk assessments (see Wildland Fire and Fuels management approach Annual Pre-Season Landscape Risk Assessment) have repeatedly identified Spruce-Fir Forest and Mixed Conifer with Aspen as ecological values at risk. There are concerns about what remains of the mid- to late-seral states and potential impacts of re-burn.

In areas that have experienced stand-replacement fire, large, down woody material provides microclimate conditions that are more likely to support germination and seedling establishment of woody species. However, the amount and continuity of large, down woody material could also be a liability in re-burn situations where the heat generated by smoldering logs can kill the seedlings growing nearby.

Most of this ecological response unit is in remote and rugged terrain within designated wilderness areas or inventoried roadless areas, which limits management options. There are approximately 2,200 acres where management is only restricted by the resources available to act. On these acres, the continuity of woody material might be disrupted using motorized equipment. This could leave some patches in place to protect seedlings that regenerate naturally, or are planted, and limit fire spread between patches. In the inventoried roadless area, prescribed fire could target early and potentially mid-seral states to support structural diversity over time. Not all acres would be treated. Prescribed fire success would be defined by small footprints of surface fuel reductions over multiple entries. Small pockets of tree mortality, assuming there is regeneration, in the early seral states would also be important to building future seral state diversity. In the mid-seral states, the strategy would need to determine whether the size and distribution of those states warrants the same treatment, or if it is more appropriate to focus efforts on limiting stand-replacement patches of any size until forest development in early seral states reaches an identified threshold. Human life and safety concerns will define ultimately determine what is possible with fire.

Related Plan Content

Content that follows under the Application of Tree Density Ranges of Values provides additional information regarding what is known about the range of historical variability and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading.

Application of Tree Density Ranges of Values

Very few studies reconstructing forest structure have been conducted in southwestern spruce-fir forests and studies from other regions are generally not applicable due to major differences in species composition, latitude, climate, and other factors (Smith 2006a). The range of average basal area presented in the mid-scale desired conditions reflects a Southwestern Regional summary of existing conditions derived from region-wide forest inventory and analysis plot data based on the assumption that the characteristic fire regime, and forest structure has not been highly altered in high-elevation, infrequent fire ecosystems (Schoennagel et al. 2004). Forest inventory and analysis data from the Gila and Aldo Leopold Wilderness Areas suggest a basal area maximum (not average maximum) of 418 square feet per acre (USDA FS 2018). While forest inventory and analysis data documents basal areas of zero (FIADB 2015) in areas of stand-replacement fire, having residual trees to act as a seed source is desirable.

References

FIADB (Forest Inventory and Analysis Database). 2015. Gila Wilderness Area and Aldo Leopold Wilderness Area on the Gila National Forest. Access database query obtained from the Rocky Mountain Research Station, Forestry Sciences Laboratory, Ogden, UT, December 2017 with supporting documentation for the query process. On file at the Gila National Forest.

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Mixed Conifer with Aspen (Wet Mixed Conifer)

Background Information

Mixed Conifer with Aspen occurs between Spruce-Fir Forest at its upper elevational limit and Mixed Conifer-Frequent Fire at its lower elevational limit. It occurs along a variety of slope gradients including gentle to very steep mountain slopes between approximately 7,000 and 10,000 feet. Degree of canopy closure, seral state, topographic characteristics, and soil properties are determining factors of tree species composition, as they influence site temperature and plant available moisture. Douglas-fir and white fir are typically codominant, with southwestern white pine, maple, aspen, and New Mexico locust sub- or co-dominant. Aspen and New Mexico locust dominance is initiated by stand-replacement fire. Ponderosa pine may be present at the lower elevations, but as a minor component. Blue and Engelmann spruce can occur in late-successional stages, but in the Gila National Forest, this has only been documented on basalt soils. Scouler's willow, mountain spray, osha, mountain lover, nine-bark, currants, and a variety of other native perennial shrubs, grasses, sedges, forbs, and ferns are commonly found in the understory. Lichens and non-vascular plants such as mosses and liverworts, are also important components.

This vegetation type provides habitat used by the Mexican spotted owl and Mexican gray wolf, both of which are federally listed, and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include the Iron Creek woodland snail, marsh slug snail, Morgan Creek mountain snail, Silver Creek woodland snail, tiger moth, western bumble bee, Arizona montane vole, Goodding's onion, heartleaf groundsel, Hess's fleabane, Mogollon death camas, Mogollon hawkweed, Mogollon Mountain lousewort, Porsild's starwort, and yellow lady's-slipper.

Mixed Conifer with Aspen occupies 2 percent of the Gila[9] National Forest and 65 percent of it is in the Gila and Aldo Leopold wildernesses. Although it is rare, both in the forest and in the broader landscape,[10] it has substantial ecological value in terms of overall biodiversity. Forest management has a greater influence on ecological integrity and sustainability because it is more common within the forest than the broader landscape.

Landscape-scale Desired Conditions (1,000 acres to 10,000+ acres)

1. The Mixed Conifer with Aspen vegetation community is a mosaic of structural and seral stages ranging from young trees through old and is composed of multiple species. Species composition within tree patches depends on seral state. The landscape arrangement is an assemblage of variably sized and aged groups and patches of trees and other vegetation.
    a. Patch sizes vary but are mostly between 100 and 300 acres, with rare disturbances creating patch sizes in the thousands of acres.
2. Tree canopies are typically more closed than in the Mixed Conifer-Frequent Fire ecological response unit. Overstory canopy cover varies with seral state and time since disturbance, topographic characteristics, and soil properties, often approaching complete canopy closure in mid- to late seral states (see terrestrial ecological unit).

[9] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel Oak Shrubland; while Gambel Oak Shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer at the time this document was prepared.
[10] The broader landscape refers to the context area defined on page 18 in the final assessment report.

3. Old growth occurs over large, continuous areas. Old growth components include old trees, standing dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old growth shifts on the landscape over time because of natural growth, death, and disturbance.
4. The Mixed Conifer with Aspen is composed predominantly of vigorous trees, but declining trees provide snags, top-killed, lightning- and fire-scarred trees, downed logs (larger than 12 inches diameter at mid-point, more than 8 feet long), and coarse woody debris (larger than 3 inches diameter).
5. Snags and coarse woody debris are well distributed. The number of snags and amount of coarse woody debris vary by site productivity, seral state, and disturbance history, generally increasing from early through late succession.
    a. Snags 18 inches or greater diameter at breast height have an average range from 1 to more than 5 per acre. Snag density in general (8 inches diameter at breast height and greater) averages 20 per acre with a range of 13 to 30.
    b. Average coarse woody debris, including downed logs, varies from 10 to 40 tons per acre or more depending on site productivity, disturbance history, and seral state.
6. An understory of native grasses, forbs, and shrubs is typically present, with basal area, canopy cover and species composition varying with seral state, degree of canopy closure, and terrestrial ecological unit.
7. Infrequent mixed-severity fire (fire regime group III) is characteristic, especially at lower elevations of this type. High-severity fires occur very infrequently (fire regime groups IV and V) and typically occur at the higher elevations of this type. Patches created by stand-replacement fire typically do not exceed 1,000 acres.

Mid-scale Desired Conditions (10 to 1,000 acres)

1. The landscape arrangement is a mosaic of variably sized groups and patches of trees, primarily even aged within groups or patches with ages varying between groups or patches. Groups and patches of tens of acres or less are relatively common. The size and number of tree groups and patches vary depending on disturbance history, topographic characteristics, and soil properties (see terrestrial ecological unit). Grass, forb, and shrub interspaces created by disturbance may involve single trees or compose up to 100 percent of the mid-scale area following major disturbances. Openness, species dominance, and overall composition also vary within and between patches, depending on seral state. Aspen is occasionally present in large patches.
2. Average tree densities range from 20 to 180 square feet of basal area or greater per acre depending on time since disturbance, seral states of the groups and patches, topographic characteristics, and soil properties.
3. The understory consists of native shrubs, perennial grasses, sedges, forbs, mosses, and other non-vascular plants with basal area ranging from less than 1 percent to 20 percent or more depending on soil properties (see terrestrial ecological unit), seral state, and degree of canopy closure.
4. Forest conditions in goshawk post-fledging family areas are like general forest conditions except these forests typically contain at least 10 percent greater basal area than goshawk

foraging areas and the general forest. Nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas.

Fine-scale Desired Conditions (less than 10 acres)

1. In mid-aged and older forest groups, trees are typically variably spaced with crowns interlocking or nearly interlocking. Trees within groups can be of similar or variable species and ages. Small openings are present because of disturbances.
2. Organic ground cover and herbaceous vegetation provide protection for soil, moisture infiltration, and contribute to plant diversity and ecosystem function.

Objective

1. Treat at least 300 and no more than 73,934 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.

Management Approach

Adaptation

Similar concerns exist for Mixed Conifer with Aspen as with Spruce-Fir Forest. The adaptation management approach described for the spruce-fir forest is also applicable to this ecological response unit. There may be more opportunities to take adaptive actions on approximately 7,200 acres without management restrictions other than the resources to act.

Related Plan Content

Content that follows under the Application of Tree Density Ranges of Values provides additional information regarding what is known about the range of historical variability and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading.

Application of Tree Density Ranges of Values

Few studies reconstructing forest structure have been conducted in mixed conifer (Smith 2006b, Smith 2006c). Of those studies conducted, most focused on frequent fire, dry mixed conifer sites where ponderosa pine, southwestern white pine, or both are dominant or co-dominant components (Reynolds et al. 2013). The range of average basal area presented in the mid-scale desired conditions reflects a Southwestern Regional summary of existing conditions derived from region-wide forest inventory and analysis plot data based on the assumption that the characteristic fire regime and forest structure has not been highly altered in this ecosystem (USDA FS 2018, Schoennagel et al. 2004). Forest inventory and analysis data from the Gila and Aldo Leopold Wilderness Areas (FIADB 2015) suggest a basal area maximum (not an average maximum) of 353 square feet per acre. While forest inventory and analysis data documents basal areas of zero (FIADB 2015) in areas of stand-replacement fire, having residual trees to act as a seed source is desirable.

References

FIADB (Forest Inventory and Analysis Database). 2015. Gila Wilderness Area and Aldo Leopold Wilderness Area on the Gila National Forest. Access database query obtained from the Rocky Mountain Research Station, Forestry Sciences Laboratory, Ogden, UT, December 2017 with supporting documentation for the query process. On file at the Gila National Forest.

Reynolds, R.T., A.J. Sánchez Meador, J.A. Youtz, T. Nicolet, M.S. Matonis, P.L. Jackson, D.G. Delorenzo, and A.D. Graves. 2013. *Restoring Composition and Structure in Southwestern Frequent-Fire Forests: A science-based framework for improving ecosystem resiliency*. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-310.

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Smith, E. 2006b. *Historical Range of Variation and State and Transition Modeling of Historical and Current Landscape Conditions for Mixed Conifer of the Southwestern U.S*. Prepared for the USDA Forest Service, Southwestern Region by The Nature Conservancy, Tucson, AZ. 31 pp.

Smith, E. 2006c. *Historical Range of Variation for Aspen of the Southwestern U.S*. Prepared for the USDA Forest Service, Southwestern Region by The Nature Conservancy, Tucson, AZ. 21 pp.

USDA FS (United States Department of Agriculture – Forest Service). 2018. *Desired Conditions for Use in Forest Plan Revision in the Southwestern Region: Development and Science Basis.* Living document on file at USDA Forest Service, Southwestern Region. Albuquerque, NM. 57 pp.

Mixed Conifer-Frequent Fire (Dry Mixed Conifer)

Background Information

The Mixed Conifer-Frequent Fire is transitional between Ponderosa Pine Forest, Ponderosa Pine-Evergreen Oak, and Mixed Conifer with Aspen. In the Gila National Forest, it typically occurs between 6,000 and 9,300 feet on steep slopes (40 to 120 percent rise) although sometimes it is found on gentler terrain. Degree of canopy closure, seral state, topographic characteristics, and soil properties are determining factors of tree species composition as they influence site temperature and plant available moisture.

Shade-intolerant trees such as ponderosa pine, southwestern white pine, quaking aspen and Gambel oak dominate the forest, with mid-tolerant species such as Douglas-fir being common. Shade tolerant species such as white fir may occasionally be present. A wide range of native grasses, forbs, shrubs, and ferns are present with variable species composition depending on latitude, elevation, aspect, and soil properties. Some common species include Oregon grape, screwleaf muhley, mountain muhley, Arizona fescue, mountain brome, pine dropseed, fleabane, penstemon, and wood sorrel. Lichens and non-vascular plants, such as mosses and liverworts, are also important components.

This vegetation type provides habitat used by the Mexican spotted owl and Mexican gray wolf, both of which are federally listed, and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include Lewis's woodpecker, Iron Creek woodland snail, marsh slug snail, Morgan Creek mountain snail, Silver Creek woodland snail, western bumble bee, Arizona montane vole, Goodding's onion, Metcalfe's penstemon, Mimbres figwort, Mogollon clover, Mogollon hawkweed, Porsild's starwort, and yellow lady's-slipper.

Mixed Conifer-Frequent Fire comprises 12 percent of the Gila[11] National Forest and is more common in the forest than within the broader landscape,[12] providing management a greater opportunity to contribute to ecological integrity and sustainability. Approximately 43 percent of this ecological response unit is in the Gila, Aldo Leopold, and Blue Range Wildernesses.

Landscape-scale Desired Conditions (1,000 acres to 10,000+ acres)

1. The Mixed Conifer-Frequent Fire vegetation community is a mosaic of structural and seral stages ranging from young trees through old and is composed of multiple species. Forest appearance is variable but is generally uneven-aged and open. Occasional patches of even-aged structure are present.
2. The forest arrangement is an assemblage of variably sized openings of grasses, forbs, and shrubs. Size, shape, number of trees per group, and number of groups per area are variable across the landscape. Where they occur, groups of aspen and all structural stages of oak are present. Denser tree conditions exist on northerly aspects, steep slopes, toe slopes, and in canyon bottoms.
3. Old growth occurs throughout the landscape, generally in small areas as individual old-growth components, or as clumps of old growth. Old-growth components include old trees, standing dead trees (snags), downed wood (coarse woody debris), and structural diversity. Declining trees are a well-distributed component providing for snag and coarse woody debris recruitment. The location of old growth shifts on the landscape over time because of natural growth, death, and disturbance.
4. Mixed Conifer-Frequent Fire is composed predominantly of vigorous trees, but declining trees provide snags, top-killed, lightning- and fire-scarred trees, downed logs (more than 12 inches diameter at mid-point, over 8 feet long), and coarse woody debris (more than 3 inches diameter). Snags and coarse woody debris are well distributed. The number of snags and amount of coarse woody debris vary by site productivity, seral state, and disturbance history.
5. Dwarf mistletoe occurs in less than 15 percent of host trees in uneven-aged forest structures and less than 25 percent in even-aged forest structures.
6. Frequent, low-severity fires (fire regime group I) are characteristic, including throughout goshawk home ranges. Infrequent mixed-severity fire (fire regime group III) is characteristic only in the higher elevations where this type transitions with mixed conifer with aspen or where topography and other physical site conditions are predisposed to more severity.

[11] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel Oak Shrubland; while Gambel Oak Shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer.
[12] The broader landscape refers to the context area defined on page 18 in the final assessment report.

Mid-scale Desired Conditions (10 to 1,000 acres)

1. The Mixed Conifer-Frequent Fire vegetation community is characterized by variation in the size and number of tree groups depending on disturbance history, elevation, aspect, topography, topographic position, and soil properties (see terrestrial ecological unit). The more productive sites contain more trees per group and more groups per area. Openness typically ranges from 50 percent in more productive sites to 90 percent in less productive sites.
2. Average tree densities range from 40 to 125 square foot basal area per acre depending on disturbance history, topographic characteristics, and soil properties (see terrestrial ecological unit).
3. Patch size, as measured by individual trees or clumps of trees, ranges from less than 1 acre to tens of acres. The mosaic of tree groups is generally composed of uneven-aged forest with all age classes and structural stages included. Occasionally, small patches of even-aged forest structure are present but are generally less than 60 acres. A small percentage of the landscape may be predisposed to larger even-aged patches. Even-aged stand size depends on the timing of regeneration establishment and the timing, frequency, and severity of disturbance events.
4. Snags 18 inches or larger diameter at breast height average three per acre. Snag density in general (over 8 inches diameter at breast height) averages eight per acre.
5. Downed logs (over 12 inches diameter at mid-point) average three per acre within forested areas. Average coarse woody debris, including downed logs, ranges from 5 to 15 tons per acre in forested areas, depending on site productivity, disturbance history, and seral state.
6. The understory consists primarily of perennial grasses and forbs capable of carrying low-severity surface fire, with basal vegetation values ranging between less than 1 and 25 percent depending on soil properties (see terrestrial ecological unit) and seral state. Basal vegetation values at the low end of this range are typically restricted to soils formed from certain rhyolite and tuff units (see terrestrial ecological unit).
7. Forest conditions in goshawk post-fledging family areas are like general forest conditions except these forests typically contain at least 10 percent greater basal area than goshawk foraging areas and the general forest. Nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas.

Fine-scale Desired Conditions (less than 10 acres)

1. Trees typically occur in irregularly shaped groups and are variably spaced with some tight clumps. Crowns of trees in the mid-to-old age groups are interlocking or nearly interlocking. Groups in the mid-to-old age groups consist of 2 to approximately 50 trees per group. Size of tree groups is typically less than 1 acre. Trees within groups are of similar or variable ages and one or more species.
2. Interspaces surrounding tree groups are variably shaped and composed of a mixture of grasses, forbs, and shrubs. Some natural openings contain individual trees or snags.
3. Organic ground cover and herbaceous vegetation provide protection for soil, moisture infiltration, and contribute to plant diversity and ecosystem function.

Objective

1. Treat at least 6,875 and no more than 282,400 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.

Related Plan Content

Content that follows under the Application of Tree Density Ranges of Values provides additional information regarding what is known about the historical range of variability and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading.

Application of Tree Density Ranges of Values

Few studies reconstructing forest structure have been conducted in the mixed conifer (Smith 2006b, Smith 2006c). Of the studies conducted, most have focused on frequent fire, dry mixed conifer sites where ponderosa pine and southwestern white pine are dominant or co-dominant components, of which 15 are summarized by Reynolds and others (2013). The range of average basal area presented in the mid-scale desired conditions reflects their recommendations and corresponds with a range of average trees per acre between 20 and 100 (Reynolds et al. 2013).

In this summary, only 3 of the 15 reconstruction studies reported a full range of variability. Most reported only single average values. The reconstruction study used to establish the maximum average value contained in the desired conditions statement documents a maximum (not average) of 235 square feet of basal area and a maximum of 151 trees per acre. The minimum average value corresponds with the mean reported for a single study in northern Arizona's San Francisco Peaks (Reynolds et al. 2013).

Desired conditions statements demonstrate a pattern of decreasing tree density from Mixed Conifer-Frequent Fire to Ponderosa Pine Forest (including perennial bunch grass and Gambel oak subtypes), on to Ponderosa Pine-Evergreen Oak (USDA FS 2018). However, this may be an oversimplified pattern, given that reconstruction studies in pine-oak document basal areas as high as 337 square feet per acre and 262 trees per acre (studies cited in Reynolds et al. 2013). The presence of resprouting species such as oak likely influences tree density but will have less influence on basal area and more influence on trees or stems per acre. Reconstruction studies also demonstrate a strong bias toward basalt and limestone derived soils (studies cited in Reynolds et al. 2013). Whether there is a bias toward slopes under 40 percent remains somewhat speculative, as most of the publications, including those summarized by Reynolds and others, provide very little, if any discussion about this physical site characteristic.

Recent work by Rodman and others (2017) has since demonstrated a positive relationship between slope steepness and trees per acre and correlated basal area with parent material and terrestrial ecological unit. Korb and others (2013) strongly suggest a need to consider topography and other site variables and avoid generalization of structure and fire regimes in dry mixed conifer after finding an "unexpected diversity" in their reconstruction study. Local topography and its effects on microclimate may also buffer long-term changes in climatic variability (Moritz et al. 2013) and signal potential refugia for some species (Keppel et al. 2012, Ackerly et al. 2010, Ashcroft et al. 2009).

Applying desired conditions, historical range of variability, and landscape diversity goals to this ecological response unit will benefit from Terrestrial Ecological Unit Inventory applications (see

Abella and others (2011) for an example) and site-specific, field-based application of desired conditions. In other recent work by Rodman and others (2016), consideration of fine-scale site conditions and the life history requirements of specific tree species may also be useful in designing and implementing restoration and adaptation projects. In general, values at the low end of the range might be expected to occur near transition zones with ponderosa pine types, in areas of low topographic relief and on southerly aspects. Conversely, higher tree densities might be expected where this ecological response unit transitions to Mixed Conifer with Aspen, or in drainage bottoms, toe slopes, northerly aspects, and on some soils that are not capable of supporting a robust herbaceous understory (see terrestrial ecological unit). A robust herbaceous understory can limit suitable germination sites; compete with seedlings; and carries frequent, low-severity fire with flame lengths sufficient to kill regenerating conifers. When comparing apples to apples (for example, southerly aspects to southerly aspects), tree density may increase with slope steepness (Rodman et al. 2017), given soil depth and physical properties do not restrict tree growth (North et al. 2009). Higher densities where local topography includes swales or concave pockets may also provide important fine-scale habitat elements for some species (North et al. 2009). A final consideration relates back to slope angle. Standard land survey practices measure only the horizontal distance between two points, not true ground distance. Steeper slopes have greater surface area per horizontal acre and a correction for slope angle may be useful.

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Ponderosa Pine Forest

Background Information

The Ponderosa Pine Forest includes two sub-types: Ponderosa Pine-bunchgrass and Ponderosa Pine-Gambel oak, which generally occur at elevations typically ranging from 6,000 to 7,500 feet. Ponderosa pine dominates both subtypes, which often include Gambel oak and evergreen oak species, or both, and juniper and pinyon pine. Aspen, Douglas-fir, and white fir may also be present, depending on physical site characteristics. The understory is composed of a wide diversity of native grasses, sedges, forbs, shrubs, and ferns. Common grasses include blue grama, mountain muhley, screwleaf muhley, muttongrass, June grass, and pine dropseed. Other common species include Fendler's buckbrush, New Mexico locust, lupine, penstemon, fleabane, vetch, and ferns. Lichens and non-vascular plants such as mosses and liverworts are also important components. This ecological response unit contains relatively small areas where Arizona pine (also known as Apache pine), rather than ponderosa pine, is dominant. These areas are generally limited to rhyolite/tuff terrestrial ecological units within the Gila and Aldo Leopold wildernesses.

This vegetation type provides habitat used by the Mexican spotted owl and Mexican gray wolf, both of which are federally listed, and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include the Arizona toad, Lewis's woodpecker, Iron Creek woodland snail, marsh slug snail, Morgan Creek mountain snail, Silver Creek woodland snail, Western bumble bee, Arizona montane vole, Arizona crested coralroot, cliff brittlebrush, Metcalfe's penstemon, Mimbres figwort, Mogollon clover, Mogollon hawkweed, Porsild's starwort, and yellow lady's-slipper.

Ponderosa Pine Forest is relatively common, representing 19 percent of the forest.[13] There is also more of it in the forest than in the broader landscape,[14] providing management a greater opportunity to contribute to ecological sustainability. Approximately 16 percent of this ecological response unit is in the Gila, Aldo Leopold, and Blue Range wildernesses.

Landscape-scale Desired Conditions (1,000 acres to 10,000+ acres)

1. The Ponderosa Pine Forest is composed of trees from structural stages ranging from young to old. Forest appearance is variable but is generally uneven-aged and open; occasional areas of even-aged structure are present.
2. The forest arrangement is in individual trees, small clumps, and groups of trees interspersed within variably sized openings of grasses, forbs, and shrubs like historical patterns. The size, shape, number of trees per group, and number of groups per area are variable across the landscape. Denser tree conditions exist on northerly aspects, steep slopes, toe slopes, and in canyon bottoms.
3. In the Gambel oak subtype, all sizes and ages of oak trees are present.
4. Old growth occurs throughout the landscape, generally in small areas as individual old-growth components, or as clumps of old growth. Old-growth components include old trees, standing dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old growth shifts on the landscape over time because of natural growth, death, and disturbance.
5. The Ponderosa Pine Forest is composed predominantly of vigorous trees, but declining trees provide snags and coarse woody debris; downed logs (larger than 12 inches diameter at mid-point, over 8 feet long) and coarse woody debris (over 3 inches diameter). Snags and coarse woody debris are well distributed. The number of snags and amount of coarse woody debris vary by seral state.
6. Dwarf mistletoe occurs in less than 15 percent of host trees in uneven-aged forest structures and less than 25 percent in even-aged forest structures.
7. Frequent, low-severity fires (fire regime group I) are characteristic, including throughout goshawk home ranges.

Mid-scale Desired Conditions (10 to 1,000 acres)

1. The Ponderosa Pine Forest vegetation community is characterized by variation in the size and number of tree groups depending on disturbance history, topographic characteristics, and

[13] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel Oak Shrubland; while Gambel Oak Shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer at the time this document was prepared.
[14] The broader landscape refers to the context area defined on page 18 in the final assessment report.

soil properties (see terrestrial ecological unit). The more productive sites contain more trees per group and more groups per area. Openness typically ranges from 52 percent in more productive sites to 90 percent in less productive sites. In areas with high fine-scale aggregation of trees into groups, mid-scale openness ranges between 78 and 90 percent.

2. Tree density generally ranges from an average of 22 to an average of 89 square foot basal area per acre depending on disturbance history, topographic characteristics, and soil properties (see terrestrial ecological unit). Denser tree conditions exist on northerly aspects, steep slopes, toe slopes, and in canyon bottoms.
3. The mosaic of tree groups is generally composed of uneven-aged forest with all age classes and structural stages. Occasionally, small patches of even-aged forest structure are present. A small percentage of the landscape may be predisposed to larger even-aged patches. Even-aged stand size depends on the timing of regeneration establishment and the timing, frequency, and severity of disturbance events.
4. Snags are typically 18 inches or larger diameter at breast height and average one to two per acre. In the Gambel oak subtype, large oak snags (more than 10 inches diameter at mid-point) are a well-distributed component.
5. Downed logs average three per acre. Average coarse woody debris, including downed logs ranges from 5 (Graham et al. 1994, Brown et al. 2003) to 10 tons per acre.
6. The understory consists primarily of perennial grasses and forbs capable of carrying frequent, low-severity surface fire, with basal vegetation values ranging between less than 1 and 25 percent depending on soil properties (see terrestrial ecological unit) and seral state; basal vegetation values at the low end of this range are typically restricted to soils formed from some rhyolites and tuffs (see terrestrial ecological unit).
7. Forest conditions in goshawk post-fledging family areas are similar to general forest conditions except these forests typically contain 10 percent or greater basal area than goshawk foraging areas and the general forest. Nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas.

Fine-scale Desired Conditions (less than 10 acres)

1. Trees typically occur in irregularly shaped groups and are variably spaced with some tight clumps. Crowns of trees in the mid- to old-age groups are interlocking or nearly interlocking. Groups in the mid-to old age groups consist of 2 to approximately 40 trees per group. Size of tree groups is typically less than one acre, but average half an acre. Trees within groups are of similar or variable ages and may contain species other than ponderosa pine.
2. Interspaces surrounding tree groups are variably shaped and composed of a mixture of grasses, forbs, and shrub. Some natural openings contain individual trees or snags.
3. Organic ground cover and herbaceous vegetation provide protection for soil, moisture infiltration, and contribute to plant diversity and ecosystem function.

Objective

1. Treat at least 6,320 and no more than 600,300 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.

Related Plan Content

Content that follows under the Application of Tree Density Ranges of Values provides additional information regarding what is known about the range of historical variability and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading.

Application of Tree Density Ranges of Values

Most studies reconstructing forest structure have been done in ponderosa pine and pine-oak systems on basalt or limestone parent materials (Reynolds et al. 2013). The range of average basal area presented in the mid-scale desired conditions reflects the recommendations of Reynolds and others and corresponds with a range of average trees per acre between 11 and 124 (Reynolds et al. 2013). The average minimum is based on Woolsey plots near Tusayan, Arizona, and the average maximum is set by a site at Fire Point, Arizona. As with the Mixed Conifer-Frequent Fire, many of the studies summarized by Reynolds and others only report a single average value for tree density, but many report a full range. Of these, the minimum basal area value is zero, corresponding to a forest opening. The maximum basal area value (not average) for the site used to establish the average maximum is 132, with another site in the same study providing a maximum (not average) of 337. Both studies were done in pine-oak systems where Gambel oak was the dominant oak species. Published literature suggests lower basal area ranges might apply to the perennial bunchgrass subtype (Reynolds et al. 2013), although the science is not without limitations. Existing science does a good job describing northern Arizona ponderosa pine systems on basalt and limestone soils (studies cited in Reynolds et al. 2013) but may not reflect the full range of historical variability for the rest of the Southwest (Smith 2006d, Rodman et al. 2017).

Applying desired conditions, historical range of variability, and landscape diversity goals to this ecological response unit will benefit from Terrestrial Ecological Unit Inventory applications (see Abella and others (2011) for an example) and site-specific, field-based development of project-level desired conditions. In general, values at the low end of the range might be expected in areas of low topographic relief and on southerly aspects. Conversely, higher tree densities might be expected in drainage bottoms, on toe slopes and northerly aspects, in transition zones with Pinyon-Juniper Woodland, and on some soils that are not capable of supporting a robust herbaceous understory (see terrestrial ecological unit). A robust herbaceous understory can limit suitable germination sites, compete with seedlings, and carries frequent, low-severity fire with flame lengths sufficient to kill regenerating conifers. When comparing apples to apples (for example, southerly aspects to southerly aspects), tree density may increase with slope steepness (Rodman et al. 2017) given soil depth and physical properties do not restrict tree growth (North et al. 2009). Higher densities where local topography includes swales or concave pockets may also provide important fine-scale habitat elements for some species (North et al. 2009).

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Ponderosa Pine-Evergreen Oak

Background Information

Ponderosa Pine-Evergreen Oak is a transition zone between the Ponderosa Pine Forest, Mixed Conifer-Frequent Fire, and the woodland ecological response units. It generally occurs at elevations ranging from 5,500 to 7,200 feet. It is dominated by ponderosa pine and can be distinguished from Ponderosa Pine Forest by somewhat more even-aged dynamics and by one or more well-represented evergreen oak species such as Emory, silverleaf, or gray oak. Other species include juniper and pinyon pine. Ponderosa Pine-Evergreen Oak has two subclasses—one with a more continuous layer of native perennial grasses, forbs, and few shrubs, and one with an understory of primarily native evergreen shrubs, including manzanita, sumac, and mountain mahogany. Common grass species found in this ecological response unit include blue and sideoats gramas, pinyon ricegrass, and muttongrass. Lichens and non-vascular plants such as mosses and liverworts are also important components.

This vegetation type provides habitat used by the federally listed Mexican gray wolf and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include the Arizona toad, Lewis's woodpecker, Iron Creek woodland snail, marsh slug snail, Morgan Creek mountain

snail, western bumble bee, Arizona crested coralroot, cliff brittlebrush, Mimbres figwort, and Piños Altos fame flower.

Ponderosa Pine-Evergreen Oak is relatively common, representing 12 percent of the Gila National Forest.[15] There is also more of it in the forest than in the broader landscape,[16] providing management a greater opportunity to contribute to ecological integrity and sustainability. Approximately 31 percent of this ecological response unit is in the Gila, Aldo Leopold, and Blue Range Wildernesses.

Landscape-scale Desired Conditions (1,000 to10,000+ acres)

1. The perennial grass subtype of Ponderosa Pine-Evergreen Oak is composed of structural and seral stages ranging from young trees through old and is composed of multiple species. Forest appearance is variable but is generally uneven-aged and open at the landscape scale, although it can appear even-aged within tree groups; occasionally larger areas of even-aged structure are present.
2. The forest arrangement is in individual trees, small clumps and groups of trees interspersed within variably sized openings with grasses, forbs, and shrubs. The size, shape, number of trees per group, and number of groups per area vary across the landscape. Denser tree conditions exist on northerly aspects, steep slopes, toe slopes, and in canyon bottoms.
3. All age and structural classes of oak are present with old trees occurring as dominant individuals and small groups occurring typically within openings. In the perennial grasses subtype, shrubs occur at low densities that do not inhibit ponderosa pine regeneration, typically averaging less than 30 percent canopy cover. In the evergreen shrub subtype, shrub canopy cover averages more than 30 percent.
4. Old growth occurs throughout the landscape, generally in small areas as individual old-growth components, or as clumps of old growth. Old-growth components include old trees, standing dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old growth shifts on the landscape over time because of natural growth, death, and disturbance.
5. Ponderosa Pine-Evergreen Oak is composed predominantly of vigorous trees, but declining trees provide snags and coarse woody debris; downed logs (larger than 12 inches diameter at mid-point, more than 8 feet long), and coarse woody debris (over 3 inches diameter). Snags and coarse woody debris are well distributed. The number of snags and amount of coarse woody debris vary by seral state.
6. Dwarf mistletoe occurs in less than 15 percent of host trees in uneven-aged forest structures and in less than 25 percent in even-aged forest structures.
7. Frequent, low-severity fires (fire regime group I) are characteristic of the perennial grasses subtype, including throughout goshawk home ranges. Mixed-severity fire (fire regime group III) is characteristic of the evergreen shrub subtype.

[15] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel Oak Shrubland; while Gambel Oak Shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer at the time this document was prepared.
[16] The broader landscape refers to the context area defined on page 18 in the final assessment report.

Mid-scale Desired Conditions (10 to 1,000 acres)

1. The Ponderosa Pine-Evergreen Oak is characterized by variation in the size and number of tree groups depending on disturbance history, topographic characteristics, and soil properties (see terrestrial ecological unit). The more productive sites contain more trees per group and more groups per area. Openness typically ranges from 10 percent in more productive sites to 70 percent in less productive sites.
2. The mosaic of tree groups is generally composed of uneven-aged forest with all age classes and structural stages, though tree groups and patches may be relatively even-aged. Occasionally, small patches of even-aged forest structure are present. A small percentage of the landscape may be predisposed to larger even-aged patches. Even-aged stand size depends on the timing of regeneration establishment and the timing, frequency, and severity of disturbance events.
3. Average tree density ranges from 20 to 80 square foot basal area per acre depending on disturbance history, topographic characteristics, and soil properties (see terrestrial ecological unit). Denser tree conditions exist on northerly aspects, steep slopes, toe slopes, and in canyon bottoms.
4. Snags are typically 18 inches or larger diameter at breast height and average one to two per acre. Snags between 8 and 18 inches average 5 per acre. Large oak snags (over 10 inches diameter at mid-point) are a well-distributed component.
5. Downed logs average four per acre. Average coarse woody debris, including downed logs varies with seral state and ranges from 5 (Graham et al. 1994, Brown et al. 2003) to 15 tons per acre in forested areas depending on site productivity, disturbance history, and seral state.
6. In both subtypes, the understory consists primarily of native shrubs, perennial grasses, and forbs capable of supporting the natural fire regime with basal vegetation values ranging between 5 and 25 percent, depending on the terrestrial ecological unit.
7. Forest conditions in goshawk post-fledging family areas are similar to general forest conditions except these forests typically contain 10 percent or greater basal area than goshawk foraging areas and the general forest. Nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas.

Fine-scale Desired Conditions (less than 10 acres)

1. Trees typically occur in small groups and are variably spaced with some tight clumps. Crowns of trees in the mid-to-old-age groups are interlocking or nearly interlocking. Trees within groups are of similar or variable ages and may contain species other than ponderosa pine. Patch size, as measured by individual trees or clumps of trees, is typically less than half an acre in the evergreen shrub subtype and less than 1 acre in the perennial grasses subtype.
2. Interspaces surrounding tree groups are variably shaped and composed of a mixture of grasses, forbs, and shrubs reflective of each subtype. Some natural openings include large open-grown oaks.
3. Organic ground cover and herbaceous vegetation provide protection for soil, moisture infiltration, and contribute to plant diversity and ecosystem function.

Objective

1. Treat at least 1,000 and no more than 540,000 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.

Related Plan Content

Content that follows under the Application of Tree Density Ranges of Values provides additional information regarding what is known about the historical range of variability and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading.

Application of Tree Density Ranges of Values

The Madrean influenced Ponderosa Pine-Evergreen Oak ecological response unit (Wahlberg et al. 2014) has very limited information on which to base an understanding of stand or age structure. Most studies have focused on fire history reconstructions. A single study near Durango, Mexico, provides tree density reconstructions (Schussman 2006). Because it is not stated in the Southwestern Regional Office's science summary and desired conditions document (USDA FS 2018), it is assumed that the average minimum and average maximum values presented in the desired condition statements represent the recommendations made by Reynolds and others (2013) for ponderosa pine and pine-oak systems adapted by regional office staff based on the assumption that warmer, drier conditions in this ecological response unit result in lower basal area values as compared to Ponderosa Pine Forest.

Applying desired conditions, historical range of variability, and landscape diversity goals to this ecological response unit will benefit from Terrestrial Ecological Unit Inventory applications (see Abella and others (2011) for an example) and site-specific, field-based development of project-level desired conditions. Careful consideration of the evergreen oak response, related changes in subtype and fire regime, maintenance requirements and available tools could aid in project development and implementation with best efforts being made to avoid converting the perennial grasses subtype to the evergreen shrub subtype and a predominantly frequent, low-severity fire regime into a mixed-severity fire regime (USDA FS 2017a).

In general, values at the low end of the range might be expected in areas of low topographic relief in the perennial grasses subtype (see Terrestrial Ecological Unit Inventory). Conversely, higher tree densities might be expected in drainage bottoms, on toe slopes and northerly aspects, transition zones with Pinyon-Juniper Woodland, and on some soils that are not capable of supporting a robust herbaceous understory (see terrestrial ecological unit). A robust herbaceous understory can limit suitable germination sites, compete with seedlings, and carries frequent, low-severity fire with flame lengths sufficient to kill regenerating woody species. When comparing apples to apples (for example, southerly aspects to southerly aspects), tree density may increase with slope steepness (Rodman et al. 2017) given soil depth and physical properties are not restrictive to tree growth (North et al. 2009). Higher densities where local topography includes swales or concave pockets may also provide important fine-scale habitat elements for some species (North et al. 2009).

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Wahlberg, M., F.J. Triepke, W. Robbie, S. Strenger, D. Vandendriesche, E. Muldavin, and J. Malusa. 2014 in draft. *Ecological Response Units of the Southwestern United States*. United States Department of Agriculture, Forest Service, Southwestern Region, Albuquerque, NM. 201 pp.

Woodland Ecological Response Units

Madrean Pinyon-Oak Woodland

Background Information

The Madrean Pinyon-Oak Woodland ecological response unit occurs from approximately 4,500 to 7,000 feet. This ecological response unit makes up approximately 1 percent of the forest and is transitional between Ponderosa Pine-Evergreen Oak and the Semidesert Grassland, and intergrades with other woodland types. Approximately 16 percent of this ecological response unit is in the Gila and Blue Range Wilderness Areas.

The central tendency of Madrean Pinyon-Oak Woodland is dominated by an open to closed canopy of evergreen oaks, alligator juniper, Mexican pinyon, border pinyon, Chihuahua pine, and other pines with a grassy understory. While the Madrean influence can be observed in the plant communities throughout the southern half of the Gila National Forest, it is not strongly expressed.

Some areas in the forest where plant communities are dominated by tree-form evergreen oaks, with or without pinyon and juniper co-dominants, have been placed in this ecological response unit as a provisional resort, pending updates to the ecological response unit framework. In these cases, composition varies from the communities of the Madrean province, although the structure and dynamics of the system are consistent with Madrean Pinyon-Oak Woodland concepts.

In the Gila National Forest, in the “true” Madrean Pinyon-Oak Woodland, two-needle pinyon is dominant, with Mexican and border pinyon being subordinate, and only occasionally codominant. Chihuahua pine is uncommon but does occur. Gray, silverleaf, netleaf, and Emory oak are the dominant oak species. Alligator juniper is generally present, but subdominant. Sotol, silktassel, sumac, desert buckthorn, beargrass, mountain mahogany, agave, and yucca species are common, as are a variety of grama grasses, three-awns, muhleys, a diversity of other perennial native grasses, forbs, ferns, and cacti. Lichens and non-vascular plants such as mosses and liverworts are also important components.

On the other hand, the “true” Madrean Pinyon-Oak Woodland in the forest deviates somewhat from the central tendency of this ecological response unit concept in that the potential for a grassy understory is limited. This ecological response unit has a significant area mapped on a terrestrial ecological unit characterized by shallow, weakly developed soils on rhyolite or tuff with relatively low moisture-holding capacity and fertility, and a significant bedrock outcrop component (25 percent rock outcrop). This leads to more of an evergreen shrub-dominated understory, rather than a grassy understory. Like the Ponderosa Pine-Evergreen Oak ecological response unit, an understory dominated by perennial grasses may be an indicator of a frequent, low-severity surface fire regime; whereas an understory dominated by evergreen shrubs may be indicative of an infrequent, mixed-severity fire regime. The bedrock outcrop component, combined with steep slopes, may also warrant consideration of some Pinyon-Juniper Woodland fire regime concepts. On these sites, very infrequent high-severity fire may also be characteristic, or factors such as insect and disease may be the only disturbance agents that affect woodland development.

This vegetation type provides habitat used by the federally listed Mexican gray wolf and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on

this habitat, or habitat elements found within this vegetation type include the Arizona toad, Cockerell Holospira snail, Iron Creek woodland snail, western bumble bee, lesser long-nosed bat, pinyon jay, Arizona crested coralroot and Piños Altos fame flower.

Landscape-scale Desired Conditions (1,000 to 10,000+ acres)

1. The Madrean Pinyon-Oak Woodland is characterized by relatively homogenous structure, generally uneven-aged with open or closed canopies. Occasional patches of even-aged structure are present.
2. Old growth occurs throughout the landscape, generally in small areas as individual old-growth components, or as clumps of old growth. Old-growth components include old trees, standing dead trees (snags), downed wood (coarse woody debris), and structural diversity. Declining trees are a well-distributed component providing for snag and coarse woody debris recruitment. The location of old growth shifts on the landscape over time because of natural growth, death, and disturbance.
3. Infrequent mixed-severity fire (fire regime group III) is characteristic, with high-severity fire occurring very infrequently (fire regime group V).

Mid-scale Desired Conditions (10 to 1,000 acres)

1. Most of the woodland is in a moderately open condition with overstory tree cover averaging between 10 and 50 percent or more depending on disturbance history, topographic characteristics, and soil properties (see terrestrial ecological unit). Higher overstory tree cover values typically occur on northerly facing slopes, toe slopes, drainage bottoms, and areas where local topography includes concave pockets.
2. Tree groups vary in size, shape, and number depending on disturbance history, topographic characteristics, and soil properties (see terrestrial ecological unit). The more productive sites contain more trees per group and more groups per acre. Patch sizes, as measured by groups or clumps of trees, range from less than 1 acre to tens of acres, applicable at both the mid and fine scales.
3. Mixed-severity fire and other disturbances occasionally favor the development of even-aged patches at both the mid and fine scales.
4. All structural stages of oak are present with old trees occurring as dominant individuals and small groups.
5. The vegetation community is predominantly vigorous, but declining trees are a component and provide for well-distributed snags and coarse woody debris.
    a. Snags 18 inches diameter at breast height or larger average one per acre; snags in general (8 inches diameter at breast height or larger) average four per acre; large oak snags (over 10 inches diameter at breast height) are also a well-distributed component.
    b. Coarse woody debris varies with seral state but averages 2 to 5 tons per acre.
6. Basal vegetation values vary from less than 1 to 5 percent, depending on disturbance history, seral state, degree of tree canopy closure, soil properties and shrub species (see terrestrial ecological unit).
7. The amount of shrub canopy cover varies between less than 1 to more than 30 percent, depending on disturbance history, seral state, degree of tree canopy closure, soil properties, and shrub species (see terrestrial ecological unit).

Fine-scale Desired Conditions (less than 10 acres)

1. The woodland arrangement is in individual trees, small clumps, and groups of trees interspersed within variably sized openings containing grasses, forbs, and shrubs. Some openings include large, open-grown oaks. Tree groups vary in size and number depending on climate, soil properties, and past disturbance. The more biologically productive sites contain more trees per group and more groups per acre. As a result, patch sizes can vary from less than one acre to tens of acres.
2. Trees within groups are of similar or variable ages and may contain species other than oak, juniper, and pinyon pine.
3. Crowns of trees within the mid-to-old-age groups are interlocking or nearly interlocking. These groups consist of 2 to approximately 40 trees.
4. Organic ground cover and herbaceous vegetation provide protection for soil, moisture infiltration, and contribute to plant diversity and ecosystem function.

Related Plan Content

Content that follows under the Historical Range of Variability and the State of the Science heading is intended to provide additional information regarding the range of historical variability, and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading, as previously described.

Historical Range of Variability and the State of the Science

Historical information supporting this ecological response unit comes from 11 tree-ring studies from southeastern Arizona into northern Mexico (Schussman and Gori 2006). Most of these studies focused on fire return intervals. Stand and age structure information comes from three of these 11 studies. See Schussman and Gori (2006) and Wahlberg and others (2014) for science summaries relevant to this ecological response unit.

References

Schussman, H. and D. Gori. 2006. *Historical Range of Variation and State and Transition Modeling of Historical and Current Landscape Conditions for Madrean Pine-Oak of the Southwestern U.S*. Prepared for the USDA Forest Service, Southwestern Region by The Nature Conservancy, Tucson, AZ. 35 pp.

Wahlberg, M., F.J. Triepke, W. Robbie, S. Strenger, D. Vandendriesche, E. Muldavin, and J. Malusa. 2014 in draft. *Ecological Response Units of the Southwestern United States.* United States Department of Agriculture, Forest Service, Southwestern Region, Albuquerque, NM. 201 pp.

Pinyon-Juniper Woodland (Persistent Woodland)

Background Information

Regionally, this ecological response unit is a broad grouping of different plant associations for descriptive purposes, with variable species composition, but similar structure and function. Disturbances (such as fire, insects, and disease) are typically infrequent and of high severity. These disturbance patterns create and maintain the even-aged nature of this type. Development takes place in distinctive phases from open grass-forb to early and mid-aged open canopy, to

mature closed canopy conditions. Where fire is very infrequent, the fire regime is usually attributed to local site characteristics such as rock outcrop, et cetera. On these sites, factors such as insects and disease may be the only disturbance agents that affect woodland development. Common tree species are pinyon pine, oneseed juniper, and alligator juniper. Understories are frequently sparse and composed of native perennial grasses and annual and perennial forbs. Cacti and rock ferns are not uncommon. The shrub component is typically sparse. Oak species, manzanita, silktassel, mountain mahogany, sotol, and agave are common shrub or sub-shrubs found in this ecological response unit. Because of shallow soils and the predominance of rock outcrop, a proportion of the Gila National Forest's mature Pinyon-Juniper Woodland is in open-canopy, very infrequent fire systems.

This vegetation type provides habitat used by the federally listed Mexican gray wolf and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include the Arizona toad, Iron Creek woodland snail, western bumble bee, lesser long-nosed bat, pinyon jay, Arizona crested coralroot, Davidson's cliff carrot, Mimbres figwort, and Piños Altos fame flower.

Pinyon-Juniper Woodland is currently mapped as the most common ecological response unit, representing approximately 26 percent of the forest[17] and ranging in elevation from 4,500 to 7,500 feet. There is a higher percentage of Pinyon-Juniper Woodland in the Gila National Forest than in the broader landscape,[18] providing management a greater opportunity to contribute to ecological integrity and sustainability. Approximately 17 percent of this ecological response unit is in the Gila, Aldo Leopold, and Blue Range Wildernesses.

Landscape Scale Desired Conditions (1,000 acres-10,000+ acres)

1. The Pinyon-Juniper Woodland is characterized by even-aged patches of pinyon and juniper species that at the landscape level, form multi-aged woodlands.
2. Old growth occurs throughout the landscape and is often concentrated in mid- and fine-scale units as patches of old growth. Old-growth components include old trees, standing dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old growth shifts on the landscape over time because of natural growth, death, and disturbance.
3. Very old trees (more than 300 years old) are present, while snags and older trees with dead limbs and tops are scattered across the landscape.
    a. Snags 18 inches diameter at root crown and above average one per acre.
    b. Snags 8 to 18 inches at root crown average five snags per acre.
    c. Coarse woody debris increases from early successional states through later successional states and averages 2 to 5 tons per acre.
4. Fire as a disturbance is less frequent and variable due to differences in understory conditions, though some sites can carry frequent surface fire. Most fires that do occur are mixed to high severity (fire regimes III, IV, and V).

[17] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel oak shrubland. while Gambel oak shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer at the time this document was prepared.
[18] The broader landscape refers to the context area defined on page 18 in the final assessment report.

Mid-scale Desired Conditions (10 to 1,000 acres)

1. Tree density and canopy cover are high, shrubs are sparse to moderate, and herbaceous cover may be low and discontinuous, depending on the terrestrial ecological unit.
2. Trees occur in even-aged patches ranging from young to old, where patch sizes range from tens to hundreds of acres.
3. Understory basal vegetation values (shrubs, grasses, and forbs) typically range from less than 5 percent to 25 percent, depending on soil properties (see terrestrial ecological unit) and seral state.

Management Approach

Restoration, Adaptation, and Verification of the Ecological Response Unit Map

While working with the ecological response unit map during the assessment, forest staff developed concerns regarding the classification accuracy within the woodland vegetation types. For example, much of the woodland area on North Star Mesa is mapped as Pinyon-Juniper Woodland, but soils information and observations in the field suggest that historically these areas were most likely Juniper Grass Woodland. They are mapped as Pinyon-Juniper Woodland because the high extent and degree of departure from historical conditions are high. Conversely, there are open canopy areas mapped as Pinyon-Juniper Woodland on the south end of the forest that satellite imagery and field observation indicate would be better classified as Juniper Grass. Restoration projects in woodland ecological response units might be best initiated by field validating the classification using the most current best available science before determining which desired conditions apply. Documentation of field validation will be important in coordinating with the regional office in future updates to the ecological response unit map.

Further, both the Regional Climate Adaptation Strategy (USDA FS 2023) and a recent science synthesis regarding the effects of mechanical treatments in woodland systems (Jones 2019) would be important to consider when developing projects in this and all other woodland types. Jones concluded that there is a wide disparity in response to treatments for variables such soil stability, watershed productivity, wildlife responses, herbaceous functional groups and fuels management warrant a cautious approach (2019). Jones' meta-analysis found some studies had positive effect, some had negative effects, but the majority had no significant effect. This signals working in woodlands does not support the intended effects unless all the site variables that could influence outcomes are addressed in treatment design and post-treatment management (Jones 2019). The Regional Climate Adaptation Strategy suggests deferment of treatments aimed at reducing tree density in high-vulnerability juniper woodland settings because local mortality from warming trends and drought are likely to do the thinning for us; therefore, limited management resources might be better spent elsewhere where climate is less likely to affect tree density. All things considered and with concerns for the persistence of species like the pinyon jay, large landscape-scale treatments of pinyon and juniper woodlands may not be advisable. Smaller treatment areas dispersed across space and time, supported by controls and monitoring (Jones 2019) are probably management's best bet outside the wildland-urban interface.

Related Plan Content

Content that follows under the Historical Range of Variability and the State of the Science heading provides additional information regarding what is known about the historical range of variability and the state of the science, to aid in implementing the Ranges of Values and

Application of Science management approach under the All Upland Ecological Response Units heading, as previously described.

Historical Range of Variability and the State of the Science

Information about persistent woodlands comes exclusively from four studies on the Colorado Plateau. See Gori and Bate (2007) and Wahlberg and others (2014) for science summaries relevant to this ecological response unit.

References

Gori, D. and J. Bate. 2007. Historical Range of Variation and State and Transition Modeling of Historical and Current Landscape Conditions for Pinyon-Juniper of the Southwestern U.S. Prepared for the USDA. Forest Service, Southwestern Region by The Nature Conservancy, Tucson, AZ. 141 pp.

Jones, A. 2019. Do Mechanical Vegetation Treatments of Pinyon-Juniper and Sagebrush Communities Work? A Review of the Literature. Wild Utah Project. Technical Report. DOI:10.13140/RG.2.2.12538.13760.

USDA FS (United States Department of Agriculture – Forest Service). 2023a. Regional climate adaptation strategy: Integrating existing tools, science, and collaborative outcomes for climate adaptation, mitigation, and socioeconomic vulnerability. Version 9. USDA Forest Service technical guide. Southwestern Region, Albuquerque, NM. 158 pp.

Wahlberg, M., F.J. Triepke, W. Robbie, S. Strenger, D. Vandendriesche, E. Muldavin, and J. Malusa. 2014 in draft. *Ecological Response Units of the Southwestern United States*. United States Department of Agriculture, Forest Service, Southwestern Region, Albuquerque, NM. 201 pp.

Pinyon-Juniper Grass and Juniper Grass Woodlands

Background Information

The Pinyon-Juniper Grass and Juniper Grass Woodlands are typically found between 4,500 and 7,500 feet. Although they have the same elevational range and may intergrade, Juniper Grass Woodland is most often found in warmer and drier settings, beyond the environmental limits of pinyon. Tree species include oneseed juniper, alligator juniper, and pinyon pine, with pinyon absent in Juniper Grass Woodland. Frequent, low-severity disturbances are characteristic of these systems, which create and maintain an uneven-aged open canopy woodland. Understories are dominated by a diversity of native perennial grasses and both annual and perennial forbs. Shrubs are absent or scattered.

These vegetation types provide habitat used by the federally listed Mexican gray wolf and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include the Arizona toad, western bumble bee, Gunnison's prairie dog, lesser long-nosed bat, Iron Creek woodland snail, pinyon jay (Pinyon-Juniper Grass only), Arizona crested coralroot, and Greene's milkweed.

Pinyon-Juniper Grass and Juniper Grass Woodlands are not uncommon on the Gila National Forest (approximately 9 percent and 4 percent, respectively).[19] There is a higher representation of Pinyon-Juniper Grass Woodland, but a lower representation of Juniper Grass Woodland as compared to the broader landscape.[20] Approximately 21 percent of Pinyon-Juniper Grass Woodland is in the Gila, Aldo Leopold, and Blue Range Wilderness Areas. Approximately 6 percent of Juniper Grass Woodland is in the Gila and Blue Range wilderness areas. Opportunities for management to contribute to ecological integrity and sustainability in Pinyon-Juniper Grass Woodland are higher than in Juniper Grass Woodland, although it is important to both ecological response units.

Landscape-scale Desired Conditions (1,000 acres to 10,000+ acres)

1. Pinyon-Juniper Grass and Juniper Grass Woodlands are generally uneven-aged and open in appearance.
2. Old growth occurs throughout the landscape, generally in small areas as individual old-growth components, or as clumps of old growth. Old-growth components include old trees, standing dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old growth shifts on the landscape over time because of natural growth, death, and disturbance.
3. Fires are typically frequent and low severity (fire regime I).

Mid-scale Desired Conditions (10 to 1,000 acres)

1. Snags and coarse woody debris are scattered across the landscape.
    a. Snags 18 inches diameter at root crown or above average one per acre
    b. Snags 8 to 18 inches diameter at root crown average five per acre
    c. Coarse woody debris increases from early seral states through late seral states and averages 1 to 3 tons per acre.
2. Scattered shrubs and a dense herbaceous understory including native grasses, forbs, and annuals are present to support frequent surface fires, with shrub canopy cover averaging less than 30 percent and understory vegetation basal area values averaging between about 10 and 30 percent, depending on soil properties (see terrestrial ecological unit).

Fine-scale Desired Conditions (less than 10 acres)

1. Trees occur as individuals, but occasionally in small groups ranging from young to old. Individual trees and clumps range from less than one-tenth to one acre. Occasionally patches of uneven-aged structure are present because of disturbance and regeneration establishment timing. A small percentage of the landscape may be predisposed to larger even-aged patches, based on physical site conditions that favor mixed-severity and stand-replacement fire and other disturbances.
2. Organic ground cover and herbaceous vegetation provide protection for soil, moisture infiltration, and contribute to plant diversity and ecosystem function.

[19] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel oak shrubland. While Gambel oak shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer at the time this document was prepared.
[20] The broader landscape refers to the context area defined on page 18 in the final assessment report.

Objectives

1. In Pinyon-Juniper Grass, treat at least 4,000 and no more than 145,800 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.
2. In Juniper Grass, treat at least 4,000 and no more than 88,000 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.

Management Approach

Restoration and Verification of the Ecological Response Unit Map

Please refer to the management approach in the Pinyon-Juniper Woodland section with the same name.

Related Plan Content

Content that follows under the Historical Range of Variability and the State of the Science heading provides additional information regarding what is known about the historical range of variability and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading, as previously described.

Historical Range of Variability and the State of the Science

According to Gori and Bate (2007), most reference sites are small, isolated mesas. Caution is warranted when applying historical range of variability in larger, more contiguous landscapes. Gori and Bate also suggest that the studies establishing historical range of variability may be conservative estimates of historical tree density. While there are many more studies to define historical range of variability than for the persistent woodlands, Gori and Bate assert that the number and distribution of available studies are limited, given the extensive distribution of these systems in the Southwest. See Gori and Bate (2007) and Wahlberg and others (2014) for science summaries relevant to this ecological response unit.

References

Gori, D., and J. Bate. 2007. *Historical Range of Variation and State and Transition Modeling of Historical and Current Landscape Conditions for Pinyon-Juniper of the Southwestern U.S.* Prepared for the USDA. Forest Service, Southwestern Region by The Nature Conservancy, Tucson, AZ. 141 pp.

Wahlberg, M., F.J. Triepke, W. Robbie, S. Strenger, D. Vandendriesche, E. Muldavin, and J. Malusa. 2014 in draft. *Ecological Response Units of the Southwestern United States*. United States Department of Agriculture, Forest Service, Southwestern Region, Albuquerque, NM. 201 pp.

Shrubland Ecological Response Units

Mountain Mahogany Mixed Shrubland

Background Information

Mountain Mahogany Mixed Shrubland occurs in the foothills, canyon slopes, and lower mountain slopes of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico extending north into Colorado. These shrublands are often associated with exposed sites, rocky substrates, dry conditions, and recurrent but infrequent historical fire that limited tree growth. Scattered trees or inclusions of grassland patches may be present, but the vegetation is typically dominated by a variety of shrubs including mountain mahogany, and gray, silverleaf, or turbinella oak.

This general description fits much of the Mountain Mahogany Mixed shrubland in the forest, which typically occurs between 4,500 and 7,500 feet. However, oak-dominated areas, primarily in the Gila Wilderness, have been mapped as mountain mahogany mixed shrubland when they are more accurately described as early seral states. This is the result of stand-replacement fire in what would most likely have been mapped pre-fire as Mixed Conifer-Frequent Fire or Ponderosa Pine-Evergreen Oak. Additionally, this shrubland is mapped in gentle sloping terrain in the Burro Mountains where oak species, predominantly as a shrub lifeform, are dominant. Mountain mahogany, desert ceanothus, catclaw, silktassel, sumac, and beargrass are typically subordinate. Historical overgrazing and granitic soils strongly influence existing vegetation in this area, which may represent an altered grassland state.

This vegetation type provides habitat used by the federally listed Mexican gray wolf and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include the Arizona toad and western bumble bee.

Mountain Mahogany Mixed Shrubland is relatively common in the forest, representing 5 percent of the land area,[21] but is rare within the broader landscape,[22] making management of this ecological response unit important to ecological integrity and sustainability. Approximately 51 percent of this ecological response unit is in the Gila, Aldo Leopold, and Blue Range Wilderness Areas.

Landscape-scale Desired Conditions (1,000 to 10,000+ acres)

1. The Mountain Mahogany Mixed Shrubland vegetation community is a mosaic of structural and seral states ranging from young trees through old and is composed of multiple species.
2. Tree cover is less than 10 percent, except in dissimilar inclusions driven by local topography, microclimate, and soil properties (see terrestrial ecological unit).
3. Infrequent, stand-replacement fire (fire regime group IV) is characteristic of this vegetation type.

[21] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel oak shrubland. while Gambel oak shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer at the time this document was prepared.
[22] The broader landscape refers to the context area defined on page 18 in the final assessment report.

Mid-scale Desired Conditions (100 to 1,000 acres)

1. Shrub cover is greater than 10 percent and may exceed 30 percent in late seral states, depending on disturbance history, elevation, aspect, topography, and soil properties (see terrestrial ecological unit). Shrub basal area values typically range from 5 to 15 percent or more.

Related Plan Content

Content that follows under the Historical Range of Variability and the State of the Science heading provides additional information regarding what is known about the historical range of variability and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading, as previously described.

Historical Range of Variability and the State of the Science

Studies from similar shrubland ecosystems establish the historical range of variability for mountain mahogany mixed shrubland, as no research specific to this system as conceptualized in the ecological response unit classification has been conducted. See Schussman (2006) and Wahlberg and others (2014) for science summaries relevant to this ecological response unit.

References

Schussman, H. 2006a. *Historical Range of Variation and State and Transition Modeling of Historical and Current Landscape Conditions for Interior Chaparral of the Southwestern U.S.* Prepared for the USDA. Forest Service, Southwestern Region by The Nature Conservancy, Tucson, AZ. 24 pp.

Wahlberg, M., F.J. Triepke, W. Robbie, S. Strenger, D. Vandendriesche, E. Muldavin, and J. Malusa. 2014 in draft. *Ecological Response Units of the Southwestern United States*. United States Department of Agriculture, Forest Service, Southwestern Region, Albuquerque, NM. 201 pp.

Grassland Ecological Response Units

Background Information

Grassland ecological response units collectively represent 9 percent[23] of the Gila National Forest, and generally occur from 4,500 feet to 8,500 feet in elevation. Forest management is important to the ecological integrity and sustainability of grasslands, especially the Montane/Subalpine Grasslands that are more common in the Gila National Forest than within the broader landscape.[24]

These vegetation types provide habitat used by the federally listed Mexican gray wolf and the monarch butterfly, which is a candidate for listing. Species of conservation concern that rely on this habitat, or habitat elements found within this vegetation type include the Arizona toad, western bumble bee, Gunnison's prairie dog, Greene's milkweed, and lesser long-nosed bat.

[23] Based on ecological response unit map dated August 25, 2015, with tabular adjustments for Gambel oak shrubland. while Gambel oak shrubland is an ecological response unit farther north, the acres mapped on the Gila National Forest represent a seral state in the mixed conifer.

[24] The broader landscape refers to the context area defined on page 18 in the final assessment report.

Colorado Plateau-Great Basin Grassland

This grassland ecological response unit is typically found on slightly cooler and wetter sites than the Semidesert Grassland and warmer and drier sites than the Montane/Subalpine Grasslands. It is typically associated with woodland and forested ecological response units where pinyon pine is part of the potential natural vegetation. It is most common on the northern one-third of the forest but is mapped as far south as the Mimbres Valley. Common grasses may include but are not limited to blue grama, squirrel-tail, Wright's muhley, western wheatgrass, wolftail, and threeawn species. Historically, this ecological response unit may have had more than 10 percent shrub cover, but less than 10 percent tree cover. Approximately 5 percent of the Colorado Plateau-Great Basin Grassland occurs in the Gila Wilderness.

Montane/Subalpine Grasslands

The coolest and wettest of the grassland ecological response units, the Montane/Subalpine Grasslands often harbor several distinct plant associations with varying dominant herbaceous species. Such dominant species may include Arizona fescue, mountain, screwleaf or Wright's muhley, pine dropseed, a variety of sedges, bulrushes, wire rush, Rocky Mountain iris, and corn lily. Trees that may occur along the periphery of these grassland meadows include Engelmann or blue spruce, corkbark, and Douglas- or white fir. Meadows are typically seasonally wet, which is tied to snowmelt. Montane/Subalpine Grasslands are frequently associated with the Herbaceous Riparian ecological response unit. Tree and shrub cover were historically less than 10 percent each. Approximately 5 percent of the Montane/Subalpine Grasslands occur in the Gila Wilderness.

Semidesert Grassland

The Semidesert Grassland is the warmest and driest of the grasslands and is typically associated with shrubland and woodland ecological response units. Historically, this ecological response unit may have had more than 10 percent shrub cover, but less than 10 percent tree cover. Of the four Semidesert Grassland subtypes, the foothill grassland is the best fit for most of this system in the Gila National Forest. Sideoats; black, hairy, and blue grama grasses; wolftail; plains lovegrass; and a variety of threeawn and muhley species are common. Curly mesquite may be dominant in areas of heavier clay soils. While shrubs and sub-shrubs are subordinate, they are common and sometimes abundant. The most common shrubs are sotol, beargrass, and yucca, although other shrub and sub-shrub species may include yerba de pasmo, Wright's beebrush, turbinella and gray oak, winterfat, mariola, featherplume, and others. The presence and abundance of acacia, mimosa, turpentine bush, and honey mesquite may be interpreted as indicators of drought or disruptions in the natural disturbance regimes. Approximately 2 percent of the Semidesert Grassland occurs in the Gila Wilderness.

All Grasslands

Landscape-scale Desired Conditions (1,000 to 10,000+ acres)

1. Vegetation is dominated by native herbaceous plants. Biological diversity is high. In mid- to late seral states, species composition is at least 66 percent, similar to site potential (see terrestrial ecological unit). There are inclusions of tree or shrub cover, or both, and variability within the landscape as well as ecotones on the fringes.
    a. Old-growth components may exist but are limited to some savanna settings with sparse tree cover, where there are scattered large trees and occasional snags. The location of

these components shifts over time because of natural growth and mortality, drought, and fire.

2. Fire plays its natural role on the landscape, thereby limiting conifer encroachment. Vegetation height and density carry frequent, low-severity fire.[25]
3. There is regeneration, seed head production, and a balance of native perennial grasses and forb species, including warm and cool season species in most years, reflecting the capability of soils, weather patterns, and the range of natural variability.

Mid-scale Desired Conditions (100 to 1,000 acres)

1. The composition, structure, and distribution of native vegetation reflect a mix of early, middle, and late seral states. Early seral states will typically contain more forbs, with older states being dominated by a diversity of native perennial grasses and fewer forbs. Native plant species are present in all age classes and are healthy, vigorous, and reproducing.
2. Tree and shrub cover are each less than 10 percent, except in the Colorado Plateau-Great Basin Grassland and Semidesert Grassland where shrub cover, but not tree cover, may occasionally exceed 10 percent.
3. Biological diversity is high. Within site capability, a mosaic of vegetation density exists across the landscape, ranging from densely vegetated areas to small bare areas that result from natural processes, such as freeze-thaw action or burrowing by small mammals.
4. Vegetation conditions provide hiding, nesting, and thermal cover in contiguous blocks for wildlife, including small mammals and songbird nesting.

Fine-scale Desired Conditions (less than 100 acres)

1. Within site capability, a mosaic of vegetation density exists across the landscape, ranging from densely vegetated areas to small bare areas that result from natural processes, such as freeze-thaw action or burrowing by small mammals.
2. Organic ground cover and herbaceous vegetation provide protection for soil, moisture infiltration, and contribute to plant diversity and ecosystem function.

Objectives

1. In Colorado Plateau-Great Basin Grassland, treat at least 2,000 and no more than 59,500 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.
2. In Montane/Subalpine Grasslands, treat at least 4,600 and no more than 94,800 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.
3. In Semidesert Grassland, treat at least 800 and no more than 88,900 acres per decade using a combination of naturally ignited wildfire, prescribed fire, and mechanical methods to maintain or move toward desired conditions.

[25] Low severity as defined by monitoring trends in burn severity data. LANDFIRE classifies natural fire severity in grasslands as high because the aboveground portions of grasses are consumed. Monitoring trends in burn severity describes severity in terms of percent change from previous condition; because perennial grasses are relatively quick to sprout after fire, this is typically classified as low severity.

Related Plan Content

Content that follows under the Historical Range of Variability and the State of the Science heading provides additional information regarding what is known about the historical range of variability and the state of the science, to aid in implementing the Ranges of Values and Application of Science management approach under the All Upland Ecological Response Units heading, as previously described.

Historical Range of Variability and the State of the Science

While grassland ecosystems are well studied, most studies are not able to provide the same quality or level of detailed information to describe historical range of variability that is available for forests and woodlands. This is because of the herbaceous nature of these communities and the widespread overgrazing that occurred after European settlement. See Finch (2004), Smith and Schussman (2007), Schussman (2006) and Wahlberg and others (2014) for science summaries relevant to grasslands.

References

Finch, D.M. (ed.). 2004. *Assessment of grassland ecosystem conditions in the Southwestern United States*. Volume 1. USDA Forest Service Gen. Tech. Rep. RMRS-GTR-135-vol. 1. Rocky Mountain Research Station, Fort Collins, CO. Pp. 11–17.

Schussman, H. 2006. *Historical Range of Variation and State and Transition Modeling of Historical and Current Landscape Conditions for Semi-Desert Grassland of the Southwestern U.S.* Prepared for the USDA Forest Service, Southwestern Region by The Nature Conservancy, Tucson, AZ. 53 pp.

Smith, E. and H. Schussman. 2007. *Historical Range of Variation for Montane and Subalpine Grasslands of the Southwestern U.S.* Prepared for the USDA Forest Service, Southwestern Region by The Nature Conservancy, Tucson, AZ. 43 pp.

Wahlberg, M., F.J. Triepke, W. Robbie, S. Strenger, D. Vandendriesche, E. Muldavin, and J. Malusa. 2014 in draft. *Ecological Response Units of the Southwestern United States*. USDA Forest Service, Southwestern Region, Albuquerque, NM. 201 pp.

Soils

Background Information and Description

Soil is a critical watershed and ecosystem component, as well as being a complex and dynamic ecosystem in and of itself. It consists of a mineral component, organic matter, air, water, and living soil organisms. It is formed over time by interactions between climate, parent material, topography, and organisms, both above and below ground. It provides air, water, nutrients, and physical support to plants, and is where many plant seeds accumulate and are stored until conditions are right for their germination and establishment. The topsoil layer is vitally important, as this is where most of the plant and animal organic matter accumulate, decompose, and eventually become soil nutrients. It is the zone of maximum biological activity and nutrient release. A shovel-full of topsoil contains more biodiversity than an entire forest.

Soil receives and processes rainfall and is a key factor in influencing how much rainfall becomes surface runoff, how much is stored for slow sustained delivery to streamflow and groundwater recharge, and how much is used for soil processes (Potyondy et al. 2011). Soil is not only an active participant in water and nutrient cycling, but also an active participant in global carbon cycling, as carbon dioxide is both released by the activity of microorganisms and sequestered as soil organic carbon. It also contributes to thermal regulation, absorbing heat energy when temperatures are high, and releasing it when temperatures are cool.

When management results in accelerated soil loss, these soil functions are altered or impaired, and ecosystem services are reduced. While some soil functions or a degree of soil function may be recovered within a human lifetime, soil itself is essentially a non-renewable resource due to the time it takes for soil to form. It has been estimated that in the water-limited Southwest, it can take 300 to 1,000 years to form an inch of soil (USDA FS 1986).

At an ecosystem level, soil condition assessments are conducted using the Forest Service Southwestern Region's most current soil quality technical guidance. These assessments are based on the status of indicators, which reflect the soil's ability to support essential functions, relative to their natural capability.

At a watershed level, these assessments inform the watershed condition classification's soil condition indicator. The watershed condition classification evaluates soil condition in terms of erosion, productivity, and contamination. Contamination is primarily considered in terms of atmospheric deposition of sulfur or nitrogen (Potyondy et al. 2011) but may include pollutants associated with mining activities or landfills. The main concern with atmospheric deposition of sulfur or nitrogen is acidification. In the Gila National Forest and the Southwest generally, soils are naturally well buffered against such changes in acidity.

Desired Conditions (All Scales)

1. The soil can perform essential functions, sustain biological productivity and overall ecosystem and watershed health, and contribute to resilience. The ability of the soil to sustain ecosystem services within its natural capability is high.

    a. Soil functions are broadly resilient to the impacts of human activities and natural disturbances, including long-term climatic variability and extreme weather events, where resilience is measured by the area where soil condition is restored to, or maintained in satisfactory or equivalent condition class. Naturally unstable and other high-risk soils

(see Terrestrial Ecological Unit Inventory information) are influenced primarily by natural processes.

b. Overstory and understory plant species composition support soil functions and are each at least 66 percent similar to site potential as measured by each particular terrestrial ecological unit but can vary considerably at fine- and mid-scales owing to a diversity of seral conditions (see also All Upland Ecological Response Units landscape scale desired conditions).

c. Organic ground cover (leaf litter, needle cast, coarse woody debris, nonvascular plants and biological crusts, and basal area) and vegetative canopy cover contribute to soil functions and maintain soil loss rates at near natural rates, thereby contributing to high water quality and watershed and ecosystem function (see also All Upland Ecological Response Units landscape-scale desired conditions).

d. No new gullies or headcuts are forming and existing ones are stabilizing or have stabilized.

e. Soil organic carbon represents reference conditions for a given ecological response unit (see Regional Carbon Supplement), but are transitory and adaptive with site potential, characteristic disturbances, and long-term trends in climate (see All Upland Ecological Response Units landscape-scale desired conditions).

Objectives

1. Implement at least one action per year to improve an area of "impaired" or "unsatisfactory" soil condition.
2. Implement at least 10 projects per decade to address active headcuts or gully erosion. Examples of projects meeting the intent of this objective include construction or maintenance of watershed structures, or road maintenance and improvement of drainage features associated with active headcuts or gullies. Examples of projects not meeting the intent of this objective include prescribed fire and mechanical vegetation treatments.

Standard

1. Best management practices identified in the project proposal or decision documentation will be followed to mitigate negative impacts to water quality and the long-term productivity of the land (see Related Plan Content).

Guidelines

1. Projects and activities should incorporate the applicable management potentials, capabilities, hazards, suitability, and other interpretations for each terrestrial ecological unit into design and implementation (see the Terrestrial Ecological Unit Inventory information).
2. New activities that encourage concentrated use (for example, recreation sites, landings, construction, stock tanks, mineral supplements, and corrals) on poorly drained or saturated, unsatisfactory soils, or those with severe erosion hazards or high mass wasting hazards, should be mitigated (see the Terrestrial Ecological Unit Inventory information).
3. All projects and activities should be designed and implemented so that they do not result in downward trends in soil condition and include actions to improve those soils not in satisfactory condition (or equivalent condition class), within the capacity of the project.

Management Approach

Adaptation, Restoration and Relationships

Forest staff and leadership look for opportunities to work collaboratively with soil and water conservation agencies and groups, permittees, and other interested stakeholders to restore and maintain soil functions.

Related Plan Content

Best Management Practices Resources

The following is a sampling of resources available to facilitate best management practice development. It is not a comprehensive list, just a place to get started.

Busse, M.D., K.R. Hubbert, and E.E.Y. Moghaddas. 2014. *Fuel reduction practices and their effects on soil quality*. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. Albany, CA. General Technical Report PSW-GTR-241. 156 pp.

Dwire, K.A., K.E. Meyer, G. Riegel, and T. Burton. 2016. *Riparian Fuel Treatments in the Western USA: Challenges and Considerations*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-352. 156 pp.

Edwards, P.J., F. Wood, and R.L. Quinlivan. 2016. *Effectiveness of Best Management Practices that Have Application to Forest Roads: A Literature Synthesis*. U.S. Department of Agriculture, Forest Service, Northern Research Station. General Technical Report NRS-GTR-163. 171 pp.

New Mexico Department of Game and Fish (NMDGF). 2019. Bridge and Culvert Construction Guidelines for Stream, Riparian and Wetland Habitats. Habitat Handbook. Santa Fe, New Mexico. 12 pp.

New Mexico Department of Energy, Minerals, Natural Resources Department (NM EMNRD), State Forestry Division. 2008. New Mexico Forest Practices Guidelines. Available online at https://www.emnrd.nm.gov/sfd/wp-content/uploads/sites/4/ForestPracticesGuidelines2008.pdf.

USDA FS (United States Department of Agriculture-Forest Service). 2012. National Best Management Practices for Water Quality Management on National Forest System Lands. FS-990a. Vol. 1. 165 pp.

Glossary

Best management practices are site- and project-specific methods or measures to prevent or mitigate potential adverse impacts to environmental quality, especially water quality. They include protection measures to address potential detrimental changes in water temperatures, blockages of water courses, deposits of sediment in streams, streambanks, shorelines, lakes, wetlands, and other bodies of water that are likely to affect water quality or aquatic habitat seriously and adversely.

Erosion hazard is a management interpretation describing the relative magnitude (slight, moderate, or severe) of accelerated soil loss that would occur if all vegetative cover were

removed. This interpretation is based on soil loss modeling with the Rangeland Hydrology and Erosion Model developed by the Agricultural Research Station. Soil surface texture, slope shape, and steepness are the primary influences on the erosion hazard rating. While management never intentionally proposes to remove all vegetative cover, this interpretation is useful for understanding the role of vegetative cover in soil stability.

Management interpretations, in the context of soil survey, are "predictions of soil behavior for specified land uses and specified land management practices. They are based on soil properties that directly influence the specified use of the soil" (USDA NRCS 2018). They do not prohibit or advocate for specific management actions; rather they convey potential opportunities, challenges, considerations, or consequences of a particular land use.

Mass wasting hazard is a management interpretation that indicates the relative likelihood of mass movements such as landslides, debris flows, and other hillslope failures. Ratings are low, moderate, or high (USDA FS 1986). This interpretation is a product of physical site characteristics and soil properties. Unlike the erosion hazard interpretation, it is not dependent on removal of all or even some vegetation cover. The hazard exists even if the site reflects desired conditions. Management should anticipate consequences if soils with high mass wasting hazards are disturbed.

Parent material is a soil science term describing both the primary origin of the matter from which the soil is formed, either geologic or organic, and its last mode of transport. Parent materials in the Gila National Forest are geologic in nature and are dominated by volcanic and sedimentary rock types. Modes of transport include flowing water (alluvium), wind (eolian), gravity (colluvium), and standing water in lakes (lacustrine). If the material was not transported after its original deposition, it is referred to as residuum.

Renewable resources have been defined in several ways. Here are two:

- Can be renewed as quickly as they are used up and can, in theory, last indefinitely, and
- Are naturally replenished within a human lifetime.

Site potential is a term used to describe the characteristic ecological conditions in the latest successional state, resulting from interactions among climate, soil, and vegetation.

Site potential boundaries is a concept linked to site potential that reflects the fact that not all soils were "created equal" in their ability to resist erosion, capture, store and release water, cycle nutrients, support vegetation and therefore their ability to provide ecosystem services. Differences are due to variability in the five soil-forming factors: (1) climate, (2) topography, (3) parent material, (4) interactions with living organisms (biota), and (5) time.

References

Potyondy, J.P., T.W. Geier, P. Luehring, M. Hudy, B. Roper, R. Dunlap, T. Doane, G. Kujawa, P.T. Anderson, J. Hall-Rivera, J. Keys, M. Ielmini, A. Acheson, R. Thompson, B. Davis, S. Friedman, K.D. Rosa, and T. Brown. 2011. Watershed Condition Framework: A Framework for Assessing and Tracking Changes to Watershed Condition. U.S. Department of Agriculture, Forest Service, Washington DC. FS-977. 34 pp.

USDA FS (United States Department of Agriculture-Forest Service). 1986. Terrestrial Ecosystem Survey Handbook. Southwestern Region (R3). Albuquerque, NM.

USDA NRCS (Natural Resources Conservation Service). 2018. National Soil Survey Handbook Part 617: Soil Survey Interpretations. National Soil Survey Office, Lincoln, Nebraska.

Water Quality

Background Information

The Federal Clean Water Act is administered by the Environmental Protection Agency, although the Agency delegates many functions to the Army Corps of Engineers and state governments. The New Mexico Water Quality Control Commission sets standards that define water quality goals by designating uses (for example, domestic water supply, irrigation, livestock watering, wildlife habitat, and aquatic life), setting criteria to protect those uses, and establishing provisions to preserve water quality. Use attainability studies are conducted on a 3-year rotating basis to examine water quality standards for changes to reflect new technology, data, or scientific understanding.

Every two years, the New Mexico Environment Department (NMED) Surface Water Quality Bureau prepares an assessment of the quality of the state's surface waters, which includes a list of impaired waters. Impaired waters are those waters determined to be in non-attainment of standards for one or more of their designated uses. Due to limitations associated with budget and personnel, not all waters are assessed in any given 2-year cycle. The state water quality assessment is released in a document called the State of New Mexico Clean Water Act 303(d)/305(b) Integrated List and Report.

In 2010, the State of New Mexico's Water Quality Control Commission designated all perennial rivers, streams and wetlands located within wilderness areas as Outstanding National Resource Waters.[26] At the time this document was published, only those perennial rivers, streams, and wetlands within wilderness areas carry this designation. The criteria for outstanding national resource waters designations in New Mexico are set forth in the Water Quality Standards in Section 20.6.4.9.B of the New Mexico Administrative Code. These waters are subject to the same water quality criteria as other waters with the same designated uses but receive a higher degree of protection from human activities that could negatively alter their water quality status. Any activities that may impact Outstanding National Resource Waters have an associated reporting requirement, including fire suppression activities and piscicide applications for native fish recovery.

Nonpoint source pollutants are the primary source of water pollution in the state of New Mexico and in the Gila National Forest (NMED 2016). Point source pollutants can be traced back to a single point, such as pipes or ditches from industrial or sewage treatment facilities. Nonpoint source pollution is caused by water moving over and through the ground and carrying natural and human-made pollutants into streams and waterbodies. It remains the Nation's largest source of water quality problems. Common nonpoint source pollutants include temperature (too warm), excessive sediment, metals, bacteria, and nutrients. Activities potentially generating nonpoint source pollutants on National Forest System lands include mining activities, fire, grazing, roads, timber and fuelwood harvesting, recreational uses, and ground disturbance generated by off-highway vehicle use. Atmospheric deposition of pollutants created by emissions from off-forest industry can also affect water quality in the forest (see Air Quality section).

[26] See https://www.env.nm.gov/swqb/ONRW/FAQ/index.html

The interrelationships between watershed condition, water quality, and aquatic ecosystems have contributed to the rise of integrated, watershed-based approaches to manage water quality at both the state and federal government levels. The State of New Mexico's Nonpoint Source Management Plan[27] describes the state's adaptive and progressive approach to address nonpoint source water quality issues, which includes requirements for watershed-based plans (NMED 2019), which share some similarities with the watershed-based plans that are part of the Forest Service's Watershed Condition Framework (see Watersheds).

Desired Conditions

1. Water quality meets or exceeds state water quality standards and provides for the attainment of designated uses. Water quality is sustained at a level that retains the biological, physical, and chemical integrity of aquatic systems, and benefits the survival, growth, reproduction, and migration of native aquatic and riparian species (see also Soils, Watersheds, Riparian and Aquatic Ecosystems plan components and related content).

Management Approaches

Outstanding National Resource Waters and Wildland Fire Management

As described in the background information section, Outstanding National Resource Waters are protected from human activities that could negatively impact their water quality status. Under the direction provided in this plan, fire management is the primary activity with the potential to affect Outstanding National Resource Waters. State regulations require fire management to limit potential degradation using best management practices. Retardant avoidance areas are an example of a fire management best management practice. Additional resources for specialists looking for best management practices are identified under the Related Plan Content subheading in the Soils section of the plan. Planned actions are subject to a permitting process and reporting requirements. Emergency response actions are subject to notification and reporting requirements.

Adaptation, Restoration and Relationships

Forest leadership looks for opportunities to align the forest's priority watersheds with those identified as priorities by New Mexico Environment Department Surface Water Quality Bureau. Forest leadership and staff recognize that coordination and partnership with the Bureau on total maximum daily load determinations, the development and implementation of watershed-based restoration and adaptation plans, and projects designed to leverage Clean Water Act grant funding is essential to accomplishing shared water quality goals. As part of developing watershed-based plans, forest leadership and staff look for opportunities to include decommissioning of unneeded roads to improve water quality.

Glossary

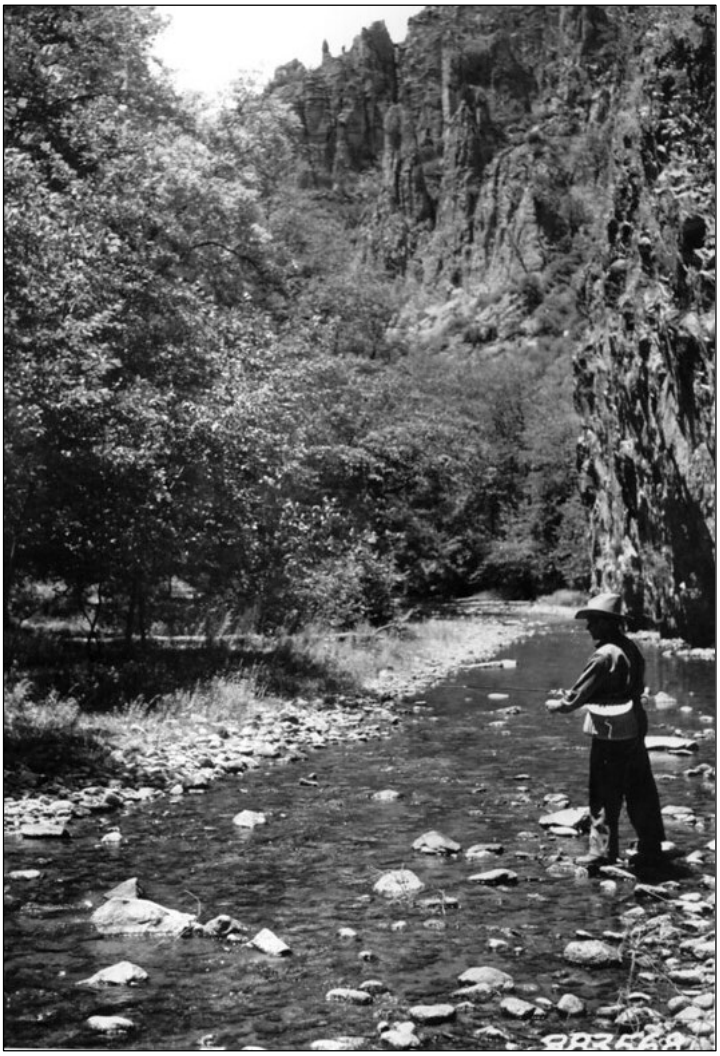
Best management practices are site- and project-specific methods or measures to prevent or mitigate potential adverse impacts to environmental quality, especially water quality. They include protection measures to address potential detrimental changes in water temperatures, blockages of water courses, deposits of sediment in streams, streambanks, shorelines, lakes, wetlands, and other bodies of water that are likely to affect water conditions or fish habitat seriously and adversely.

[27] See https://www.env.nm.gov/surface-water-quality/nps-plan/.

Total Maximum Daily Load is a calculation of the maximum amount of a pollutant allowed to enter a waterbody without contributing to a violation of water quality standards.

Reference

NMED (New Mexico Environment Department). 2019. Non-Point Source Management Plan. Santa Fe, NM: New Mexico Environment Department. Retrieved from NPS Management Plan (nm.gov)



Trout fishing in the Gila Wilderness. USDA Forest Service photo by W.H. Shaffer, 1939. FS#383568

Watersheds

Background Information

In the American Southwest, every drop of water is important and will only become more vital in the future. With increasing human demand on water resources and uncertainty about future climate variability, managing for healthy, resilient watersheds is of the utmost importance to people and terrestrial, riparian, and aquatic ecosystems and species. Securing favorable conditions of water flow, consistent with federal and state water laws, was one of the foundational reasons for which the national forests and grasslands were established. It is the goal of watershed management.

Water from the Gila National Forest supports many uses in southwestern New Mexico, and farther downstream into southern Arizona. Information about New Mexico water law, water rights, and water uses is found in the Water Uses section of this plan. Streams, springs, seeps, and other natural waters are centers of high biological diversity in arid landscapes, and their ecological health is essential. Wildlife is more concentrated near water sources than in the surrounding landscape, and aquatic and semiaquatic species are dependent on these limited and scattered resources. Collectively, surface waters contribute to connectivity for wildlife across the landscape, potable water supplies, agricultural uses (livestock watering and irrigation), and recreation. Water, the water cycle, and springs are important to indigenous cultures.

The forest is also an important source of recharge to groundwater in the Gila-San Francisco, Mimbres, Middle and Lower Rio Grande, Las Animas, Hot Springs Artesian, and Lordsburg Underground Water Basins declared by the New Mexico Office of the State Engineer. Groundwater recharge occurs because of mountain-front or alluvial mechanisms. Mountain-front recharge is very important in arid and semiarid regions like the Southwest. It occurs as the result of higher precipitation and lower temperatures in the mountainous areas, the relatively shallow nature of mountain soils compared to lower-lying areas, and the fractured nature of the bedrock. Alluvial recharge occurs because of high-flow events, originating from streams that begin in the forest. The significance of alluvial recharge has been emphasized in the Mimbres subbasin (Conover and Akin 1942).

Locally important, but relatively small, shallow alluvial aquifers are found in valley bottoms across the plan area. Groundwater is both recharged and discharged from these aquifers. Zones of recharge and discharge may change over time along any stream in response to surface runoff contributions and changes in channel and floodplain location and materials. Also of local importance are perched aquifers, which are relatively small areas of high groundwater tables above the larger, regional groundwater tables. Although comprehensive information describing their extent and distribution is not available, these aquifers support springs, seeps, and wetlands in the Gila National Forest. Groundwater is used in the forest and on surrounding lands for many purposes, including drinking, waste disposal, domestic use, livestock and wildlife watering, and to supply Forest Service facilities.

Watershed condition is integral to all aspects of resource management and use. Good watershed management maintains the productive capacity of soils, protects water quality and quantity, sustains native species, provides for state-designated beneficial water uses, and reduces the threat of fire and flood damage to Forest Service infrastructure and downstream values. The Gila National Forest intersects 202 6th level watersheds (see Spatial Scales).

Watershed condition framework[28] was initiated in 2011 and is a comprehensive Forest Service approach for proactively implementing integrated restoration. The watershed condition framework includes the watershed condition classification (Potyondy et al. 2011), which is a nationally consistent approach to classifying watershed condition. It uses a comprehensive set of 12 indicators representing the underlying biological and physical functions and processes affecting watershed condition. The primary emphasis is on aquatic and terrestrial processes and conditions that Forest Service management activities can influence. Using this classification model, watersheds are evaluated and classified as functioning properly, functioning at risk, or impaired function (Potyondy and Geier 2011). Information related to the condition of 6th level watersheds can be found on the publicly accessible website at Watershed Condition Framework (arcgis.com), which is updated annually if conditions change. Many of the desired conditions and other plan components for watersheds and riparian and aquatic ecosystems in this plan have their origins in the science that supports the watershed condition classification. All indicators are addressed in plan direction but may not be addressed directly in this subsection. Cross-references are provided.

The watershed condition framework provides a mechanism to enhance communication and coordination with external agencies and partners; is the mechanism for identifying priority watersheds; and serves as an outcome-based performance measure for documenting actions to improve watershed condition at forest, regional, and national levels.

Priority Watersheds

Priority watersheds are identified using the watershed condition framework (Potyondy et al. 2011) as areas where plan objectives for restoration focus on maintaining or improving watershed condition. These priorities will likely change over the life of this plan. Forest leadership identifies priority watersheds based on (1) ecological values, and restoration and adaptation priorities; (2) alignment with regulatory requirements and objectives; (3) regional and national Forest Service priorities and those of other agencies, Tribes and Pueblos, organizations, and stakeholders; and (4) the importance of water and watersheds.

Watershed restoration action plans are associated with priority watersheds identified through the watershed condition framework. The watershed condition framework map viewer[29] contains the current watershed condition framework priority watersheds and associated information. The Gila National Forest also has "legacy" priority watersheds that pre-date the watershed condition framework. These are associated with Ecosystem Management Areas established under the 1986 Forest Plan. These watersheds and associated projects do not have associated watershed restoration action plans but will remain priorities until restoration activities are completed. The plan direction and other content that follows applies to all watersheds, including priority watersheds.

Desired Conditions (4th, 5th, and 6th Level Watersheds)

1. Watersheds are functioning properly (or equivalent condition class) and exhibit high geomorphic, hydrologic, and biotic integrity relative to their potential condition as evaluated at the 6th level watershed as indicated by the following:

[28] See https://www.fs.usda.gov/biology/watershed/condition_framework.html.
[29] See https://usfs.maps.arcgis.com/apps/MapSeries/index.html?appid=f4332e5b80c44874952b57e1db0b4407

a. Water quality is sustained at a level that retains the biological, physical, and chemical integrity of aquatic systems (see also Water Quality).

b. Quantity and timing of water flows support ecological structure and functions, including aquatic and riparian species diversity, and downstream human values. Watershed resilience to drought, higher air temperatures, reduced snowpack, erratic runoff timing, and other effects of long-term climate variability is sustained, maintained, or restored.

c. There is a low likelihood of losing defining ecosystem components affecting hydrologic and sediment regimes due to natural disturbance or human activity as indicated by the following.

    i. Vegetation structure supports fire frequencies, severities and extents that are characteristic of the watershed's component ecological response units (see also All Upland Ecological Response Units).[30]

    ii. Insect and disease levels are within the natural range of variability (see also All Upland Ecological Response Units).

    iii. Understory vegetation communities are composed of native or desired non-native plant composition (at least 66 percent similarity to site potential) and herbaceous canopy and ground cover is at near-natural levels, as defined in the watershed's component Terrestrial Ecological Units (see also All Upland Ecological Response Units).

    iv. Invasive and noxious plant populations are absent (see also Non-Native Invasive Species).

2. Watersheds support high-quality, resilient aquatic habitat and stream channel conditions. All native aquatic communities and life histories appropriate to the site and watershed are present and self-maintaining. Desired non-native species, such as triploid rainbow trout in reservoirs may be present, but do not negatively impact the presence, distribution, or persistence of native species (see also Riparian and Aquatic Ecosystems and Wildlife, Fish, and Plants).

    a. Riparian vegetation communities are composed of native species and are in proper functioning condition or equivalent classification (see also Riparian and Aquatic Ecosystems).

    b. The density, distribution, and maintenance of roads and linear motorized features do not substantially alter hydrologic and sediment regimes.

    c. Soil condition is in satisfactory, functioning properly, or equivalent condition category (see also Soils).

3. Watersheds provide for groundwater recharge and sustain groundwater quantity and quality as indicated by a functioning properly (or equivalent) condition class rating.

4. Groundwater provides a water source for aquatic and riparian wildlife habitat and for beneficial uses within the forest boundary.

[30] There are many potential ways that this may be evaluated. Seral state proportion departure could be used alone, with greater than 33 percent departure from the reference being the metric. Or spatial predictions of the probability of high-severity fire (should a fire occur) prepared by Parks and others at the Rocky Mountain Research Station (2018) could be informative at identifying the extent to which soil functions, including hydrologic function might be compromised by existing fuel structure. Or a combination of both could support evaluation of risk.

Objectives

1. Improve condition class in at least five 6th level watersheds within the planning period.
2. Aside from unavoidable consequences that may result from naturally ignited wildfire, maintain condition class in those 6th level watersheds currently in proper functioning condition (or equivalent condition class) over the planning period.

Standards

1. Project-specific best management practices will be developed, identified in the proposed action and followed as part of the interdisciplinary process and as a principal mechanism for controlling nonpoint source pollutants to protect beneficial uses and riparian and aquatic ecosystem values (see Best Management Practices Resources in the Soils section).
2. Landscape-scale projects will incorporate activities identified in watershed restoration action plans, other watershed-based plans, or other restoration and adaptation plans to move toward soil and watershed desired conditions.

Guidelines

1. Management should strive for proper functioning condition (or equivalent condition class) in all indicators of watershed condition as described in the watershed condition classification technical guide (Potyondy and Geier 2011). If the Forest Service watershed condition model changes, the intent of this guideline will be met by managing for equivalent conditions as described by that model.
2. New and reauthorized management activities should not negatively impact groundwater quality or quantity to the extent that ecosystems are adversely affected.

Management actions in designated municipal watersheds or those watersheds with human values at the outlet or in the floodplain should assess risk and develop mitigation measures to provide for favorable conditions of water flow (see also Timber, Forest, and Botanical Products and Wildland Fire and Fuels Management).

Management Approaches

Adaptation, Restoration and Relationships

Forest staff and leadership continue to link landscape and watershed-scale restoration and adaptation efforts. Management seeks to address the root cause of watershed-related issues, rather than just the symptoms, wherever and whenever possible. In this process, staff and leadership look for opportunities to work collaboratively with diverse agencies and groups, permittees, volunteers, and other stakeholders to restore, maintain and enhance watershed condition and actively support the New Mexico State Water Plan policies, goals, and strategies for watershed management.

Glossary

Best management practices are site- and project-specific methods or measures to prevent or mitigate potential adverse impacts to environmental quality, especially water quality. They include protection measures to address potential detrimental changes in water temperatures, flow regimes, excessive deposits of sediment in streams, streambanks, shorelines, lakes, wetlands, and other bodies of water that are likely to affect water quality or aquatic habitat seriously and adversely.

Endemic species are those that occur only in a certain area. In this context, the term is used to describe species that exist only in the Gila National Forest, or only in New Mexico and are found nowhere else in the world.

Narrow endemic species may only occur in a single drainage or in a small elevational range within a drainage.

References

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Erosion checkpoint. USDA Forest Service photo by F.W. Quesenberry, 1939. FS#386740

Photos from top to bottom, left to right: Fall Colors by Kristina Deem; early post-fire recovery along Whitewater Creek (USDA Forest Service photo); Chiricahua leopard frog photo by Sandra Taylor; Gila trout–photo by Dustin Myers; river flowing through Gila National Forest (USDA Forest Service photo)

Riparian and Aquatic Ecosystems

Background Information

Riparian areas are affected by the presence of surface and subsurface, perennial, or intermittent, flowing or standing bodies of water. They are composed of distinctively different vegetative species than adjacent areas where water is more limited. In these systems, terrestrial and aquatic ecological processes are integrated within watersheds.

Riparian areas are more productive than other vegetation communities in terms of plant and animal biomass per acre. As a result, they provide some of the most important habitat on the Gila National Forest and in the Southwest and are vital to maintaining regional biodiversity (Gregory et al. 1991, Naiman et al. 1993, Patten 1998, Sabo et al. 2005). The Gila River supports some of the highest numbers of bird species in the lower 48 states of the United States, including important breeding habitat (Gori et al. 2014). Aquatic habitats and fish productivity are directly related to the health and function of riparian systems (Knutson and Naef 1997). Riparian and aquatic ecosystem management have a strong and direct relationship.

Stream systems and their riparian zones function as important natural corridors for the movement of organisms and materials through landscapes. Riparian corridors are important for migrating animals and for dispersal for plant propagules. Plant propagules include seeds, roots, and stems from which new plants can become established. Movements of species facilitate gene flow on a broad scale, thereby contributing to genetic and biological diversity. Riparian ecosystems can also function as refuges during periods of widespread environmental shifts, such as periods of prolonged drought, thereby conserving regional biodiversity over the long term (Naiman et al. 2005).

Riparian and aquatic ecosystems within the forest provide essential habitat for wildlife and aquatic species, including federally recognized and proposed threatened or endangered, species of conservation concern, and rare or narrow endemic plants. These species include the federally listed Chiricahua leopard frog, narrow-headed gartersnake, Northern Mexican gartersnake, southwestern willow flycatcher, western yellow-billed cuckoo, Chihuahua chub, Gila trout, loach minnow, spikedace and New Mexico meadow jumping mouse. It also includes the monarch butterfly, which is a candidate for listing. Species of conservation concern that depend these ecosystems include the Arizona toad, roundtail chub, Gila woodpecker, Lewis's woodpecker, Rio Grande sucker, bearded mountain snail, “Gila” mayfly (*L. dencyanna*), *A.c. argenticola* (no common name), *A.t. animorum* (no common name), *A.t. inermis* (no common name), *A.t. mutator* (no common name), Sonoran snaggletooth snail, two stonefly species (*T. jacobii and C. caryi*), Whitewater Creek woodland snail, Arizona montane vole, Goodding’s onion, Metcalfe’s penstemon, Mimbres figwort, Mogollon clover, New Mexico groundsel, Wooton’s hawthorn, yellow lady’s-slipper, Gila springsnail, and New Mexico hot springsnail.

In addition to supporting high levels of species and genetic diversity, riparian systems provide numerous other ecological services. Riparian forests exert strong controls on stream microclimate, including temperature regimes, which regulates many biological processes and ecosystem functions. Water temperature influences the distribution, metabolism, behavior, and life cycle events of stream organisms (Naiman et al. 2005, among others). Riparian forests also contribute substantial amounts of organic matter to streams, which is the foundation of stream food webs. Along with providing nutrients, riparian zones also serve as buffers against pollution from upland runoff and are critical to protecting water quality. Woody debris from riparian

forests influence stream channel shape and function, sediment routing (Patten 1998), and instream habitat. Healthy riparian areas slow water

movement, which raises the water table, expands the saturation zone, and recharges aquifers. They also dissipate stream energy, which can reduce flood damage. Soils in riparian ecosystems play a key role in nutrient and water storage and distribution.

The diversity of species and ecological processes in riparian and aquatic ecosystems is sustained by dynamic natural disturbance regimes. Riparian areas are adapted to disturbance and defined by change; however, they are susceptible to degradation and loss. The ability of riparian and aquatic ecosystems to maintain ecological integrity and sustainability depends largely on the presence of water; the type, extent, frequency, and magnitude of disturbance; the status of their condition prior to the disturbance; and the natural events or human activities that occur at the same time or after the disturbance.

Riparian condition is currently assessed and described using the interdisciplinary proper functioning condition field protocols.[31] This dataset is used in the watershed condition classification process, described in the Watersheds section of the plan. The proper functioning condition protocol provides for assessing both streamside riparian and wetland areas, as well as those riparian and wetland areas associated with standing water. It describes three condition categories: proper functioning condition, functional at risk, and nonfunctional, and provides for trend analysis.

Riparian areas in proper functioning condition have high ecological integrity, resilience, and adaptive capacity. A rating of functional at risk suggests ecological integrity, resilience, adaptive capacity, and sustainability are compromised and indicates a need to adjust management. A rating of nonfunctional suggests an area is no longer capable of supporting the ecological and human use values it previously supported and may require substantial changes in management and investments in restoration to regain function.

More than half of the Gila National Forest's riparian and aquatic ecosystems were not properly functioning at the time this document was prepared because of one or more of the following reasons:

1. Non-native invasive aquatic species;
2. Alterations in the amount, timing, and duration of water flows due to drought, diversions and withdrawals, or post-fire effects;
3. Poor water quality related to excessive sediment or temperature;
4. Riparian and wetland vegetation conditions resulting from drought, fire or post-fire effects, excessive herbivory by livestock, grazing and browsing wildlife, or both; and
5. Degraded channel shape and function resulting from the same factors impacting riparian and wetland vegetation conditions and alterations of water flow.

[31] See https://efotg.sc.egov.usda.gov/references/public/CO/TR_1737-15.pdf and https://www.blm.gov/or/programs/nrst/files/Final%20TR%201737-16%20.pdf.

Direction contained in the subsections that follow, and in the Watersheds, Non-Native Invasive Species and Wildlife, Fish, and Plants sections of the plan is all-important to restoring and sustaining the ecological integrity of riparian management zones.

Riparian Management Zones

The following plan direction and other related content apply to riparian management zones. These zones include those portions of watersheds around lakes, perennial and intermittent streams, groundwater-dependent ecosystems, wetlands, and high-elevation wet meadows that have characteristic riparian vegetation and provide riparian function or have the ecological potential to do so. It encompasses any surface water and its associated aquatic habitat, connected shallow groundwater, aquatic and riparian vegetation, associated soils (that is, hydric and alluvial), and contributing fluvial landforms.

The exact width of riparian management zones will vary, but the following should be considered when developing the appropriate riparian management zone at the project level, providing special attention to the first 100 feet from the edges of all permanent surface water (Forest Service Handbook 1909.12 chapter 20):

1. Presence of at-risk or rare species;
2. Ecological or waterbody type;
3. Hydrologic and habitat connectivity;
4. Width and slope of the riparian vegetation zone, soil type and hydrologic soil group and geomorphic factors;
5. Condition of the riparian area, adjacent land use, and threat of contamination from pollutants or chemicals and;
6. Significant topographic changes, such as abrupt canyon edges, may be used as boundaries if activities beyond the canyon walls do not negatively influence the functioning of the riparian management zone.

4th and 5th Level Watershed-Scale Desired Conditions

1. Riparian, wetland, and aquatic ecosystems support the distribution, diversity, and complexity of watershed and watershed-scale features that, in turn, support biodiversity, contribute to the recovery of listed species, and support the persistence of species of conservation concern, as well as native and desired non-native aquatic and riparian-dependent plant and animal species. The system's ability to support unique physical and biological attributes is sustained by necessary soil, water, and vegetation characteristics.
2. The ecological function of riparian and wetland areas is resilient to natural disturbances, animal use, human activities, and long-term climate variability (see also Watersheds).
    a. Riparian and wetland areas have reduced fire frequency and severity compared to the surrounding upland vegetation communities, owing to characteristics such as surface water and saturated soils. Fire is infrequent and patchy, and riparian areas and wetlands are resilient and able to recover following fire.
    b. Regeneration, growth, and persistence of riparian and wetland dependent vegetation is supported by natural variation in depth to groundwater, volume of surface water, and the timing and magnitude of their fluctuations. Flooding and scour occur at a frequency and

magnitude characteristic of the watershed, or at least supports the regeneration of dependent native vegetation and a diverse plant structure including herbaceous, shrub and tree species of all ages and size classes.

3. Woody vegetation and high levels of structural and compositional diversity provide food, cover, and water for terrestrial, riparian-dependent, semi-aquatic and aquatic wildlife species. Riparian areas have sufficient structural diversity to support high bird species diversity and provide an abundance of nesting and foraging opportunities for neotropical migrant birds, raptors, and cavity-dependent wildlife. The density and structure of vegetation provides site-appropriate shade to regulate water temperature in streams.
4. All seral states are present and there is a low overall departure from reference proportions as described in the most recent Region 3 Seral State Proportion Supplement, which is a positive indicator of ecosystem condition.
5. Overall plant community composition, functional group diversity, or both are greater than 66 percent similar to site potential but can vary considerably at the 6th level watershed or fine scales owing to disturbance history and the diversity of seral conditions.
6. Spatial connectivity is provided within and between watersheds. Where appropriate, riparian corridors provide important dispersal corridors, access to new habitats, and perpetuation of genetic diversity. Within riparian corridors and wetland areas, aquatic, riparian, and upland components reflect their natural linkages and range of variability. Drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries and intact habitat refugia. These connections provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic, riparian-dependent, and many upland species of plants and animals.
7. Riparian and aquatic conditions protect or improve dependent resources while allowing for management of other compatible uses.

6th Level Watershed-Scale Desired Conditions

1. A diverse vegetation structure, including mature trees, snags, logs, and coarse woody debris, is present to provide habitat for dependent species. The species composition and structural diversity of vegetation communities provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration. The amount, spatial distribution, and sizes of coarse woody debris and fine particulate organic matter are sufficient to sustain physical complexity and stability.
2. The composition, structure, and function of riparian and aquatic ecosystems are resilient to the frequency, extent, and magnitude of disturbances, animal uses, human activities, and long-term climate variability.
3. Floodplains and adjacent upland areas provide diverse habitat components necessary for migration, hibernation, or extended periods of inactivity specific to the needs of riparian and wetland dependent species including the Chiricahua leopard frog, New Mexico meadow jumping mouse, Arizona montane vole, narrow-headed gartersnake, beavers, and others.
4. Riparian areas with the site potential for a strong tree component have large trees and snags to support species including beaver, yellow-billed cuckoo, bald eagle, common black hawk, various bat species, and others. Woody regeneration is sustainable, approximating reference conditions according to the overall percentage of early to mid-seral states (see 4th and 5th Level Watershed-Scale Desired Condition 4).

5. Vegetative groundcover ranges between 5 to 30 percent depending on site potential for a given terrestrial ecological unit or as determined through field reconnaissance of reference sites, while the amount of bare ground likewise reflects site potential with a greater than 66 percent similarity to that site potential.
6. Riparian and wetland areas can filter sediment, aiding floodplain development, dissipating wind and water energy, and contributing to water retention and groundwater recharge. Soil functions are maintained in satisfactory condition as defined by the most current Southwestern Region soil quality technical guidance. Conditions support the life history requirements of burrowing animals, including at-risk species.
7. Riparian vegetation consists mostly of native species that support a wide range of animal species. Invasive plant and animal species are rare or absent. Native riparian and wetland-dependent vegetation dominate bank cover. Upland, dry-site vegetation is not increasing, and the extent of riparian communities is widening or has achieved its potential and is within the natural range of variability.
8. The distribution and health of riparian, wetland, and aquatic communities perpetuate ecosystem functions and biodiversity. They are resilient to natural disturbances, human activities, and climate variability (see also Watersheds). Riparian and aquatic health and resilience are determined by a functioning properly (or equivalent condition class) rating for watershed condition indicators addressing aquatic physical and biological processes at a 6th level watershed scale. These include:
    a. Riparian and aquatic habitat provides for self-sustaining populations of native fish, amphibians, reptiles, and other aquatic and semi-aquatic species within their historical and future distribution. Habitat is resilient to long-term climate variability and extreme events. Streams and rivers provide a variety of habitats for aquatic species, including deep pools and overhanging banks, structure provided by large wood, off-channel areas, and protective cover within the potential of each fine-scale unit.
    b. Streams exhibit full connectivity (more than 95 percent of historical aquatic habitats are still connected) except where barriers to movement are necessary to protect native species and prevent movement of non-native species (for example, fish barrier structures to protect Gila trout populations from non-native fish). Ephemeral watercourses provide for dispersal, access to new habitats, and perpetuation of genetic diversity, as well as nesting and foraging for riparian, aquatic, and semi-aquatic species.
    c. Streambank and slope stability, wood delivery to streams and floodplains, and other organic matter input, thermal shading, microclimates, and water quality are consistent with natural disturbance regimes.
    d. The connections of floodplains, channels, and water tables distribute flood flows and sustain diverse habitats. Hydric and alluvial soil functions are maintained, supporting natural sediment regimes, patterns of water flow, and amount and distribution of plant-available water and nutrients. Width-to-depth ratios are what would be expected in the absence of human influence and are stable in at least 95 percent of the 6th level watershed.
    e. Within their type and capability, riparian vegetation communities are composed of a diversity of native species, functional groups, and multiple age classes (at least two) to provide large woody debris and groundcover, protect streambanks and capture sediment, dissipate stream energy, and protect and enrich soil.

f. Wetlands and groundwater-dependent ecosystems in upland settings, including springs, seeps, and wet meadows, persist in size, seasonal and annual timing, and exhibit groundwater table elevations within their natural range. They also support stable, vigorous, native herbaceous and woody vegetative communities. Wet meadows have substantive ground cover, functional group diversity, and a diverse species composition, especially of grasses and forbs.

g. Groundwater discharge supports base flows and water temperature in streams, springs, seeps, and wetlands that sustain the function of surface and subsurface aquatic ecosystems within their natural range of variability.

9. Riparian and aquatic conditions protect or improve dependent resources while allowing for management of other compatible uses.

Fine-scale Desired Conditions (Riparian Management Zone Associated with Stream Reach, Ecological Response Unit Polygon, or Point Feature)

1. Riparian areas are in proper functioning condition, or equivalent condition class as demonstrated by the following:

   a. Frequent flood flows (approximately 1.5-year recurrence interval) can spread out across the floodplain to dissipate energy, deposit sediment, recharge floodplain aquifers, inundate riparian vegetation, and redistribute organic matter and nutrients. In upland environments, saturation at or near the land surface maintains hydric soils and the potential natural riparian or wetland vegetation community.

   b. Riparian systems are in balance with the water and sediment being supplied by the watershed (that is, no excessive erosion or deposition) and floodplain and channel characteristics (such as rocks, woody material, vegetation, floodplain size, and overflow channels) are adequate to dissipate energy. In streamside riparian systems, sinuosity, gradient, and width-to-depth ratios are in balance with the landscape setting (that is, landform, geology, and bioclimatic region). Streams are laterally and vertically stable and are not incising.

   c. Riparian vegetation communities are dominated by vigorous native species, indicative of the site's soil moisture characteristics, and are capable of stabilizing streambanks, dissipating energy during flood flows, and regulating water temperatures within state water quality standards. There is an adequate diversity of species and age classes (at least two) for maintenance and recovery.

   d. Native upland species are present where they are part of the potential natural vegetation community and are absent where they are not. Upland species composition and density in riparian corridors do not contribute to increases in fire frequency or severity.

   e. Upland and riparian plant communities are an adequate source of large woody debris, which is recruited into the stream system at near-natural levels.

   f. The area occupied by riparian and wetland vegetation is expanding or has achieved its potential extent, as defined by topography, soil properties, and water availability.

2. Hydric and alluvial soil functions are maintained, supporting natural sediment regimes, patterns of water flow, and amount and distribution of plant-available water and nutrients.

3. The location, characteristics, and condition of all riparian management zones are known.

Objective

1. Implement at least one riparian improvement project annually.[32]

Standards

1. Decision's authorizing uses and activities in riparian management zones must provide preferential consideration to riparian and aquatic resources. Project-specific best management practices will be developed, identified in the proposed action, and followed as the principal mechanism for demonstrating preferential consideration and controlling nonpoint source pollutants to protect beneficial uses and riparian and aquatic ecosystem values (see Best Management Practices Resources in the Soils section).
2. Activities in and around surface waters will follow decontamination procedures that prevent the spread of non-desirable fungus, disease, non-native or invasive organisms.[33]
3. Special use permits for new groundwater or surface water uses will not be issued if it is determined those uses would have an adverse impact on riparian or aquatic resources within the forest.

Guidelines

1. To minimize sediment delivery to streams, new construction or realignment of roads and motorized routes, recreation sites or other infrastructure should not be located within the 100-year floodplain or within 300 feet of a riparian management zone. Exceptions for stream crossings are made where determined necessary by site-specific analysis to reduce potential long-term investments in maintenance or adverse impacts (a downward trend or movement away from desired conditions) to floodplains and water resource features.
2. New or redesigned stream crossings, such as bridges and culverts, should be wide enough to at least pass the bankfull width unimpeded and incorporate aquatic organism passage design[34].
3. Projects should leave downed woody material in riparian management zones in place, except where interdisciplinary teams determine it exists at excessive levels and poses a fire or safety concern.
4. All projects and activities that include riparian management zones within their area should provide for the maintenance of those riparian management zones that are in proper functioning condition (or equivalent condition class) and include actions to improve riparian management zones that are not in proper functioning condition, within the scope of the project.
5. New or reconstructed spring developments should be designed to maintain or restore ecological conditions and functions for the dependent ecosystems and maintain water quality and quantity.

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[32] Treatments to address noxious or invasive species do not count toward accomplishing this objective. Those treatments contribute to achieving the objectives in the non-native invasives species section of the plan.
[33] Preventative measures are described in the most current version of Preventing Spread of Aquatic Invasive Organisms Common to the Southwestern Region, Declining Amphibian Task Force Fieldwork Code of Practice, and in the most current National Interagency Fire Center guidance.
[34] The New Mexico Department of Game and Fish's bridge and culvert construction guidelines (https://www.wildlife.state.nm.us/wpfb-file/bridge-and-culvert-construction-guidelines-for-stream-wetland-and-riparian-habitats-2019-pdf/) may be helpful and inform design criteria.

Management Approaches

Inventory, Monitoring, and Relationships

While remote sensing products derived from satellite data, like the National Inventory of Wetlands, are providing more and better information on the location and some characteristics or conditions of riparian and aquatic ecosystems, they cannot substitute for field-based inventory and monitoring data. This is especially true in the Southwest, where the widths of many stream systems and the size of springs and seeps are often too small to be captured at the product scales commonly available. With limited staff and financial resources to conduct field-based inventory and monitoring, most of the fieldwork that has been completed was associated with project-level activities. Forest leadership and staff seek opportunities to engage partners and volunteers in multi-party inventory and monitoring efforts to accomplish this important work.

Restoration and Relationships

Riparian and aquatic ecosystems are a management priority for national headquarters, the Southwestern Region, and the Gila National Forest. This priority is demonstrated in the following ways:

1. Riparian and aquatic ecosystem conditions are part of many approved recovery plans for federally listed species. These recovery plans and consultation with the U.S. Fish and Wildlife Service can compel the Forest Service to implement riparian and aquatic ecosystem protection measures, and this forest plan articulates and further enforces the forest's obligation to recovery plans.
2. Riparian and aquatic ecosystem conditions are heavily weighted in the national watershed condition framework. Many of the essential projects identified in watershed restoration action plans are riparian and aquatic ecosystem projects.
3. The Southwestern Region's 2022 Strategic Plan defines multiple objectives and outcomes that prioritize riparian and aquatic ecosystem conditions with established timeframes for completion.
4. The Southwestern Region's Riparian and Aquatic Ecosystem Strategy prioritizes these ecosystems and underpins the forest plan's desired conditions.
5. Direction within this plan requires programs and activities to support maintenance and achievement of desired conditions for watershed, riparian, and aquatic ecosystems.
6. Direction within this plan requires projects and activities to contribute attainment of proper functioning riparian conditions where possible, regardless of whether the plan objective, project, or activity is expressly defined as a riparian or aquatic project.

Riparian and aquatic ecosystem restoration can involve a watershed-based approach, site-specific activities, or both, as appropriate. It can involve reducing or temporarily removing management-related stressors such as recreation or grazing, reintroduction of beaver, beaver dam analogs, and other structural design features that promote any combination of channel reconfiguration, bank and channel stabilization, and floodplain restoration as appropriate for the site and circumstances.

When circumstances necessitate structural design features, native riparian plantings, loose rock structures, and beaver dam analogs are preferred. This is because they require relatively minimal investment and maintenance and are least likely to cause unintended damage if they fail. For

structural features that require more engineering, forest leadership and staff would seek out the appropriate professional expertise. As with other restoration efforts, management looks for opportunities to work collaboratively with diverse agencies and groups, permittees, volunteers, and other stakeholders who value these ecosystems and the ecosystem services they provide when in proper functioning condition. Where beaver reintroduction is identified as appropriate, forest staff would coordinate with the New Mexico Department of Game and Fish to ensure the necessary authorizations were obtained.

Water Projects

Implementation of standard 3 in this section of the plan involves proposals by non-Forest Service entities for new groundwater wells, surface water diversions or impoundments, or changes in existing points of diversion or impoundment within the Gila National Forest. Agency staff with appropriate expertise evaluate those proposals to determine the likely effects to riparian and aquatic ecosystems and their dependent resources. If staff conclude that adverse impacts are likely, but modification to the proposal could allow it to go forward without adverse impacts, those proposals could be authorized with the appropriate modifications. If staff conclude there are no modifications that could prevent adverse impacts, those proposals would not be authorized.

There may be proposals for water projects outside the forest's boundaries, which may have adverse impacts on riparian and aquatic ecosystems within the forest boundaries. The authority and responsibility for authorizing these projects lies solely with the New Mexico Office of the State Engineer. In these cases, agency staff with the appropriate expertise are likely to evaluate those impacts and communicate concerns to the Office of the State Engineer. Just as a member of the public with a permitted water right has an opportunity to be involved and communicate their concerns, the agency can participate in the process based on federal reserved and permitted water rights. Staying engaged in the public part of the state's water allocation and use process has always been important and will likely become more so as climate change progresses.

Glossary

Alluvial soils, in the context of riparian zones, are typically young soils with little to no subsurface development because flood-related erosion and deposition are relatively frequent events. Even though they are not well developed, they are highly productive due to the proximity of water and periodic nutrient replenishment that occurs with deposition of floodwater sediments.

Best management practices are site- and project-specific methods or measures to prevent or mitigate potential adverse impacts to environmental quality, especially water quality. They include protection measures to address potential detrimental changes in water temperatures, natural flow regimes, deposits of sediment in streams, streambanks, shorelines, lakes, wetlands, and other waterbodies likely to affect water quality or aquatic habitat seriously and adversely.

Fluvial landforms are those formed by flowing water such as stream channels, floodplains, and terraces.

Geomorphic describes something that is controlled or influenced by the shape and configuration of the landscape.

Groundwater-dependent ecosystems are those supported by groundwater, including springs and seeps, playas, caves, and karst systems. In many cases, rivers, wetlands, and lakes are also included. Groundwater, as river baseflow or discharge to springs is an important source of water, particularly in semiarid climates.

Hydric soils are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions (without oxygen) in the upper layers.

Hydrologic soil group is a management interpretation based on the soil's runoff potential. The four groups are A, B, C and D. A's have the lowest runoff potential because they have high infiltration and transmission rates. D's have the greatest runoff potential because they have very low infiltration rates, contain a high percentage of clay, are associated with a permanently high water table, are shallow, or have an impervious layer near the surface.

Recurrence intervals, or return intervals are an estimate of the likelihood of flood of a certain size in response to a given precipitation event.

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Cliffs and Rocky Features

Background Information

Cliffs, rock outcrops and talus (or scree) slopes are common in the mountainous West. Cliffs are vertical or near vertical rock faces ranging in height from a few feet to hundreds of feet tall. Talus slopes are accumulations of rock fragments at the base of mountains or cliffs, or on steep slopes. Both cliffs and talus slopes are inherently dynamic, subject to rock fall, ice, and erosion by wind and water. They are found across a wide elevation range spanning cool alpine landscapes to desert environments and contribute to scenic character and biological diversity.

The unique geology, geomorphology, and microclimates associated with cliffs provide habitat for plants and animals adapted to a vertical environment. They provide perches, roosts, and nest sites for raptors, and microsites for a variety of vegetation. Talus slopes provide habitat and denning during the winter for small mammals, reptiles, and invertebrates. In the Gila National Forest, cliffs and rocky features provide important habitat for the federally listed Mexican spotted owl, as well as Rocky Mountain bighorn sheep and peregrine falcons. They also support several plants and land snails that are species of conservation concern including cliff brittlebrush, Davidson's cliff carrot, Hess's fleabane, Metcalfe's penstemon, Bearded mountain snail, Black Range mountain snail *(O.m. acutidiscus*), Black Range mountain snail (*O.m. hermosensis*), Black Range woodland snail, Cockerell Holospira Snail, Mineral Creek mountain snail, Morgan Creek mountain snail, *A.c. pertubosa* (no common name), *O.m. radiata* (no common name), *O.m. concentrica* (no common name), Silver Creek woodland snail, Sonoran snaggletooth snail, and the Whitewater Creek woodland snail. These features also provide opportunities for rock climbing, rock collecting, and in some cases, mineral extraction. Rock art found on cliffs and rocky features is often important to tribes.

Desired Conditions (All Scales)

1. Cliffs and rocky features maintain natural levels of moisture and are subject to historical levels of sedimentation.
2. Cliffs and rocky features provide specialized habitats for a variety of plant and animal species including rare, endemic, and special status species. They provide nesting and feeding habitats for birds of prey, roosting habitat for bats, and escape, bedding, and lambing cover for bighorn sheep.

Guidelines

1. Management activities affecting rockslides and talus slopes should maintain denning spaces and substrate for small mammals, lizards, snakes, rare and endemic plants, land snails, and other special status species except where necessary to maintain existing road or trail access or to protect public safety.
2. Management activities should be designed to avoid disturbance or alteration of naturally occurring rock outcrops or cliff faces.
3. Rock climbing and similar recreation activities should not disrupt the life processes of cliff- or rocky feature-dependent species such as the American peregrine falcon, Mexican spotted owl, bats, rare or endemic plants, or land snails, or diminish the function of specialized vegetation such as mosses and lichens. Where rock climbing or other recreational activities have the potential to disturb known populations of special status plant or animal species, or cultural sites, signs should be posted educating groups how to avoid impacts.

4. Installation of permanent rock-climbing hardware and use of motorized drills should not be authorized in areas where cultural, ecological, geological, and scenic values can be impacted.
5. Talus slopes should not be altered or be used as a common variety mineral materials source where disturbance would destabilize the slope or alter any endemic or rare species habitat or presence. In areas that harbor talus-dependent species such as snails, vegetation treatments should be designed to retain microhabitat characteristics.

Management Approach

Conservation, Education and Relationships

Forest staff seek opportunities to collaborate with others to raise awareness and valuation of cliffs and rocky features, especially as it pertains to at-risk, rare, and endemic species. This includes engaging climbing organizations in seasonal surveys and targeted monitoring, closures to certain recreational activities in vulnerable locations, and collaborative education programs that provide public information on how to minimize impacts. Forest leadership and staff also support research that fills information gaps on the rare and endemic species that use cliffs and rocky features, as more knowledge can improve management.

Rock spires above the East Fork of the Gila River. USDA Forest Service photo by R.P. Boone, 1937. FS#354581

Caves and Abandoned Mine Lands

Background Information

Caves are any naturally occurring void, cavity, recess, or system of interconnected passages beneath the Earth's surface. This includes any large crack, lava tube, natural pit, karst feature, or other opening that is an extension of a cave entrance or an integral part of the cave. Karst features are those created by water dissolving the bedrock. Karst landscapes include but are not limited to sinkholes, sinking streams, caves, and springs. Karst features are typically associated with limestones or gypsum deposits, which dissolve more easily than other rock types. Although there are limestones on the Gila National Forest, there are no known karst features.

Cave resources include any material or substance occurring naturally in caves such as plant and animal life, archaeological materials, fossils and any associated deposits, water and sediments, minerals, cave formations, and cave relief features. Many caves also have important traditional cultural significance to Tribes and Pueblos. Most cave resources are not replaceable or renewable. Some caves possess features, characteristics, values, or opportunities that are significant as defined by the Federal Cave Resources Protection Act of 1988. There are six caves in the Gila National Forest that have either been evaluated for significance, or currently are being evaluated. However, as of 2023, no caves had been nominated or designated as significant under the Act.

Abandoned mines are the remains of former mining operations (see also Minerals). While some mines have interesting historical and educational features, some can pose hazards to the public. The Forest Service's Abandoned Mine Lands program identifies mine features posing a danger to the public, which are prioritized and identified for closure or remediation. The classification as abandoned applies when there are no entities or individuals left operating the mining activity or who have financial ties to the mine. The significance of this classification is that for most abandoned sites there is no money from the original operators available to clean up the sites. Although occasionally a responsible party can be found to contribute funds toward cleanup, the major burden falls on the Forest Service to finance cleanup and remediation. Forest leadership and staff do not have any influence on this program or any of its processes as it is a national program funded and operated by national headquarters staff.

Cave resources and abandoned mines provide specialized seasonal and year-round habitats for a variety of wildlife species, such as bats, cliff-nesting birds, snails, reptiles, and amphibians. This includes the federally listed Mexican spotted owl, the lesser long-nosed bat (a species of conservation concern), and several endemic species. While many mammals use cave resources opportunistically, many species of bats depend on them. Eighteen bat species are known to regularly use caves or abandoned mines in the American Southwest. New Mexico is home to all these species. A cave's suitability for bat roosting and hibernation is determined primarily by cave microclimate—particularly temperature and humidity—as well as protection from disturbance. Cave ecosystems rely almost entirely on the surface for nutrients. Bats deposit considerable amounts of surface nutrients through their fecal material, called guano, which supports the entire cave ecosystem. When safe and appropriate, caves and abandoned mines can also provide opportunities for education and recreation.

Desired Conditions

1. Cave resources continue to develop or erode under natural conditions. Water flowing into, from, or within these systems contains naturally fluctuating background levels of sediment, organic matter, and dissolved minerals, and is not polluted by human activities.
2. Cave resources and abandoned mine lands provide habitat for species, particularly bats, that require specialized niches for raising young, roosting, and overwintering. Caves maintain humidity, temperature, and disturbance levels consistent with historical conditions. Caves known to be important for endemic, rare, federally listed, species of conservation concern, or cave-roosting bats are intact and provide habitat for these species. Disease is not spread by human activities.
3. The cultural, archaeological, geological, hydrological, paleontological, biological, and scenic resources associated with caves are maintained. Cave resources are not damaged or defaced by human activities.
4. Features, characteristics, values, or opportunities for which caves have been designated or nominated as “significant” are maintained.
5. Abandoned mine lands do not pose an environmental quality, public health, or safety hazard.

Standards

1. Authorization of activities with the potential to impact caves that have been designated or nominated as “significant,” management must include design criteria that maintain the features, characteristics, values, or opportunities for which they were recognized.
2. When closing mine features and caves to public entry, pre-closure inspections must be conducted to determine if cave-dependent or other species are present. Closures will be designed and implemented to address the needs of resident or historically occurring wildlife within the constraints of meeting public safety needs.
3. The most current guidance and decontamination procedures must be used to avoid the spread of white-nose syndrome or other pathogens and diseases.

Guidelines

1. Environments in caves and abandoned mines should not be altered except where necessary to protect associated natural resources, health, and safety.
2. Identified bat roosts should be managed to provide for the enhancement and protection of bat populations. Protection measures may include seasonal or permanent closures, public education, or both. Where closures are necessary, they should preserve habitat for wildlife, including roosting bats, and avoid direct impacts to bats. If bats or other species are present, structures should meet the most current regional guidelines for wildlife-friendly closures.
3. Management activities that have the potential to affect microclimate, hydrology, water chemistry, sediment regime, or structural integrity of the cave or mine feature should incorporate a buffer zone to avoid impacting the cave or mine feature environment. The size of the buffer may be dependent on site and activity but should be at least 100 feet. Buffer zones less than 100 feet may only be used where necessary to protect associated natural resources, health, or safety.

Management Approaches

White-nose Syndrome Response Plans and Relationships

While the cause of white-nose syndrome in bats is well established as the fungus *Pseudogymnoascus destructans*, or *Pd* for short, modes of transmission are still an active area of research (Bernard et al. 2020). However, it is known that a cave or abandoned mine environment containing *Pd* is infectious to hibernating bats. *Pd* was first detected in New Mexico in 2021, in two caves managed by the Bureau of Land Management in De Baca and Lincoln Counties. Forest leadership and staff recognize that preventing the spread of the fungus and the disease is critical to the persistence of bat species. We seek opportunities to develop a response plan for white-nose syndrome through continued collaboration with the U.S. Fish and Wildlife Service, Bat Conservation International, New Mexico Department of Game and Fish, the National Speleological Society, and others with interests in conservation management for bat species. We seek collaborative opportunities to increase awareness of white-nose syndrome and other pathogens at local and regional levels that include a focus on best practices for preventing outbreaks. We also seek to engage the North American Bat Monitoring Program (NABat) on opportunities for monitoring and testing.

Cave Management Plans and Relationships

Forest staff and leadership seek opportunities to foster the collaboration and exchange of information between governmental agencies, partners, caving organizations like the Southwest Region of the National Speleological Society, and other stakeholders to address conservation, interpretation, and education for cave resources, grottos, and associated species. This includes opportunities to work together to complete inventories and mapping products, prepare cave management plans, conduct seasonal surveys and monitoring, and implement wildlife-friendly closures where they are necessary.

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Photos from top to bottom, left to right: Peregrine falcon by Jim Rogers; Coyote by Jim Rogers; Seeman's sunbonnet by Andrew Tree; Beautiful wings by Dalue Mize; Quail's kin by Viktoriea Thomas; Mule deer by Jim Rogers

Wildlife, Fish, and Plants

Background Information

The needs of individuals or groups of wildlife species include food, water, shelter, space, and connected habitats. Plant and animal species are highly dependent on the function of ecosystems with specific characteristics and conditions. This plan addresses species viability and persistence by providing guidance to maintain and enhance these habitat characteristics and conditions and address threats to specific habitats and species. Collectively, this guidance is found in this and other sections of this plan that relate to habitats, management activities, and multiple uses.

At least 2,300 known native plant and animal species are found in the Gila National Forest. These species provide or contribute to supporting ecosystem services such as primary production, nutrient cycling, soil formation, and seed dispersal. They provide or contribute to regulating services such as climate regulation, pollination, erosion control, and water storage. Species also provide provisioning ecosystem services such as forage, wild foods, medicine, fiber, and building materials. Some species provide cultural ecosystem services including recreational opportunities such as hunting, fishing, wildlife viewing, and nature photography; opportunities for scientific discovery and education; and cultural, intellectual, or spiritual inspiration.

Some wildlife, fish, and plant species found in the Gila National Forest are common nationally, like black bears, or regionally, like Abert's squirrel. Others are rare or endemic, meaning they occur only in the forest, sometimes isolated to a narrow elevational range in a single mountain range (such as Mogollon death camas), or a single canyon or talus slope (such as the Iron Creek woodland snail). As of 2023, over a dozen species known to occur in the forest were federally recognized under the Endangered Species Act. Almost 60 additional species are recognized through the 2012 Planning Rule and agency directives as species of conservation concern, approximately two-thirds of which are dependent on riparian or aquatic ecosystems. Species of conservation concern are species that are native and known to occur in the forest and for which there is science that establishes a substantial concern about the species' ability to persist in the forest.

Together, species recognized under the Endangered Species Act and species of conservation concern are referred to as at-risk species. At-risk species are listed in the background section for each upland vegetation community they depend upon, and in the background section for Riparian and Aquatic Ecosystems. As this list is subject to change, a consolidated list is maintained as a separate, stand-alone document available on the forest's planning webpage (https://www.fs.usda.gov/main/gila/landmanagement/planning). The lists within the plan will need to be updated with an administrative change whenever species are added or removed through the established processes.

Habitat connectivity is crucial to daily and seasonal movements, finding mates, being able to use available habitat across the landscape, and finding new suitable habitats when landscape conditions change. Biological diversity in arid landscapes is highest where there is water. Stream corridors, springs, seeps, and constructed waters collectively contribute to connecting habitat for wildlife across the landscape and may offer refugia for some species.

The Gila National Forest plays a valuable role in game and fish management in New Mexico. Seven of the state's 10 big game species occur in the forest. Small game species and their habitat are abundant. The forest also provides sport fisheries that support both native and non-native sport fish. Triploid rainbow trout that cannot reproduce are stocked in reservoirs managed by the

New Mexico Department of Game and Fish. Non-native sport fish such as small-mouth bass and brown trout that can reproduce have legacy populations in the forest's streams. Extensive efforts to remove non-native fish and restore native assemblages, including Gila and Rio Grande trout, are ongoing. Opportunities to fish for Gila and Rio Grande trout in their native streams benefit the state's outdoor recreation economy.

Gila trout post-fire evacuation and restocking efforts. USDA Forest Service photos

The Forest Service has the ultimate responsibility for managing habitat on National Forest System lands, while the New Mexico Department of Game and Fish and the U.S. Fish and Wildlife Service are the lead agencies responsible for managing wildlife populations in New Mexico. The U.S. Fish and Wildlife Service is responsible for managing species recognized under the Endangered Species Act and Migratory Bird Treaty Act. The New Mexico Department of Game and Fish is responsible for managing all other wildlife species, including all other protected vertebrates, mollusks, and crustaceans identified in the State Wildlife Action Plan.

Species and habitats are managed in conjunction with other resources according to the Multiple-Use Sustained-Yield Act of 1960. For federally endangered and threatened species, habitat management and compatible multiple uses are determined in accordance with Section 7 of the Endangered Species Act as amended. For species of conservation concern, habitat management and compatible multiple uses will be accomplished in such a way that ensures those species' persistence in the forest, per the 2012 Planning Rule.

Metcalfe's beardtongue, *Penstemon metcalfei*, from the Black Range. Photo by Andrew Tree.

Important Plant Areas

A large proportion of New Mexico's rare plants are restricted to narrowly distributed habitats. Some species distributions are so narrow that they are more vulnerable to extinction events caused by management activities, invasive species, natural processes, and climate-altered disturbance regimes.

According to the New Mexico Rare Plant Conservation Strategy, "Important Plant Areas (IPAs) are specific places across New Mexico that support either a high diversity of sensitive plant species or are the last remaining locations of our most endangered plants." The strategy identifies 12 Important Plant Areas in the Gila National Forest, three of which received the highest biodiversity ranking of outstanding. These are in the Mogollon Mountains, the Signal Peak area of the Piños Altos Mountains (including Signal Peak), and the Emory Pass vicinity of the Black Range Mountains. The other nine important plant areas received biodiversity rankings of moderate to high (EMNRD 2017). These areas support not just a diversity of rare and endemic plants, but several species that are on the species of conservation concern list. According to the strategy, one of the central issues impeding meaningful and proactive conservation of New Mexico's rare plant species is the limited information regarding abundance, distribution, status,

trends, life history, habitat requirements, and threats (EMNRD 2017). Whether the species identified in the strategy are federally recognized under the Endangered Species Act or on the species of conservation concern list, strategy species are important components of the forest's overall biodiversity and are treated as such wherever they occur.

Desired Conditions (All Scales)

1. Sustainable populations of native wildlife, fish, and plants, including at-risk, rare and endemic, and special status species, are supported by healthy, connected ecosystems and watersheds as described in the desired conditions for vegetation communities, soils, water quality, watersheds, riparian and aquatic ecosystems, cliffs and rocky features, caves and abandoned mine lands, and non-native invasive species. Species are well distributed throughout a majority of their historical and potential future ranges.
2. The ecological conditions affecting habitat quality, distribution and abundance as described in the desired conditions for vegetation communities, soils, water quality, watersheds, riparian and aquatic ecosystems, cliffs and rocky features, caves, and abandoned mine lands, contribute to self-sustaining populations of plant and animal species, including at-risk, rare and endemic and special status species. Conditions provide for the life history requirements, distribution, and natural population fluctuation of the species within the biological capacity of the ecosystem. Populations are healthy, well distributed, genetically diverse, and connected, enabling species to adapt to changing environmental conditions including long-term climatic variability and extreme events.
3. Ecological conditions as described previously provide habitat that contributes to the survival, recovery, and delisting of species under the Endangered Species Act; preclude new listings; improve the status of species of conservation concern; and sustain both common and uncommon native species.
4. The locations of rare and endemic plant and animal species, habitat requirements, abundance, threats, and responses to management are known. Habitats and refugia for these species are intact, functioning, and sufficient for species persistence.
5. Habitat connectivity and distribution provide for genetic exchange, daily and seasonal movements of animals, predator-prey interactions, and other interspecific relationships across the landscape, consistent with the existing terrain.
6. Habitat configuration and availability, and species genetic diversity allow adaptation or long-distance range shifts of plant and animal populations in response to changing climatic conditions. Human-induced barriers to movement only exist to protect native species and prevent the movement of non-native species (such as in-stream fish structures to protect native trout from non-native invasion).
7. Habitat fragmentation between National Forest System lands and other public and privately conserved lands is reduced and connectivity is enhanced.
8. Important plant areas provide opportunities for collaborative inventory, monitoring, research, outreach, and education that support the conservation of the forest's rare and endemic plant species.
9. Desirable non-native fish species provide recreational fishing in reservoirs and other artificial waters where those opportunities are not in conflict with the recovery of native species.

10. Hunting, fishing, plant-gathering, and other species-based recreation, and cultural opportunities exist but do not compromise species, populations, or habitat.
11. All riparian and aquatic habitats are as described in the desired conditions for water quality, watersheds, and riparian and aquatic ecosystems support diverse populations of prey species that support both resident and migratory species.
12. Foraging habitat for pollinators such as the monarch butterfly, western bumble bee, tiger moth, and other common and uncommon species, is provided by conditions described in the desired conditions for vegetation communities, which include a diverse mix of native grasses, wildflowers, cacti, shrubs, and trees across multiple vegetation community developmental stages. Populations of northern bog violet (*Viola nephrophylla*) in mid- to high-elevation moist meadows and riparian areas are sufficient to sustain the nitocris fritillary butterfly.
13. The risk of disease transmission from domestic livestock to bighorn sheep is low.

Objectives

1. Assess and complete maintenance, reconstruction, or decommissioning activities as determined necessary by the assessment on 10 percent of upland water features constructed for wildlife per year.
2. Assess and complete maintenance, reconstruction, or decommissioning activities as determined necessary by the assessment on 10 percent of constructed aquatic barriers per year.
3. Implement at least 20 activities that contribute to the recovery of federally listed species over each 10-year period.
4. Restore or enhance at least 100 miles of stream habitat over each 10-year period.
5. Implement at least 20 projects that maintain or enhance upland habitat connectivity over each 10-year period.

Standards

1. Constructed water features such as tanks and troughs, must be designed to provide safe access and escape for wildlife, such as ramps or other climbing features (see also Livestock Grazing S3).
2. Where there are known populations of rare and endemic plants, no new permanent roads or motorized trails will be constructed unless it is to provide legal access to private property. Temporary motorized routes that facilitate management activities are acceptable provided appropriate avoidance or mitigation measures are incorporated. Temporary motorized routes are closed when no longer needed.
3. Where there are known populations of rare and endemic plants, the use of non-selective herbicides or herbicides that may have activity on the species will not be authorized unless it is to control or eradicate noxious weeds, and other integrated pest management efforts have failed or are unlikely to succeed.
4. Project activities and special uses occurring within occupied, designated, or proposed critical habitats for federally listed species must follow the most recent approved U.S. Fish and Wildlife Service recovery plan and integrate habitat management objectives and species

recovery, conservation, and protection measures identified in the plan unless otherwise negotiated through consultation.

Guidelines

1. Guidelines for northern goshawk habitat include the following:
    a. A minimum of six nest sites (known and replacement) should be located per territory. Goshawk nest and replacement nest areas should generally be in drainages, at the base of slopes, and on northerly (northwest to northeast) aspects. Nest areas should be 25 to 30 acres in size.
    b. Goshawk post-fledging family areas of approximately 420 acres in size should be designated surrounding the nest sites.
    c. In goshawk foraging areas and post-fledging family areas, groups of three to five reserve trees should be retained within management-created openings greater than 1 acre in ponderosa pine-evergreen oak and dry mixed-conifer communities, and six reserve trees should be retained within management-created openings greater than 0.5 acre in wet mixed-conifer and spruce-fir communities.
    d. Potentially disturbing project-related activities should be minimized in occupied goshawk nest areas during nesting season (March 1 through September 30).
2. Where the Forest Service has entered into signed conservation agreements that guide activities or actions to be carried out by the forest, those activities or actions should be undertaken consistent with the guidance found within those conservation agreements.
3. If new information indicates concern about a species' capability to persist over the long term in the plan area, that species should be evaluated for species of conservation concern status. For new species of conservation concern, best available science and consultation with species experts should be used to determine what measures are needed to provide for their sustainability.
4. Permits authorizing the collection of species should only be issued when there is information indicating it will not be detrimental to species persistence, is necessary for species conservation, is important for tribal collection, or is a research request that will aid in the management of that species.
5. Specifications for all new fence construction should include wildlife-friendly[53] design features, unless the purpose of the fence is to exclude wildlife (for example, an elk exclosure fence around a spring restoration). When existing range fences are identified for reconstruction or maintenance as part of permit administration, the permit modification should specify and incorporate wildlife-friendly design features and what is to be done with the old fence and any excess materials. Other existing fences without wildlife-friendly design features, such as those associated with recreation or administrative sites not located in populated places should include those design features when fences are identified for reconstruction or replacement.
6. Except for structures deemed necessary to achieve conservation goals for aquatic species, such as in-stream fish barriers to protect native fish from non-native invasion, infrastructure should avoid fragmentating aquatic habitats and isolating populations through design features appropriate to the site and type of infrastructure.

7. Where there are populations of rare or endemic plant species, maintenance of existing motorized routes should avoid ground disturbance outside the existing road prism and associated drainage features.
8. Rare and endemic plant populations should be avoided when siting new developed recreation facilities such as trailheads, campgrounds, and parking areas.
9. Projects and management activities should be designed or managed to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease.
10. In areas of high diversity and concentration of rare and endemic plant species, trailheads and other gathering sites such as parking areas or campsites should include interpretive and educational signage to increase awareness and valuation of these resources.
11. All open top vertical pipes used for fences, survey markers, building plumbing vents, signposts, or other infrastructure with an inside diameter greater than one inch should be capped or otherwise designed to prevent animal entrapments.
12. Trash cans and food storage boxes at developed recreation areas should be wildlife resistant.
13. Management of coldwater streams should include streamside vegetation cover and width-to-depth ratio to move toward State of New Mexico standards for stream water temperatures. (See also Riparian and Aquatic Ecosystems and Water Quality desired conditions.)
14. As part of construction, maintenance, or reconstruction of wildlife habitat improvement projects, all materials (including barbed and smooth wire, storage tanks, pipe, et cetera) that are no longer needed, or were more than what was needed, should be removed to provide for the safety of forest visitors, wildlife, recreational and permitted livestock, and aesthetics. Such requirements should be incorporated into contracts, permits, and agreements. Forest personnel should resolve any such safety hazards identified during project or incident activities.

Management Approaches

Adaptation, Restoration and Relationships

Strong relationships among forest leadership and staff, other federal and state agencies, local governments, and non-governmental organizations is critical when it comes to biodiversity conservation and managing toward desired conditions. Forest leadership and staff recognize this and continually work to strengthen relationships and seek opportunities for collaboration, cooperation, coordination, and partnership. Successful implementation of this plan will require continued coordination with New Mexico Department of Game and Fish and U.S. Fish and Wildlife Service regarding listed and native species; reintroductions, introductions, or transplants of listed or native species; the management of sport and native fishes, including identification of native-only stream reaches; and the control or eradication of non-native animals. This coordination extends to the New Mexico Department of Agriculture when it comes to non-native noxious plants. At times, the Animal and Plant Health Inspection Service may also be a valuable partner in dealing with non-native species (see also plan direction and other content under the Non-Native Invasive Species heading).

Forest leadership and staff look for opportunities to participate and contribute to the development and implementation of the State Wildlife Action Plan, Statewide Fisheries Management Plan, and U.S. Fish and Wildlife Service recovery plans. Plan implementation will generally benefit

from cooperation between state and federal wildlife management agencies to minimize conflicting wildlife resource issues related to listed, hunted, fished, and trapped species.

Collaborative development of conservation measures to prevent species from being listed under the Endangered Species Act and to aid in delisting of species will remain integral to the Wildlife, Fish and Rare Plants program in the forest. The New Mexico Department of Game and Fish and U.S. Fish and Wildlife Service will remain important partners in that work. The work itself is likely to become more critical as climate change progresses and additional collaborations and partnerships will add value and benefit all. Forest staff and leadership seek opportunities to increase the involvement of the research community and local university staff, local experts, sportsman's groups, non-governmental organizations such as the Gila Native Plant Society and Heart of the Gila, and other stakeholders as it relates to the management of wildlife, fish, and plant resources.

Increased inclusion and participation in collaborative inventory, monitoring, and research programs will be especially important when it comes to at-risk, rare, and endemic species as these species are likely to be most vulnerable to climate change. These types of programs are accompanied by a sense of urgency for rare and endemic species where basic information about distribution, abundance, habitat requirements, threats and responses to management is limited or lacking. Considering how much ground there is to cover, it is expected that inventory and monitoring of rare and endemic plant species will need to prioritize areas of rare soil types or geologic features and known biodiversity hotspots like Important Plant Areas. Forest leadership and staff recognize that when it comes to rare and endemic plant species, local university staff and other botanical experts, the Gila Native Plant Society, New Mexico Native Plant Society, the New Mexico Energy, Minerals and Natural Resource's Forestry Division Rare Plants program, and the New Mexico Rare Plants Technical Council are invaluable partners. Forest leadership and staff seek opportunities to support and contribute to the achievement of the New Mexico Rare Plant Conservation Strategy's goals and objectives. We also seek opportunities to work with Forest Service Research and Development Branch, the U.S. Geological Survey, New Mexico Department of Game and Fish, U.S. Fish and Wildlife Service, Natural Heritage New Mexico, The Nature Conservancy, Heart of the Gila, Trout Unlimited, and others to obtain, manage, and disseminate data and encourage research on and increase appreciation of rare and endemic plant and animal species.

Rare, Endemic, and Non-Native Plant Species Management

Herbicides are a class of pesticides that are formulated to kill problematic plants by disrupting plant-specific metabolic or other plant processes. Herbicides may be selective, meaning they have modes or sites of action that are only found in broadleaf plants, or only grasses, et cetera. Some herbicides are not selective and act in ways and on cells or components of cells that are common in all types of plants. In national forest applications, target plant species are most often non-native, invasive, or noxious weeds. Herbicides are one of several tools to protect native plant communities from being displaced by invasive and noxious weeds. There are many site- and species-specific things to consider before herbicide is chosen as the most appropriate and effective option. One consideration is the presence of rare and endemic plant species and whether they are also federally listed or species of conservation concern.

Herbicides and their use are highly regulated by federal law and there are many practices that reduce the potential for off-target effects. First, the label is the law. All herbicide applications must comply with instructions for use on the label. The usage instructions on the label are based on risk assessments that support the Environmental Protection Agency's (EPA) registration of a

chemical. Chemicals must be registered with the EPA prior to being allowed in the marketplace. The usage instructions on the label are designed to mitigate potential risks to non-target plants, animals, and humans. More information about these risk assessments can be found on the EPA's website.[35] The Forest Service conducts is own risk assessments, in addition to those that support a product's registration. These risk assessments and associated workbooks inform additional measures to reduce risks for a given application scenario. More information about these risk assessments and workbooks can be found on the Forest Service's pesticide management and coordination webpage.[36]

This plan also includes standards and guidelines for herbicide use in the Non-Native Invasive Species section. These are intended to form a baseline for developing site- and species-specific constraints for a given application scenario. When there are federally listed species present in a proposed treatment area, additional measures may be required through section 7 consultation with the U.S. Fish and Wildlife Service.

Native Pollinators

Forest leadership and staff appreciate the relationship between plant community diversity and native pollinators. We look for opportunities to contribute to efforts aimed at reversing native pollinator losses, enhancing habitat, and restoring of healthy populations. The plan supports the life history needs of native pollinators including desired conditions for upland and riparian ecosystems that provide quality foraging habitat, and reproductive, nesting, and overwintering sites. Pollinator-friendly management practices on federal lands include participation in collaborative education programs, invasive plant species control, using native seed in revegetation projects, thinning forests, restoring grasslands and meadows, and restoring, maintaining, and enhancing riparian areas. All these activities provide opportunities to achieve the plan's desired conditions and objectives. Leadership and staff also look for opportunities to incorporate pollinator-friendly management practices in project design. Design elements incorporated into pesticide application, prescribed fire implementation, livestock grazing management, and even landscaping and groundskeeping at agency facilities can improve outcomes for pollinators (USDA and USDOI 2015).

Raptors

Gila National Forest wildlife biologists coordinate with other program areas to survey and identify active raptor nests and fledging areas where project activities will result in disturbance. Timing restrictions, adaptive percent utilizations, distance buffers, or other means of minimizing disturbance may be used as supported by best available information and on site- and species-specific factors like topography and available habitat.

Wildlife Corridor Action Plan

As discussed in the plan management approach titled Change and Uncertainty, habitat connectivity is generally high within the forest, with diffuse flow being interrupted along the relatively low-volume two-lane state highways. Prompted by state legislation passed in 2019, New Mexico Department of Game and Fish and New Mexico Department of Transportation developed a wildlife corridor action plan that identifies wildlife-vehicle collision hotspots and prioritizes areas for mitigation projects. The action plan prioritizes wildlife vehicle collision hotspots in the state, one of which is near the town of Silver City. The 27-mile-long hotspot is

[35] https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/overview-risk-assessment-pesticide-program.
[36] https://www.fs.usda.gov/foresthealth/protecting-forest/integrated-pest-management/pesticide-management/pesticide-risk-assessments.shtml.

the state's second highest priority and includes section of U.S. Highway 180 and New Mexico Highway 90. Most of this hotspot is bordered by private lands, but small portions of New Mexico State Land Office, U.S. Department of Defense, and Forest Service lands are also present (Cramer and others 2022). Forest leadership and staff seek opportunities to work collaboratively with the two state agencies and others such as the Federal Highway Administration to address hotspots mapped within the forest's administrative boundary.

Cross-Jurisdictional Connectivity

While the Gila National Forest is largely contiguous, there are inholdings within the administrative boundary, as well as other private, municipal, county, state, and federal lands between the Burro Mountains and the rest of the forest. Forest leadership and staff see opportunities to collaborate with other adjacent landowners and jurisdictions to encourage improved landscape connectivity where natural systems span multiple administrative boundaries.

Bighorn Sheep

Forest leadership and staff recognize that disease transmission from domestic livestock to bighorn sheep remains a threat to the species and an active area of research. Although the plan provides science-based guidance for issuing special use permits that include the use of pack goats, there are uses that do not require a special use permit and no tool other than an educated public to limit the risk of transmission. Forest staff look for opportunities to engage in collaborative education efforts to increase awareness of disease transmission, the science that supports it, and the most current preventative practices. The North American Packgoat Association may be an important partner in such education efforts.

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Fendler's hedgehog cactus in bloom by Sandy Taylor

Non-Native Invasive Species

Background Information

Executive Order 13751, which amended Executive Order 13112, defines an invasive species as any non-native (or alien) organism to the ecosystem under consideration, whose introduction causes or is likely to cause economic or environmental harm or harm to human, animal, or plant health. Invasive species generally have one or more of the following characteristics: aggressive and difficult to manage; poisonous, toxic, or parasitic; or a carrier or host of a serious insect or pathogen. Not all introduced species are invasive and some are considered desirable. For example, the triploid rainbow trout is not native, but it provides recreational fishing opportunities in reservoirs within and adjacent to the forest.

Some invasive plant species are so harmful they have been given a regulatory designation of "noxious" by the federal or state departments of agriculture. Noxious weed species are highly competitive, disturbance-adapted, prolific reproducers, and are readily disseminated by wind, water, animals, and humans. They often have an advantage over native species because they have been introduced unaccompanied by their natural predators or diseases that would normally keep them in check. Invasive species pose an increasing threat to the integrity of ecosystems by decreasing native plant and animal diversity and range, interfering with natural fire regimes, reducing rangeland productivity, and in some cases, accelerating erosion and sedimentation.

The New Mexico Department of Agriculture coordinates weed management among local, state, and federal land managers and private landowners. The New Mexico Noxious Weeds Management Act directs the state department of agriculture to develop a noxious weed list, identify methods of control for designated species, and educate the public about noxious weeds. A list of plants designated as noxious in New Mexico and additional information on these species and other troublesome species can be found on the New Mexico Department of Agriculture website.[37]

Species designated as Class A and B noxious weeds are the highest priority for treatment. Class A species are those not currently present in New Mexico or that have limited distribution. Class B species are limited to portions of the state but are not widespread. Class C species are widespread throughout the state, and management decisions for these species should be determined at the local level, based on feasibility of control and level of infestation (NMDA 2020). Local conditions may include treatments for species that are not yet on the Class, A, B or C list. For example, an invasive species is found in a small population but has not yet made onto the state noxious weed list (Early Detection Rapid Response (EDRR)). There may also situation where local knowledge identified a problematic population and treatment would benefit a healthy ecosystem.

The New Mexico Department of Game and Fish is responsible for the management of aquatic invasive animal species. Currently, zebra and quagga mussels are the most immediate concern with watercraft inspection stations throughout the state. There are no inspection stations on the Gila National Forest. More information on their Clean, Drain, and Dry program can be found on their website.[38]

[37] See https://nmdeptag.nmsu.edu/apr/noxious-weeds.html.
[38] See https://www.wildlife.state.nm.us/fishing/fishing-regulations/aquatic-invasive-species/.

Feral domestic livestock have been or are a problem in some areas of the forest. These animals are managed by the Forest Service with technical assistance provided by other federal and state partners. While feral hogs are not documented in the forest, there exists the potential for them to arrive and cause issues as they do in other areas of the state. The State of New Mexico considers feral hogs unprotected and is actively trying to eradicate them in several areas. Efforts will be made to eradicate feral hogs if they are documented to occur within the forest. Feral cattle are an ongoing issue arising from legacy non-compliance issues and are more appropriately discussed in the Livestock Grazing section of this plan.

Many streams and rivers in the Gila National Forest have a high number of non-native aquatic species, though not all are considered invasive. For example, rainbow and brown trout are not native, but not considered invasive. There have been efforts to remove non-native fish from certain stream reaches to aid in native fish reintroduction or reduce competition for native fish. Gila and Rio Grande cutthroat trout have benefited from non-native fish removal. Invasive animals have the potential to adversely affect native species and ecosystem function. They can outcompete and prey upon native animal species, alter food web interactions, and impact native vegetation.

Invasive insects, diseases, and pathogens pose an increasing threat to both aquatic and terrestrial native species. Chytrid fungus has been linked to infectious disease and dramatic die-offs in amphibians worldwide, including in the Gila National Forest. Whirling disease in fishes, caused by a non-native invasive parasite, can lead to drastic population declines in both native and non-native rainbow trout. Non-native brown trout are less susceptible because they evolved with the parasite. Whirling disease was first detected in New Mexico in 2004. White-nose syndrome has been decimating bat populations and slowly moving westward in North America (see Caves and Abandoned Mine Lands management approach). It was detected in New Mexico in 2021. A native of Asia, white pine blister rust was first introduced to the United States from Europe in the early 1900s; it is established within the Gila National Forest and other forests across the Southwest (see Timber, Forest, and Botanical Products).

Although the Gila National Forest and most of the southwestern United States is outside areas generally known to be infested by the gypsy moth, forest managers have a long-standing (effective since 1989) memorandum of understanding with Animal and Plant Health Inspection Service to conduct detection monitoring in the forest. Such efforts are important because if introduced populations go undetected and become established, eradication and control measures become costly and time-consuming.

Desired Conditions

1. Plant and animal communities are dominated by native species. Non-native invasive and noxious species are absent or exist at levels that do not cause economic harm or negatively impact human health, disrupt ecological processes, alter hydrologic or sediment regimes, reduce biodiversity, or affect the sustainability of native and desirable non-native species, such as non-reproducing triploid rainbow trout stocked in lakes or reservoirs.
2. Collaborative information and education programs build awareness of non-native invasive and noxious species and the threats they pose at all levels and across all jurisdictions.
3. Information and collaborative education programs build awareness of the laws and regulations governing pesticide use, the role of pesticides in integrated pest management systems, the risks and benefits of their use, and the design criteria that can mitigate those risks.

Objectives

1. Treat at least 100 acres of noxious weed species annually.
2. Inventory up to 2,000 acres annually.
3. Reduce non-native fish and other aquatic species within native aquatic populations in at least four to six stream reaches during each 10-year period.
4. Remove non-native fish populations from at least one stream reach containing a natural or constructed barrier in compliance with recovery plans over a 10-year period.

Standards

1. Forest projects, authorized activities, and special use permits must include appropriate decontamination procedures to prevent the spread of invasive species, non-desirable fungi, and diseases[39] (see also Wildlife, Fish, and Plants, Caves and Abandoned Mine Lands, Riparian and Aquatic Ecosystems, and Wildland Fire and Fuels Management).
2. When drafting water from streams or other waterbodies, measures must be taken to prevent entrapment of fish and aquatic organisms (see also Wildland Fire and Fuels Management).
3. Prevention, control, containment, and eradication of invasive species will be designed and implemented using integrated pest management to maintain or improve ecosystem and watershed function and minimize treatment impacts on native species and human health.
4. Projects and special uses must use certified noxious weed-free products for all products where there is a certification process in place. Exceptions may occur only if no certified weed-free product or alternative non-seed-bearing product is available and there is a health and safety reason the project or use cannot be delayed until the certified product or alternative is available.[40] Fill and rock material, and source areas will be visually inspected for invasive and noxious weeds, and treated, if necessary, prior to transport and use elsewhere.
5. Planting and seeding projects will use native plant species. Local genetics or those with genetics that may be more suitable in future climate scenarios are preferred where the quantities required are available within project timelines. Exceptions apply to the use of non-native annual cereal grains for emergency watershed stabilization if those cereal grain species are not designated as noxious by New Mexico Department of Agriculture.
6. Domestic goats and sheep will not be used to control invasive plants.
7. Application of all herbicides will be performed or supervised by a state or federally licensed applicator.

[39] Some preventative measures are described in the most current version of Preventing Spread of Aquatic Invasive Organisms Common to the Southwestern Region, the Declining Amphibian Task Force Fieldwork Code of Practice, and the most current National Interagency Fire Center guidance. New Mexico Department of Game and Fish's Clean, Drain and Dry program is another source of information for preventative measures.

[40] In 2021, there was a shortage of certified weed-free hay, which forced the agency's hand. Animals still needed to be fed. These caveats are included in case something similar happens again in the future. Projects and uses that don't involve feeding animals may have options other than using uncertified products or could be delayed until the certified product became available. A scenario where an alternative product could replace a certified product during a shortage would be using wood straw instead of agricultural straw in a burned area emergency response situation. Of course, this may ultimately lead to no mulching scenarios depending on the values and level of risk as certified weed-free seeding alone was demonstrated to be nearly as effective as seeding and mulching on the 2013 Silver Fire.

8. All treatment projects that involve using herbicides will develop and implement pesticide use plans that include transportation and handling specifications.
9. Herbicide use will be restricted to those formulations containing active ingredients that have both an Environmental Protection Agency and Forest Service risk assessment. If mixtures of herbicide formulations are applied with Hazard Quotients greater than 1.0, additional mitigation measures will be included.[41]
10. All timing stipulations, terms and conditions, reasonable and prudent measures, buffers, or avoidance areas identified through consultation efforts (that is Tribal, Section 106, and Section 7 consultations) and site-specific analysis will be integrated into all application scenarios. If these differ from what is included in plan direction, the most restrictive criteria will be applied.
11. Only adjuvants,[42] such as surfactants or dyes, and inert ingredients included in Forest Service hazard and risk assessment documents will be used. The least toxic options will be used.
12. Aerial application will not be authorized. To reduce or eliminate direct or indirect effects to non-target plants, animals, and water quality, follow the label and consult the risk assessment. All product label instructions will be followed.
13. Herbicide must not be sprayed within 100 feet of known rock art sites, caves, or rock shelters due to the possibility of materials that could be damaged. Larger buffer zones must be used if site and herbicide-specific characteristics warrant it.
14. Loading or mixing of herbicides will occur at a minimum of 300 feet from live water and private residences.
15. Backpack spray and boom or broadcast spray applications will use drift control agents to reduce the potential for drift to non-target species, food, and water sources.
16. To reduce the risk of offsite and non-target impacts, application will only occur under favorable weather conditions as identified in the label instructions and in accordance with equipment manufacturer's specifications. All spraying will occur with winds less than 10 miles per hour unless otherwise indicated in the label instructions.
17. Granular herbicides will not be used on slopes greater than 15 percent due to the probability of runoff carrying the granules into non-target areas.
18. If feral hogs are found in the forest, any efforts to eradicate them will be in coordination and cooperation with the New Mexico Department of Agriculture and Animal and Plant Health Inspection Service, consistent with the National Feral Swine Damage Management Program.[43]
19. In designated and recommended wilderness areas, non-native, invasive species will be treated using methods and procedures consistent with wilderness character, or characteristics as appropriate, to allow natural processes to predominate.

[41] The sum of hazard quotients for substances that affect the same target organ or organ system is called the hazard index. The total of exposures below a hazard index of 1.0 will not likely result in adverse non-cancer health effects to humans over a lifetime of exposure.
[42] Adjuvants are non-pesticide ingredients that help herbicide formulations or mixtures work better. For example, adding a surfactant helps droplets of the herbicide stick to the leaf surface where it is absorbed by the plant.
[43] See https://www.aphis.usda.gov/aphis/resources/pests-diseases/feral-swine/feral-swine-eis.

Guidelines

1. A decision matrix should be used when choosing the best treatment option for any pest control project. This will include highest chance of success and least impactful option for ecosystem and human health.
2. When more than one herbicide may be suitable for a specific application scenario, the one with the lowest toxicity to wildlife should be selected, unless there is information to suggest that doing so would promote the development of resistance to the lower toxicity herbicide in the target species.
3. To enable individuals to make informed choices when visiting the forest, the public should be provided advance notification of any pesticide application, like prescribed fire implementation. Multiple communication tools should be used to ensure environmental justice communities and those with limited access to technology have equal access to information.
4. Site-specific soil characteristics, surface drainage patterns, proximity to surface water, and local water table depth will be considered to determine the appropriate herbicide formulation, application timing and method, and if there is a need for riparian or aquatic buffer zones. Where herbicide is likely to be delivered to surface waters, only use products registered for aquatic use. For herbicide formulations not registered for aquatic use, the minimum buffers should be established.
5. To prevent off-site movement and maintain treatment effectiveness, if there is a 50 percent or greater probability of local rainfall amounts of 0.25 inch or more within 24 hours, then applications should only occur when it is anticipated that there will be sufficient time (at least 4 hours) for the application to dry before rainfall occurs.
6. Ground-disturbing activities should be assessed for risk of noxious weed invasion or establishment of latent seed in the seed bank and incorporate measures that reduce the potential for the spread of noxious and invasive species.
7. Burned area emergency response recommendations should include early detection rapid response actions for noxious weeds.
8. Permitted activities and the forest's saddle and pack stock program should certified weed-free feed products to prevent the introduction of noxious weeds.
9. Treatment of invasive plant species should be prioritized according to the New Mexico Department of Agriculture noxious weed classification. Exceptions may occur when weeds identified as noxious by Animal and Plant Health Inspection Service or other state departments of agriculture are newly discovered in New Mexico, even if they have not yet been analyzed for designation as noxious by New Mexico Department of Agriculture. If such exceptions occur, treatment of those species should take precedence in keeping with early detection rapid response principles.
10. Desirable non-native fish species should be managed in such a way that they do not conflict with the recovery of native species or existing multiple uses.
11. Measures should be incorporated into authorized activities, project planning, and implementation to prevent, control, contain, or eradicate priority infestations or populations of invasive species to ensure the integrity of native species populations and their habitats are maintained.

12. Habitat improvement and aquatic restoration projects within or adjacent to water sources occupied by Chiricahua leopard frogs, northern Mexican or narrow-headed gartersnakes, or native fish should include provisions to remove non-native invasive animals.

Management Approaches

Early Detection Rapid Response

Although noxious and invasive plant species are generally not as large of a problem in the Gila National Forest as they currently are elsewhere in the nation, additional survey is needed to fully understand the status of these species. Forest leadership and staff recognize that just because they are generally not a large problem now does not mean it will always be the case, especially if we let our guard down. Early detection rapid response is a central tenet of the national interagency framework for managing invasive species (USDI 2016, NISC 2016) and the Forest Service national strategy and implementation plan for invasive species management (USDA Forest Service 2013). Forest staff and leadership will continue to invest in noxious weed surveys, but given limited workforce capacity and financial resources, collaboration, and coordination between stakeholders, including Soil and Water Conservation Districts, New Mexico Department of Transportation, and county governments is key to success.

Also key to success is the ability to respond to emerging threats rapidly. This means being proactive about environmental analysis requirements and Clean Water Act permitting processes required for pesticide use. Additional National Environmental Policy Act procedures that seek to expand upon rapid response capabilities are likely to occur over the life of this plan.

Integrated Pest Management and Relationships

Forest leadership and staff seek opportunities to develop and improve relationships with other agencies, organizations, volunteers, and other stakeholders, including cooperative weed management areas. Cooperative weed management areas represent partnerships between federal, state, and local governmental agencies; tribes; individuals; and non-governmental agencies to manage noxious and invasive plants in a geographically defined area. Cooperative weed management areas are opportunities to improve relationships, pool resources, leverage funding, and promote weed-related information and education. There are there three cooperative weed management areas that include portions of the Gila National Forest: Southwestern New Mexico, Sierra, and Socorro /Catron. As with early detection rapid response, collaboration and coordination between stakeholders contribute to the success of integrated pest management approaches to non-native invasive and noxious species management.

Survey and Documentation Strategy

Noxious weed surveys not associated with project-level work prioritize riparian areas, wilderness, and unique and rare habitats first. Areas of high use or disturbance such as material pits, trailheads, campgrounds, corrals, roads, boat ramps, and bridges are generally prioritized second. When forest staff identify suspect populations of invasive species during noxious weed surveys or other field work, documentation ideally includes location coordinates, estimates of population size and density, photographs, and collection of several whole plant specimens including roots, vegetative parts, and reproductive parts. Forest staff work toward standardizing survey and treatment documentation using approved field collection systems, such as Arc Field Maps, and data storage in the database of record, which is currently Threatened, Endangered, Sensitive Plants-Invasive Species (TESP-IS).

Plant Identification

Whether by forest staff, volunteer, or other stakeholder, correct plant identification is critical for two reasons: (1) invasive and noxious weed treatment is a substantial effort of time, labor, and money; and (2) incorrect identification can lead to treatment of native species. Correct plant identification often requires the entire plant, including the root and reproductive parts. Management verifies correct identification with at least one professional botanist before investing in treatment.

Herbicide Use, Plan Compliance, and Effectiveness Monitoring

Projects that use herbicides are high priorities for implementation and effectiveness monitoring. The plan's monitoring program includes a compliance question related to these types of projects, which would be included in the plan's biennial monitoring report. The intent of plan compliance monitoring and reporting on these types of projects is to promote transparency, accountability, and trust among the forest's stakeholders and users. Project-level effectiveness monitoring would inform future projects that consider herbicide use and included in the plan's biennial monitoring report to further support transparency, accountability, and trust.

Information, Education, and Research

Forest staff and leadership support information sharing, education, and research related to non-native invasive and noxious species through interpretive signage at trailheads and other forest access points to alert recreationists about relevant invasive species and noxious weeds, encouraging public use of certified weed-free feed products, decontamination procedures, and scientific research. Staff and leadership look for opportunities to (1) invest in conservation education that includes a non-native invasive and noxious species component and (2) participate in collaborative education programs with New Mexico Department of Agriculture and the Cooperative Extension Service through New Mexico State University.

Glossary

Integrated pest management is the process by which one selects and applies a combination of management methods or techniques to control a particular pest species with minimal adverse impacts to non-target species.

Memorandum of understanding is a document describing an agreement between two or more parties. It expresses common intention and line of action related to a given issue, but it is not a legal commitment.

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USDA Forest Service. 2013. National Strategic Framework for Invasive Species Management. FS–1017. Washington, D.C., 35 pp.

USDI (United States Department of the Interior). 2016. Safeguarding America's Lands and Waters from Invasive Species: A National Framework for Early Detection and Rapid Response. Washington, D.C., 55 pp.

Air Quality

Background Information

Air resources in national forests are a vital resource to be protected. Air provides oxygen for respiration, carbon dioxide for photosynthesis, and global redistribution of atmospheric gases and heat. The public values the fresh air and sweeping views national forests provide, and high air quality supports water quality and healthy ecosystems.

The goals of air quality management are to meet human health standards, achieve visibility goals in areas of high scenic value, and address other air quality concerns, such as atmospheric deposition of pollutants (see also Water Quality). Human health standards are defined in the National Ambient Air Quality Standards set by the Environmental Protection Agency for seven pollutants considered harmful to public health: carbon monoxide, lead, nitrogen dioxide, particulate matter 10 microns in size or smaller (PM_{10}), particulate matter 2.5 microns in size or smaller ($PM_{2.5}$), ozone, and sulfur dioxide.[44] However, authority and primary responsibility for implementation and enforcement is delegated to the states.

Within the 1977 Clean Air Act, Congress designated all national parks over 6,000 acres and all wilderness areas over 5,000 acres as class I areas. Other wilderness areas were designated as class II areas, including those that meet the size criteria, but were established after 1977. The intention of this designation is to protect visibility in areas of high scenic value. Class I areas are subject to the highest visibility protection requirements in the Clean Air Act. Class II areas are subject to slightly less stringent requirements. The Gila Wilderness is a class I area, and the Aldo Leopold and Blue Range Wildernesses are class II areas. The State of New Mexico has developed a state implementation plan with long-term strategies to make "reasonable progress" in improving visibility in class I areas inside the state and in neighboring jurisdictions and focuses on human-generated sources of emissions.

Airsheds are like watersheds in that they are defined geographic areas. The difference, and the challenge, is that air masses and air pollutants move freely between airsheds based upon larger weather and climatic patterns, whereas surface water does not naturally move between watersheds unless they are physically connected in an upstream-downstream relationship. This means that the Gila National Forest and surrounding communities may be impacted by air quality issues over which management of the Gila National Forest has little or no influence. One example was the smoke impacts experienced in southwestern New Mexico from fires in Arizona, the Pacific Northwest, Montana, and Mexico during the summer of 2017. Air and water quality impacts resulting from non-fire emissions generated on lands under other jurisdictions, including atmospheric deposition of mercury into local reservoirs, also occur.

The primary air quality issue Gila National Forest management has the most influence on is particulate matter associated with smoke and dust generated by activities in the forest. The National Ambient Air Quality Standards pollutants of concern from wildland fire are PM_{10} and $PM_{2.5}$. Because of its small size, $PM_{2.5}$ has an especially long residence time in the air and penetrates deeply into the lungs. Ozone is also a National Ambient Air Quality Standards

[44] See https://www.epa.gov/criteria-air-pollutants/naaqs-table.

pollutant. Smoke from prescribed and natural fires may contribute to ozone formation under certain atmospheric conditions, but at this time, there are no known ways to minimize ozone creation under these conditions. The same fine particulate matter that poses health risks is also largely responsible for visibility impairment.

This plan does not contain extensive guidance for air quality because so much of its management is already decided by law and regulation. Gila National Forest managers have and will continue to comply with Clean Air Act, Regional Haze Rule, and New Mexico State Smoke Management Program (and Title 20, Chapter 2, Part 65 of the New Mexico Administrative Code), as required under the approved state implementation plan. From a visibility standpoint, smoke generated from wildland fire is generally acceptable under the state implementation plan. From a human health standpoint, the New Mexico State Smoke Management program includes requirements for burn registration, notification of local communities regarding burn date(s), visual tracking, and reports for all prescribed or natural fires greater than 10 acres. If air flow (ventilation) conditions or air quality conditions are not within the parameters set in New Mexico Administrative Code 20.2.65, the prescribed fire must be postponed. Prescribed fire can also be postponed by order of New Mexico Environment Department Air Quality Bureau for other reasons. Naturally ignited fires must be registered at 100 acres or greater.

Forest staff routinely monitor smoke generated by wildland fire, regardless of where that smoke is generated. Real time data from particulate monitors are available on the Interagency Real Time Smoke Monitoring website.[45] However, smoke impacts are always a concern and can be a challenge for relationships between the forest and local communities, especially as the agency works to restore the natural role of fire.

Heavy equipment used on paved and unpaved roads during the implementation of projects and activities, or other administrative or public motorized use has the potential to create localized impacts from fugitive dust. With dry conditions and high wind, this fugitive dust can be carried for many miles. These impacts can be reduced or mitigated with best available control measures or emission reduction techniques.

Desired Conditions

1. Air quality contributes positively to visibility, human health, quality of life, economic opportunities, quality recreation, and wilderness values.
2. Air quality meets or surpasses New Mexico and federal ambient air quality standards.
3. Air quality impacts are minimized during prescribed fire. The future risk to air quality, associated with natural fire, is lowered by prescribed fire.
4. Air quality impacts associated with natural fire are minimized to the extent possible using multiple strategies.
5. Information and collaborative education programs result in community leaders and residents that are informed about air quality.
6. Information related to smoke impacts from fires, occurring both on and off-forest, is timely, wide-reaching, and comprehensive.
7. Air quality-related values, including high-quality visibility conditions, are maintained or improved over the long term in class I and sensitive class II areas of the forest.

[45] See Fire and Smoke Map (airnow.gov).

8. Atmospheric deposition of pollutants does not negatively impact water quality and other ecosystem components (see also Water Quality).
9. Air quality is improved by increased energy efficiency and other environmentally sound practices.

Guidelines

1. When an air quality hazard is known to exist or is predicted, information should be provided to the public in a timely manner. Multiple communication tools should be used to ensure environmental justice communities and those with limited access to technology have equal access to information.
2. Project design for prescribed fires should incorporate identification of smoke-sensitive areas, including environmental justice communities, and incorporate as many necessary emission reduction techniques as feasible subject to economic, technical, and safety criteria.
3. During naturally ignited fire incidents, techniques to minimize smoke impacts (such as public notification, timing of ignitions, mass ignitions, limiting fire spread, et cetera) should be considered, including the identification of smoke management objectives in the decision document.
4. Dust abatement should occur during project implementation where dust impacts are a concern.

Management Approaches

Smoke

Following the New Mexico State Implementation Plan (and therefore the Regional Haze Rule and State Smoke Management Plan) is the primary means by which forest management has met and plans to continue meeting its legal responsibilities to the Clean Air Act. Legal requirements aside, it is important that land managers be responsive to the public's tolerance thresholds for smoke to balance ecological benefits with social and economic values. Smoke-sensitive communities and groups, including environmental justice communities and others likely to be impacted by a particular fire, are identified during the decision-making and documentation process for both prescribed fire and wildfire incidents. Although best efforts and provisions are made to minimize potential human health impacts as they pertain to prescribed fire, smoke impacts from wildland fires are inevitable and sometimes uncontrollable, for example, when fires are burning on other jurisdictions.

Providing timely, relevant information to the public using a variety of effective methods is a standard of justice and equity that forest managers hold themselves to (Air Quality S1). Continuing to develop a long-term particulate monitoring program to detect sudden changes in air quality not related to forest management activities and continuing to deploy particulate monitors during prescribed fire and wildland fire incidents in the forest, can support efforts toward providing timely, relevant information.

At a national level, the Forest Service has recognized and responded to the threat that smoke poses to public health and safety by spearheading the interagency Wildland Fire Air Quality Response Program. Under this program, air quality resource advisors are available to provide support when communities have the potential to be negatively impacted. These advisors prepare predictions, health warnings, press releases, and daily reports to inform the public and aid fire

managers in decision making. Naturally ignited fire incidents occurring in the Gila National Forest will continue to include air resource advisors as needed and as they are available.

Prescribed fires and naturally ignited fires being managed for resource benefit are generally lower intensity, thereby reducing the potential for destructive wildfires and protecting long-term air quality. However, prescribed fires still generate smoke. Burn plans are developed for prescribed fires and contain measures to limit human exposure to smoke in relation to the predicted weather and ventilation conditions. These measures are often referred to as best available control measures or emission reduction techniques. While a suite of potential emission reduction techniques is available (Blades et al. 2018), not all are feasible, appropriate, or equally effective in every situation. Management chooses the techniques best suited to the conditions of each individual fire. Coordinating the timing and duration of prescribed fires across the forest, between other national forests and grasslands in the region, and other jurisdictions could be important to minimizing impacts on regional air quality.

Forest staff and leadership welcome opportunities to collaborate with local governments to bring an air quality and smoke workshop to local communities in the future. These types of events can provide opportunities to learn about smoke, how it affects air quality and human health, how smoke impacts are forecasted and managed, and the things that individuals, households, and communities can do to help themselves, especially those that are sensitive to smoke impacts. We also look for opportunities to find and leverage programs and grant funding that provide air filtration devices that can be distributed to low-income, disadvantaged, and socially vulnerable households with smoke-sensitive individuals.

Atmospheric Deposition

Forest leadership and staff seek opportunities to support research establishing critical loads for pollutants that may impact the Gila National Forest's ecosystems and environmental quality. We continue to participate in regional air quality monitoring programs, including lichen studies in the Blue Range, Aldo Leopold, and Gila Wildernesses to support air quality and wilderness character desired conditions and objectives.

Glossary

Environmental justice is defined by the Environmental Protection Agency as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that Forest Service management activities do not place a greater burden of environmental harms and risks on low-income, minority and indigenous populations than the general population. Meaningful involvement means that agency leadership and staff involve environmental justice populations in our decisions. Fair treatment and meaningful involvement are the processes that bring about the equitable distribution of Forest Service benefits to communities, which is the goal of environmental justice.

Environmental justice communities include indigenous peoples, minority populations, low-income populations, underserved communities, underserved populations, disadvantaged communities, socially vulnerable communities, and frontline communities. As defined by the Environmental Protection Agency:

> **Indigenous peoples** include state-recognized tribes, indigenous and tribal-community based organizations; individual members of federally recognized tribes, including those living on a different reservation or living outside Indian country; individual members of

state-recognized tribes; Native Hawaiians; Native Pacific Islanders; and individual Native Americans.

Minority populations are not single-race white. This includes individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

Low-income populations are populations characterized by limited economic resources. The U.S. Office of Management and Budget has designated the Census Bureau's annual poverty measure as the official metric for program planning and analysis, although other definitions exist.

Underserved communities are populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life. Namely, these are Black, Latino, and Indigenous and Native American persons, Asian Americans, Pacific Islanders, and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.

Underserved populations are populations that face barriers in accessing and using victim services, and populations underserved because of geographic location, religion, sexual orientation, gender identity, racial and ethnic identity, and special needs such as language barriers, disabilities, alienage status, or age.

Disadvantaged communities include those that experience: low income, high or persistent poverty or both; high unemployment and underemployment; racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government entities; linguistic isolation; high housing cost burden and substandard housing; distressed neighborhoods; high transportation cost burden or low transportation access or both; disproportionate environmental stressor burden and high cumulative impacts; limited water and sanitation access and affordability; disproportionate impacts from climate change; high energy cost burden and low energy access; jobs lost through the energy transition; and access to healthcare.

Socially vulnerable communities are identified by the Centers for Disease Control as those that have special needs for equity and environmental justice actions. This includes people who are living below the poverty line, those who are unemployed, low-income individuals, those without a high school diploma, people over 65 and under 17, people with disabilities, single-parent households, people who are a minority race or ethnicity, people with limited English proficiency; those living in multi-unit structures, those in mobile homes, those living in crowded conditions, those with no vehicle, and those living in group quarters.

Frontline communities are identified by the National Association for the Advancement of Colored People as groups of people who are directly affected by climate change and inequities in society at higher rates than people who have more power in society. They are on the "frontlines" of the problem. In other words, those who experience oppression because of race, income, gender, sexual orientation, disability, gender identity, age, et cetera are more likely to have less resources and protections in our society in general.

Smoke-sensitive areas are those in which smoke from outside sources is intolerable, for reasons such as heavy population, existing air pollution, or intensive recreation or tourist use.

Smoke-sensitive groups include people with asthma or other respiratory disease, people with cardiovascular disease, children under 18 years of age, pregnant women, older adults, people of low socio-economic status, and outdoor workers.

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On the way home to the Gila National Forest. Photo by Lynne Meeks

Photos from top to bottom, left to right: Johnson Fire 2021 by Stewart Robinson; USDA Forest Service photos—Helitack firefighting crew rappelling from a helicopter, Firefighters heading out on horseback, Firefighters heading out on foot, Firefighter setting and monitoring backfire, Air tanker ground support team, Strategizing the day's activities, Maintaining radio contact during wildfire operations, and Wildland firefighters taking a well-deserved break as another group heads out.

Wildland Fire and Fuels Management

Background Information

Fire is an important ecological process that plays a variable role in every ecosystem within the Gila National Forest. Wildland fire management strives to maintain and restore the ecological process while protecting known values at risk. Fuels management strives to restore, maintain, and protect ecosystem health, while protecting values from adverse impacts of undesirable fire effects. The most important value is human life and safety.

Wildland fire and fuels management implements a coordinated risk management approach to building landscapes that are resilient to fire-related disturbances and preparing for and executing a safe, effective, and efficient response to fire. The National Interagency Fire Center Guidance for the Implementation of Federal Wildland Fire Management Policy[46] provides much of the current direction for managing wildland fire on federal lands, including wilderness areas. The plan direction provided here is consistent with and supports the current interagency guidance and policy.

Wildland fire is a general term describing any non-structure fire that occurs in wildlands. It includes both natural and prescribed fire. Wildfire is an unplanned ignition of a wildland fire or an escaped prescribed fire. It includes unplanned fires that are human-caused and those that are naturally ignited by lightning. Prescribed fire is a wildland fire originating from a planned ignition to meet specific objectives identified in an approved prescribed fire plan for which applicable environmental analysis requirements have been met prior to ignition. Sometimes prescribed fire is referred to as a controlled burn; however, prescribed fire is a more precise term.

Whether natural or prescribed fire, the direct and indirect effects of any one fire are rarely all positive or all negative. Fire can restore or maintain landscape diversity and vegetation structure, or it can reduce landscape diversity or fragment habitat. It can increase nutrient availability, or it can result in a loss of nutrients and soil productivity. It can accelerate erosion and sediment delivery to streams or reduce the risk of accelerated erosion and sediment delivery, or both. It can result in the loss of carbon, but also increase the ability and sustainability of the system to sequester carbon over the long term. The potential for any of these effects depends on many variables, including but not limited to fuel and weather conditions, topography, and management decisions. Fire effects are also cumulative and interact with previous or subsequent effects of other activities and disturbances in beneficial or detrimental ways. For example, watershed impacts, and recovery time increase when two fires occur on the same piece of ground with insufficient recovery time between. For example, when a stand-replacement fire was followed by a re-burn with long duration heating as fire consumed heavy fuel loading on the soil surface. On the other hand, multiple fires within an area over time can limit fire size, intensity, and undesirable fire effects. Some plant species life cycle events, like germination or blooming, are triggered by smoke.

Despite often unavoidable tradeoffs, when appropriate weather and fuel conditions exist, fire is not only a natural process; it is the most cost-effective restoration tool. In some places, fuel reduction treatments may be needed before fire can be restored to the system. The intent of vegetation treatments for hazardous fuels reduction is to change predicted fire intensity and duration, and mitigate the rate of fire spread, thereby restoring, or maintaining natural fire regimes and reducing potential detrimental impacts to watershed health, wildlife habitat, and

[46] See https://www.nifc.gov/policies/policies_main.html.

community values at risk. Not all fuels are hazardous. Some fuel loading is both characteristic and necessary to support natural fire regimes, wildlife habitat, soil function, and other ecological processes, as described in plan direction for each vegetation type.

Fuels treatment activities include, but are not limited to, those that provide wood products to individuals, tribes, businesses, and organizations, as discussed in the Timber, Forest, and Botanical Products section. These treatments are also expensive as compared to fire, and while they may mimic the outcomes of natural processes, they cannot substitute for them. For example, some plant species require exposure to smoke or heat to germinate or bloom. With limited resources, strategic placement and design of these fuel treatments are critical to achieve maximum cost and treatment effectiveness.

Livestock grazing can compete with fire restoration objectives because the fine fuels necessary to support fire occurrence, spread, and flame lengths sufficient to thin stands, is also the forage crop grazing permittees depend on. There are times and locations where a lack of adequate fuel loading is the challenge to restoring the natural role of fire. Many of the forest's grazing permittees have been and continue to be supportive of the forest's fire management program, adjusting pasture rotations, numbers, and other aspects of their operations to facilitate prescribed fire implementation.

Restoring the natural role of fire is not the desired outcome in the wildland-urban interface. Providing for the opportunity to protect human values and prevent fire from crossing ownership boundaries is the desired outcome. Management direction for the wildland-urban interface is found in.

Naturally ignited fires may be managed for one or more objectives at the same time. Objectives are developed based on fuel conditions, current and expected weather, current and expected fire behavior, topography, resource availability, and values at risk. Objectives can change as the fire spreads across the landscape, and in response to fuel and fire weather conditions. Parts of a fire may be managed to meet protection objectives, while other parts are managed to maintain or enhance resources. The resource benefit objective means making progress toward or maintaining desired conditions. Site-specific analysis is conducted for prescribed fires and for any naturally ignited fire that extends beyond initial attack. For prescribed fire, environmental analysis requirements under the National Environmental Policy Act (NEPA) must be met; the decision document is the signed NEPA decision. Naturally ignited fires are exempt from that legal requirement; however, an interdisciplinary environmental analysis is conducted using a web-based tool like the Wildland Fire Decision Support System[47] and signed by the decision maker.

Desired Conditions

1. Safety of firefighters, other agency personnel, and the public is the priority in every fire and fuels management activity. Fire and fuels management activities minimize the risk of loss of life or injury and damage to property and improve ecosystem and watershed function.
2. Fire management uses an all-lands approach that is risk-based, consistent with current national policy guidance and strategy, responsive to the latest fire and social sciences, and adaptable to rapidly changing conditions. The full range of fire management activities and tactics is recognized and used by forest administrators as an integral part of achieving sustainability and ensuring firefighter and public safety.

[47] See https://wfdss.usgs.gov/wfdss/WFDSS_Home.shtml.

In the wildland-urban interface, fuel reductions provide the opportunity to contain or reduce fire intensity before it travels to lands of other ownership or moves from lands of other ownership to the forest (see Chapter 3. Management Areas, Wildland-Urban Interface).

3. Sites with facilities that support agency administration and those that house authorized special uses are maintained to provide defensible space.
4. Information and collaborative education programs result in:
    a. Children and adults who recognize their responsibility for preventing human-caused fires.
    b. Home and business owners, community leaders, service providers, and permittees invested in or adjacent the forest who are knowledgeable about fire risk. They recognize that wildland fire is a natural process integral to sustainability and understand the need to adapt their communities, properties, and structures to fire.
    c. Individuals and communities are informed about smoke-related human health impacts; smoke generated from fires, within and outside the forest; and measures fire managers take to balance tradeoffs between fire management and air quality (see also Air Quality).
5. Wildland fire functions in its natural ecological role, burning with a range of intensity, severity, and frequency that allows ecosystems and watersheds to function in a healthy and sustainable manner.
6. Wildland fire functions in its natural ecological role on a landscape scale and across administrative boundaries, under conditions where safety and values at risk can be enhanced, mitigated, or protected.
7. Frequent, low-severity fire mitigates high-severity disturbances and protects social, economic, and ecological values at risk.
8. High-severity fires rarely occur where they were not historically part of the fire regime. Where high-severity fire is part of the fire regime, patch sizes larger than what is known to have occurred historically are rare.
9. Non-native invasive and noxious species, diseases, and pathogens are not introduced or spread by wildland fire and fuels management activities and associated equipment.

Standards

1. Human life must be the highest priority in all fire response actions.
2. Managers will use a decision support process to guide and document all wildland fire management decisions. Appropriate response strategies will be developed based on consideration of risks to life, safety, and potential resource impacts with interdisciplinary participation from forest resource staff; other agency personnel; and other agencies, authorities, and jurisdictions, if needed and as appropriate.
3. Whether in the forest or on an off-forest assignment, forest personnel must follow the operational guidelines for invasive species, aquatic invasive species, and decontamination provided in the most current Interagency Standards for Fire and Fire Aviation Operation (see also Non-Native Invasive Species S1 and S2).
4. Aerial application of retardant to water, riparian, wetland, and aquatic ecosystems must be avoided unless it is necessary to protect human safety or prevent property loss.

Guidelines

1. Natural ignitions should be managed to meet multiple objectives when fire weather and fuel conditions facilitate progress toward desired conditions for ecosystems and watersheds.
2. To avoid unintended and unacceptable negative post-fire watershed effects because of fire management activities, soil erosion and mass wasting hazard ratings should be considered during planning and decision-making processes.
3. Fuel treatments should retain amounts and distributions of coarse woody debris (1,000-hour fuels) as described in desired conditions for each ecological response unit. For coarse woody debris amounts appropriate to wildland-urban interface situations, see Chapter 3. Management Areas (see also Timber, Forest, and Botanical Products).

Management Approaches

Restoration of Natural Fire Regimes

In general, restoring natural fire regimes is not about managing for the mean fire return interval or other measures of central tendency, nor can the number of fires an area "missed" due to the suppression era be calculated based on mean values (Agee 1993, Moritz et al. 2013, Weins et al. 2012). Fire history reconstructions clearly demonstrate the minimum, maximum, and average number of years between fires in the same vegetation type vary by location and are synchronized with climatic fluctuations (Weins et al. 2012). It is the dynamic, random quality of natural fire that supports landscape diversity.

The Gila National Forest approach to restoring natural fire regimes recognizes the relationships between vegetation, fire, climate and weather, topography, and previous disturbances (Agee 1993, Weins et al. 2012, Baisan and Swetnam 1990, Schoennagel et al. 2004, Touchan et al. 1996, Abolt 1997, Parks et al. 2015, Rollins et al. 2000). It provides for the full range of historical variability in fire frequency, severity, size, and pattern to promote landscape diversity and support or accommodate progress toward desired conditions for natural resources and resource uses. The more locally relevant the information about historical variability in fire regime characteristics, the greater consideration it is given. Published studies by Abolt (1997), Baisan and Swetnam (1995), Rollins and others (2000) Margolis and others (2011), and Parks and others (2023) represent some of the more locally relevant information, with some or all their study locations in the Gila National Forest.

In some cases, it may be desirable to put prescribed fire on the ground within the historical mean fire return interval. In others, it may not be necessary as existing fuel conditions can support fire resulting from natural ignitions with effects we can accept. Time and resources may be better spent elsewhere. In still other cases, mechanical fuel treatments are needed before the land can accept the kind of fire and fire effects we can live with. These are places where there are relatively high likelihoods of large, contiguous extents of stand-replacement fire, if a fire were to occur (Parks et al. 2018, Krofcheck et al. 2017b). Additionally, there is some evidence that there may be a threshold for prescribed fire rotations once forest structure has been restored; two climate-informed modeling studies have demonstrated rotations shorter than 20 years may lead to vegetation type conversions (Diggins et al. 2010, O'Donnell et al. 2018). Others predict that longer fire-free periods will be necessary for natural regeneration to occur in a warmer, drier future (Enright et al. 2015). This could be addressed by reducing the frequency of maintenance prescribed fires to enable some seedlings and saplings to develop their fire-resistant bark, or by allowing for more of a mosaic of burned and unburned acres within the prescribed fire perimeter.

Otherwise, prescribed fire could push systems into more even-aged dynamics than desired. The Regional Climate Change Adaptation Strategy (USDA FS 2023 or most recent version) also contains guidance and a workflow process that may help integrate climate science into fire planning. Forest leadership and staff look for opportunities to balance maintenance with forward progress, apply climate-informed fire science to support adaptation goals, and actively foster relationships with the research community.

Annual Pre-Season Landscape Risk Assessment

Every year before fire season begins, leadership and resource specialists from all disciplines convene to evaluate resource conditions, and ecological and human values at risk based on current fuel moisture and the upcoming season's fire weather outlook. The consensus built during this assessment provides an integrated, holistic strategy for managing naturally ignited fire, personnel, and equipment for a variety of scenarios that might occur during the season. Forest managers then engage local governments, fire departments and volunteers, and Community Wildfire Protection Plan coordinators to discuss the strategies that have been developed, determine if additional community values need to be protected, and incorporate strategies that protect those values. Concerns identified through this process are carried forward into project planning and prioritization to mitigate risk into the future (see also Fire, Fuels and Relationships management approach). These annual risk assessments are value added to fire and forest management, the value of which is likely to grow as climate change progresses, extreme fire weather becomes more common, and fire season lengthens.

Smoke

See Air Quality.

Infrastructure, Restoration, and Relationships

When transportation, range, and recreation infrastructure is damaged as a direct result of any suppression action from a wildland fire, the Incident Management Team and forest personnel representing the affected program areas can identify qualifying needs for immediate repair or reconstruction and prepare a plan. The Incident Commander typically communicates with the Agency Administrator who holds the decision authority for approving the emergency repair or reconstruction plan. If approved, the plan is implemented under the fire's funding mechanism. Any action that is intended to check the fire's growth or provide for human safety, including but not limited to burning out to minimize fire intensities, fire-line construction, or safety zone construction, is a suppression action. However, not all incident-related damage qualifies for emergency funding. For example, if a burnout operation occurs adjacent to a fence, that fence would qualify. As the fire from that burnout progresses, additional fences damaged by that fire do not qualify for suppression dollars. Forest Service handbook direction provides guidance on qualifying infrastructure. Consistently engaging in this process to address fire-related damage can improve relationships, build support for restoring fire to the landscape, and help maintain management's ability to support existing multiple uses.

Fire, Fuels, and Relationships

The wildland-urban interface is the hazardous fuel treatment priority. Relationships play a pivotal role in the success of the hazardous fuels program. From identifying and setting priorities, designing projects, funding implementation, to implementation itself, management can only be successful if relationships are strong and inclusive. Forest staff and leadership continue to work with partners and stakeholders involved in the community wildfire protection plans, the Joint Power's Agreement, Cohesive Strategy, Wildfire Crisis Strategy and Implementation Plan,

and Collaborative Forest Restoration Program to meet the broad intent and goals of those plans and provide products to people. For example, when a prescribed fire is used without a mechanical treatment it could potentially include making an area available for fuelwood gathering by the public prior to the burn.

As science provides new information and tools capable of providing valuable information to the priority-setting process, forest leadership and staff use this science to identify where investing resources will result in the greatest return (Krofcheck et al. 2017b; Parks et al. 2018). This could include a landscape-level fire risk assessment (for example Scott et al. 2013, USDA FS 2017, Parks et al. 2018) specific to the forest that facilitates strategic placement of mechanical treatments The Regional Climate Change Adaptation Strategy also contains guidance and a workflow process (USDA FS 2023) that could be integrated into landscape-level assessments. This information is then integrated with pre-season landscape risk assessment strategies and the values and priorities of all partners and stakeholders.

Glossary

An **all-lands approach** brings all landowners, jurisdictions, and stakeholders in an area together across boundaries to decide on common goals for the landscapes they share and achieve long-term outcomes.

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Photos from top to bottom, left to right: Wildfire Crisis Strategy Landscape partner field day; Forest leadership team and partner week; Photo by Viktoriea Thomas "In loving memory of Dale E. Thomas, my beloved grandfather. May his passion for the Gila National Forest bless all who tread this beautiful land"; Watershed staff help with Native Fish in the Classroom field day; Smokey at the Silver City 4th of July parade; Prevention staff at New Mexico State Fair; Joint Chief's Project planning with partners; and Johnson Fire Gila Hotsprings community meeting

Community and Tribal Relationships

Background Information

One of the most distinct characteristics of southwestern New Mexico is its diversity of people, culture, traditions, and values. Understanding the unique characteristics, trends, history, and challenges of the communities is essential for public land managers working to meet the needs of the public.

Since its inception in the early 1900s as the Gila Forest Reserve, the forest has been the provider for many of the resources required for settling this region of the southwestern frontier. It was stewarded by Native American Tribes and Pueblos since time immemorial, and served Spain and Mexico long before it was managed by the Forest Service. The heritage, culture, traditions, and values that grew from this time were handed down over generations and still exist today where Native American, Hispanic, Anglo-American, and other cultures have combined to make New Mexico a multicultural center. The span of these diverse traditional uses includes ceremonial access, fuelwood, domestic livestock grazing, hunting, harvesting forest products and maintaining acequias or irrigation ditches. Ceremonial access is important for tribal ways of life. Fuelwood is important for heating homes and cooking. Livestock grazing supports traditional ways of life, and local and regional economies. Hunting has subsistence and cultural value, as do acequias and irrigation ditches. Forest products are important sources of food, medicine, and ceremonial and building materials.

Wood haulers with burros on the Black Range-Hillsboro Road. USDA Forest Service photo by E.S. Shipp, 1928. FS # 233573

While those historical values are still prevalent, the social and cultural environment has also transitioned to include contemporary uses such as recreation and individuals seeking solitude and relaxation to get away from the social pressures and pace of their everyday world and reconnect with nature. In addition, many locals rely on the forest for parts of their livelihood, such as those capitalizing on the opportunity to provide outfitting, guiding, and other services. Forest

management continues to bring communities together over issues that affect them or to foster involvement through volunteer work on their favorite part of the forest. Others continue to engage in traditional uses. All these uses help retain a strong connection to the land, maintain social cultures and longstanding traditions, and contribute to quality of life.

Relationships are a key factor that can influence the success of how the forest plan is implemented. With the challenges the forest faces today, strong working relationships with all stakeholders, partners, and volunteer groups are vital to increase capacity, help meet desired conditions, and fulfill the agency's mission to care for the land and serve the people. The Forest Service Tribal Relations Program strives to enhance relationships between the Forest Service, federally and non-federally recognized Tribes and Pueblos, Alaska Native corporations, Native Hawaiians, as well as American Indian, Alaska Native, and other indigenous individuals, communities, inter-tribal organizations, enterprises, and educational institutions, thereby improving the agency's ability to foster effective partnerships and respect tribal sovereignty.

The Gila National Forest is also dedicated to expanding the respectful application of Indigenous Knowledges in coordination with the Interagency Indigenous Knowledge Working Group. Indigenous Knowledges are proprietary information and require special safeguards and permissions to ensure that they are considered and applied in a manner that is prescribed by Tribes, Pueblos and indigenous communities in accordance with the Cultural and Heritage Cooperation Authority.

Desired Conditions

1. Gila National Forest leadership, staff, and the diverse communities and partners it serves are engaged, able to create shared understanding of issues, and successfully implement programs and projects that and sustain the social, economic, and ecological benefits that the forest provides.
2. The forest contributes to local economies through recreation and tourism, timber and forest products, livestock grazing, and other multiple use related activities and products, while sustaining the long-term productivity of the land and waters.
3. The uniqueness and values of communities, and the traditional uses important for maintaining cultures are respected and valued as important. Incorporation of Indigenous Knowledges into project planning and implementation is expanded.
4. Forest leadership and staff have a network of dependable partners and volunteers who provide additional capacity to meet forest plan desired conditions effectively and efficiently.
5. Youth, diverse communities, volunteerism, citizen science, and conservation education support work across program areas, connect people with public lands, and foster a sense of stewardship.
6. Environmental justice communities and partners are included as essential parts of the stakeholder engagement process.

Guideline

1. Engagement with community members, leaders, partners, and other stakeholders should begin in the early stages of project planning and be designed to include diverse perspectives, needs, concerns, and knowledge held within the community of stakeholders.

Tribal Relationships and Co-Stewardship

Background Information

The Gila National Forest contains a great diversity of landscapes and areas critical for the continuation of traditional cultural lifeways, wide arrays of natural and ecological resources, and those held sacred by the first peoples of this area. The Pueblos of Acoma, Isleta, Laguna, Zuni, and Ysleta Del Sur; the Navajo Nation; the Hopi Tribe; Comanche Nation; Yavapai-Apache Nation; and the San Carlos, Ft. Sill, Mescalero, and the White Mountain Apache Tribes recognize the lands within the Gila National Forest as part of their aboriginal or traditional homes and use areas. Each tribal nation has their own history, traditions, relationships to the land and to other tribal nations, and relationships with the federal government.

The nation-to-nation relationship between the Forest Service and individual federally recognized tribal nations is a sovereign nation to sovereign nation relationship that predates the United States Constitution. These relationships are codified in the U.S. Constitutional Articles, Treaties, and numerous Acts and Executive Orders. Together, these authorities direct the Forest Service to consult with all affected federally recognized Tribes and Pueblos in any action that has the potential to affect the Tribe or Pueblo, and to manage, make decisions; and administer forest management activities in a manner that takes into consideration those potential impacts to Tribes and Pueblos. This includes a decision-making process that respects and seeks to integrate into management practices traditional American Indian beliefs, cultural practices, and Indigenous Knowledges. This is achieved through consultation, engagement, and co-stewardship between those individual federally recognized tribal governments and the Forest Service.

The Gila National Forest maintains a nation-to-nation relationship with the 13 federally recognized Tribal and Pueblo governments mentioned above, and routinely consults on policy development, proposed plans, projects, programs, and forest activities that have a potential to affect tribal interests or natural and cultural resources important to the Tribes.

Specific places and properties valued and utilized by the Tribes and Pueblos have been identified on every district of the Gila National Forest; however, the areas of Tribal and Pueblo interest are not limited to these specific locations. Some of these properties can possess traditional, cultural, or religious significance. Specific locations of traditional or religious significance are often held in confidence (Freedom of Information Act exempt) to protect these important areas and resources. Traditional cultural properties are managed and protected as eligible for the National Register of Historic Places under the National Historic Preservation Act. It is important that traditional practitioners maintain continued access to traditional cultural properties, sacred sites, and areas of spiritual significance and are afforded privacy to conduct ceremonies as requested.

Tribal ways of life can be impacted by changes in land ownership and development of private land that affects their access to their ancestral lands, degradation of forest and watershed health, technological developments that interfere with traditional ceremonies, and recreational use of their ancestral lands. Climate change is also affecting the environment and influencing tribal ways of life. Tribal nations are conducting vulnerability assessments, developing adaptation plans, and establishing priorities for implementing those plans.

With the heightened emphasis on co-stewardship, there will be more collaboration and integration of Indigenous Knowledges into the management of the Tribe’s and Pueblo’s ancestral lands and waters. Co-stewardship offers a path forward. One in which the Indigenous Knowledges and practices that have allowed Native peoples to survive climatic change over

millennia can inform future management decisions that will influence the trajectory of our natural and cultural environment. Co-stewardship that values and integrates all voices and knowledges is key to climate change adaptation.

Desired Conditions

1. The uniqueness and values of the tribal cultures in the Southwest and the traditional uses important for maintaining these cultures are respected and valued.
2. The long history of tribal communities and uses including hunting, gathering plant and mineral materials, and use of sacred places on National Forest System lands and resources are respected and valued.
3. Forest resources, such as plants, minerals, and animals, important for cultural and traditional needs, as well as for subsistence practices and economic support of tribal communities, are available and sustainable.
4. Tribal practitioners have access to sacred sites, traditional cultural properties, and collection areas for activities that are essential to traditional and ceremonial use to maintain their continuity of culture.
5. There are opportunities for solitude and privacy to conduct tribal traditional and cultural activities.
6. Social, cultural, and economic resources provide a setting for educating tribal youth in culture, history, and land stewardship, and for exchanging information between tribal elders and youth.
7. Tribal interests are incorporated into management strategies for natural and cultural resources, including management changes to increase plants, animals, and trees of tribal importance.
8. Indigenous Knowledges are incorporated into project planning and decision-making. Data sovereignty is respected.

Standard

1. Confidentiality of sensitive tribal information, resources, and data shared during consultation must be maintained, unless permission to share information is given.

Guidelines

1. Requests for temporary closure orders for cultural and traditional purposes should be accommodated.
2. Consultation with Tribes and Pueblos should occur at the early stages of project planning and design, and tribal perspectives, needs, and concerns, as well as Indigenous Knowledges, should be incorporated into project design and decisions.
3. Tribal traditional use of medicinal plants and other botanical resources should take priority over applications for commercial harvesting.
4. Management activities and uses should be planned and administered in a manner that prevents or minimizes impacts to the physical and scenic integrity of places that the Tribes and Pueblos regard as sacred sites, traditional cultural properties, or as part of an important cultural landscape.

5. Human remains and cultural items disinterred from National Forest System lands or adjacent sites should be treated with respect and in accordance with the wishes of affiliated Tribes and Pueblos (for example, reburied in accordance with the requests of affiliated Tribes and Pueblos).

Management Approaches

Environmental Justice and Equity

> "In caring for the land and serving the people, our job is to connect people to the land and one another. We do that by embracing diversity and by treating everyone with dignity and respect. That includes serving everyone equitably. Communities of color, tribal communities, and low-income communities live with more environmental burdens and get fewer benefits from the lands we manage, such as timber, grazing, and access to outdoor experiences. Correcting the imbalance is up to all of us; we can start by instilling principles of equity and environmental justice into Forest Service policies, programs, and practices." -*Chief Randy Moore, 2021*

There are indigenous, minority, socially vulnerable, underserved, disadvantaged, and frontline environmental justice populations and communities that are impacted by management of the Gila National Forest. Forest leadership and staff respect and value these populations and communities by integrating environmental justice into the initial stages of project planning. This can be done by identifying all environmental justice communities and their interests at the beginning of the project development process, in keeping with Community Relationships G1. Spatial analysis methods developed by Adams and Charnley (2020) could help design projects that avoid inequitable distribution of benefits and allow decision-makers to weigh environmental justice issues in their decision-making processes. For environmental justice communities and projects in which such an analysis isn't practicable or feasible due to lack of spatial data, non-spatial analysis can still be used to inform decision-making and promote equity.

Tribal Relationships and Co-Stewardship

Forest Service policy supports the U.S. Department of Agriculture's initiative to align collaboration and consultation with Tribes and Pueblos among its agencies. Forest leadership and staff seek opportunities to use federally authorized or advocated programs to forge collaborative partnerships with Native American tribes and pueblos focused on developing and implementing projects of mutual benefit. Memoranda of understanding and other formal agreements may be useful instruments in these partnerships to promote understanding of tribal community needs, shared desired conditions, and respect. Formal agreements may be of elevated importance for collaborative management of traditional cultural properties and other sacred sites. Forest leadership and staff strive to provide the social, cultural, and economic resources that create a setting for educating tribal youth in culture, history, and land stewardship, and opportunities for exchanging information between tribal elders and youth.

In compliance with handbook direction, the Gila National Forest will develop protocols with Tribal and Pueblo officials for consultation on issues and decisions that may have a direct, substantial effect on tribal lands, subsistence uses, treaty rights, sacred sites, or cultural resources or practices on and off reservations. Forest leadership and staff will seek opportunities to work collaboratively with Tribes and Pueblos when developing interpretive and educational exhibits or other media that focuses on the history of the lands managed by the Gila National Forest. These are opportunities to provide the public with a greater understanding and appreciation of shared history, culture, and traditions. When appropriate and while honoring data sovereignty and

protecting confidential and sensitive information, we seek opportunities to educate the public on the importance of sacred sites, traditional cultural properties, and their management.

Forest leadership and staff seek training opportunities and experiences that improve our cultural competencies and help us gain a broader understanding of the unique nation-to-nation relationships between the federally recognized Tribes and Pueblos and the federal government, American Indian law, customs, traditions, and values.

Engagement and Collaboration

Forest leadership and staff recognize that achieving the results desired by the public requires that we are inclusive of diverse backgrounds, expertise, roles, values, and perspectives in everything that we do. From this place of recognition, we strive to engage highly diverse working groups and collaboratives with representatives from local, state, and federal agencies; local and tribal governments; elected officials; local, regional or national communities; businesses; recreation and forest user groups; fire safety and community protection groups; environmental and conservation organizations; users with historical ties to the forest; volunteer and stewardship groups; educators; youth groups; and others as appropriate to the task at hand.

Forest leadership and staff seek to leverage opportunities to work with Tribe, Pueblos and neighboring land managers in the design and implementation of projects that consider the interactions and implications of management practices on all sides of jurisdictional lines, and at a scale that improves landscape-scale connectivity across mixed ownerships. If an interest is expressed, tribal staff will be invited to participate in interdisciplinary planning teams. Leadership and staff recognize that having a solid understanding of the plans and policies of federal and state agencies, local governments, and other organizations, is a best practice and an underlying factor in successful partnerships. We also recognize that both formal and informal communication, collaboration and cooperation strategies have their place, depending on the task and the parties involved.

Outreach and Education

Forest leadership and staff value collaborative outreach and education because, in general, the more people know about the forest's diverse ecological, social, and economic resources, laws and regulations that govern their management, management tools, and land use ethics, the better prepared they are to effectively engage and influence the ecological, cultural, and social landscapes we live in. Forest leadership and staff strive to play an active part in connecting people with public lands and nature and cultivate communities that are informed and effective participants in the management of the forest.

Engaging Youth

Forest leadership and staff recognize that our youth are our future. We actively seek opportunities to participate in collaborative outreach and education efforts that support them. Forest leadership supports staff from all educational backgrounds and professional disciplines that seek opportunities to engage and encourage youth at events such as the annual fishing derby at Lake Roberts, the Native Fish in the Classroom program, Kids in the Woods, Envirothon, Science Olympiad, Expanding Your Horizons and science fairs held at local schools. Forest leadership and staff seek opportunities to work collaboratively with local schools, Western New Mexico University, and other universities, to develop and implement programs that prepare students for careers in natural resource management, including internships. Forest leadership and staff also recognize that engaging youth is more than outreach and education and look for

meaningful opportunities to ask youth for their input and involve them in project development, implementation, and monitoring.

Supporting Local Businesses

Forest leadership and staff provide contracting opportunities in local communities for small businesses whenever possible, compliant with all equal opportunity and federal purchasing regulations. This includes local small businesses, woman-owned businesses, service-disabled veteran-owned businesses, and small disadvantaged businesses.

Glossary

Climate justice is an extension of environmental justice. It is the fair treatment of all people and the freedom from discrimination in the creation of policies and projects that address climate change, as well as the systems that create climate change and perpetuate discrimination. The term acknowledges that the multiple consequences of climate change (including but not limited to, increased flooding, more frequent and severe storms, prolonged drought, severe fires, and sea-level rise) disproportionately impact people who already experience more inequity in our society.

Environmental justice is defined by the Environmental Protection Agency as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that Forest Service management activities do not place a greater burden of environmental harms and risks on low-income, minority and indigenous populations than the general population. Meaningful involvement means that agency leadership and staff facilitate involvement of environmental justice populations in our decisions. Fair treatment and meaningful involvement are the processes that bring about the equitable distribution of Forest Service benefits to communities, which is the goal of environmental justice.

Environmental justice communities include indigenous peoples, minority populations, low-income populations, underserved communities, underserved populations, disadvantaged communities, socially vulnerable communities, and frontline communities. As defined by the Environmental Protection Agency:

> **Indigenous peoples** include state-recognized tribes, indigenous and tribal-community based organizations; individual members of federally recognized tribes, including those living on a different reservation or living outside Indian country; individual members of state-recognized tribes; Native Hawaiians; Native Pacific Islanders; and individual Native Americans.
>
> **Minority populations** are a population of people who are not single-race white. Populations of individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.
>
> **Low-income populations** are populations characterized by limited economic resources. The U.S. Office of Management and Budget has designated the Census Bureau's annual poverty measure as the official metric for program planning and analysis, although other definitions exist.

Underserved communities are populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life. Namely, these are Black, Latino, and Indigenous and Native American persons, Asian Americans, Pacific Islanders, and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.

Underserved populations are populations who face barriers in accessing and using victim services, and populations underserved because of geographic location, religion, sexual orientation, gender identity, racial and ethnic identity, and special needs such as language barriers, disabilities, alienage status, or age.

Disadvantaged communities include those that experience: low income, high or persistent poverty or both; high unemployment and under employment; racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government entities; linguistic isolation; high housing cost burden and substandard housing; distressed neighborhoods; high transportation cost burden or low transportation access or both; disproportionate environmental stressor burden and high cumulative impacts; limited water and sanitation access and affordability; disproportionate impacts from climate change; high energy cost burden and low energy access; jobs lost through the energy transition; and access to healthcare.

Socially vulnerable communities are identified by the Centers for Disease Control as those that have special needs for equity and environmental justice actions. This includes people who are living below the poverty line, those who are unemployed, low-income individuals, those without a high school diploma, people over 65 and under 17, people with disabilities, single-parent households, people who are a minority race or ethnicity, people with limited English proficiency; those living in multi-unit structures, those in mobile homes, those living in crowded conditions, those with no vehicle and those living in group quarters.

Frontline communities are identified by the National Association for the Advancement of Colored People as groups of people who are directly affected by climate change and inequities in society at higher rates than people who have more power in society. They are on the “frontlines” of the problem. In other words, those who experience oppression because of race, income, gender, sexual orientation, disability, gender identity, age, et cetera are more likely to have less resources and protections in our society in general.

Equity is defined in Executive Order 13985 as the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, Indigenous, and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.

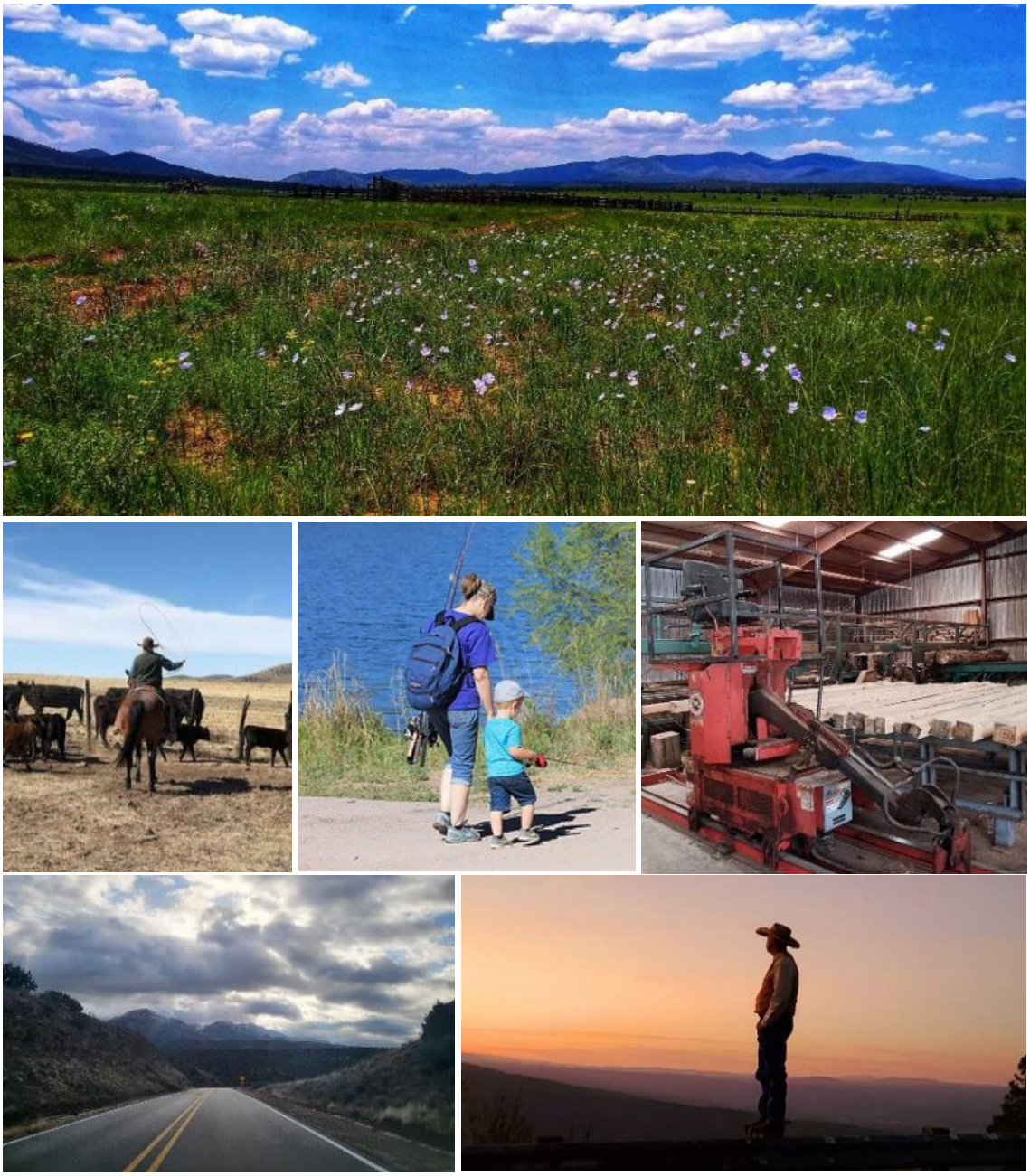
Indigenous Environmental Justice recognizes that while indigenous peoples are encompassed in the definition of minority populations under environmental justice, federally recognized tribes

are sovereign nations and are thus political entities, not racial entities. While all indigenous environmental justice issues are environmental justice issues, not all environmental justice issues are indigenous environmental justice issues. The federal trust responsibility to tribal nations is first and foremost. It includes protection of Indian trust lands, Indian use rights of those lands, tribal sovereignty, and rights of self-governance. Indigenous peoples include state-recognized tribes, tribal members, and indigenous community-based organizations. Indigenous environmental justice recognizes that indigenous peoples are the holders of unique languages, knowledge systems and beliefs, and possess invaluable knowledge of practices for sustainable management of natural resources.

References

Adams and Charnely (2020), and Charnley, Jaworski and Huber-Stearns (2018) as cited in McDaniel, J. 2021. Reducing Fuels and Advancing Equity: Incorporating Environmental Justice Into Hazardous Fuels Management. Science Findings, Issue 243, October 2021. USDA Forest Service, Pacific Northwest Research Station.

Photos clockwise from upper left: Amanita by Elizabeth Sorells; Elk in velvet Black Range Ranger District by Micah Kiesow; and Honeybee on sunflower by Johnathan Yosten (photo contest)



Photos from top to bottom, left to right: Reserve Ranger District by Amanda Gehrt; Branding time on the Glenwood Ranger District by Kendall Brown; Mother and son go fishing at Lake Roberts (USDA Forest Service photo); Reserve mill by Amanda Gehrt; Scenic view of the Mogollon Mountains from State Highway 180 by Sandra Taylor; and Sunset over the Gila by Dalue Mize.

Multiple Uses and Social, Cultural, and Economic Sustainability

Cultural Resources and Archeology

Background Information

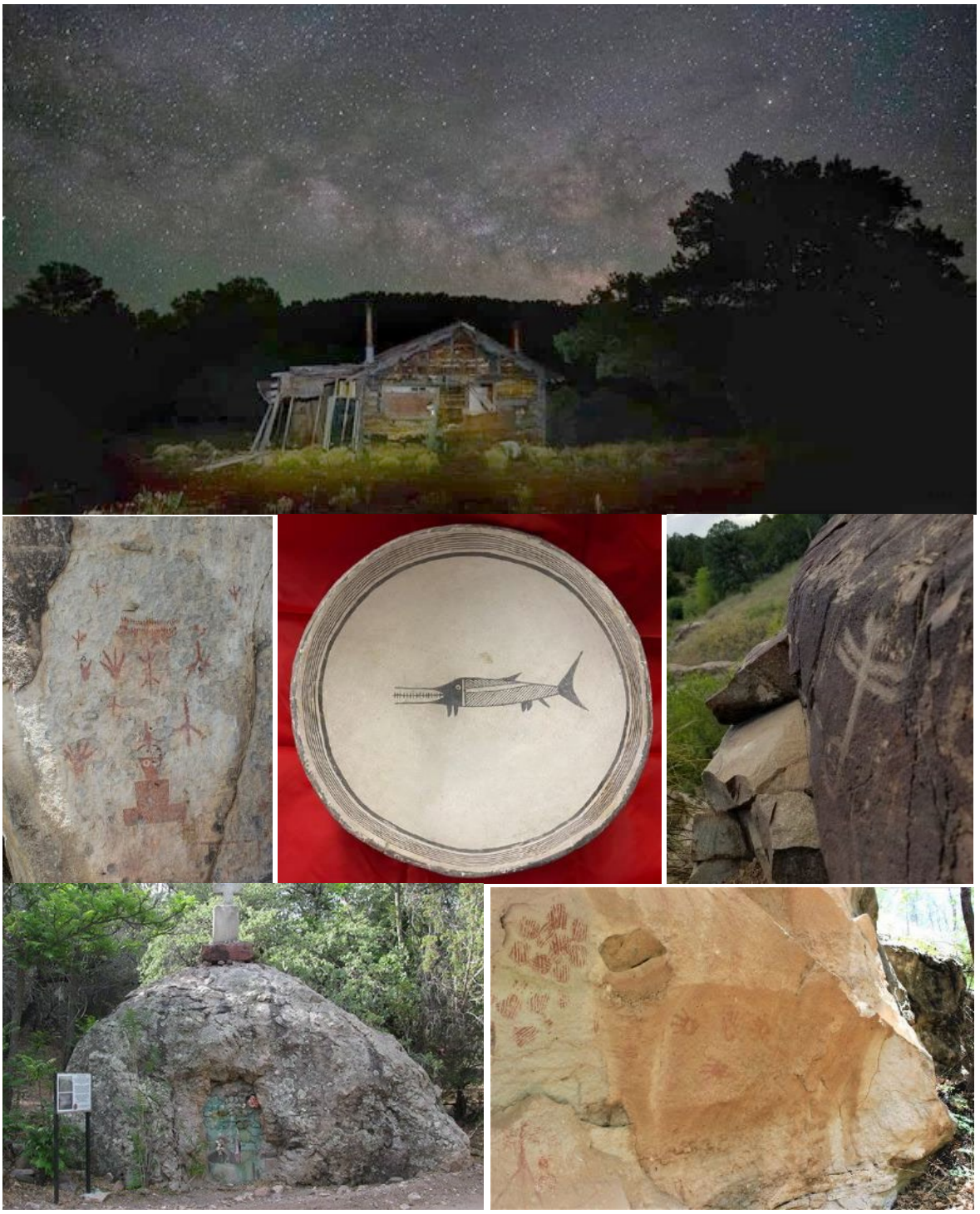
The Gila National Forest contains cultural and archaeological resources that demonstrate human occupation and use for at least the past 12,000 years. The occupation and use of the forest by Native Americans (American Indians) with Pueblo and Athabaskan ethnic affiliations and groups ancestral to these ethnic affiliations has occurred over this entire time span. Occupation and use of the forest by Euro-Americans and other peoples occurred over the past 400 years as well. As a result, the Gila National Forest includes numerous locations of historic and cultural value. Many different groups assign cultural value to the places located within the boundaries of the Gila National Forest, and therefore a variety of property types with ascribed cultural meaning exist.

Archeological site densities vary from 5 or fewer to over 25 sites per square mile with only about 20 percent of the forest inventoried to an acceptable standard. Many cultural resources are considered traditionally significant to tribes and pueblos associated with the lands managed by the Gila National Forest. As of September of 2020, 9,292 archaeological sites had been recorded within the forest. Based on current data, roughly 92 percent of the archaeological sites are associated with its prehistoric occupation (over 400 years ago). Archaeological resources associated with the historical occupation of the area (ca. 400 to 50 years ago) compose roughly 8 percent of the known resources.

Of these sites, only eight have been formally listed on the National Register of Historic Places. Roughly 40 percent of all cultural resources have been recommended as being eligible for inclusion in the National Register of Historic Places, and only 45 percent of all resources have been recommended as being not eligible for inclusion. The eligibility of the remaining 15 percent of known cultural resources is currently undetermined.

Historic properties are a major source of information regarding the history of human occupation. Cultural sites contribute to the social and economic health of the area, providing opportunities for tourism, education, and research. They are also necessary for maintaining the cultural identity of traditional communities associated with the forest. To many traditional communities, the land itself and the connection to it, is part of their cultural identity.

Cultural resources are nonrenewable. Once the resource has been disturbed, damaged, moved, altered, or removed, nothing can recover the information that could have been gained through analysis or replace the opportunity for individuals to understand and experience the site. Forest Service management activities, public use, fire, flooding, and erosion have affected cultural resources. While anecdotal, related impacts have increased through time. Damage from vandalism and theft continues to be a management issue, and the effects of climatic instability to cultural resources are anticipated to increase. Forest management practices are aimed at minimizing or avoiding negative impacts to cultural resources.



Photos from top to bottom, left to right: (Photos by Bella Mollard) Claremont cabin, Rock art, Mimbres bowl, Dragonfly, and Handprints; Conney's Tomb (USDA Forest Service photo).

Desired Conditions

1. Historic properties and other cultural resources that may be eligible for inclusion in the National Register of Historic Places are stable and retain site integrity.
2. Cultural resources are evaluated for their eligibility to the National Register.
3. Historic and prehistoric sites, including known American Indian sacred places and traditional cultural properties, retain their cultural importance.
4. Site integrity and stability remain intact where the values are rare or unique.
5. Site eligibility is not impacted by visitors. Priority heritage assets are all stable and their significant values are protected.
6. Vandalism, looting, theft, and damage to heritage resources are rare.
7. Interpretation and tribal and public involvement in archaeological activities increases appreciation and respect of cultural values and fosters a sense of stewardship for shared heritage.
8. Heritage resources provide educational opportunities that connect people, past and present, to the land and its history. Public enjoyment is enhanced by opportunities to visit interpretive heritage resource sites.
9. Visitors have the information they need to treat archaeological sites appropriately and preserve site integrity and value.
10. Opportunities exist for volunteers to participate in heritage resource conservation activities such as research, site stabilization, conservation, and interpretation projects.
11. Heritage programs, interpretive presentations, publications, and interactive learning opportunities are available to provide the public with opportunities to learn about, understand, and experience the forest's history and prehistory.

William Grudgings' tombstone. USDA Forest Service photo by Zack Law

Guidelines

1. Cultural artifacts should be preserved in place, except when endangered, then they should be curated following current professional standards.
2. When adverse effects to cultural resources occur, known communities to whom the resources are important should have the opportunity to be involved in resolving the adverse effects.
3. Historical documents such as photographs, maps, should be properly preserved and made available for research and interpretation by Forest Service staff, contractors, other agencies, universities, American Indian tribes, and the public.
4. Heritage-based interpretive sites should be managed to enhance the public's understanding of the resource and be consistent with tribal interests to protect the cultural setting of the site and visitor experience.
5. Heritage interpretive sites, structures, and other resources should be managed to develop visitor appreciation for the region's history and increase awareness of preservation efforts.
6. Through consultation with tribes who are descendants of the prehistoric people that have associations with the area, prehistoric sites should be managed to prevent or minimize adverse effects.
7. Cultural resources should not be actively managed or interpreted in congressionally designated wilderness. Visitor information regarding prehistoric and historic resources within designated wilderness should be provided at district offices or nearby educational and interpretive displays located outside of wilderness boundaries, and not within designated wilderness boundaries.

Management Approaches

Heritage Program

The goal of heritage program management is to achieve a balance between activities that ensure cultural resource management projects follow legal requirements (National Historic Preservation Act, Section 106) and activities that focus solely on the cultural resources themselves (National Historic Preservation Act, Section 110). This can be accomplished through the inventory, documentation, study, and preservation of sites, and conducting a program of "public archaeology" aimed at educating and informing people about cultural resources through hands-on interpretation and involvement.

When stabilization and restoration work are necessary to preserve sites, the work should generally be prioritized based on the importance of the site, tribal concerns, information potential, uniqueness, and visitation levels. A monitoring and assessment program that includes completed work may help in planning and performing maintenance before it becomes critical to the condition of a site.

Another aspect of the forest's heritage program management involves physical records and artifacts that may have been removed from sites for various reasons. Forest staff typically develop agreements with forest-approved repositories to curate these records and artifacts to ensure they are stored properly and reduce the amount of office space necessary to house them at Forest Service facilities. These approved repositories and the collections housed should be periodically inspected to ensure professional standards are met. Forest staff recently completed a digital migration of all heritage record housed at the Supervisor's Office. The hard copy records are now stored at the National Archives.

Cultural Resources Overview

The cultural resources overview is a document that synthesizes information and describes the role of the forest's cultural resources as it relates to local, state, regional, and national heritage issues. It focuses on priority heritage assets and sites at risk. Priority heritage assets are those that contribute to significant research issues at local, state, and national levels. This document should provide the cultural context and guidance on evaluating the significance of individual sites. Every forest in the region is expected to complete a cultural resources overview in consultation with tribal partners. Gila National Forest staff are currently in the process of developing this document and using it to advance program management.

Interaction with other Program Areas

Forest leadership and staff are always looking to improve interaction and coordination between program areas. Early involvement of staff from all program areas during project development helps ensure that diverse resource concerns are considered during planning activities. One way we have created more efficient coordination and streamlined cultural resource protection is through the development of databases of fire-sensitive sites, structures, and other resources that is available to for fire management purposes.

Survey Prioritization

Project-related surveys are generally prioritized over non-project related surveys. Non-project related surveys are likely to be prioritized considering: (1) areas where proactive survey could be anticipated to contribute to larger planning activities; (2) areas where eligible cultural resource are threatened or ongoing impacts are unknown and need to be assessed; (3) areas indicated to have high cultural value or high density of cultural resources; (4) areas of importance to traditional communities; and (5) areas where additional survey will contribute to a greater regional understanding of a management unit.

Relationships

Heritage resources provide educational opportunities that connect people, past and present, to the land and its history. Public enjoyment is enhanced by opportunities to visit interpretive heritage resource sites. Interpretation of the human history of the Gila National Forest promotes greater public understanding and appreciation of the prehistoric and historic cultures and communities that have depended on this landscape for their livelihood, recreation, and spiritual well-being, and provides connections between prehistoric, historical, and modern people.

With leadership support, forest staff seek opportunities to:

1. Develop interpretive materials with children, members of Tribes and Pueblos, and other community members.
2. Cooperate with private industry, museums, secondary schools, universities, organizations, and other federal, state, and local governmental agencies to provide for heritage tourism that enhances the overall experience of visitors, results in preservation of heritage resources and their setting, and is consistent with tribal interests and desires.
3. Encourage partnerships with American Indians, commercial ventures, volunteers, museums, and universities for documenting, preserving, interpreting, and managing sites and for evaluating and developing creative management opportunities.

4. Maximize opportunities for partnerships and volunteerism in all heritage program elements. Cooperate with local, state, and federal agencies, organizations, educational institutions, and local tribes in accomplishing program goals and objectives.
5. Provide orientation and training opportunities for Forest Service personnel, permittees, contractors, and volunteers that encourages efficiencies in National Historic Preservation Act processes.
6. Find teaching opportunities to educate personnel on the identification, management, and protection of significant cultural resources.
7. Synthesize cultural resource findings and interpret and share them with the scientific community and public through prehistoric and historic contexts, formal presentations, publications, and educational venues.
8. Develop heritage tourism in concert with local communities and other agencies.

Glossary

Athabaskan denotes a speaker of North American languages including Diné (Navajo) and various Apache languages of the southwestern United States, several languages of coastal California and Oregon, and many languages from Alaska and northwestern Canada.

Water Uses

Background Information

Water is an ecological resource and a vital life-sustaining requirement. The social concern regarding adequacy of water was one of the elements for which the Forest Service was created. The headwaters of major river systems have played influential roles in the history of communities in and around the Gila National Forest. These systems have provided and continue to provide critical water resources for agriculture and ranching and assist in sustaining a quality of life for communities. The integrity of these upper watersheds is important in supporting the delivery of quality water to users and uses downstream. Forest leadership and staff have a role in supporting this need through management, protection, and restoration activities. The management of the forest to ensure a sustainable supply of clean water will continue to be a major consideration into the future.

All natural waters flowing in streams and water courses and found underground in New Mexico are declared to be public and subject to appropriation for beneficial use. In New Mexico, beneficial use includes the following: domestic use, livestock and wildlife watering, irrigation, prospecting and mining, and construction of public works, highways, and roads. Water for fish culture is not, nor are instream flows considered a beneficial use by the state.

Civilian Conservation Corps (CCC) watershed structure. Upstream arch principle in dam construction. USDA Forest Service photo by W.G. Koogler, 1933, FS#282625. This long, low dam is a wirebound masonry type dam-apron. Woven wire is anchored in a trench under the dam.

The four basic rules that govern New Mexico water law are:

1. "First come, first served." Water in New Mexico is governed by the "doctrine of prior appropriation." The fundamental principle of this doctrine is that the first person to divert water from a stream has the right to continue that use in times of shortage.
2. Water must be applied to a beneficial use. "Waste" of water is prohibited under New Mexico water law.
3. Water rights are freely transferable. In New Mexico, water rights may be bought, sold, and moved around rather freely within the basin. Users may change both their "point of diversion" and type of use.
4. "Use it or lose it." Unlike other property rights, simple failure to use water for a period of time may result in a permanent forfeiture of the right to use water in the future.

Surface water and groundwater are managed and administered by the New Mexico Office of the State Engineer through a permitting process. This applies to new appropriations, transfers of location, changes in beneficial use, or changes in point of diversion. Stream systems and underground basins as outlined by the State Engineer determine those rules and regulations under which each water right claim will fall.

The most common water right claims within the forest include spring developments, stock tanks, and wells. Spring developments and stock tanks fall under surface waters that are regulated by stream system, while wells fall under groundwater, which is regulated by declared underground water basin. Approximately 75 percent of the forest lies within the Gila-San Francisco stream system and its associated groundwater basin. The remainder lies within the Little Colorado, Rio Grande, Lordsburg,

Animas, and Mimbres stream systems and their associated declared underground water basins. Maps of the New Mexico stream systems and groundwater basins can be found on the State Engineer's website. While similar in many cases, the map boundaries are not the same as the National Hydrography Dataset watershed currently used by the Forest Service, and coordination is always necessary to ensure that State Engineer maps are used for water rights claims.

The Gila-San Francisco stream system has been adjudicated. That means the court has determined water rights. This basin is considered fully appropriated, which means no additional water rights will be permitted by the Office of the State Engineer. Transfers of water from surface to ground, changes in points of diversion, places, and purposes of use are common. Any new developments that were constructed by the agency in this stream system after July 3, 1978, require a water right be transferred from some other development within the basin, unless forest management can claim a reserved right. Federal reserved rights are discussed later in this background information section. Other completed adjudications relevant to the Gila National Forest include the Animas and Mimbres stream systems. The only active adjudication that affects the forest is the ongoing Lower Rio Grande stream system, which was initiated in 1997.

In the Rio Grande, Lordsburg, and Little Colorado basins, which are not adjudicated, forest management routinely files on and constructs spring developments, drills wells in declared groundwater basins, and constructs stock tanks for small amounts of water for beneficial uses that support the agency's multiple-use sustained-yield mandate. A permit is required to impound surface water in unadjudicated stream systems, including surface water for livestock.[48]

There are 29 declared underground water basins in New Mexico, of which the forest occupies portions of 8. The largest of these are the Lordsburg, Mimbres, and Gila-San Francisco declared underground basins. Most of the eight basins within which the forest is located were declared between 1960 and 1965, with the remaining being declared in 2005.

Reserved rights are water rights that accompany land that was reserved or withdrawn from the public domain under the authority of the Organic Administrative Act of 1897, to establish a national forest. Sufficient water to fulfill the purposes of the reservation was also withdrawn by implication. The principle also holds that the priority date for the withdrawn water is the date of the land withdrawal, even though the water may not be put to beneficial use for years. The Gila National Forest has exercised reserved water rights for (1) continuous supply of timber, including water for such things as administrative sites, road construction for timber, forest fires, et cetera, and (2) favorable conditions of water flow, which includes water impounded by earthen dams to stabilize gullies and retain sediment. The intent of these is not to impound water, but to minimize the quick blast of water and sediment that the gully system may produce.

There are number of agreements with other water right holders to use water on National Forest System lands for varying uses. Three types of agreements are currently in place.

1. Water Use Agreements: These agreements provide for privately held water rights to be used on National Forest System lands. These agreements, to date, have only occurred between a livestock grazing permittee and forest managers.

[48] A permit is required by the New Mexico Office of the State Engineer for the Rio Grande and Lordsburg basins. For the Little Colorado River, a permit is required by the Arizona Department of Water Resources.

2. Lease Agreements: There is one lease agreement currently in place with Freeport-McMoRan Inc., a neighboring mining company. This lease agreement provides water to be used for livestock and wildlife purposes in the Silver City Ranger District over a 10-year period.
3. Emergency Water Use Agreements: There is currently one emergency water use agreement. This agreement covers the use of Bear Canyon Reservoir, which is located on state lands immediately adjacent to National Forest System lands in the Wilderness Ranger District. The use is limited for firefighting emergencies and coordinates the use between the Forest Service, New Mexico Department of Game and Fish, and irrigation.

Acequias, or community ditches, are community operated and organized water irrigation systems. Many of the state's acequia associations have been in existence since the Spanish Colonial period in the 17th and 18th centuries. Acequia and community ditch associations are political subdivisions of the State of New Mexico and occupy a unique place in forest management. Many acequias were established before the land on which they are located was reserved for national forest purposes. Such acequias are within valid rights-of-way granted by the United States under laws and treaties that pre-date the Federal Land Policy and Management Act, and do not require Forest Service authorization for the use and occupancy of National Forest System lands within the historical right-of-way. It is important to note that any changes to the management of the historical right-of-way may be subject to a Forest Service authorization.

Much of the water diverted by acequias comes from National Forest System lands and can be affected by forest management activities upstream. Acequias remain a vital water delivery and community organizing system today. Currently, 30 acequias or community ditches depend on water that flows from the forest. They serve as important water infrastructure for communities, and their associations are important community organizations.

Desired Conditions

1. Watershed conditions support favorable conditions of water flow and permitted water uses both in the forest and downstream (see Watersheds desired conditions).
2. Where they are necessary, watershed structures slow water flow and retain sediment to support favorable conditions of water flow.
3. Permitted water rights held by the Gila National Forest provide water for designated beneficial uses that adequately support multiple uses in the forest.
4. Water uses in the forest support state water conservation and the public welfare.
5. Acequia and community ditch systems are accessible for operation, maintenance, repair, and improvement.

Guideline

1. Acequia and community ditch associations access to operate, repair, maintain, and improve acequia infrastructure located in the forest should be facilitated.

Management Approaches

Reserved and Permitted Water Rights

Forest management follows state law as it exercises its federally reserved water rights, maintains existing permitted water rights, and looks for opportunities to acquire new permitted water rights to support multiple uses in the forest.

Conservation and Relationships

Forest management seeks to make the most efficient use of existing water sources to benefit the public and multiple uses in the forest and supports the water conservation goals of the State Water Plan. As opportunities arise, the forest leadership and staff seek to develop conservation plans with interested partners.

Lands and Realty

Background Information

The land administered by the Gila National Forest is primarily land designated as National Forest System land by numerous acts of Congress, Presidential proclamations, and Executive orders, eventually combined and identified as the Gila National Forest. The portion of the Apache National Forest that is in New Mexico was combined administratively with the Gila National Forest in 1971. Also, approximately 2,000 acres of the former Fort Bayard Military Reservation that had been transferred to the Veteran's Administration was "administratively given" to the Gila National Forest in 1948.

Since the forest was created, numerous land transactions have added and subtracted from the administrative area through land exchanges, purchases, donations, and sales. The forest currently consists of approximately 3.3 million acres of land, making it one of the largest national forests in the nation. While relatively contiguous, there are several communities and numerous inholdings of private and other governmental ownerships within the administrative boundaries. The Big Burro Mountains portion of the forest is a roughly 155,000-acre parcel that is located approximately 7 or 8 air miles southwest of the main body of the forest.

The functions of the National Forest System's lands program are land survey and boundary management, land adjustments, and special uses. Boundary management ensures that management secures and protects the rights, title, values, and interests of the American public on National Forest System lands. This includes the management of boundary lines within the forest that border state, private, and other federal agency lands, including the resolution of encroachment issues, as well as secured right-of-way for public and administrative access to the forest. Land adjustments consolidate and improve management efficiency through land transactions including sales, purchases, exchanges, conveyances, donations, and easements within the proclaimed Gila National Forest boundary.

Special-use permits are authorized when the proposed activities support the Forest Service mission, meet demonstrated public needs, and are consistent with the desired conditions for the proposed use area. Permits are a partnership between the Forest Service and private businesses, academia, non-governmental organizations, or individuals. Special uses are divided into two categories—lands and recreation. Most of the direction for managing special uses is specified in Forest Service directives and regulations.

Lands special-use permits are authorized for infrastructure-related uses including but not limited to communication sites; electrical, communication, and internet lines; pipelines such as those for natural gas and water; access to roads that are not part of the open road system; sanitation; alternative energy development; and research and monitoring. Communication sites are critical to ensuring good communications across southwestern New Mexico and contribute to national infrastructure systems. Special-use permits associated with utility and energy transmission rights-of-way, along with communication sites, are generally long-term commitments. Requests to locate communication and electronic sites within the forest have increased over the past few years. This trend is expected to continue as is increased demand for utility lines, community infrastructure, and private land access.

Desired Conditions

1. Land ownership adjustments improve accessibility, management efficiency, habitat connectivity and conservation, and sound community development.
2. Residents and visitors are aware of Forest Service regulations and common property boundaries.
3. All interior and exterior administrative boundaries have been surveyed, posted, and permanently marked. Boundaries of areas with special management direction such as designated wilderness, wilderness study areas, and research natural areas have been surveyed and are clearly marked at common access points, which eliminates unauthorized use.
4. Unauthorized, unpermitted construction or placement of fences and gates, structures, signs, or other private personal property on forest lands does not occur on the forest.
5. Owners of private inholdings have reasonable and appropriate legal access across the forest to reach their property.
6. Documented road and trail easements across jurisdictional and ownership boundaries enable adequate access to the forest.
7. Special-use authorizations include only those required by law or fulfilling a public need, and do not interfere with forest management objectives.
8. Special-use authorizations are current and contain complete and correct information.
9. Permitted research promotes a greater understanding of ecological, social, cultural, and economic systems, and maintains wilderness characteristics in recommended wilderness and wilderness character in designated wilderness.
10. Special uses protect public health and safety, conserve natural resources, and are consistent with National Forest System management plans.
11. Special uses are administered based on sound resource management objectives and business principles.

Objectives

1. Post at least 4 miles of property boundary per year or 40 miles for each 10-year period in areas not currently posted.
2. Maintain at least 4 miles of previously posted property boundary per year or 40 miles for each 10-year period.
3. Resolve at least one existing encroachment or trespass case per year or at least 10 for each 10-year period unless all cases have been resolved.

Standard

1. Maintenance of National Forest System roads and trails to access communication sites, above and beyond normal Forest Service maintenance will be carried out by the facility owner or association only after obtaining the appropriate road use permit. Maintenance of National Forest System roads providing private property access, will be carried out by the private landowner only after obtaining the appropriate road use permit.

Guidelines

1. Boundary lines between National Forest System lands and other ownerships that have been surveyed, posted, and marked should be protected as investments and maintained for visibility to deter encroachment.
2. Property boundary management surveys should be prioritized by the following criteria:
    a. Where known litigation is pending, a title claim has been asserted, encroachments are suspected, or the probability of encroachment can be reduced.
    b. Where significant resource values exist and use or manipulation of resources is planned (this includes the location, by survey, of rights-of-way or easements necessary for resource management).
    c. To ensure that any land, resource, or restoration project that occurs near or adjacent to any Forest Service boundary line does not proceed until the legal National Forest System boundary lines are properly located and physically marked in the field prior to any management action.
    d. To provide an accurate delineation and location of administrative boundary lines to help prevent boundary disputes or loss of valued National Forest System land and its resources.
    e. All remaining property lines.
3. Land exchanges should maintain, create, or contribute to contiguous ownership patterns.
4. Land acquisitions and exchanges should evaluate, and possibly include, associated beneficial encumbrances such as water rights, mineral rights, and easements.
5. Land exchanges should not result in a net decrease of riparian, wetland, or perennial stream habitat in within the forest's administrative boundary.
6. Acquired easements should include both administrative and public access.
7. Road closure decisions over acquired easements should prioritize public access interests. If the road closure remains in effect, the easement should be retained for possible future considerations.
8. To minimize impacts to ecological, cultural, and visual resources, special-use infrastructure should be consolidated or located together whenever possible. New buildings and structures should be co-located with existing ones. Linear uses should be routed parallel to each other.
9. Clearing of vegetation around communication sites should be limited to that which poses a hazard to facilities and operational efficiency (see the communication site plan for further direction).
10. New and replacement antennas and towers should be below the height for which the Federal Aviation Administration requires lights to avoid interfering with fire lookout towers and to minimize impacts to visual resources.

11. If the agency or applicant goals can be met outside of designated wilderness, special-use permits should not be issued in designated wilderness unless a valid existing right or use existed prior to designation.
12. Electronic interference with the National Radio Astronomy Observatory should be kept within acceptable limits identified in the most current agreement with the observatory.

Management Approaches

Land Adjustments

Land adjustments are land exchanges, purchases, donations, or sales. They help to consolidate the National Forest System land base, reduce administrative problems and costs, enhance public access and use, support resource management objectives, and foster sound community development when and where appropriate. The Gila National Forest lands program emphasizes restoration and retention of public access to the forest and understanding the potential expansion needs of local communities.

When a land adjustment or easement is proposed, forest staff and leadership can strengthen relationships by providing notification and justification to local governments, congressional representatives, adjacent landowners, and permittees that may be affected and allow an opportunity to provide feedback on the proposal. Conservation easements, land trust management, deed restrictions, or public acquisition of high-priority parcels adjacent to the forest may also contribute to the conservation of the forest's resources and character. Forest leadership and staff look for opportunities to explore these options as they arise.

In general, lands desirable for purchase generally meet one or more of the following criteria:

- Lands that enhance public access and use, recreation opportunities, and protection of aesthetic values.
- Land that would provide needed access to adjacent National Forest System land.
- Wetlands, riparian areas, and other water-oriented lands.
- Lands needed for important wildlife habitat and for protection of threatened and endangered species.
- Lands needed to protect significant historical or cultural resources when these resources are threatened or when management may be enhanced by public ownership.
- Lands needed to protect and manage administrative and congressionally designated areas.
- Lands needed to reduce expenses of both the Forest Service and the public in administration and utilization.
- Lands with water rights that can be used to accomplish purposes for which the national forest was created, or related resource obligations.
- Inholding tracts of land that are surrounded by National Forest System land.
- Consolidation of split land ownership estates.
- Lands that improve fire management, watershed management, meet a specified administrative need, provide for multiple uses, or benefit other national forest programs.

In general, National Forest System lands that may be considered for exchange or other transfer of ownership through established authorities met one or more of the following criteria:

- Lands inside or adjacent to communities or intensively developed private land, and chiefly valuable for non-National Forest System purposes. Lands that support community expansion.
- Parcels of land that will serve a greater public need in state, county, city, community, or other federal agency ownership.
- Inaccessible parcels isolated from other National Forest System lands or scattered parcels intermingled with private land that cannot be efficiently managed.
- Parcels under long-term special-use permits or having existing uses whose use and purpose are not substantially consistent with national forest purposes and character. Parcels do not have significant recreational, cultural, or ecological value, and the transfer does not affect public access or resource management objectives.
- Parcels that have boundaries, or portions of boundaries with inefficient configurations, for example long, narrow strips of land. Lands that result in more logical and efficient management.
- Parcels eligible for transfer under the Small Tracts Act, Townsite Act, or other statutory authorities.
- Transfers retain existing public access with rights-of-way or easements.

Boundaries

Forest leadership and staff recognize that survey and posting of boundaries between National Forest System lands and other lands is important so that people know where they are. This locational awareness helps reduce encroachment and trespass issues, and the law enforcement workload associated with those issues. The Title Claims Encroachment Management System is the database of record. It enables the agency and Congress to review known instances of encroachment. Ideally, encroachment, trespass, and title claims on National Forest System lands are identified and resolved quickly, which reduces the likelihood of future issues. Forest leadership and staff look for opportunities to work with adjacent landowners and administrators to accomplish survey and posting of boundaries. This includes requesting Bureau of Land Management resurveys where townships and section corners have not been surveyed or monumented, especially in areas of complex land patterns, where development is taking place, or where there are landscape-scale disturbances.

Access

The importance of forest access was a frequent topic during plan revision public engagement efforts. In addition to protecting existing public access and public access being a heavily weighted criterion in identifying important land purchases, forest leadership and staff can: (1) prepare and maintain current site-specific plans to guide rights-of-way and boundary management that meet administrative and public access needs; (2) work with adjacent landowners and administrators to minimize conflicts and; (3) work with the New Mexico Department of Game and Fish through their access programs and be proactive to maintain public access to traditional routes.

Lands Special Uses

Before special-use permits are authorized, forest leadership and staff evaluate whether proposed uses are consistent with the agency's mission and if those uses can be reasonably accommodated on lands of other ownership. Evaluating the potential for uses to be reasonably accommodated on other lands

helps ensure that the special-use permit application is not prompted by the ease of obtaining approval or lower cost. These and other screening and application criteria can be found in 36 CFR 251.54.

Because plan direction guides management toward reducing the total footprint of special uses, maintaining existing communication sites, and completing site management plans for those with multiple users will be beneficial for coordination and cooperation purposes. Forest leadership and staff also use the authority granted under the Federal Power Act to participate in Federal Energy Regulatory Commission licensing processes when power projects may affect National Forest System lands.

National Radio Astronomy Observatory

When evaluating special-use permit applications that involve electronics, forest leadership and staff remember to consult with representatives of the National Radio Astronomy Observatory (also known as the Very Large Array) to make sure the use would not interfere with their equipment and activities.

Minerals

Background Information

It is Forest Service policy to support responsible, environmentally sound energy and mineral development and reclamation. Federal law and mineral type prescribe how minerals may be searched for or acquired on National Forest System lands. Minerals of economic interest are classified as leasable, salable, or locatable. Leasable materials are those that may be acquired under the Mineral Leasing Act of 1920 (as amended) and include coal, oil shale, oil and gas, phosphate, potash, and sodium. Geothermal resources are also leasable under the Mineral Leasing Act, but other renewable energy sources such as wind and solar are not addressed in the mining laws. Salable minerals or mineral materials are those that may be acquired under the Minerals Act of 1947 and include common varieties of sand, stone, gravel, pumice, and clay. Minerals that are not salable or leasable are referred to as locatable minerals and subject to the General Mining Law of 1872 (as amended). Locatable minerals include most metallic and certain nonmetallic and industrial minerals such as gold, silver, copper, tungsten, and uranium.

As economic conditions fluctuate, certain mineral commodities can become more valuable, prompting new or renewed interest in prospecting, exploration, and mining. The goals of the forest's minerals program are to provide appropriate access to mineral resources in accordance with the law and contribute to local, national, and global markets for valuable commodities while facilitating development in a manner that minimizes adverse impacts to other natural resources and uses.

Leasable Minerals

The Gila National Forest does not have the geologic environment to host conventional oil and gas or solid leasable materials in any volume that would be of economic interest. There is limited potential for geothermal energy, but there have been proposals to develop those resources in the past.

Salable Minerals or Mineral Materials

The forest contains many salable minerals or mineral materials such as sand, gravel, decorative rock and building stone. Traditionally, many of these materials have been mined from dry stream washes and other convenient places where the materials naturally collect. In some instances, this method of removal has created erosion, altered stream beds and channels, and damaged riparian habitat. Better

planning and oversight of these areas needs to be incorporated up front to prevent mining activities from seriously and adversely affecting soil, watershed, water, and riparian resources.

From a regional or national perspective, demand for the salable mineral materials the forest has to offer is low, but it is locally significant. Demand for crushed gravel is the highest. Sales of these materials are divided into commercial-use and personal-use operations. The amount of material desired usually determines what category the use is. Commercial use usually requires a pit plan to ensure the unused resource is left intact and potential resource problems addressed. Permit sales are primarily to private individuals and small businesses and there are several pits for state, county, and Forest Service uses.

Locatable Minerals

The Gila National Forest hosts occurrences of important mineral resources, and mineral extraction has resulted in large quantities of ore being mined and processed from the area, even before the national forest was established. Evidence of this historical work is evident throughout the mountainous landscape. Within the mineralized portions of the forest, there are numerous historical mining communities, mostly no longer occupied, with evidence of mine workings still evident. Past mining primarily produced gold, silver, copper, lead, manganese, zinc, iron, and tin.

Mining remains an important industry in southwestern New Mexico and demand for these resources is likely to continue. There is a reasonable expectation that future proposals to expand the Chino-Cobre and Tyrone mines to meet the demand driven by movement toward more renewable energy sources could involve lands within the Gila National Forest. Uranium and rare earth elements occur in the Big Burro Mountains, but they are not of a size or quality that would make them of economic interest anytime soon. Rare earth elements are key components in electronic devices and have a variety of industrial applications in renewable energy generation, aerospace, automotive, and defense. Panning for gold and rock collecting are recreational pursuits that may be authorized.

Abandoned Mine Lands

Abandoned mines are the remains of former mining operations. The classification as abandoned applies when there are no entities or individuals left operating the mining activity or with financial ties to the mine. The significance of this classification is that for most abandoned sites there is no money from the original operators available to clean up the sites. Although occasionally a responsible party can be found to contribute funds toward cleanup, the major burden falls on the Forest Service to finance cleanup and remediation. The Forest Service's Abandoned Mine Lands program identifies mine features posing hazards to the public and prioritizes them for closure or remediation. Forest leadership and staff do not have any influence on this program or any of its processes as it is a national program funded and operated by national headquarters staff. Plan direction for these lands is found primarily in the Ecological Sustainability and Biodiversity section of this chapter under the Caves and Abandoned Mine Lands heading because of the important habitat they provide.

Desired Conditions

1. Mining and geothermal energy activities meet the legal mandates to facilitate their development in a manner that minimizes adverse impacts to watersheds and water resources, ecological sustainability, biodiversity, scenic character, sustainable recreation, and the desired conditions for other natural resources and uses.

2. Historical mining operations have been reclaimed, their hazards resolved and no longer pose a human health and safety threat or environmental concern.
3. Information on Forest Service operating requirements and opportunities for mining and rock collecting activities considered recreational in nature is available to the public and compliance issues are nonexistent.
4. Salable mineral materials are available for personal, commercial, county, and Forest Service use in convenient, accessible locations. The location and methods of mining these materials do not cause excessive erosion, degrade stream beds or channels, or damage riparian areas.

Standards

1. Plans of operation must be required for all operations that will likely cause significant[49] disturbance to surface resources.
2. Reclamation bonds will be collected for all undertakings requiring a plan of operation to ensure appropriate closure for the size of the site.
3. Road construction, reconstruction, and commercial road use for the purposes of locatable mineral operations must be authorized through a plan of operations. When mine development proposals include roads, the appropriate National Environmental Policy Act processes and procedures must include both the operation and the proposed roads.
4. Permits and authorizations for exploration and development of salable, common variety minerals must include terms and conditions for controlling operating methods and timing to prevent adverse impacts to other natural resources and uses.
5. Salable mineral materials source areas must have associated close-out plans and those plans must be implemented.
6. Geothermal leasing must undergo site-specific environmental analysis to determine if leases can be authorized and what site-specific stipulations may be required.

Guidelines

1. Structures and occupancy for mining purposes should be limited to only those that are necessary and incidental to approved mining operations.
2. Locatable mineral operations should make diligent and honest efforts to accommodate desired conditions of other resources.
3. Streambed material disturbed by placer mineral operations should be replaced in its source location for stream stability as soon as possible following its processing.
4. Given the requirements of the operation, mineral developments should be located to blend in with the environment, so as not to detract from the scenic character and remain visually subordinate to the surrounding landscape.
5. Long-term or final reclamation should return the land to a planned use that is consistent with the overall land use objectives of the area. Reclamation plans should be appropriate for the setting. Reclaimed areas should blend in with the surrounding landscape. Seed mixes, vegetation, and

[49] Significant disturbance means that based on experience, direct evidence, or sound scientific projection, the responsible official reasonably expects that the proposed operations would result in impacts which more probably than not need to be avoided or ameliorated by means such as reclamation, bonding, timing restrictions, and other measures to minimize adverse environmental impacts to National Forest System resources.

soil used for reclamation should be representative of the local ecosystem (see also Non-Native Invasive Species S3 and S5).

6. Reclamation bonds should be sufficient to ensure the full costs of reclamation, including reasonable Forest Service administrative costs; restoration of productivity; and long-term physical, chemical, and biological stability. Plans of operation should include requirements for annual or biennial review of bonds.
7. Where settlement ponds, tailing dams, or impoundments are necessary, each should be located, designed, constructed, and inspected under the development and supervision of a certified professional engineer.
8. Unless otherwise authorized, all garbage or refuse associated with mining activities should be removed from National Forest System lands and deposited in a certified landfill or other state-approved designated disposal location.
9. Salable mineral material source areas should be located where economical and scenic integrity objectives can be met. Source areas and extraction methods should have a corresponding environmental analysis and decision incorporating mitigation measures to reduce possible effects to other surface and subsurface natural resources and uses.
10. Existing designated salable mineral material source areas should be fully used before new areas are developed and designated. New source areas should provide for sustainable administrative use, and balance private and community needs.
11. Streambed and floodplain alteration or removal of salable mineral material should not be authorized if it prevents the eventual attainment of riparian and aquatic ecosystem desired conditions.
12. Salable mineral material such as sand and gravel from designated source areas should be available for the Gila National Forest's transportation system maintenance needs and be issued as free use on a mineral material permit to other federal, state, county, and local agencies for use in public projects in accordance with 36 CFR 228 part C, 228.57(d) and 228.62.
13. Salable mineral material should be made available to support internal resource management needs, such as erosion control features, rock dams, barriers, and landscaping at Gila National Forest facilities.
14. Authorization of continued personal-use salable mineral material source areas should confirm resource damage or overuse is not occurring.
15. When a salable mineral material source area is depleted, or if unanticipated significant resource damage is occurring, the area should be closed, and a different site should be used for future permits.
16. Talus slopes should not be used as a common variety mineral material source area where disturbance would destabilize the slope or alter any at-risk species habitat or presence (see also Cliffs and Rocky Features).

Management Approaches

Relationships, Operations, and Reclamation

Forest leadership and staff value the close working relationships and coordination with staff and leadership at the Mining and Minerals Division of the New Mexico Energy, Minerals, and Natural

Resources Department, the Mining Environmental Compliance Section of the New Mexico Environment Department, and the Bureau of Land Management and recognize that continuing under the current memorandum of understanding is desirable and advantageous. Sharing information about mining operations and mineral claimants in the forest creates opportunities to ensure consistency with operational and closure requirements and supports efficient use of resources through coordination of inspections and enforcement. Forest leadership and staff appreciate the opportunity to continue working alongside the State of New Mexico's Mining and Minerals Division on approving operations and holding joint bonds.

Alongside our partners, we will continue to administer active mineral operations in accordance with acknowledged plans of operation, conduct environmental analyses, and require adequate reclamation bonds as needed. Reclamation on the Gila National Forest goes together with all mineral activities and operations. Each operation has a reclamation component that is site-specific and tied to that single operation. For example, appropriate reclamation is discussed with operators for small sluicing operations as well as being required in plans of operation for larger-scale mining. It is the responsibility of the operator to reclaim mineral activity sites as authorized in their plan of operation. In addition to plans of operation, bonds ensure that money is available for site reclamation. The bond can be returned to the operator once the authorized officer determines completion is satisfactory based on the environmental analysis and provisions in the plan of operations.

Withdrawals

An administrative land withdrawal is the withholding of federal land from settlement, sale, location, or entry under some or all the general land, mining, and mineral laws for the purpose of limiting activities covered by those laws to maintain other public values in the area or reserving it for a particular public purpose or program. Section 204 of the Federal Land Policy and Management Act of 1976 gives the Secretary of the Interior the general authority to make, modify, extend, or revoke withdrawals, including minerals under National Forest System lands. Forest leadership and staff have a goal to pursue administrative withdrawal of lands identified as having high value resources that require protection beyond the agency's surface management regulations. Where this is the goal, forest leadership and staff would need to work with their counterparts in the Forest Service Southwestern Regional Office. The Regional Forester would apply to the Bureau of Land Management requesting that the Secretary of the Interior withdraw the lands from mineral entry. The Bureau would then publish a notice in the Federal Register, hold at least one public meeting, and provide the public an opportunity to comment (43 CFR 2300) and the Forest Service would need to complete an environmental analysis. If the withdrawal is approved, a public land order would be signed by the Secretary or Assistant Secretary of the Interior and published in the Federal Register. This order may be made for a period not to exceed 20 years from the date the order is signed. The Bureau of Land Management records the land status of all federal lands and maintains master title plats to display this information, including withdrawals. These plats are available online for mining proponents to understand where lands are open or where activities may be limited or excluded.

Forest leadership and staff consider it a best practice to review existing withdrawals on a regular basis and recommend them to the Department of the Interior for retentions, revocations, and modifications as appropriate. This helps avoid potential issues and the effort of navigating the withdrawal process again if those withdrawals were allowed to expire.

Mineral Entry in Wilderness

Beginning January 1, 1984, all areas designated as wilderness by Congress are withdrawn from mineral entry, subject to valid existing rights. Valid existing mineral rights include valid mineral

claims, leases, and pre-existing material sales. New mineral leases or sales are not allowed in congressionally designated wilderness.

Section 5(b) of the Wilderness Act of 1964 indicated that when valid mining claims or other valid occupancies are wholly within a wilderness, ingress and egress can be permitted so long as it is consistent with the preservation of the area as wilderness. Only grant access for mineral extraction that is determined to be the "minimum necessary" by an approved minimum requirements analysis. This means if supplies can be transported by horse, but the right holder wants to use a truck, require the supplies to be transported by horse. Since ingress and egress must preserve wilderness character, authorize mechanical transport and motorized equipment only if they are determined by a minimum requirements analysis to be the minimum necessary.

Residences on Mining Claims

In the past, numerous mining operators declared that they needed to live at the mining operation to protect it from intruders or have a full-time guard present. This resulted in numerous cases where the proposed or existing mining operation was potentially used as an excuse for someone to reside cost-free in the national forest. Their presence deterred others from venturing on to the area, as the permitted area was considered the resident's property. In the future, forest leadership are likely to require necessary demonstration of the case for any kind of residence on a mining claim in support of a mining venture. If allowed, the authorization is likely to be revoked at any time the necessity is questionable. Forest leadership is unlikely to consider historical use or a pending need justification for such residences.

Recreational Rock and Mineral Collection

Forest leadership and staff make information about the available recreational rock and mineral collection activities readily accessible to the public through handouts or pamphlets they can pick up at any physical office location and in electronic formats online. This may help increase the public's understanding of the forest's policies and assist those interested in this type of recreation.

Salable Mineral Materials Program

The mineral materials program is a discretionary use of the forest. However, forest leadership and staff are generally responsive to requests for mineral materials desired by local landowners and the public. Forest leadership and staff can proactively support this program by identifying and providing suitable locations for the development of common variety mineral resources ahead of permit requests. Common variety minerals include things like landscape rock, sand, gravel, and soil.

Borrow Pits

Forest leadership and staff identify and select the location of borrow pits necessary to support administrative needs, especially those of the transportation system. We also communicate with other governmental agencies, including those that have authority or expertise in salable minerals, and look for opportunities to work together to make sure we all have the products we need while minimizing adverse effects to other natural resources and uses.

Abandoned Mine Lands

Gila National Forest leadership and staff look for opportunities to work with state and other agencies to inventory, mitigate, and rehabilitate hazardous abandoned mines and mined areas. When areas containing public health and safety hazards are identified, they are marked on a map, posted on the ground, and public access restricted. Leadership and staff also recognize the important habitat that

some of these mine features can provide and look to the Ecological Sustainability and Biodiversity section of this chapter of the plan under the Caves and Abandoned Mine Lands heading for management direction and approaches that promote species persistence.

Working over old tailings, using a rocker to find gold at the Whitewater Mill. USDA Forest Service photo by J.D. Jones, 1934. FS#288763

Glossary

Memorandum of understanding is a document describing an agreement between two or more parties. It expresses common intention and line of action related to a given issue, but it is not a legal commitment.

Renewable Energy

Background Information

This section applies to renewable energy sources like solar and wind. There is no history of solar or wind energy development in the forest, but wind energy development has occurred on adjacent lands administered by the Bureau of Land Management.

Desired Condition

1. Exploration, development, production, and transmission of renewable energy sources contribute social and economic benefits to local economies and are conducted in a manner that minimizes adverse long-term impacts to water resources, habitat connectivity, ecological integrity, biodiversity, and other uses.

Standards

1. Wind energy facilities must incorporate appropriate siting, design features, and operational protocol to minimize and mitigate bat and bird collisions.
2. Wind and solar energy facilities must incorporate engineering methods and other best management practices (see also Soils, Water Quality, and Watersheds) as necessary to mitigate the effects of site preparation and maintenance on soils, overland flow patterns, erosion, and sedimentation.

Photos by Kendall Brown. Photo captions from top to bottom, left to right: Livestock water tank and troughs; branding calves; herding cattle on horseback; maintaining grazing lands; livestock gate with sign "Please Close the Gate"; Forest service truck, trailer, and horses

Livestock Grazing

Background Information

The production of forage to support livestock grazing is a benefit humans derive from many of the forest's ecosystems. Livestock grazing in the forest contributes to the livelihood of the permittees and to the economy of local communities and counties. It is a traditional cultural use of the forest, and one of the multiple-use sustained-yield elements for which National Forest System lands are managed.

Rangelands, as working landscapes, sustain beef cattle ranching while providing habitat for wildlife, recreation opportunities, open space amenities and cultural values that define a way of life (Maher et al. 2021). Continuing this way of life enhances cultural heritage for future generations. Many people living in and near local communities participate in or have connections to ranching and identify with the associated values. Forage provided by rangelands supports livestock grazing and provides provisioning ecosystem services which contribute to the livelihood of permit holders and to the economy of local communities and counties. Livestock grazing opportunities contribute to the economic viability of local ranches, which helps to conserve open space by keeping private lands in agricultural production and avoiding exurban development (Bradford et al. 2002, Brown and McDonald 1995, Resnick et al. 2006 and USDA FS 2007). Well-managed livestock grazing can aid in maintaining or improving rangeland health (Adler et al. 2001 and Strand et al. 2014), which in turn facilitates their ability to provide supporting ecosystem services such as nutrient cycling and regulating ecosystem services such as long-term carbon storage (Havstad et al. 2007, Teague and Kreuter 2020, and Yahdijian et al. 2015).

Livestock grazing is directed by regulations set in 36 CFR 22 Subpart A, which mandates the agency to develop, administer, and regulate the grazing use. The use, timing, duration, and other considerations are evaluated by an interdisciplinary team through regulations set by the National Environmental Policy Act. The responsible official, typically a district ranger, considers the interdisciplinary team's evaluation, input and feedback received during the public process mandated by the National Environmental Policy Act, and decides what will be authorized. This decision is then outlined in a multi-year allotment management plan, which guides adaptive management. Grazing permits incorporate the Allotment Management Plan and may also include additional allotment-specific terms. Both the issuance of the permit and the development or amendment of an Allotment Management Plan that becomes part of the permit is considered an administrative action that implements the National Environmental Policy Act decision (FSH 2209.13 chapter 90 section 94). Permanent grazing management modifications that are consistent with the National Environmental Policy Act decision can be authorized through the term grazing permit. consistent with the National Environmental Policy Act decision.

Annual operating instructions are developed to carry out the allotment management plan. They are reviewed annually as an opportunity to make any adjustments needed to respond to environmental conditions. Rangeland utilization and infrastructure monitoring are conducted to provide information on conditions that inform the need for adjustments. Annual operating instructions allow for temporary adjustments while implementing the terms and conditions of the permit. Annual operating instructions do not constitute a permit modification and are not an appealable decision (36 CFR 214.4). Grazing permits, allotment management plans, permit modifications, and Annual Operating Instructions are site-specific and outside the scope of the forest plan.

Adaptive management is the cornerstone of sustainable livestock grazing. Successful adaptive management hinges on good relationships, communication, and monitoring. However, without sufficient and functional range infrastructure like fences and water sources, there can be less management flexibility, more inconvenience, and additional costs.

Challenges facing the Gila National Forest's livestock grazing program include the condition of some range infrastructure. Some range infrastructure is in poor condition or is non-functional due to age, lack of maintenance, poor design features or locations, damage associated with recent fires, or a combination of these factors. There have been instances where infrastructure condition has resulted in injury to other forest users and livestock that encounter downed and obscured barbed wire fencing material. Permittees and forest staff have invested substantial efforts to address fire-damaged infrastructure with limited financial resources, but much work remains.

Desired Conditions

1. Sustainable livestock grazing contributes to long-term social, economic, and cultural diversity and sustainability of local communities, and helps to preserve the rural landscape, cultural heritage, and long-standing tradition.
2. Livestock use provides for conditions that support movement toward natural fire regimes.
3. Livestock grazing and use is compatible with the desired conditions for ecological sustainability, biodiversity, and other uses.
4. Range infrastructure facilitates livestock management and the production of forage, allows wildlife safe and reliable access to water, provides for habitat connectivity and wildlife movement, and does not negatively affect the safety of forest users or Forest Service personnel.
5. Rangeland condition data describing change over time across the landscape are current and available to support livestock grazing decisions.
6. Required environmental analyses are conducted in a thorough and timely manner to reduce regulatory uncertainty and encourage investment by permit holders.[50]

Objectives

1. Implement at least one action per year to improve poor or very poor range condition (or equivalent condition class), other than mechanical treatments targeting woody invaders (woody invaders are addressed through the objectives for vegetation communities. All Upland Ecological Response Units.
2. In cooperation with every permit holder, evaluate consistency with annual operating instructions and document pasture rotation, utilization compliance, and improvement maintenance annually.[51]

Standards

1. Project-specific best management practices identified in the proposed action will be followed (see also Soils, Water Quality, and Watersheds) to mitigate impacts to soil, water, riparian, and aquatic resources.

[50] The National Environmental Policy Act decision-making process is outlined in the most current Forest Service Handbook 2209.13 Chapter 90: Rangeland Management Decision-making. See https://www.fs.usda.gov/im/directives/.
[51] If these evaluation meetings are held annually with every permit holder, this objective is met.

2. New or reconstructed[52] range improvements will be designed to prevent wildlife entrapment (for example, escape ramps in water troughs and cattleguards) and allow for wildlife passage except where specifically intended to exclude wildlife (for example, elk exclosure fence)[53] or to protect human health and safety (see also Wildlife, Fish, and Plants).
3. New livestock handling facilities designed to hold or concentrate livestock (for example, corrals, traps, or water developments) will be located outside of riparian management zones, significant archeological sites, and occupied sites of at-risk plant species. Buffer distances will be determined during project planning on a case-by-case basis in coordination with the permittee to adequately address management needs, site-specific circumstances, species-specific characteristics, and any associated legal requirements.
4. Permit conversions to domestic sheep or goats will not be authorized, to minimize the risk of disease transfer to bighorn sheep.
5. The Congressional Grazing Guidelines for Wilderness must be applied to all decision-making regarding management of grazing in wilderness areas.

Guidelines

1. Annual operating instructions should address ecological resources such as native plant communities, at-risk species, soils, riparian health, and water quality, if they are departed from desired conditions, as determined by data that are relevant to the allotment and the current management system.[54]
2. In areas recommended for wilderness designation, authorization of mechanized or motorized access and equipment for the maintenance or replacement of existing infrastructure should encourage protection of the wilderness characteristics.
3. Existing livestock handling and watering facilities located in riparian management zones should be modified or relocated where interdisciplinary evaluation finds they are not compatible with movement toward desired conditions for other resources. These evaluations would be made during environmental analysis or review or triggered by monitoring results. Any modification or relocation of infrastructure should include consultation with the permittee.
4. Mineral (for example, salt) or vitamin supplements should not occur on or adjacent to known occupied sites of at-risk plant species, significant archaeological sites, cave entrances, poorly drained or saturated soils, unsatisfactory soils, or those with severe erosion hazard or high mass wasting hazard ratings. Buffer distances will be determined on a case-by-case basis in coordination with the permittee to adequately address management needs, site-specific circumstances, species-specific characteristics, and any associated legal requirements.
5. Mineral (for example, salt) or vitamin supplements should not be authorized within 0.25 mile of water sources to support maintenance of or movement toward desired conditions for soil, water quality, watersheds, riparian and aquatic ecosystems, and range condition by encouraging better distribution of use. Exceptions may occur if prior written approval is obtained from the appropriate line officer and one or more of the following sets of circumstances are present:

[52] The difference between repair or maintenance and reconstruction is a judgement call made by range staff in conference with the District Ranger.
[53] Resources that may be helpful for designing wildlife friendly infrastructure include the most current New Mexico Department of Game and Fish's Livestock-Wildlife-Fence Guidelines and A Landowner's Guide to Wildlife Friendly Fences by the Natural Resources Conservation Service and Montana's Private Landowner Technical Assistance Program.
[54] Guidance can be found in the Grazing Permit Administration Handbook, Regional Supplements, and National Best Management Practices for Water Quality on National Forest System Lands and other best available science.

(1) the water source is not in a riparian management zone and special circumstances dictate a short-term need; (2) the water source is not in a riparian management zone and the intent of placing the supplement near water is to draw use away from riparian areas; or (3) the water source is not in a riparian management zone and the particular supplement requires that it be close to water to encourage better distribution (for example, high-protein liquid feed).

6. As part of implementing prescribed fire, stocking and management of grazing allotments should be evaluated by an interdisciplinary team and the permittee before applying prescribed fire to balance the availability of forage and fine fuels, and after prescribed fire to evaluate and determine range readiness.
7. Vacant allotments should be considered for temporary use by holders of a current permit during times or events when their allotment(s) require growing season recovery time because of wildfire or other disturbance, drought, or to minimize livestock and wildlife conflicts.
8. As part of all management activities, range infrastructure and associated materials (including barbed and smooth wire, storage tanks, pipeline, et cetera) that are no longer functioning or are more than what was needed for the maintenance, reconstruction, or construction activity, should be removed to provide for the safety of forest visitors, wildlife, recreational and permitted livestock, and aesthetics. Such requirements should be incorporated into contracts, permits, and agreements. Forest personnel should resolve any such safety hazards identified during project or incident activities.
9. All monitoring data collected by non-Forest Service personnel that adhere to Forest Service approved protocol should be accepted for consideration and made available to permit holders for allotment management.

Management Approaches

Collaboration, Adaptation, and Monitoring

Forest leadership and staff strive toward collaborative range management and monitoring as part of an adaptive strategy in which allotment permit holders are a valued partner in developing proposals for projects, adaptation actions, monitoring, and evaluation. Forest leadership and staff are open to receiving technical expertise from Soil and Water Conservation Districts, New Mexico State University Extension Research Service, Water Resource Research Institute, Range Improvement Task Force, New Mexico Department of Agriculture, and New Mexico Association of Conservation Districts, and New Mexico Coalition of Conservation Districts' technical support teams and look for opportunities to bring these entities and the people representing them into partnership. Forest leadership and staff also seek opportunities to bring the New Mexico Department of Game and Fish, permitted outfitter guides, and their associations and advocacy groups into these partnerships. A diverse collaborative around rangeland management, grazing wildlife, and permitted domestic livestock issues may increase the degree of success that can be achieved in moving toward desired conditions for the landscape and the ecosystem services it provides.

Forest leadership and staff seek opportunities to leverage satellite imagery and the data it provides to inform allotment management. Existing and emerging technologies to do so create unbiased, efficient ways to track trends over time and are retrospective, meaning data go back in time and cover 1984 to the present. However, all scientifically defensible monitoring should be considered because there are limitations of scale and detail associated with all datasets. Collaborative field-based monitoring that includes allotment permit holders and other diverse partners can also create unbiased ways to track trends over time given protocol are understood and adhered to. When anyone

collecting data allows their personal preferences to interfere with the integrity of the data or its interpretation, it undermines effective management. Forest staff and leadership look for opportunities to support collaborative monitoring training for interested allotment permit holders, partner-agency staffs, volunteers, and other interested parties with potential co-sponsors such as soil and water conservation districts, New Mexico State University, and cooperative extension service.

Forest staff work with permit holders on allotment monitoring and inspections, encouraging them to participate in those activities.[55] Working with the permittee helps create a shared understanding of conditions and the contributing events or circumstances. Monitoring results that indicate a need for an adaptive management response include movement away from the plan's desired conditions. While environmental conditions outside management control, like weather patterns, can be primary contributing factors (see also Drought, Forecasting Services and Adaptation), movement away from desired conditions still triggers a management response. Effective adaptation measures may be more difficult to design and implement without the intimate knowledge the permittee can contribute.

Range Infrastructure and Relationships

Livestock producers are delegated responsibility for the maintenance, reconstruction, or construction of structural improvements, including costs, as part of their permitted use of one or more allotments. Forest leadership and staff will continue to provide what assistance is possible with limited Range Betterment funding. The Natural Resources Conservation Service also has funding mechanisms to assist producers. The Environmental Quality Incentives Program and the Regional Conservation Partnership Program are two examples of Natural Resources Conservation Service producer assistance programs. The Gila National Forest seeks opportunities to partner with permittees, the Natural Resources Conservation Service, local governments, state agencies, and others to leverage resources and improve management flexibility.

Many permit holders have also inherited range infrastructure and materials (especially barbed and smooth wire) that are no longer functional, needed, or wanted, and may be in such a state that they pose a safety hazard to other forest users, agency personnel, wildlife, and recreational and permitted livestock. This is also true in some areas that are no longer allotted for livestock grazing like the former Glen allotment within the Gila Wilderness. The volume of this material across the forest is substantial. There are potential volunteers who are willing to help clean up, and forest management seeks opportunities to engage those individuals or groups and bring them into partnership activities.

Adaptation and Forage Reserves

Climate change and vegetation management activities present opportunities and challenges for livestock production, grazing permit holders, and forest leadership and staff. Challenges can arise because the herbaceous vegetation that provides forage for livestock is the same vegetation that provides the fine fuels necessary to support the natural role of fire on the landscape and flame heights that are effective at killing young trees that are encroaching grasslands and infilling forest and woodland openings. Fire damage to range infrastructure is another significant, but not insurmountable, challenge. Forest staff and leadership continue to work with grazing permittees and other interested stakeholders to minimize challenges and maximize opportunities related to fire management to the greatest extent possible. This includes addressing fire damage to range infrastructure within existing authorities (see Wildland Fire and Fuels Management) and evaluating allotments, when grazing permits that are waived back to the forest, for their suitability for use as

[55] Allotment inspections are field inspections. This does not refer to the annual meeting between forest range staff and the permittee that occurs in an office setting and deals with the paperwork side of permit administration.

forage reserves or swing allotments. A small, strategically located network of swing allotments could help increase options available to permittees during drought years, before or after fire, and when there are conflicts between livestock and wildlife. The Forest Service would be responsible for the maintenance and upkeep of range infrastructure and developments within these swing allotments when they are not being used to that they are ready to be stocked when the need arises. This maintenance would need to be integrated into the forest's program of work, prioritized, and then completed by forest staff, contractors, partnerships, or a combination of those resources.

Drought, Forecasting Services and Adaptation

Drought is an inevitable occurrence in the southwestern United States. The question is not will drought occur, but are forest leadership, staff, and permittees prepared for drought? The intent of this management approach is to highlight technologies that can inform allotment-specific drought plans and adaptation and emphasize the importance of early and frequent communication. There are many sources of information that can be helpful in developing strategies to cope with drought. The ability to forecast in-season forage production, green up, and curing out and relate that to past conditions and management strategies can support a timely, more effective, and complete response to drought. The 2021 Rangeland Technology Summit[56] highlighted over 40 tools that have recently become operational for agency staff, permittees, and the public. Many of them leverage satellite data. Tools like Fuelcast.net provide weekly, in-season projections of herbaceous production in pounds per acre and PhenoMap allows a weekly comparison of how the current season is tracking with past seasons back to 1984, in terms of average greenness. The Rangeland Allotment Monitoring tool is a web application that combines access to PhenoMap and annual productivity data. There are also tools such as the SPI Explorer and Quick Drought Response Index, or QuickDRI. SPI stands for Standardized Precipitation Index (SPI), which is a unit of measure that compares recent precipitation values for a period of interest with long-term historical values to assess moisture conditions. QuickDRI is a relatively new measure of drought that monitors rapid, short-term changes in landscape-level dryness to detect the onset of drought and rapidly developing flash droughts. QuickDri combines the standardized precipitation index with measures of vegetation health, root-zone soil moisture, evaporative stress, and other environmental characteristics that influence drought. Armed with a knowledge of past management strategies specific to the allotment and tools such as these allow management to anticipate drought impacts and develop the appropriate adaption actions with greater agility than ever before.

To maintain a trajectory toward desired conditions for livestock grazing as a use of the forest and for the natural resources that support such use, early and frequent communication and coordination with permittees and others is critical. The Forest Service, Natural Resources Conservation Service, other federal agencies, state and local government entities, and non-governmental organizations have different abilities to leverage different resources for drought response. Strong partnerships founded on communication and trust will be essential adaptation tools. The United States Department of Agriculture's Action Plan for Climate Adaptation and Resilience specifically identifies programs available through the Natural Resources Conservation Service as response mechanisms. There are also programs available through the Farm Service Agency that could be important as droughts become more frequent and intense. The Farm Service Agency recently released an online tool for drought-stricken producers[57] that helps them estimate costs associated with supplemental feed and water and reimburses ranchers for a portion of those costs. Ranchers considered underserved may be

[56] See https://vimeo.com/showcase/8429328?page=1.
[57] See https://www.fsa.usda.gov/news-room/news-releases/2021/usda-offers-online-tool-for-drought-stricken-ranchers-to-estimate-compensation-for-feed-transportation-costs.

eligible for up to 90 percent reimbursement on costs associated with supplemental feed. The New Mexico Department of Agriculture, Office of the State Engineer and Interstate Stream Commission, and other state agencies and working groups such as the New Mexico Healthy Soil Working Group, also have plans and resources for adaptation that can be brought to the table. Forest leadership and staff recognize these entities as critical partners for success and seek opportunities to actively collaborate with them.

Livestock and Wildlife

There are challenges associated with livestock grazing and management for threatened and endangered species, species of conservation concern, and rare or endemic species. To address these challenges for species listed under the Endangered Species Act, the Forest Service Southwestern Region and the Fish and Wildlife Service developed and are implementing a streamlined consultation process. The Master Framework for Streamlining Grazing Consultation provides criteria for making consistent effects determinations which is intended to simplify and speed up the consultation process. The Framework requires specific documentation to support effects determinations, including monitoring data, but does not provide allotment management direction. Forest leadership and staff have and intend to continue following the guidance criteria and using the streamlined grazing consultation process. While measures identified through consultation may help address some conflicts, additional support is needed to address others. For example, conflicts between livestock and the federally listed Mexican gray wolf involve the wolf interagency field team.

While the Forest Service employs a biologist as a liaison for the Southwestern Region who is integrated with the team, the interagency field team is responsible for carrying out day-to-day, on-the-ground recovery activities. The team works directly with grazing permittees to improve husbandry practices that benefit both the wolf and livestock producers, especially during high-risk periods such as calving and denning. Husbandry practices include altering the timing and location of livestock grazing, and other science-based conflict-reduction mechanisms (for example Musiani et al. 2003, Musiani et al. 2005, McManus et al. 2014, Oakleaf et al. 2003).

Forest leadership and staff support and encourage permittees to adopt key husbandry practices that reduce conflict. These practices include removing sick or injured livestock and the carcasses of deceased livestock as soon as their existence and location is known. Increased range riding during calving season is another encouraged practice. Range-riding can be useful during less sensitive times as well, and is a practice included in Allotment Management Plans. Forest leadership, staff and permittees recognize that these and other conflict reduction practices will remain important after recovery is achieved and the wolf is de-listed.

As the agency implements adaptation actions, there is likely to be an emphasis on allotments containing species recognized under the Endangered Species Act. Gila National Forest leadership and staff recognize that a similar emphasis on communication, coordination, collaboration, and partnerships that support drought adaptations will be just as important in this context. Partnerships, collaboratives, or working groups aimed at achieving sustainability are likely to be most successful if they are inclusive of both drought and species issues.

Not all situations in which there are both livestock and wildlife considerations are likely to be as complex as with the Mexican gray wolf, or riparian or aquatic ecosystem dependent species. For example, there may be opportunities to build or retrofit existing constructed water sources to provide water for livestock and incorporate design features that allow bats to drink. This is an example of a win-win scenario that could benefit wildlife and livestock grazing as a use of the forest.

Riparian Critical Habitat

The management of riparian critical habitat is essential to fulfill the legal obligations the Gila National Forest has under the Endangered Species Act, to support ecological integrity and biodiversity, and sustain livestock grazing as a use of the forest. The U.S. Fish and Wildlife Service designates riparian critical habitat. Management appropriate to the recovery of listed species is determined through consultation between the agencies and incorporated into livestock grazing permits, allotment management plans and annual operating instructions. This management approach is intended to keep our commitments to managing riparian critical habitat at the forefront. We recognize that there are large-scale, urgent habitat concerns for at-risk species, especially those dependent on riparian and aquatic ecosystems. Keeping our commitments is a core tenant of proper land stewardship.

Unauthorized and Excess Livestock

Unauthorized and excess livestock use is prohibited by law, regulation, and policy. It is not compliant with this forest plan. It is a threat to our ability to maintain, make progress toward and achieve desired conditions for ecological sustainability, biodiversity, and livestock grazing as a use of the forest. It is an implementation and enforcement issue that is not unique to the Gila National Forest. It is expected to be an ongoing challenge over the next several years as the Gila and other forests in the region strive to reach the goal of eliminating unauthorized and excess use.

Glossary

Carrying capacity is the average number of livestock and wildlife that may be sustained on a management unit (such as an allotment) compatible with management objectives for that unit. In addition to site characteristics, it is a function of management goals and management intensity (Forest Service Handbook 2209.13 Chapter 90 R3 Supplement 2209.13-2016-1).

Grazing capability is a qualitative expression of the inherent ability of an ecosystem to support grazing use by various kinds and classes of livestock while maintaining sustainability of the resource and providing for multiple uses and ecosystem services. Grazing capability of a land area is dependent on the interrelationships of the soils, topography, vegetation, forage production, and animal behavior (Forest Service Handbook 2209.13 Chapter 90 R3 Supplement 2209.13-2016-1).

Riparian management zones include those portions of watersheds around lakes, perennial and intermittent streams, groundwater-dependent ecosystems, wetlands, and high-elevation wet meadows that have characteristic riparian vegetation and provide riparian function or have the ecological potential to do so. It encompasses any surface water and its associated aquatic habitat, connected shallow groundwater, aquatic and riparian vegetation, associated soils (that is, hydric and alluvial), and contributing fluvial landforms. More information about identifying these zones is provided in the direction for riparian and aquatic ecosystems.

Unauthorized livestock refers to any cattle, sheep, goat, hog, or equine not defined as a wild free-roaming horse or burro by 36 CFR 22.20(b)(13), which is not authorized by permit (or bill for collection) to be upon the land on which the livestock is located, and which is not related to use authorized by a grazing permit. Noncommercial pack and saddle stock used by recreationists, travelers, other forest visitors for occasional trips, as well as livestock to be trailed over an established driveway when there is no overnight stop on Forest Service-managed land do not fall under this definition.

Excess livestock is any livestock owned by a holder of a National Forest System grazing permit but grazing on National Forest System lands in greater number, or at times or places other than permitted under Part 1 of the grazing permit or authorized on the annual Bill for Collection.

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USDA Forest Service photos. Photo captions from top to bottom, left to right: Local mill at Luna, New Mexico; log decks at Baseball, Reserve Ranger District; post-harvest forest conditions, Reserve Ranger District; pinyones; post-harvest forest conditions near Cooney, Wilderness Ranger District; harvesting operations at Cooney, Wilderness Ranger District

Timber, Forest, and Botanical Products

Background Information

National Forest System lands were established with the intent of providing goods and services to satisfy public needs over the long term, which includes the production of a sustainable supply of timber, forest, and botanical products. Timber products include but are not limited to firewood, sawtimber, pulpwood, non-sawlog materials removed in log form, and biomass for electricity. Forest products include but are not limited to Christmas trees, posts, poles, vigas, and biomass for wood mulch, wood-based mulch products, and biochar. Botanical non-forest products include but are not limited to pinyon nuts, bark, berries, boughs, cones, herbs, wildlings (plant transplants), mushrooms, pine needles, and wildflowers.

The production of timber, forest, and botanical products are provisioning ecosystem services provided by the forest. These benefits are sustainable when the removal of these products maintains or improves ecosystem and watershed function or does not detract from it. There are areas in the forest where the removal of wood products provides socio-economic value, improves wildlife habitat, reduces fuel loading and the risk of epidemic levels of insect and disease activity, and meets other project-specific objectives.

In 2000, Congress passed the Community Forest Restoration Act (Public Law 106-393, Title VI). The Act authorized the establishment of the Collaborative Forest Restoration Program in New Mexico to provide cost-share grants to stakeholders for forest restoration projects on public land designed through a collaborative process. These projects may include any combination of federal, tribal, state, county, or municipal forest lands, and must include a diverse and balanced group of stakeholders in their design and implementation. Each project must also address specific restoration objectives including (1) wildfire threat reduction; (2) reestablishment of historical fire regimes; (3) reforestation; (4) retention of desirable quantities of old and large trees; and (5) increased utilization (percent) of small-diameter trees. Collaborative Forest Restoration Program projects and grants have been and are anticipated to remain one of several important tools for establishing and building partnerships and businesses that contribute to the sustainability and resilience of social, cultural, economic, and ecological systems within and surrounding the forest.

Plan direction for the timber program is subject to several requirements under the National Forest Management Act, the 2012 Planning Rule, and associated Forest Service directives, including but not limited to a suitability analysis (Forest Service Handbook 1909.12 Chapter 60). The standards and guidelines that follow are largely dictated by law, regulation, and agency policy direction.

Desired Conditions

1. Silvicultural treatments (for example, prescribed fire, manual, mechanical, and chemical treatments) and utilization of products promotes movement toward, achievement, and maintenance of ecosystem and watershed desired conditions.

    a. Treatments mimic the outcomes of natural ecological processes, integrating considerations for socioeconomic values, soil and water quality, wildlife habitat, recreation, and aesthetics.

    b. Soil impacts are minimized. Previously managed areas that have incurred detrimental soil disturbance recover through natural processes or restoration activities. Organic matter and woody debris remain on site after treatments in sufficient quantities to retain moisture, maintain soil quality, and enhance soil development and fertility by periodic release of

nutrients as they decompose (see individual ecological response unit mid-scale desired conditions).

c. Treatments promote long-term sustainability of ecosystems by reducing the risk of undesirable effects from altered disturbance regimes, including fire, drought, wind, insect infestations, and disease epidemics.

2. A sustainable diversity of forest products supports individuals, tribes, businesses, and organizations and contributes to social, economic, and cultural sustainability of local and regional communities.

   a. Forest products are available to individuals, tribes, businesses, and organizations, through a variety of methods such as permits, sales, grants, or agreements consistent with desired conditions for other resources and activities, applicable laws, and regulations.

   b. Sustainably scaled industry infrastructure and capacity are supported by predictable forest product yields that meet local and regional market demand.

   c. Lands identified as suitable for timber production have a regularly scheduled timber harvest program that contributes jobs and income, while achieving and maintaining desired conditions for ecological sustainability and biodiversity.

   d. In areas suitable for timber production, existing infrastructure facilitates salvage of dead or dying trees, recovering as much of the economic value of the wood as possible while retaining enough material to provide for wildlife habitat, soil productivity, and shelter for future regeneration of trees (see individual ecological response unit mid-scale desired conditions)

   e. In areas suitable for timber production, post-treatment environments favor natural regeneration and seedling survival, support the natural fire regime, and retain sufficient tree density to sustain ecosystem services. Following high-severity disturbances, planting environments favor seedling survival. Artificial regeneration in these areas provides tree densities sufficient to act as seed sources for long-term recovery.

   f. On lands identified as not suitable for timber production and where not prohibited by law, timber harvest supports achievement of desired conditions for ecological sustainability and biodiversity while providing benefits to people.

   g. The collection of live plants, mushrooms, and other forest and botanical products does not negatively impact species' persistence.

Standards

1. During project planning, interdisciplinary teams must incorporate recreation, range, watershed, timber, wildlife, rare plants, aquatic, cultural resources, and fire and fuels program areas as appropriate.

2. No timber harvest for the sole purpose of producing timber products may occur on lands identified as not suited for timber production (see Chapter 4. Suitability).

3. No timber harvest for any purpose may occur where soil, slope or other watershed condition would be irreversibly damaged (see Chapter 4. Suitability).

4. Project-specific best management practices will be developed, identified in the proposed action, and followed (see also Soils, Water Quality, Watersheds, and Air Quality) to mitigate effects to soil, water, riparian, aquatic, and air resources.

5. Project planning and implementation must provide for forest health through detection, monitoring, and control.[58]
6. Clearcutting and other such even-aged harvest methods will be used only where an interdisciplinary team has assessed the potential environmental, biological, aesthetic, engineering and economic impacts, and consistency with the multiple uses of the project area, and determines those methods are appropriate and will contribute toward achieving both project- and plan-level desired conditions.
    a. Openings created by even-aged harvest methods will adhere to the established maximum size limits (Forest Service Handbook 1909.12 Chapter 60) in any one harvest operation and must be consistent with the desired conditions for the relevant ecological response unit(s). Exceptions may be authorized based on threats and approval from the responsible official (Forest Service Handbook 1909.12 Chapter 60). This limitation does not apply to salvage or sanitation harvest as long as it remains consistent with other plan components.
    b. Project design and layout will include the use of natural terrain, consider seral state proportion for the relevant ecological response unit(s), and consider the distribution of those proportions across the landscape.
    c. Even-aged stands must have reached or surpassed the culmination of mean annual increment (95 percent culmination of mean annual increment as measured by cubic volume) prior to regeneration harvest, unless such harvest would assist in reducing fire risk within the wildland-urban interface. This would address severe stand damage, disease or insect infestation, or when such harvest will trend landscapes toward the desired conditions for the relevant ecological response unit(s).
7. Projects and activities will be planned to provide reasonable assurance of adequate restocking within 5 years of final regeneration harvest.
8. When selecting the timber harvesting system, cost efficiency, infrastructure and harvest requirements must be considered, but the selection must be made based on how effectively it will achieve desired conditions and not its ability to provide the greatest dollar return.
9. The quantity of timber sold per decade must be equal to or less than 10 times the estimated quantity that can be removed annually in perpetuity on a sustained-yield basis (see Chapter 4. Suitability). This does not prohibit salvage or sanitation harvest above this limit. Harvest levels above this limit, other than salvage or sanitation harvests, may be authorized if the purpose is to accelerate movement toward desired conditions.
10. Permits, contracts, and agreements that authorize removal and or use of forest and botanical products will include provisions to protect, maintain, or enhance relevant resource values.
11. Projects and activities must implement approved recovery plans for species recognized under the Endangered Species Act as described in Wildlife, Fish, and Plants S4.

Guidelines

1. Permits, contracts, and agreements should not allow for collection of plant species or plant parts recognized as rare or at-risk unless the forest has information that indicates it will not be

[58] During project development and implementation, insect and disease infestations not captured by annual detection flights may be detected during field visits. Regardless of detection method, silvicultural prescriptions and other project design features would be adjusted as necessary. Depending on the insect species or disease agent, mitigation measures, such as timing restrictions would also be included in the project.

detrimental to species' persistence, it is necessary for species conservation, is important for tribal collection, or is a research request that will aid in the management of that species.

2. Projects and activities should determine whether manual, mechanical, aerial, chemical, prescribed fire, or other methods are the most effective means to promote desired conditions. When the method generates timber or other forest products, those products should be provided to people.
3. Projects and activities should promote movement toward plan-level desired conditions for habitat connectivity, seral state diversity, species composition, size class distribution, old growth, patch size, and coarse woody debris (see All Upland Ecological Response Units and individual ecological response unit desired conditions).
4. Where ponderosa or pinyon pine are present, projects and activities should reduce opportunities for *Ips* beetle populations to increase through treatment timing and management of residual green slash.
5. Projects and activities should:
    a. Encourage release and development of healthy southwestern white pine and aspen as minor components where they occur.
    b. Sustain representation of healthy spruce and corkbark fir where they occur within potential or identified refugial areas.
6. Projects and activities should retain coarse woody debris sufficient to meet wildlife needs, maintain site productivity, and support natural fire regimes (see individual ecological response unit mid-scale desired conditions), except in the wildland-urban interface (see Chapter 3. Management Areas).
7. Tree planting should consider reforestation potential information in the Terrestrial Ecological Unit Inventory and relevant climate change vulnerability assessments.

Management Approaches

An Integrated Approach to Ecological and Socioeconomic Sustainability

Healthy forest and woodland ecosystems provide timber, fuelwood, and other forest and botanical products. The forest's timber and fuelwood programs can also contribute to the sustainability of ecological, social, economic, and cultural systems. The forest continues to improve existing relationships and build new ones with other federal, state, and local agencies, Tribes and Pueblos, private organizations, non-governmental organizations, and individuals to accomplish restoration work and promote the use of forest products that result from restoration activities.

The forest maintains and shares a 5-year treatment plan and continues to: (1) design projects to accommodate both small- and large-scale operators; (2) promote and develop markets for low-value timber and other wood products; (3) use stewardship contracting authority when appropriate to achieve integrated natural resource management goals, including ecological restoration and provisioning of wood products; (4) look for opportunities to encourage the use of forest products generated by efforts to increase safety and site distance in transportation corridors and; (5) work with Tribes and Pueblos to facilitate collection of forest products needed for traditional, ceremonial, and subsistence purposes.

Timber Suitability

Timber suitability is a plan-level decision. It is not intended to be a precise accounting of every acre, nor is there an existing dataset that could facilitate that. There are small areas that may be suited for timber production within areas mapped as not suited. Likewise, there are small areas that may not be suited for timber production within areas mapped as suited. A suitability determination does not necessarily mean that timber harvest will or will not occur. It depends on why the area was removed from the suitable timber base. The suitable timber base provides a steady supply of timber products, which helps maintain or move the vegetation community toward the plan's desired conditions. Areas that were not identified as suitable, may provide timber products when it helps move toward desired conditions, but not at any dependable frequency. See chapter 4 for more information.

Firewood Program

Forest leadership and staff look for opportunities to contribute to the sustainability of ecological, social, economic, and cultural systems by using firewood harvest as a restoration tool to restore grasslands and historically open canopy woodlands and timber producing forest vegetation types. Firewood harvesting is a long-standing traditional use as firewood is the sole source of heat for many residents. Collecting firewood without a permit or outside of designated areas is illegal and can have negative ecological impacts. The forest continues to provide legal opportunities for firewood gathering through the permitting system. Green and dead firewood areas are designated through the permit guide, which is updated as needed. The permit guide also includes descriptions of available wood for purchase, and cutting and removal procedures including tree species, size, timing, and other restrictions. The guide and the permits are readily available at any of the forest's offices for a small fee.

Reforestation Program

The forest seeks opportunities to engage interested volunteers and other stakeholders to assist in implementing its reforestation program. Reforestation success is unpredictable in the southwestern climate, in the sense that it can take up to a decade or longer for climatic conditions to produce a good cone crop that subsequently aligns with conditions that support germination, establishment, and growth of seedlings. Natural regeneration has been the forest's preferred approach to reforestation in the recent past, but large-scale disturbances may result in areas with inadequate seed sources. The forest is in the process of developing an operational reforestation and cone collection strategy to address this issue where it can. The reforestation program is informed by the best available science and incorporates: (1) climate adaptation options; (2) traditional and new, innovative planting strategies to establish seed sources within deforested areas; (3) site preparation by manual, mechanical, aerial, chemical, prescribed fire, or other methods as best suits site conditions; (4) reforestation through manual or mechanical planting, manual, mechanical or aerial seeding, or though natural seeding; and (5) protective seedling shelters, control of rodents, and protection from elk and cattle (fencing or other methods) when necessary.

Western yellow pine seedlings (60 days old) at the Fort Bayard Forest Nursery in Grant County, New Mexico. USDA Forest Service photo by W.R. Mattoon, 1905. FS # 64322

Glossary

Adequate restocking is a determination made by a silviculturist that describes the number of seedlings, saplings, and other size classes that must be established to provide a sustainable supply of timber into the future.

Artificial reforestation or regeneration refers to planting tree seedlings, saplings, or seeds.

Culmination of mean annual increment is the age of a tree or stand at which the average annual growth stops increasing and begins to decline.

Even-aged harvest methods regenerate and maintain a stand with one or two age classes. These methods may be part of an even-aged system, in which a stand composed of a single age class is the desired condition, or they may be used within an uneven-aged system as one step toward the desired condition of multiple age classes.

Natural reforestation or regeneration refers to allowing natural processes to govern the germination and establishment of trees.

Salvage harvest is the practice of logging trees in forest areas that have been damaged by wildfire, severe windstorms, disease, insect infestation, or other natural disturbance to recover economic value that would otherwise be lost.

Sanitation harvest is timber harvest for removing insects or diseases from a stand of trees or to prevent diseases or pests from spreading to nearby trees.

Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

Silvicultural treatments are methods or systems of methods for tending, harvesting, and reestablishing a stand of trees.

Timber harvest is the activity of cutting trees either for timber production or for restoration. Where timber production is the objective, regular, periodic timber harvest is predictable and supports the achievement and maintenance of non-timber-related desired conditions. It does not imply or require that timber yields be maximized. Under the restoration objective, harvest may be unpredictable, unnecessary, or undesirable based on desired conditions and objectives.

Timber harvesting system is a term referring to the procedure by which a stand of trees is harvested.

Timber production is a resource use based on the objective of growing, tending, harvesting, and regenerating crops of trees on a regulated basis to produce logs or other products for industrial or consumer use.

Uneven-aged harvest methods regenerate and maintain a stand with three or more age classes.

Utilization [percent], as it applies to timber and some forest products, is the estimated volume of a standing tree, log, or log input to a mill, and the volume of its manufactured or merchantable product. In other words, it is a measure of how much of the tree results in useable products with commercial value.

Gila National Forest Construction and Maintenance Crew clockwise from upper left: Patrick Garcia, Eddy Tovar, Rafael Acosta, Donny Gonzalez, and Clifford Martinez; road grader maintaining one of Gila National Forest's roads. USDA Forest Service photos.

Roads

Background Information

The forest is accessed through a network of federal, state, and county roads. Several different agencies are responsible for keeping these roads open and safe for all users. The Gila National Forest's road system allows agency personnel to perform resource management activities and supports the many uses and opportunities the public enjoys. Roads allow access to gather firewood, hunt, fish, hike, and recreate. Local communities and businesses benefit from visitors who come to spend time in the forest. Gaining access to the forest through roads is vital for locals to continue their traditional uses, which are integral in maintaining the social and cultural fabric of the area's communities.

The Forest Service uses a road maintenance plan to prioritize, plan, budget, schedule, and perform maintenance of National Forest System roads. When roads are scheduled for maintenance, the maintenance performed should meet the criteria for the road's assigned maintenance level. Maintenance levels range from 1 to 5. A maintenance level 1 road is closed, and a maintenance level 5 is associated with roads providing the highest level of service. Roads managed as maintenance levels 3, 4, or 5 are designed and maintained for passenger cars. They see more traffic traveling at higher speeds than maintenance level 2 roads, so more time and money are directed toward maintaining them. Maintenance level 2 roads are designed and maintained for four-wheel drive vehicles.

The forest's most current motor vehicle use map (2023) shows approximately 3,330 miles of National Forest System roads open for motorized use by the public. An additional 330 miles of routes are designated for administrative use or by written authorization only, and approximately 910 miles are closed. Approximately 2,930 miles or 88 percent of the forest's roads are maintenance level 2. The remaining open roads are maintenance level 3 to maintenance level 5. There are 12 road bridges in the road system. The forest has worked with local county agencies to clarify jurisdictional issues associated with roads passing through the Gila National Forest. The result is a transfer of nearly 400 miles of National Forest System roads to Catron and Grant Counties.

Roads cause ecological impacts and are susceptible to the environmental effects. Road infrastructure contributes to ecological sustainability when it is properly designed, integrated within the landscape, and well maintained. Given recent road maintenance funding levels, it is a struggle to keep pace with maintaining the transportation system. Flash floods from isolated thunderstorms, persistent monsoon rains, downed trees from the past winter or spring winds, and potholed pavements from freeze-thaw cycles comprise some of the maintenance challenges throughout the year. Since the 1990s, the impacts of larger and more severe fires, and the monsoon rains that follow, have caused the road system to experience increased flooding and washouts.

Desired Conditions

1. Roads and bridges are well marked and provide safe, reasonable access for public travel, multiple uses, and land management activities. The forest's road system is interconnected with other federal, state, and local public roads to facilitate access to lands, facilities, and utilities.
2. The road system provides a variety of motorized recreation opportunities while limiting resource and user conflicts.
3. Bridges and other roadway features provide for public safety to the appropriate standard for the intended use.

4. Roads have minimal impacts on ecological and cultural resources.
5. Unneeded roads are closed to motor vehicle use and decommissioned as appropriate to reduce impacts to ecological sustainability and biodiversity.
6. The design, management, and maintenance of the designated open road system provides for a climate-resilient transportation system able to withstand related stressors such as extreme precipitation and flooding events, wildfires, landslides, and tree mortality. A vulnerability assessment supports identification of potential "problem spots" and adaptation responses to reduce impacts or mitigate consequences.

Objective

1. Decommission at least 50 miles of closed roads every 10-year period until the need has been met.

Standards

1. Motor vehicle use off the designated system identified on the Gila National Forest's most current motor vehicle use map is prohibited, except as authorized by law, permits, or orders in connection with resource management, and public safety.
2. Road construction and maintenance should incorporate best management practices (see also Soils, Water Quality, and Watersheds) to minimize impacts to water quality.
3. Chemicals for dust abatement must not be used; water is the only acceptable agent for dust abatement.

Guidelines

1. Roads should be located, designed, and maintained to ultimately achieve the desired conditions for other uses and resources.
2. Construction and maintenance of roads should accommodate terrestrial and aquatic species movement and habitat connectivity.[59]
3. New road construction should avoid riparian management zones, areas occupied by populations of rare and endemic plants, and unstable areas (see Terrestrial Ecological Unit Inventory interpretations). Where unavoidable due to terrain or topography, new road construction should incorporate best management practices into design and implementation (see also Soils, Water Quality, and Watersheds) to minimize impacts. Engineering specifications for road construction and reconstruction should avoid side-casting fill material in riparian management zones. Routine maintenance should involve pulling any loose material from the stream side of the road back onto road surface to finish the cap.
4. Construction of temporary roads in areas with desired recreation opportunity spectrum classifications of semi-primitive non-motorized should be avoided unless required by a valid permitted activity or management action. If authorized, roads should be constructed and maintained at the lowest maintenance level needed for the intended use and then obliterated or naturalized when the permitted activity or management action is completed.

[59] New Mexico Department of Game and Fish's Bridge and Culvert Construction Guidelines is a source of design features and best practices that would be a useful tool. Available online at https://www.wildlife.state.nm.us/download/conservation/habitat-handbook/project-guidelines/Bridge-and-Culvert-Construction-Guidelines-for-Stream-Wetland-and-Riparian-Habitats-2019.pdf

5. Temporary roads that support adaptation and restoration activities, fuels management, or other projects should be restored to more natural vegetative conditions upon project completion to assist in moving toward desired conditions for watersheds and habitats and to discourage illegal motorized use.
6. Maintenance and reconstruction of existing roads should be emphasized over permanent new road construction.

Management Approaches

Roads and Relationships

Forest leadership and staff work collaboratively with local communities, other land managers, and transportation authorities to promote connected road systems across multiple ownerships. We cooperate with local and county governments, New Mexico Department of Transportation, and the Federal Highway Administration on the planning, design, construction, and maintenance of highway corridors. We work closely with the state, counties, and other federal agencies to resolve right-of-way issues and ensure public access to and through the forest meets management objectives for all jurisdictions and ownerships. Forest leadership and staff look for opportunities to acquire rights-of-way to promote connectivity and manageability of the road network. Collaboration with utility companies on rights-of-way and road access to that infrastructure is ongoing.

Forest leadership and staff also work together and with the information gathered from collaboration to develop and maintain road management objectives for all National Forest System roads in the forest. Road management objectives are used to describe the level of service provided by a specific road and help determine the road's maintenance level. Whenever there are changes in road status or significant changes in traffic pattern due to management activities or disturbance, leadership notifies county officials and other users who could be affected.

If need for a new permanent road arises in the future, leadership and staff could reach out to the New Mexico Department of Game and Fish and the New Mexico Department of Transportation, identify any wildlife habitat or habitat connectivity issues, and explore ways to mitigate these issues. Leadership and staff also consider the desired recreation opportunity spectrum settings to maintain a trajectory toward desired conditions for those settings. We recognize the dual benefits of reducing road maintenance needs and conserving natural resources and look for opportunities and funding to relocate roads away from floodplains, perennial stream channels, riparian areas, and sensitive cultural resources.

Forest leadership and staff encourage stakeholders to provide specific feedback on the road system to assist with travel management implementation and look for opportunities to resolve issues in an adaptive management approach. We also encourage private landowners who use forest roads to take maintenance responsibility for roads that serve primarily private uses. Forest leadership and staff seek opportunities to use technology to assist forest visitors and users in reporting road condition issues to the forest. For example, ArcGIS StoryMaps could be used to create a "report a pothole" system on the forest's website. We strive to do a better job at providing notification to county governments, permittees, and the public of changes in road status and significant deviations in traffic pattern.

Road Decommissioning

Forest leadership and staff seek public input to help develop project-level proposed actions for roads projects to help identify those roads that communities value, and those that may be appropriate for

decommissioning. High-risk, low-value roads identified for decommissioning through a public process are generally prioritized based on the following factors: redundant routes; roadbeds on erosive soils; close to waterbodies or have adverse impacts to water quality, including those identified in watershed-based plans; at-risk species and areas of high potential conflict; impacts to habitat connectivity and species movements; sensitive cultural resources; vulnerability to climate-related impacts; or within inventoried roadless areas that negatively affect roadless character.

Photos clockwise from top: USDA Forest Service photos—Sign for Quemado Ranger District, Apache National Forest, Mogollon Lookout Cabin, and Beaverhead Work Center; Signal Peak Lookout by Bella Mollard

Facilities

Background Information

A variety of facilities in the forest are designed to enable the agency to fulfill its mission. These include administrative facilities such as offices, warehouses, employee housing, and fire facilities; public recreational facilities such as visitor centers, campgrounds, and picnic ground restrooms; and water and wastewater treatment systems, airstrips, and communication sites.

Facilities maintenance requirements are increasing, with much of the preventative, routine maintenance being postponed or deferred. The accumulation of deferred maintenance leads to deteriorated performance, increased costs to repair, and decreased facility value. As workforce and mission services continue to evolve, existing infrastructure may become obsolete from the originally designed purpose and will require the forest to look at adaptive ways to address accumulating deferred maintenance.

Desired Conditions

1. All facilities function as intended or are adapted to accommodate the current or anticipated demands, or both.
    a. Administrative infrastructure provides employees a safe and mission-oriented working environment.
    b. Recreational infrastructure aligns with the recreational uses for that area.
2. Facilities provide an environment free from recognized hazards for people and avoid or minimize negative impacts to natural and cultural resources.
3. Facilities are in a well-maintained condition to enhance public service, support health and safety, and provide long-term sustainability of the capital investments.
4. Potable water systems serve the public or administrative needs and comply with current standards.
5. Facilities are safe and accessible.

Standards

1. Where construction, reconstruction, and maintenance of facilities have the potential to impact water quality, best management practices will be incorporated into design and implementation to mitigate those impacts (see also Soils, Water Quality, and Watersheds).
2. Construction of new facilities in floodplains, wetlands, and other environmentally sensitive areas will not be authorized unless a practical alternative does not exist. In these cases, the disturbance footprint must be as small as possible and incorporate design features to minimize impacts.

Guidelines

1. Emerging technologies and sustainable concepts consistent with the Built Environment Image Guide (USDA FS 2001 or similar guidance), should be incorporated in facility design, maintenance, and renovation to improve energy efficiency, conserve water and other natural resources, improve functionality, and ensure consistency with scenic character.
2. Facilities and structures should be designed and maintained to address the needs of physically challenged individuals and to prevent or mitigate impacts to terrestrial and aquatic species.
3. Facilities no longer used as intended should be repurposed to accommodate a new use or should be decommissioned to minimize maintenance backlog and protect public safety and health.

4. Adaptive reuse of historic properties should be pursued when cost to maintain or rehabilitate do not exceed other practical measures. Maintenance and renovations should maintain historical design.
5. As part of site planning, design, or redesign, recreation sites with substantial investments in facilities should be recommended to the Bureau of Land Management for withdrawal from mineral entry.
6. If regular bird collisions are occurring on specific windows, management should evaluate and implement the most appropriate collision prevention measures for the facility and window(s). Fire lookouts are exempted from this guideline.

Management Approaches

Facilities Master Plan

The facilities master plan documents administrative sites and major visitor centers and the most current recommendations for each facility in terms of maintenance, modification, or removal from service. It does not include recreational or special use sites (please refer to Sustainable Recreation management approach Developed Recreation and Relationships). This master plan was developed in response to agency policy direction stemming from Executive orders related to “Freeze the Footprint” and “Sustainability” and is tiered to a national-level strategy.

Significant issues raised during development of the Gila National Forest’s 2017 facilities master plan relate to the Gila Visitor Center, the aerial fire base at the Grant County airport, the Wilderness and Glenwood district offices, and employee housing in remote locations. The Gila Visitor Center is operated in partnership between the Forest Service and the Gila Cliff Dwelling National Monument unit of the National Park Service. The Forest Service is responsible for improvements and maintenance of the visitor center, but the facility is primarily used by the National Park Service. The facility master plan recommends forest leadership and staff actively seek to transfer much of the infrastructure on site to the National Park Service, retaining only the facilities necessary for Forest Service operations. Recommendations for the aerial tanker base include a request for regional and national office staff to evaluate the site and its current and future ability to support fire management. If it is determined to keep this operation at this location, the facility master plan recommends working with Grant County to resolve inefficiencies.

The 2017 facilities master plan determined the Wilderness district office and the modular annex at Glenwood are crowded and substandard. It recommends initiating planning to acquire facilities to house employees, provide reception space and restrooms for visitors, and improve the public image. The master plan also discusses the limited availability of affordable housing for seasonal and other lower-wage employees in the communities they serve, and inadequate government housing options. The plan recommends considering specific leasing programs with options to purchase modular bunkhouses.

Using the facilities master plan as a baseline, forest staff and leadership develop and implement a comprehensive preventive maintenance program to minimize major unplanned repairs or replacements and prioritize the backlog of deferred maintenance with items affecting health and safety addressed first. When necessary or appropriate, environmental analysis and opportunities for public engagement will occur prior to implementing recommendations for decommissioning or disposal of facilities that are no longer providing service. The heritage program is a critical component in developing maintenance plans, especially for administrative facilities that are also historic resources.

Potable Water Systems

Forest leadership and staff prioritize potable water systems as described in the facilities master plan, and recreation facility analysis to meet health and safety requirements for employees and the visiting public.

Airstrips and Recreational Aviation

People value the recreational access and opportunities provided by backcountry airstrips located within the forest. Forest leadership and staff recognize the value of and look for opportunities to partner with the New Mexico Pilots Association and the Recreational Aviation Foundation to maintain backcountry airstrips.

Reference

USDA FS (United States Department of Agriculture-Forest Service). 2001. The Built Environment Image Guide. FS-710. Available online: https://www.fs.usda.gov/recreation/programs/beig/

Left: Rocky Canyon Forest Camp site (USDA Forest Service photo); Right: Kingston Campground sign. Photo by Dalue Mize

Photos top to bottom, left to right: Hikers lead pack stock in the Gila Wilderness (USDA Forest Service photo); Catwalk Recreation Area, Glenwood Ranger District (USDA Forest Service photo); Negrito forest airstrip by Dana Brejakova; walking in the forest among pines and golden leaves (USDA Forest Service photo); Cosmic Campground sign; mountain bike ride on Dragonfly Trail by Bella Mollard; Quemado Lake by Randall Chavez

Sustainable Recreation

Background Information

National forests provide diverse outdoor recreation opportunities, connecting people with nature in an unmatched variety of settings and activities. Participation in outdoor recreation provides an understanding of the meaning, history, and relevance of public lands. It contributes to the physical, mental, and spiritual health of individuals; bonds family, friends, and strangers; instills pride in heritage; and provides economic benefits to local and regional communities and the nation. Gila National Forest recreation resources and opportunities, as defined in this plan, include developed and dispersed recreation, non-motorized and motorized trails, and recreation special uses.

The most popular recreation activities tend to be trail related. The Gila National Forest's approximately 1,930 miles of system trails provide a diversity of non-motorized and motorized recreation opportunities. The character of the forest's recreation settings and opportunities are summarized in the Gila National Forest's 2007 Recreation Facility Analysis:

> "From wilderness to western heritage, visitors to the Gila National Forest have the opportunity to 'find themselves' in the wildness of the forest. The essence of the Gila is the freedom to explore vast expanses of backcountry. Heritage and cultural connections allow local communities, Native Americans, and recreationists to establish long-term bonds with the forest. Traditional gathering of forest products and hunting bring visitors from near and far. Rivers and lakes, uncommon in the Southwest, provide relief from heat across the forest."

The ways in which people recreate in the forest are ever-changing. New types of recreation are always emerging. Mountain biking, rock climbing, and geo-caching represent activities that have recently become more prominent or that may not have existed 20 or 30 years ago. The opportunities and facilities that are available on the forest may not meet the needs of today's recreationists, let alone those of the future. The gap between supply and demand can lead to increased impacts from recreation such as user-created trails, underutilized developed sites, heavily used dispersed sites, and maintenance backlogs. It is important that the Gila National Forest have a sustainable recreation program that can adapt to changes in demand, available resources, and opportunities. Strong relationships with partners and volunteers are key elements in a sustainable recreation program.

This plan uses the desired recreation opportunity spectrum to identify development levels of recreation activities available to visitors. The recreation opportunity spectrum is a continuum used for managing recreation opportunities based on a combination of physical, biological, social, and managerial settings ranging from primitive to urban. The recreation opportunity spectrum uses the following classifications for recreation settings ranging from least to most developed: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, and urban. These classifications are also used in project planning to analyze whether a proposal and its alternatives will likely result in movement toward or away from desired conditions for recreation opportunity settings. Due to the process and scale of mapping for recreation opportunity spectrum, some inconsistencies may be present, especially along recreation opportunity spectrum boundaries. A map providing a visual depiction of the desired recreation opportunity spectrum can be found in appendix B.

Developed Recreation

Developed recreation is defined as recreation that requires facilities and results in concentrated use of an area. It provides a more accessible experience, with available parking, shelters, running water, or other facilities. Some of these facilities are a gateway to the natural benefits that the forest provides, such as trailheads and campgrounds. Others like group sites and fishing piers are an attraction unto themselves.

The Gila National Forest has 33 developed campgrounds including two group sites; six picnic sites, three of which are group sites; 98 developed trailheads; three public target shooting ranges operated under special use permits with the corresponding counties within the Glenwood, Silver City, and Reserve Ranger Districts; an observation site; and an Interpretive Visitor Center shared with the National Park Service near the Gila Cliff Dwellings National Monument. Developed sites and areas experience greater use during the summer and fall seasons, weekends, and on holidays, although several facilities remain open and receive use year-round.

Dispersed Recreation

Dispersed recreation activities occur outside of and completely independent of developed recreation facilities. The large size of the forest and generally contiguous nature of the National Forest System lands it encompasses provide a unique opportunity for dispersed recreationists to experience solitude within and outside of designated wilderness. Dispersed recreation includes a variety of both motorized and non-motorized activities that can occur year-round because of the forest's relatively mild climate.

Motorized activities include off-highway vehicle driving, scenic driving, car camping, and recreational aviation. Most motorized dispersed recreation occurs on or along the designated road and motorized trail systems, which vary in condition and level of development. Currently there is one designated area on the Reserve Ranger District where cross-country travel or off-road travel is authorized for motorcycles, utility terrain vehicles, and all-terrain vehicles. This area was established in the 2013 travel management decision. All other motor vehicle use is restricted to the roads and motorized trails identified by the most current travel management decision.

Non-motorized dispersed recreation activities include hiking, backpacking, climbing, mountain biking, bike-packing, horseback riding and packing, fishing, hunting, canoeing, kayaking, and rafting, exploring caves, geocaching, and nature viewing. Some non-motorized dispersed recreation activities are mechanized, like mountain biking, and are prohibited by the Wilderness Act within designated wilderness areas.

While there are rock climbing and cave exploration enthusiasts who appreciate the opportunities the forest provides, there are some limiting factors. One limiting factor to the popularity of rock climbing has been the poor quality of rock at many locations with otherwise suitable rock faces. There are higher quality locations nearby, outside the forest boundary. Similarly, cave exploration occurs, but is primarily limited to locations on the Black Range Ranger District.

Although the climate is semi-arid, fishing and water-based recreation opportunities are available on over 900 miles of perennial streams and rivers, as well as three small reservoirs: Quemado Lake, Lake Roberts, and Snow Lake. Three reaches of the Gila River and one reach of the San Francisco River are recognized as class I or class II whitewater reaches, which are good for beginners or those preferring a relaxing day on the water over adrenaline. Class I reaches are relatively calm water,

scenic float trips. Class II rapids are relatively easy to navigate with water moving fast enough to create 1- to- 3-foot whitecaps.

Trails

The Gila National Forest contains over 1,900 miles of trails. As of 2023, there are about 180 miles of motorized trails, 861 miles of trails within designated wilderness areas, and 931 miles of non-motorized trails outside of designated wilderness boundaries. The trail system represents more than just recreation opportunities. It provides vital access to the backcountry and designated wilderness areas for all aspects of management. Many of the Gila National Forest's trails are backlogged for maintenance and have been degraded by fire, flooding, and erosion. With limited funding and fewer personnel available to maintain the existing trail system, it will be necessary to collaborate with stakeholders who value the trail system to develop and maintain a system that meets the needs of the users but is sustainable with available and reasonably foreseeably resources.

Forest visitors engaging in hiking, backpacking, mountain biking, horseback riding, and packing make use of the Gila's extensive non-motorized trail system. According to the 2011 National Visitor Use Monitoring survey, hiking, or walking is the most popular primary recreation activity of forest visitors. Horseback riding and backcountry stock-packing is also a popular form of non-motorized recreation that occurs primarily within designated wilderness and less-developed forest areas adjacent to communities. Many of these backcountry trips are multi-day in duration. Day-use equestrians may access designated wilderness but are more likely to make use of forest trails located closer to local communities. Mountain bikers, prohibited in wilderness, also tend to make use of the forest trails located near local communities, but some like to venture out farther into the backcountry. There has been an increasing trend in recreational use of off-highway vehicles that may use both the motorized trail system and road system.

Recreation Special Uses

Recreation special-use permits are authorized when the proposed activities do not conflict with the Forest Service mission, meet demonstrated public needs, and are consistent with the desired conditions. Forest leadership and staff manage a variety of recreation special-use permits including those for outfitting and guiding, tours, trail guides, weddings, family reunions, school field trips, other special events, commercial photography and filming, recreation residences, and others.

The special-use permit system enables a broad range of nature- and heritage-based outdoor recreation and tourism opportunities that promote responsible use and enjoyment that would otherwise not be available to as many residents and visitors. Permit fees from many of these service providers are returned to the forest and used to improve services and facilities, providing benefits for those permit holders, their clients, and other members of the public.

Most recreation special-use permits are issued to outfitter guides to facilitate hunting, fishing, horseback riding, and packing experiences, primarily in designated wilderness. The demand for these services and these permits is expected to grow, particularly for hunting. This is expected not because the New Mexico Department of Fish and Game is planning to grant more hunting licenses, but because fewer people seeking this type of experience have the backcountry skills, animals, and equipment to do it themselves.

Desired Conditions

1. A diverse, adaptable, and sustainable range of recreation opportunities is available and responsive to trends in public interest and compatible with the desired conditions for ecological sustainability, biodiversity, and other uses.
2. Environmental justice communities experience equity and inclusion in the recreation opportunities the forest offers. The forest's recreation inequity index is approaching zero, indicating that racial and ethnic minorities in the community are finding and appreciating the forest's recreation opportunities at the same rate as their majority counterparts.
3. The unique and diverse cultural, historical, and ecological resources of the forest are appreciated through corresponding recreation opportunities, education, and interpretation. Visitors have opportunities to connect to the past, present, and future of the forest.
4. Recreation opportunities correspond with the desired recreation opportunity spectrum setting and enhance the economic, cultural, and social vitality and well-being of surrounding communities.
5. Forest leadership and staff are engaged with local communities, partners, and volunteers to foster partnerships and facilitate the sustainability of the forest's recreation program.
6. Conflicts between different types of recreationists are infrequent.
7. Recreation experiences are not diminished by vandalism, theft, or overuse.
8. Developed recreation areas are safe, well-designed, well-maintained, and capable of supporting concentrated visitor use. The number and size of constructed facilities are appropriate for the use level and activity types that occur at each site.
9. Developed campsites meet the minimum needs of vehicle-based camping. The overall capacity of sites meets demand in periods of high use.
10. Developed recreation sites complement the forest's scenery resources and scenic character.
11. Dispersed recreation opportunity ranges from remote backcountry solitude to roadside sites along popular corridors and provide visitors with natural, tranquil settings. Dispersed recreation is consistent with travel management decisions and desired recreation opportunity spectrum classes and does not adversely affect ecological resources or other uses.
12. Trails are well-marked and provide safe access for multiple uses and management activities. The design, construction and maintenance of the trail system is sustainable, consistent with public desires, enhances the recreation experience, diminishes user conflicts, and minimizes effects to natural resources, especially water resource features such as springs.
13. The trail system contains interconnecting loops and links to popular destinations within the forest and to local communities, neighborhoods, and other public lands. Motorized and non-motorized trail opportunities are generally not on shared routes.
14. Motorized trails provide a variety of experiences for a variety of vehicle classes. Associated trailheads provide parking, access, and a relatively dust-free environment that prevents erosion.
15. Recreationists engaging in motorized activities practice TreadLightly® principles.
16. Unneeded motorized trails are closed to motor vehicle use and naturalized to reduce impacts to ecological resources.
17. Recreation special-use authorizations (1) provide unique opportunities, services, and experiences for the recreating public and (2) address demonstrated demand for specific recreation

opportunities within resource capacity and without causing movement away from desired conditions for ecological resources and other uses.

18. Recreation special-use authorizations are timely, efficient, user-friendly, and consistent across ranger districts and uses.
19. Services provided by recreation special-use permittees enhance recreational experiences, provide for public health and safety, and contribute to local economies by providing opportunities for small businesses to work and grow (see also Community Relationships management approach Supporting Local Businesses).

Objectives

1. Implement a fee program on appropriate, approved sites within the first 10-year period.
2. Identify at least three additional dispersed recreation concentrated use areas for preapproved recreation events, non-commercial group use, and weddings within the first five-year period.
3. Implement at least one small-scale recreation project that enhances visitor access for dispersed uses per year. This may include but is not limited to projects providing improved parking, functionality, and accessibility at trailheads or associated with dispersed camping opportunities.
4. Restore to standard at least 1 mile of trail that has been degraded by fire or post-fire events every year.
5. Maintain or improve at least 20 miles of system trails per year. This includes realignments, reconstructions, and deferred maintenance.

Standards

1. The default length-of-stay limit will be 14 cumulative days within a 30-day period unless the forest supervisor or delegated agent grants an exception. Exceptions must be documented in writing and may only be granted on a case-by-case basis to individuals or groups that agree to mitigation terms and demonstrate a high proficiency for Leave No Trace® ethics.[60]
2. New developed campgrounds must have more than one point of entry and exit and not be located within floodplains or other areas prone to flooding or difficult to evacuate in emergencies.
3. All recreation facilities that have the potential to impact water quality must be designed, constructed, or maintained using current best management practices to mitigate those impacts (see Soils, Water Quality, and Watersheds).
4. All trails will be sustainably designed, constructed, rerouted, or maintained using current best management practices to mitigate impacts to water quality while providing for safety desired recreation opportunities (see Soils, Water Quality, and Watersheds).Recreation residences located in 100-year floodplains will not be built or rebuilt if destroyed by fire, flooding, or natural disaster.
5. Special-use permits authorizing domestic sheep and goats will not be issued with the following exception: special use permits authorizing recreational use of pack goats outside of bighorn sheep occupied range may be issued if the prospective permittee can demonstrate their animals have tested negative for pneumonia-causing pathogens, have been vaccinated against the pathogen, and are up to date with those vaccinations.

[60] The instrument that implements this standard and provides the basis for enforcement is a forest order.

6. All outfitter-guide permits issued for designated and recommended wilderness uses must include appropriate wilderness practices, including but not limited to Leave No Trace principles, and require the permit holder to incorporate wilderness education in their interactions with clients and other visitors.

Guidelines

1. All project-level decisions and implementation activities should be maintaining or making progress toward the mapped desired recreation opportunity spectrum classes and setting descriptions to sustain recreation settings and opportunities.
2. All non-fire management decisions should be in alignment with recommendations and contribute to program goals identified within a collaborative sustainable recreation action plan developed in partnership with stakeholders.
3. Measures to avoid potential conflicts between recreation and non-recreation uses should be considered during project planning.
4. Recreation facilities and improvements should be planned, designed, and managed to avoid human and wildlife conflicts.
5. Where excessive or inappropriate recreational use contributes to resource damage, temporary closure orders should be issued, and appropriate rehabilitation activities should be implemented. Recreation activities should be managed to minimize impacts to special status species and desired ecological conditions, especially within riparian management zones.
6. Management activities that would substantially diminish recreation experiences such as facility construction or repair, or tree cutting, should not be scheduled at popular developed sites on weekends or holidays during the major recreation season except in cases of wildland fire management or when doing so would otherwise not achieve project goals.
7. New developed trailheads and other recreation facilities should be located away from riparian management zones and areas where populations of rare, endemic, or at-risk plants are known. Buffer distances should be determined based on the site, species-characteristics, or both. New day-use areas should have more than one point of entry and exit except where it is not possible.
8. When closing or mitigating adverse effects of dispersed recreation areas, native vegetation and natural barriers should be used (see also Non-Native Invasive Species).
9. Rock climbing, cave exploration, and backcountry river floating should be managed to balance demand for the activity and the need to support special status species, cultural resources, and applicable designated area management requirements.
10. System trails should not be used for non-fire management activities that negatively impact trail conditions (for example, timber landings and skid trails), unless alternatives entail greater resource damage. Adverse impacts to system trails should be mitigated upon completion of the activities.
11. Where system trails intersect fences, accessible, activity-specific pass-through areas should be provided to allow easier passage.
12. System trails that are found to affect natural or cultural resources or public health and safety substantially and adversely should be evaluated for realignment to alternative routes. If there are no feasible alternative alignments that would reduce impacts, the trail should be considered for closure and decommissioning.

13. Newly constructed trails should avoid extended travel through wet meadows, seeps, springs, riverine wetlands and floodplains, sacred sites, and high concentration of significant archeological sites to avoid negative impacts to these resources. Newly constructed motorized trails should minimize the number of stream crossings or be otherwise mitigated to reduce impacts to aquatic species.
14. New motorized trails should be designed and located so as not to impede terrestrial and aquatic species movement and habitat connectivity, and to avoid Mexican spotted owl protected activity centers, northern goshawk post-fledging family areas, and other areas identified as sensitive and important to the recovery or persistence of special status species.
15. New trails should avoid naturally unstable soils, and erosional landforms and landscape positions. Where unavoidable, the Terrestrial Ecological Unit Inventory should be consulted to determine the appropriate surface grade and design features to minimize erosion.
16. If project-specific travel management decisions remove motorized trails from the network, those trails should be rehabilitated to avoid impacts to soil and watershed function and aquatic habitat.
17. Motorized uses in semi-primitive non-motorized recreation opportunity spectrum settings should be (1) limited to reasonably incidental to valid existing rights, emergency access, administrative activities, and (2) by written approval of the Forest Supervisor. New permanent motorized trails or areas should not be constructed or designated in semi-primitive non-motorized recreation opportunity spectrum settings except in cases of valid existing legal rights or written approval of the Forest Supervisor.
18. Trail markings, kiosks, and interpretive signage should be consistent across all areas of the forest and complement the scenic and cultural character of the surrounding landscape.
19. Special-use permits for organized group events at developed recreation facilities should be limited to designated group sites.

Management Approaches

Collaborative Sustainable Recreation Strategy and Relationships

In 2010, the Forest Service released the Framework for Sustainable Recreation. The framework provides a clear national vision and strategy to remodel the recreation program. Citizen participation, stewardship and strategic partnerships are among the framework's focus areas. In 2014, the Southwestern Region of the Forest Service released the Southwestern Region Sustainable Recreation Strategy. This document tiers off the national framework and creates a strategy that is tailored specifically to the region's recreation challenges. Forest-specific action plans were intended to tier to the regional strategy and be built collaboratively with diverse communities and partners. These plans were identified among the critical success factors and necessary conditions to address recreation program challenges. Each forest in the region was tasked to develop an action plan, with the intent that it would be reviewed and updated every 5 years. The Gila National Forest completed the first action plan in 2015.

Because of staffing, workload, and budget at the time the first action plan was developed, forest leadership and staff did not invest in a public process or provide clear information, readily accessible to the public at large, about the action plan. This led to misunderstanding and mistrust, specifically around a sustainable trail system. While there were other human factors at play, the release of the draft plan, which contained plan components and other content referencing the action plan, only

served to deepen the misunderstanding and lack of trust. This was evident in the comments received from important and highly valued partner groups on the draft forest plan.

It is time to update the 2015 sustainable recreation action plan. Forest leadership and staff recognize that the best way to begin improving relationships, restoring trust, and building the sustainable recreation programs that we and our stakeholders want is to include robust public involvement in the update process. There needs to be shared understanding, collective ownership of the action plan, and shared stewardship for sustainability to be achieved. The partnering principles discussed under the plan management approach Relationships could be particularly beneficial when applied to the recreation program, especially celebrating successes, and publicly recognizing the volume and quality of the work our partners produce whenever possible.

Forest leadership and staff seek opportunities to engage, collaborate, and partner with other agencies, groups, communities, volunteers, permit holders, and interested individuals to update the action plan. Through the update process and implementation of the action plan, we see opportunities to cultivate volunteerism, citizen stewardship, user satisfaction, and provide support for local recreation-based economic development.

A particularly important part of the action plan and its implementation is the development of a trails strategy that includes trail management objectives and maintenance priorities for both non-motorized and motorized trails. The development of the strategy was one of the actions identified in the Gila National Forest's 2015 action plan, but that work was never started. This element of the action plan will tier to the Forest Service National Trails Strategy, which implements the National Forest System Trails Stewardship Act of 2016.

The Gila National Forest trails strategy could incorporate or address many of the ideas commenters on the draft forest plan advocated such as an Adopt-a-Trail program; a system of governance to recruit, train, and coordinate volunteers; opportunities to develop or connect motorized trail systems to provide loop opportunities; and reconstruction or construction of trail systems near population centers and developed recreation sites. When prioritizing trails within the strategy, those involved will need to consider user safety, appropriate recreation opportunities, minimizing erosion, and administrative needs. Given the extensive nature of the existing trail system, forest leadership and staff are likely to support new trail opportunities only where (1) partners and volunteers can provide funding, labor, and other resources for environmental analysis, construction, and maintenance, and (2) formal agreements are in place prior to their construction.

There is also room in the development of the sustainable recreation plan to address dispersed campsites and an approach to identifying, prioritizing, and addressing issues and opportunities. While not as heavily commented on as the trails program during the plan revision process, many stakeholders value and are concerned about developed recreation opportunities. Developed recreation may have a place within the sustainable recreation action plan, but there are other processes involved as discussed in the next management approach.

How soon forest leadership and staff will be able to turn time and attention to updating the sustainable recreation action plan will be influenced by internal and external forces playing out as this forest plan is being completed. The Gila National Forest has experienced significant staff turnover and difficulties getting the recreation program fully staffed. National priorities and funding levels have shifted dramatically because of the 2020 Great American Outdoors Act and the 2021 Infrastructure Investment and Jobs Act. These realities may cause a delay in revisiting the action plan

and other program planning activities, but they also provide tremendous opportunities to work together and get good work done on the ground at a previously unprecedented scale.

Developed Recreation and Relationships

The Recreation Facility Analysis is the agency process through which developed recreation sites and facilities are assessed and prioritized. Steps in the process include (1) gathering current information about each site, (2) evaluating trends in outdoor recreation, (3) performing a preliminary analysis of how well the forest's sites meet public needs and any program constraints, (4) drafting a 5-year program of work and providing it to the public for review and discussion, (5) revising the program of work based on stakeholder input and feedback, and (6) reviewing annually and revising as needed. As of 2022, forest leadership and staff actively began gathering information to initiate a new planning cycle. There will be opportunities for the public to participate in the development of the revised program of work in the future.

Regionally, a decision to implement a recreation fee program was made. Implementing a fee program will help provide long-term support of the developed recreation sites and facilities that locals and visitors value. There are also efficiencies that can be created by removing infrastructure such as vault toilets from sites identified for decommissioning and reinstalling them in appropriate and sustainable developed sites.

As developed recreation program planning and implementation continue, we will keep in mind visitor safety, location within floodplains, primary user groups at a site and volume of use, operating costs, opportunities for partnerships, concession fee or rentals, natural resource impacts, and tools such as seasonal closures, seasonally adjusted reduced services during low-use periods, and online reservation systems for larger campgrounds and group areas. We will consider all ideas and options in a robust, diverse, inclusive, and equitable process, allowing for better decisions and improved adaptability as conditions change.

Through this process, developed campgrounds located within floodplains or other areas prone to flooding are likely to be prioritized for relocation or conversion to day-use only sites. While we recognize people enjoy spending time near water, overnight camping in flood-prone areas has resulted in the loss of life on National Forest System lands more than once. While we do want people to be able to enjoy their forest streams, we do not want to provide facilities that concentrate people in flood-prone areas to sleep.

Public Information, Outreach, and Education

Forest leadership and staff recognize the importance of providing timely, accurate public information and educational information that enhances the recreating public's knowledge and understanding of recreation-related health and safety issues, resource issues, Forest Service programs, rules, and regulations. Providing this information in a variety of accessible formats empowers people to make conscious decisions about when, where, and how they choose to use the forest and interact with others. Forest staff and leadership also recognize that providing consistent messaging in a variety of formats promotes environmental justice and equity.

Forest leadership and staff make use of a variety of techniques to educate users on topics ranging from shared use and land ethics to forest history and climate change. We promote both locally significant conservation education programs and established educational programs such as TreadLightly®, Leave No Trace®, Kids in the Woods, Passport in Time, and Bear Aware. We also seek opportunities to provide interpretive services tailored to the forest's diverse ecological, cultural,

social, and economic resources and history; and, to make those services and products available at visitor centers, ranger stations, developed recreation sites, trailhead information kiosks, and landmark locations. We strive to provide trailhead information that is applicable to the specific setting but also keep messaging consistent with forestwide, regional, or national messaging at the same time, such as that provided for the Continental Divide National Scenic Trail. Forest leadership and staff work toward providing multilingual interpretation in recreation areas popular with non-English-speaking visitors. We recognize chambers of commerce and boards of tourism are natural and powerful partners and encourage them to promote recreational opportunities in the Gila National Forest through websites, brochures, conferences, and other educational or informative outlets.

Through the plan revision process, the public repeatedly emphasized the need for better and more current information about trail conditions and closures. Forest staff and leadership recognize we could do a better job and would more regularly update signs and postings at trailheads, offices, and visitor centers, websites, and social media. We will look for opportunities to provide information graphically using maps or mapping applications like StoryMaps. These could be displayed prominently at physical locations and made available on websites and through social media.

Recreation Residences, Events, and Group Uses

When preparing operations and maintenance plans for recreation residence special-use authorizations, it would be useful to include or reference the most recent edition of A Guide to Maintaining the Historic Character of Your Forest Service Recreation Residence to support improvements or maintenance appropriate for eligible historic or unevaluated recreation residences.

Forest leadership and staff are unlikely to authorize the use of popular, high-use trails and recreation sites for recreation events and group uses, preferring those uses to occur at established group-use areas and less popular trails to minimize impacts to other existing uses.

Scenic Character

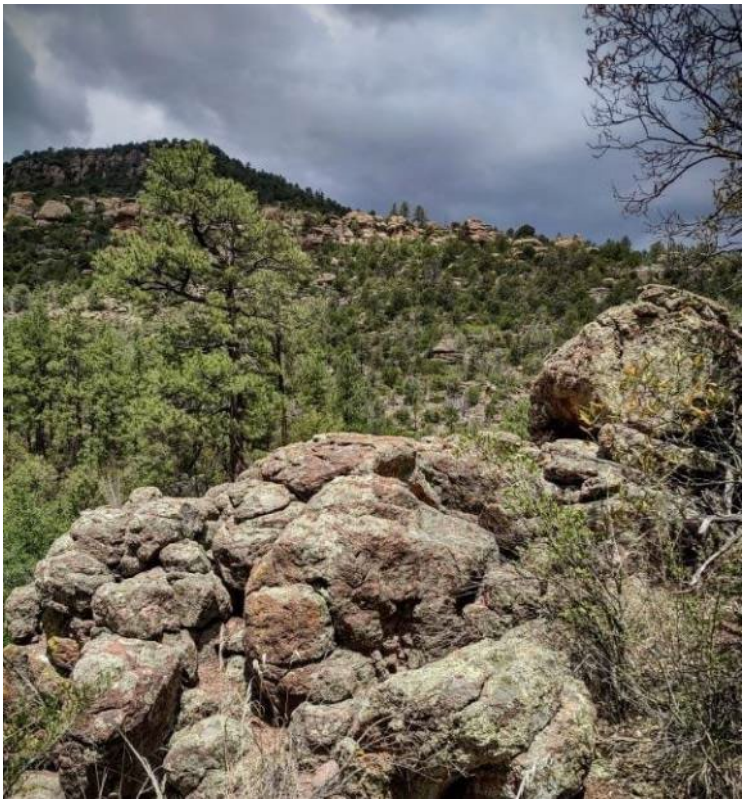
Background Information

Scenery is the arrangement of the natural elements of the landscape along with components of the built environment. Scenic character is the set of physical, biological, and cultural features that give an area its scenic identity and contribute to its sense of place. All landscapes have definable scenic character attributes. In most national forest settings, scenic character attributes encompass both social and ecological elements including landform, vegetation patterns, water characteristics, recreation opportunities, and cultural features. Buildings, structures, and other human alterations are considered a valuable aspect of scenic integrity when these features add to the sense of place or reflect the cultural legacy of the area.

The landscapes of the Gila National Forest have an abundance of features that offer spectacular scenery. People are drawn to the forest for its diversity of scenic features including high cool mountains forested with mixed conifer and aspen, mountain meadows filled with wildflowers, rolling hills and semi-arid grasslands and woodland savannahs, dramatic and complex assemblages of landforms, rugged canyons where flowing water supports ribbons of green, and dark night skies. The forest provides a scenic backdrop to local communities, offers a sense of place, and contributes to the identity of those communities.

Research shows a high degree of public agreement regarding scenic preference. People tend to value most the natural-appearing landscape. Such landscapes provide the basis for high-quality recreation

experiences that draw tourism, which benefits local and regional economies. For these reasons and others, it is important to manage scenic resources.



Bear Creek watershed views by Kristina Deem

The Gila National Forest uses the Forest Service scenery management system to determine the importance of scenery and identify resources as they relate to people. Scenic integrity measures the degree to which the scenic character attributes are intact. Scenic integrity objectives are defined by degrees or levels of alteration from the existing scenic character. The intent is to achieve the highest scenic integrity possible and move toward desired conditions.

As with all desired conditions, projects implemented under this plan must be designed to maintain or move toward desired conditions. Due to the scale of mapping for scenic integrity objectives, some inconsistencies may be present. Example of this are existing features with long-term impacts that will not achieve the desired scenic integrity objective in the life of this plan, such as roads or trails, power lines, recreation facilities, and utility corridors. There may also be inconsistencies in the mapping data, especially along scenic integrity objective boundaries. Updates to improve map accuracy by resolving these inconsistencies would be administrative changes to the map.

The forest is divided into levels of desired scenic integrity objectives. These categories are very high, high, moderate, and low and are described in the second guideline in this section of the plan on scenic character. A map providing a visual depiction of the desired scenic integrity objectives can be found in appendix B.

Desired Conditions

1. The forest provides a variety of ecologically sound, resilient, and visually appealing landscapes that enhance recreation settings and sustain scenic character in ways that contribute to a sense of place, connection with nature, and quality of life.
2. The forest appears predominantly natural and includes cultural landscapes that are valued by both forest users and local communities for their scenic and traditional values.
3. High-quality scenery dominates the landscape in areas the public values highly for scenery including scenic byways, major roads and trails, developed recreation sites, and high scenic integrity areas such as wilderness, eligible wild and scenic river corridors, and the Continental Divide National Scenic Trail.
4. Scenery is enhanced or maintained to have long-term resilience to changing conditions.
5. The scenic integrity objective map (appendix B) provides a geographic representation of where the desired conditions apply to inform project and activity decision-making.

Guidelines

1. Constructed features, facilities, and outcomes of management activities should blend with the natural-appearing landscape. The concepts of form, line, color, texture, and pattern common to the desired scenic character being viewed should be applied during project planning and design.
2. Management activities should minimize visual disturbances and be consistent with or move the area toward achieving scenic integrity objectives over the long term (as defined by the scenic integrity objective map).
    a. In areas with very high scenic integrity objectives, the scenic character should have only minor or no deviations. The areas should appear unaltered, and the majority of the area should be dominated by ecological changes.
    b. In areas with high scenic integrity objectives, the scenic character should appear intact, but may include deviations that are not evident (for example, complementarily repeating the scenic attributes of size, shape, form, line, color, texture, or patterns common to the scenic character).
    c. In areas with moderate scenic integrity objectives, the scenic character may appear slightly altered. Management activities, structures, and facilities should not dominate the scenic character (for example, repeat the scenic attributes of size, shape, form, line, color, texture, or patterns common to the scenic character).
    d. In areas with low scenic integrity objectives, the scenic character may appear moderately altered. Management activities including human-made structures and facilities may begin to dominate the scenic character, but use scenic attributes to blend into the landscape (for example, repeat the scenic attributes of size, shape, form, line, color, texture, or patterns common to the scenic character)
3. Management activities that result in short-term impacts inconsistent with the scenic integrity objectives should achieve the scenic integrity objectives over the long-term. Short-term and long-term timeframes should be defined during site-specific project planning.
4. Projects should include mitigation measures to address impacts to scenic resources.

5. Management activities that affect scenic quality should not be scheduled on weekends or holidays during the major recreation season, except in cases of fire management or when doing so would otherwise not achieve project goals.
6. Effects to scenery from prescribed fire should be considered during project planning and implementation. Efforts should be made to minimize high-intensity fire along areas valued highly by the public for scenery unless necessary to meet management objectives or ensure public safety.

Management Approaches

Relationships

Forest leadership and staff look for opportunities to cooperate with other entities, such as the New Mexico Department of Transportation, tribal and local governments, and commercial and private entities to manage for scenic integrity in and adjacent to the national forest, including along scenic byways. We share the scenery management inventory and scenic integrity objective maps and map data with adjacent and neighboring land management agencies and encourage consideration and integration of the forest's scenic resources into their projects and plans. We develop informational materials about the importance and impacts of scenery and look for opportunities to share it.

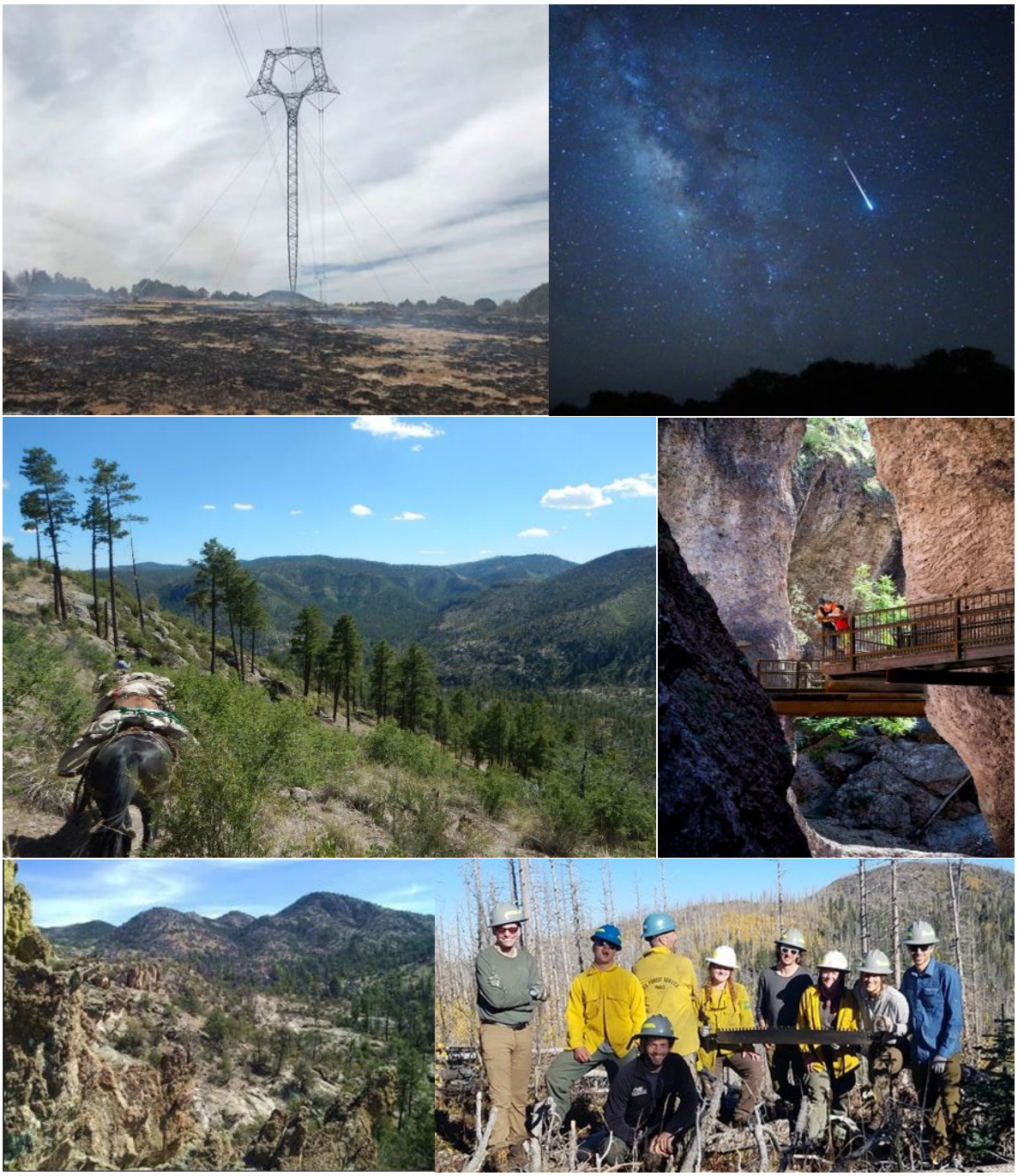
Implementation

Forest leadership and staff integrate the Built Environment Image Guide and other available best practices for environmentally sustainable design in construction or reconstruction of Forest Service facilities to ensure consistency with scenic character. As part of project development and design, forest staff are likely to prepare vegetation management plans that outline the activities to sustain desired scenic character and key visual elements, when those projects involve developed recreation sites or administrative facilities.

Rehabilitation Prioritization

Forest leadership and staff seek opportunities to rehabilitate areas where existing scenic integrity is lower than the scenic integrity objective. When setting priorities for rehabilitation, leadership considers the following:

- Foreground (within 300 feet to 0.5 mile) of high public use areas have the highest priority;
- Relative importance of the area and the amount of deviation from the scenic integrity objectives;
- Length of time it would take natural processes to reduce the visual impacts so that they meet the scenic integrity objectives;
- Length of time it would take rehabilitation measures to meet the scenic integrity objectives;
- Benefits to other resource management objectives to accomplish rehabilitation; and
- Restoration of scenic integrity in areas where it has been negatively impacted as other project work is accomplished or funds are available.



Photos top to bottom, left to right: Utilities Management Area, Indian Peaks RX Fire, Black Range Ranger District (USDA Forest Service photo); meteor shower over the Continental Divide National Scenic Trail by Michael Ruggiero; USDA Forest Service photos—Above Hells Hole, Gila Wilderness and Catwalk National Recreation Trail Glenwood Ranger District; Rabb Park Recommended Wilderness Area by New Mexico Wild; trail crew, Black Range Aldo Leopold Wilderness (USDA Forest Service photo)

Chapter 3. Management Areas

Several areas in the Gila National Forest require management that differs from the forestwide plan components in chapter 2. These areas are identified as designated areas and management areas. Designated areas in the Gila National Forest represent identified exceptional areas that have distinct or unique characteristics that previously warranted special designation. A management area represents a management emphasis for an area or several similar areas on the landscape.

Plan components for a designated or management area may differ from forestwide guidance by:

- Constraining an activity where forestwide direction does not;
- Constraining an activity to a greater degree than forestwide direction; or
- Providing for an exception to forestwide direction when forestwide direction conflicts with the management emphasis of the management area.

Forestwide plan components are applied unless there is management direction for a designated or management area. Throughout this chapter, plan components that constitute management direction for a designated or management area are displayed within numbered lists. Text outside of numbered lists is not management direction; it is background material, explanations, or descriptions of management approaches. See Appendix B. Maps of this document for maps of designated and management areas.

Background and Description

Management areas include areas established through legislation passed by Congress and areas established through Forest Service administrative procedures. These areas are established and managed for specific purposes. Management areas in this plan that are designated by Congress include national scenic trails, national recreation trails, inventoried roadless areas, designated wilderness areas, and wilderness study areas. Management areas in this plan that are established through administrative processes include designated research natural areas, recommended wilderness, eligible wild and scenic rivers, utilities, and wildland-urban interface management areas. Recommended wilderness and eligible wild and scenic rivers can only be designated by an act of Congress. The approval of this plan establishes the utilities and wildland-urban interface management areas. If the area where these occur on the ground changes in the future, the map can be updated with an administrative change.

Management areas have specific management requirements. In the case of congressionally designated areas or areas eligible or suitable for recommendation to Congress for designation, those requirements depend on the purpose and letter of the legislation involved, and agency policy direction that guides implementation of the legislation. Management requirements for areas that are established administratively depend on agency policy direction, needs identified during plan revision, or both.

Management area maps are provided in Appendix B. Maps. Larger formats are available electronically.

Designated Wilderness

Background Information

The Gila National Forest holds a unique international distinction as the location of the world's first designated wilderness. It holds unique regional distinction because its three large wilderness areas are relatively close to one another.

The concept of managing some areas within the National Forest System as wilderness was first applied in 1924 with the administrative designation of the Gila Wilderness at the urging of the conservation pioneer Aldo Leopold. The Gila Wilderness became a part of the National Wilderness Preservation System when Congress passed the Wilderness Act of 1964. In 1980, the Blue Range and Aldo Leopold Wilderness Areas became part of the National Wilderness Preservation System with the passage of the New Mexico Wilderness Act. The three wilderness areas together total around 792,584 acres or approximately 24 percent of the forest.

Trail riders in the Gila Wilderness. USDA Forest Service photo by J.J. Arnold, 1939. FS#384971

In the Wilderness Act, Congress acknowledged the immediate and lasting benefits of wild places, by passing landmark legislation that permanently protected some of the most natural and undisturbed places in America. The Wilderness Act established the National Wilderness Preservation System "...to secure for the American people of present and future generations the benefits of an enduring resource of wilderness." The act defined wilderness as:

> "A Wilderness in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain."

The Wilderness Act describes the following qualities of "wilderness character":

- Untrammeled – free from modern human control or manipulation.
- Natural – where the natural condition of the land, its plants, wildlife, water, soil, air, and the ecological processes are managed, protected, and preserved.
- Undeveloped – retaining its primeval character and influence, as it is essentially without permanent improvements or human occupation.
- Outstanding opportunities for Solitude or Primitive and Unconfined Recreation – opportunities for solitude or primitive and unconfined recreational experiences.
- Other Features of Value, which are ecological or geological or other features of scientific, educational, scenic, or historical value that are truly unique and essential to the character of a particular wilderness, but this may not be applicable to all wilderness areas.

The Wilderness Act prohibits permanent roads and the use of any form of motorized or mechanized transport within wilderness areas, except wheelchairs. The Wilderness Act requires management of human-caused impacts and protection of the area's wilderness character to ensure that it is "unimpaired for the future use and enjoyment as wilderness." Popular wilderness uses include hiking, backpacking, horseback riding, hunting, and fishing.

Gila Wilderness

The distinction of being the world's first formally designated wilderness, combined with the close association to the legacy of Aldo Leopold, makes the Gila Wilderness a national and international destination. At 559,688 acres, the Gila Wilderness is New Mexico's largest, with an extensive trail system providing visitor and administrative access. High mesas, rolling hills, and deep canyons distinguish the eastern portions, as do pinyon and juniper woodlands, broad meadows, and grassland areas. Ponderosa pines blanket the central portion, with sheer cliffs and spires outlining the Gila River. The west and southwest portions boast rugged mountains with spruce-fir and mixed conifer forests with elevations up to 10,895 feet at Whitewater Baldy. The headwaters of many important rivers and creeks originate in the Gila Wilderness.

Of the three wilderness areas in the forest, the Gila Wilderness receives the most use. Most recreational use occurs from early spring through late fall. Popular recreation activities include day hiking, backpacking, multi-day trips with saddle and pack stock, and big game hunting. Visitation is comparatively light, with minimal use conflicts. However, the East, Middle, and West Forks of the Gila River and trails located near Gila Cliff Dwellings National Monument do experience periods of high use. These areas are popular because they are near water sources and the wilderness boundary. The Gila Wilderness is the only class 1 airshed within the forest (see Air Quality).

Aldo Leopold Wilderness

The Aldo Leopold Wilderness straddles the crest of the Black Range Mountains and spans 203,797 acres, making it New Mexico's third largest wilderness area. Containing some of the most rugged mountain terrain on the forest, the crest of the range overlooks a series of east-west trending steep and narrow stream valleys, 1,000 or more feet deep. The Continental Divide cuts across the center ridgeline of the wilderness, which hosts a segment of the Continental Divide National Scenic Trail. Hiking and backpacking are the major recreational activities, but scarce water inhibits many potential visitors, as many streams and springs are seasonal and unreliable. The Aldo Leopold Wilderness is often considered New Mexico's "wildest wilderness" with low use and excellent

opportunities for solitude. Only the North Star Mesa Road (Forest Road 150) separates the Aldo Leopold Wilderness from Gila Wilderness. Before this road was constructed, the area that is now the Aldo Leopold Wilderness was part of the original administratively designated Gila Wilderness.

Access to the Aldo Leopold Wilderness is limited, and many trailheads are in remote areas and accessed by forest roads that require high clearance vehicles. Most trailheads are located off paved roads and require hiking several miles before entering the wilderness boundary. This limitation on direct access is a contributing factor to lower visitation numbers than the neighboring Gila Wilderness. Most visitors to the Aldo Leopold Wilderness stay for multiple days, likely due to the remoteness of the area and the time investment it takes to access.

View of Hillsboro Peak from Sids Prong in Aldo Leopold Wilderness. Photo by Jim Apodaca

Blue Range Wilderness

At 29,099 acres, the Blue Range Wilderness is the smallest wilderness area in the forest. It is located immediately adjacent to the Blue Range Primitive Area of the Apache-Sitgreaves National Forests in Arizona. The Blue Range Wilderness is in the eastern portion of the Blue Range Mountains, which are halved by the Mogollon Rim, the dramatic edge of the Colorado Plateau that runs east to west. There are six trails located in the wilderness, two of which may only be accessed from the Arizona side of the boundary. All the trails have higher degrees of difficulty to follow, and no dependable water sources are available. There is minimal visitation to this area by hikers, and by hunters in the fall, offering excellent opportunities for solitude.

Desired Conditions

1. Designated wilderness areas exhibit wilderness character and provide for the purpose of wilderness, which is the use and enjoyment of the American people.
2. The landscape is essentially undeveloped and natural. Constructed features exist only when they reflect the historical and cultural landscape or are the minimum necessary for administration of the area as wilderness.
3. Natural processes, including disturbance regimes such as fire and flooding, function in their natural ecological role.
4. There are abundant opportunities for solitude. Social encounters are infrequent and occur only between individuals or small groups. Visitors experience self-reliance, challenge, and risk while enjoying freedom to pursue primitive and unconfined recreation experiences with only the regulation necessary to protect wilderness character.
5. Unique features and experiences are preserved as an element of wilderness character.
6. Non-native invasive species are absent.
7. Motorized and mechanized intrusions do not occur. All wilderness boundaries are clearly marked at points of entry.
8. Special-use authorizations facilitate the use and enjoyment of wilderness character, wilderness education, or protection and do not adversely affect wilderness character.
9. Tribal importance and use, and cultural and historical resources are respected and valued.
10. Wilderness contributions to clean air, water, and wildlife habitat are recognized and valued.

Objectives

1. Annually rehabilitate or restore at least five wilderness trail segments, campsites, or other areas that have been impacted by use, fire, or other management to restore wilderness character, prevent resource impacts, and improve visitor experiences.
2. Within the first 5 years of plan approval, all congressionally designated wilderness areas are managed to at least a minimum standard as defined by the current wilderness performance reporting measures.

Standards

1. No more than 15 persons and 25 head of pack and saddle stock are permitted within a single group unless otherwise noted in a wilderness management plan. Exceptions may include emergency services, or management activities for maintaining wilderness character. Special-use permits or formal written agreements may allow for exceptions for groups that agree to mitigation terms and demonstrate a high proficiency for Leave No Trace ethics if approved by the Forest Supervisor or designated agent.
2. Outfitter-guide permits in wilderness must include appropriate wilderness practices, such as Leave No Trace principles, and incorporate building awareness of wilderness values in their interactions with clients and others.
3. A minimum requirements analysis must be used when considering nonconforming or prohibited uses in designated wilderness.

4. Treatment of non-native invasive species must use methods consistent with maintaining, restoring, or enhancing wilderness character.

Guidelines

1. Intervention in natural processes through management actions should only occur if it is necessary to preserve wilderness character, protect public health and safety, uphold other federal laws and regulations, or conform with a valid existing right.
2. All management activities should be consistent with the scenic integrity objective of "very high" to maintain wilderness character.
3. To protect wilderness character, any use of signage in wilderness should be limited to those identified as essential for resource protection and user safety. Wilderness appropriate trail markers such as axe blazes or rock cairns should be limited to areas where it is difficult to navigate that trail. Trail markers should be widely spaced so that at maximum, only one additional marker is visible from the other. Painted blazes should not be used.
4. New trail construction or existing trail realignment should only occur where it is necessary to facilitate the use and enjoyment of wilderness or protect public health and safety. These trails or trail segments should be designed, built, and maintained as minimally to moderately developed,[61]
5. Fire operations within wilderness areas should include minimum impact suppression tactics to protect wilderness character.
6. Projects and management activities adjacent to wilderness should include measures to resolve or prevent motorized and mechanized intrusions into wilderness.
7. Wilderness trail and signage activities should include making sure the wilderness boundary is clearly marked at entry points.

Management Approaches

Wilderness Character and Relationships

In keeping with the legal mandates of the Wilderness Act of 1964, forest leadership makes management decisions with humility and restraint, implementing the Four Cornerstones of Wilderness Stewardship developed by the Arthur Carhart National Wilderness Training Center to help implement law and agency policy that address the evolving issues of wilderness management:

1. Manage wilderness as a whole.
2. Preserve wildness and natural conditions.
3. Protect wilderness benefits.
4. Provide and use the minimum necessary.

Forest leadership, staff, and partners such as the Wilderness Fellows and the Society for Wilderness Stewardship work toward establishing a wilderness character baseline, implementing a wilderness character monitoring strategy for each wilderness, and completing a map of threats to wilderness character. Forest leadership and staff seek opportunities to leverage stakeholder interest in wilderness

[61] Minimally and moderately developed are intended to reference trail classes 1 and 2. Trail classes reflect the level of challenge provided by a trail, including the corresponding level of user skill and experience needed to negotiate it. The lower the number, the more challenging the trail.

and collaborate with local partners, volunteers, Adopt-a-Trail organizations, and wilderness advocacy groups on wilderness stewardship and education. It is hoped that such partnerships and collaboration will help to build an enduring volunteer base for stewardship, including recruiting and training volunteer wilderness rangers. Wilderness ranger patrols can assist with education, interpretation, stewardship projects, and when necessary, enforcement, to enhance visitor experiences and preserve wilderness character and values.

We also seek to complete use-capacity studies and vegetation inventories for each designated wilderness and to use that information to improve management. Forest leadership and staff continue to coordinate with the New Mexico Department of Game and Fish to manage native species to maintain and enhance wilderness character. We strive toward clearly and consistently marked wilderness boundaries with signage or other markers at entry points to help reduce or eliminate mechanized intrusions. We look for opportunities to collaborate and promote consistent management where there are adjacent wilderness areas under other jurisdictions.

If overuse ever causes unacceptable resource damage, diminishes wilderness character, or otherwise affects visitor experiences, forest leadership and staff can address those issues using tools and techniques appropriate to the circumstances. Overuse can be determined from limits of acceptable change studies, other resource analyses, wilderness management plans, or professional judgment Similarly, mechanized intrusions that are not addressed by clear and consistent boundary markers can be addressed using a variety of tools and techniques such as increased wilderness ranger patrols, placement of bike racks near wilderness boundaries, trail design, and expanded opportunities outside of wilderness. Where violations of group size or length of stay limits are frequently observed, increased wilderness ranger patrols may also be a tool to address violations. Forest leadership reviews orders that restrict visitor use in wilderness periodically for effectiveness and necessity and is likely to remove those not necessary to restore the unconfined nature of wilderness recreation opportunities.

Outreach and Education

Interpretation and education can encourage visitors to adopt techniques, equipment, and ethics specific to wilderness, including Leave No Trace Outdoor Ethics. News releases, postings, permit issuance, and individual visitor contacts can be used to inform visitors of areas of concentrated resource damage and restrictions on use. Forest leadership and staff are likely to develop or use existing educational materials and interpretation that encourage widespread and common understanding of and support for wilderness values, philosophy, resources, and benefits. As visitors appreciate and learn about wilderness, they can understand their role in protecting ecological systems and wilderness values. This can result in increased stewardship, ecological awareness, partnerships, and volunteerism by members of the public.

Wilderness Resource Advisors

Agency administrators are likely to request fire incident managers to assign a wilderness resource advisor or specialist to all fires within wilderness areas, with the potential to enter wilderness areas, or potentially affecting the character of an adjacent wilderness area that are not suppressed during the initial attack.

Trails

Please refer to the Collaborative Sustainable Recreation Strategy and Relationships management approach in the Sustainable Recreation section of chapter 2. When evaluating and prioritizing work on wilderness trails forest leadership, staff and partners will need to consider wilderness

administrative needs, impacts on wilderness character, recreation opportunities, and level of use. Leadership and staff strive to regularly publish up-to-date trail maps for all wildernesses in a variety of hard copy and digital formats.

Recreation Special Uses

Outfitter-guide capacity studies are likely to be completed or reviewed periodically to help inform decisions about the number of current outfitter-guide permits that are to be issued for each wilderness. If at any time a study indicates that there are more outfitter-guide permits than there is capacity for, the number of permits issued is likely to be reduced by attrition. When implementing the exceptions provided in Designated Wilderness standard 1, the, the following conditions are those that are likely to reach the threshold for consideration:

1. The outfitter-guide and their employed staff demonstrates sufficient knowledge and proficiency in the elements of Leave No Trace Outdoor Ethics to travel and camp with large groups or over extended periods of time with minimal impacts to wilderness character.
2. The outfitter-guide agrees to follow all applicable mitigations stipulated or recommended by and contained within the special-use permit and plan of operations, to minimize impacts to wilderness character and experiences of other visitors.
3. The authority is acknowledged by the outfitter-guide to be only for the specific circumstances as described within the permit and plan of operations and is not a blanket authorization beyond those specifics; any use beyond what is specified in the plan will require additional authorization.

Suggested mitigations could include the following, but are not necessarily limited to nor are applicable to all circumstances:

1. Use existing, hardened campsites that are appropriate to the size of the group; if no campsites are available, care should be taken to locate campsites on durable surfaces to prevent impacts. Care should be taken so the area is left as it was prior to its use as a temporary campsite.
2. If a campsite that is both remote from other visitors and appropriate to accommodate the size of the group cannot be located, break into smaller groups; and locate existing or temporary campsites on durable surfaces away from occupied areas to minimize impacts to other visitors.
3. Locate campsites for larger groups in areas as distant as possible from occupied areas to not impact solitude experiences of other visitors.
4. When exceeding forestwide length-of-stay limits, travel primarily over large distances and through infrequently visited areas, not remaining for long in locations, and relocating campsites frequently; this may not be applicable when chosen locations and length of stay facilitate stewardship projects dependent upon being in a few locations or one location.
5. Break large overall groups into smaller groups to travel and take different routes to reach common destinations.
6. Perform service projects that will benefit the overall wilderness character of the area during the trip, such as wilderness stewardship enhancement projects and trail maintenance, with approval and under the guidance of appropriate Forest Service staff.

Wilderness Study Areas

Background Information

When the New Mexico Wilderness Act was passed in 1980, it designated the Hell Hole and Lower San Francisco Wilderness Study Areas for review to determine if they featured wilderness characteristics to make them worthy of congressional designation as wilderness. The 1986 Forest Plan evaluated these areas as directed by Congress through the New Mexico Wilderness Act. That evaluation did not result in a recommendation for wilderness designation. The wilderness inventory, evaluation, and analysis process conducted as part of revising the 1986 plan, which resulted in this revised plan, also did not result in a recommendation for designation. Until Congress releases these areas from wilderness study area status or decides to designate them as wilderness without a Forest Service recommendation, these lands must be managed to maintain existing wilderness character per the 1980 legislation. However, no baseline monitoring data have been collected for wilderness character within these areas.

Hell Hole Wilderness Study Area

The 18,860-acre Hell Hole Wilderness Study Area is located south of Mule Creek, New Mexico, with its boundary running along the Arizona state line. Access is from the north via Highway 78 west of Mule Creek. A county road heading south from Mule Creek forms the eastern boundary of the wilderness study area.

Topographic features include deep, rugged canyons, rocky peaks, and steep cliffs across the southern portion. The northern portion is primarily rolling hills. Vegetation varies greatly with elevation and aspect. The presence of ponderosa pine in the wilderness study area is somewhat unusual, as it is scarce in surrounding areas. The wilderness study area and Mule Creek vicinity are also one of the limited locations in the forest that contain Apache pine, which looks like ponderosa pine but has much longer needles, a drooping appearance, and occasionally bundles of five needles instead of three.

The wilderness study area lends itself to a variety of primitive recreation activities. The degree of difficulty and variety of conditions found in the wilderness study area provide an adequate level of challenge regardless of users' skills. Current recreation activities are primarily hunting and viewing scenery and wildlife. There are no developed recreation sites or designated trails within the area. The present and expected future use of this area is low.

Lower San Francisco Wilderness Study Area

The 8,800-acre Lower San Francisco Wilderness Study Area is located north of the Hell Hole Wilderness Study Area, west of Highway 180 and the town of Glenwood, New Mexico, and extends to the Arizona-New Mexico state boundary. Popular recreation activities include accessing the San Francisco River at Big Dry Creek to picnic, fish, and hunt. There are no system trails within the wilderness study area. In spring, when the river is high enough, rafting and kayaking occur. Rafters typically put in above the San Francisco Hot Springs south of Glenwood and take out at Martinez Ranch in the Apache-Sitgreaves National Forests in Arizona.

Desired Condition

1. Designated wilderness study areas maintain their wilderness character and potential to be included in the National Wilderness Preservation System that existed at the time they were designated by Congress.

Standard

1. Subject to any valid existing rights, designated wilderness study areas must be administered to maintain their wilderness character that existed at the time they were designated by Congress until such time as Congress either designates the area as wilderness or releases the areas to other uses.

Recommended Wilderness

Background Information

Each national forest undertaking forest plan revision under the 2012 Planning Rule must complete a process of identifying and evaluating lands that may be suitable for inclusion in the National Wilderness Preservation System, and then determine whether to recommend any of the evaluated lands to Congress for wilderness designation. This process drew a lot of attention and energy from people who care about the Gila National Forest. There were a diversity of perspectives and opinions, all strongly held. While the more detailed information on the process may be found in the environmental impact statement appendices, Forest Supervisor Camille Howes determined it was important to include some background information in the plan about how and why she arrived at recommendations included in her decision.

Under the direction of the previous Forest Supervisor, Adam Mendonca, the planning team designed an alternative development process that was responsive to his management concerns and the diversity of perspectives and concerns expressed by the public. The criteria that were used to develop the draft proposed action (alternative 2) were designed to balance all concerns, although there were those on both sides of the issue that have and will likely continue to dispute the efficacy of that balance.

Alternative 2 sought to honor the legacy of Aldo Leopold, the father of wilderness, and the Gila National Forest as the birthplace of wilderness. It did so by only including areas that exceeded a threshold for wilderness characteristics and were located adjacent to existing designated wilderness areas. But those were not the only considerations that built alternative 2, Mendonca had other management concerns. Places that met the threshold for wilderness characteristics may not have seen a lot of human disturbance, like tree thinning or timber harvest; but had they emerged from the fire suppression era in good enough shape to be managed with fire alone? Could we accept the likely outcomes if a wildfire were to occur? What other values were out there? How would it impact the other multiple uses the agency is charged to manage for? How would it limit or enhance our management options in the future? All these considerations were built into the process, as objectively as the information and technology available would support, and Mendonca explicitly reserved the authority to consider anything else that he determined to be valid as the last step. This discretion was drawn on several times during development of the draft proposed action:

1. to exempt the Nolan South unit from the threshold for wilderness characteristics based on public comment. Nolan South was allowed to move through the rest of the process but was ultimately removed from the draft proposed action because of the risk of large, stand-replacement fire;
2. to remove the Mother Hubbard unit based on tradeoffs between the relatively small area that remained after meeting the alternative's criteria, its contributions to the wilderness niche, and the operational impact to grazing allotment management;
3. to remove the North Mogollon Mountains unit from the draft proposed action because it contained the only acreage of Spruce-Fir Forest outside of designated wilderness. Spruce-Fir

Forest is very highly vulnerable to climate change, and if Congress were to designate, it could take some adaptation options completely off the table. For example, reducing coarse woody debris or redistributing it to protect natural conifer regeneration, or planting nursery-raised conifer seedlings;

4. to include the Gila Whitewater Addition despite the fact it exceeded the threshold for area with moderate or greater likelihood of stand-replacement fire.

Between draft and final, there were discussions with the Apache-Sitgreaves National Forests in Arizona because their planning staff made an analysis assumption that the decision on their plan deferred making any recommendations for Hell's Hole, Nolan and Mother Hubbard potential wildernesses until the Gila National Forest completed its process. Gila National Forest planning staff had designed a process and followed that process to an outcome. But that outcome did not exactly reflect what Mendonca had been willing to consider if Apache-Sitgreaves National Forests' leadership had been inclined to recommend areas those areas on the Arizona side of the state line. The Mother Hubbard and Nolan South units within the Gila National Forest lie between the Blue Range Wilderness-Aspen Mountain-Nolan North area and suitable lands on the Arizona side of the state line. They were not included in the draft proposed action because the risk of large areas of stand-replacement fire exceeded the threshold established for alternative development.

Mendonca had been willing to consider recommending the Mother Hubbard and Nolan South units, along with the Aspen Mountain and Nolan North units, if the Apache-Sitgreaves National Forests' leadership had been interested in making recommendations on their side. In that event, Mendonca had determined that the larger wilderness complex that could have been created would have more value to the wilderness legacy than could be lost to stand-replacement fire. Especially since most of it is already inventoried roadless area; although mechanical treatment can be authorized through proper procedures, it would be extremely difficult and expensive to implement given the terrain and the equipment and systems that would be required. However, the Apache-Sitgreaves National Forests' leadership declined to make a recommendation due to competing priorities and limited staff capacity.

Between draft and final, the Gila National Forest also experienced several more severe drought years, experienced another large, landscape-scale wildfire, and saw a monsoon season to beat all monsoon seasons right on the heels of that fire. Adam Mendonca left the Gila National Forest to lend his skillset to national efforts addressing the wildfire crisis and Camille Howes was welcomed into the Gila National Forest family as the new Forest Supervisor. Conditions had certainly changed. New information was available. And there was a new Forest Supervisor considering everything.

Overall, Howes found the process of alternative development to be sound. However, a few modifications to alternative 2's recommendations were needed to address changed conditions, new information, and Howes' personal management concerns. Howes reviewed the areas along the Arizona state line that had been the subject of discussion with the Apache-Sitgreaves National Forests and was concerned by the network of roads separating the Blue Range Wilderness from the draft recommended units, and between the recommended units themselves. One road was one thing, like National Forest System Road 150 that separates the Gila and Aldo Leopold Wildernesses, or the Bursum Road that separates the Mineral Creek unit from the Gila Whitewater Addition, but a network of roads running between multiple units smaller than the Gila or Aldo Leopold Wildernesses crossed a threshold for her. This was not the contribution to the wilderness legacy she wanted to make. Based on these roads, the Aspen Mountain and Nolan North units had been included in the draft proposed action, were not included in the decision (alternative 2-modified).

The draft proposed action also included areas that were impacted to various degrees by the 2022 Black Fire. Although the changed circumstances analysis in the final environmental impact statement concluded that the severity patterns observed in each draft recommended unit did not negatively impact apparent naturalness or other features of value, there were other concerns. WB3-Aldo Leopold Addition was a relatively small unit northwest of Rocky Canyon Campground that lies between the National Forest System Road 150 corridor and the Aldo Leopold Wilderness. This road has been repeatedly used as a fuel break during wildfire events, but it has not been as effective as we would like. After the 2022 Black Fire, the district fuels specialist identified the potential need to do more work within the road corridor to improve its function as a fuel break. On this basis, WB3 was not included in the decision.

Monument Cabin before the Black Fire. USDA Forest Service photo by Bella Mollard. Note that this photo was included in this section not because it is in a recommended area. It is not. It was included as a memorial to a highly valued historical site that was burned to the ground in the Black Fire.

Finally, the McKnight Canyon unit was removed from the decision because of the repeated heavy trail maintenance that is going to be required to keep the highly valued trail access open after the Black Fire. Plan direction for recommended areas aligns closely with mandates for the management of designated wilderness. This was intended to honor the wilderness legacy and to avoid potential future disputes over what is and isn't allowed in these areas should Congress designate. However, direction does provide for some exceptions in some cases, including the use of mechanized equipment for trail maintenance. Based on the collective staff and partner experience in the same canyon after the Silver Fire, the expected maintenance on the McKnight Canyon trail will warrant

the use of chainsaws as a rule, rather than an exception to it for years to come. On this basis, and in the broader context of the wilderness trail maintenance need, Howes decided not to include McKnight Canyon in her recommendations.

The record of decision documents the Forest Supervisor's recommendations to Congress, which are also identified and described in table 10. Congress reserves the authority to designate wilderness through legislation, and in fact, does not need a recommendation to designate wilderness.

Table 10. Areas recommended to Congress for wilderness designation

Recommended Area	Acres
B10-ALDO LEOPOLD ADDITION NORTHEAST	8,062
B11-ALDO LEOPOLD ADDITION SOUTHEAST	944
B14-ALDO LEOPOLD ADDITION CARBONATE CREEK	2,819
B1a-ALDO LEOPOLD SECO ADDITION	4,724
B1c-ALDO LEOPOLD SECO ADDITION	48
G12-GILA WHITEWATER ADDITION	1,960
G1-MINERAL CREEK	16,538
WB1-TAYLOR CREEK	10,012
WSB1-RABB PARK	26,996
Total Acres	**72,103**

The Forest Service Planning Handbook 1909.12 Chapter 70 requires that the revised plan must include components that provide for managing any such recommended wilderness areas to protect and maintain the wilderness characteristics that supported recommendation. The handbook identifies these wilderness characteristics as:

- Apparently natural, meaning the area generally appears to be affected primarily by the forces of nature, with the imprints of human work substantially unnoticeable.
- Outstanding opportunities for solitude or primitive and unconfined recreation.
- Special features and values, or ecological, geological, or other features of scientific, educational, scenic, or historical value, where they occur.
- Sufficient size, meaning the area is at least 5,000 acres or of a size practicable to be managed as wilderness.
- Manageability, meaning the area may be managed to protect the wilderness characteristics it possesses.

Recommended wilderness areas will use the interim direction provided, until they are considered for designation by Congress. If an area is designated by Congress, the direction in this section no longer applies and the area is managed according to the Wilderness Act, agency policy, and direction for designated wilderness in this forest plan. If Congress chooses instead to release an area back to other uses, the direction in this section no longer applies and the area is managed according to forestwide plan direction and any other applicable management area direction.

Desired Conditions

1. The wilderness characteristics of recommended areas are maintained at the level they existed at the time of recommendation or are improved by management actions, where those opportunities exist, until such time as Congress designates or releases the area to other uses.
2. A very high scenic integrity objective is maintained or enhanced in recommended areas to preserve the apparent naturalness and other features of scenic value, where those features exist.
3. Primitive or semi-primitive non-motorized recreation opportunity spectrum classes preserve and enhance opportunities for solitude and primitive and unconfined recreation in recommended areas.

Standards

1. To protect the wilderness characteristic of apparent naturalness, no new roads will be constructed, and no existing roads will be maintained or improved subject to valid existing rights.
2. To protect the wilderness characteristic of apparent naturalness, no timber harvests, mechanical vegetation treatments, or cutting of trees will occur within recommended wilderness. Exceptions may occur for managing natural ignitions, mechanical preparation work in support of prescribed fire, or for trail and range infrastructure maintenance. Exceptions will be made on a case-by-case basis at the discretion of the Forest Supervisor or designated agent.
3. To protect the wilderness characteristic of apparent naturalness, no new structures, improvements, or developments will be constructed within recommended wilderness. Exceptions may be allowed at the discretion of the Forest Supervisor or designated agent if they are necessary for legal compliance associated with valid existing rights, or the management of permitted grazing and native fish.
4. No more than 15 persons and 25 head of pack and saddle stock are permitted within a single group unless otherwise noted in a wilderness management plan. Exceptions may include emergency services, management activities for maintaining wilderness character. Special use permits or formal written agreements may allow for exceptions for groups that agree to mitigation terms and demonstrate a high proficiency for Leave No Trace ethics. These must be approved by the Forest Supervisor or designated agent.
5. To protect the wilderness characteristic of primitive and unconfined recreation, all forms of motorized and mechanized transportation for recreation purposes will be prohibited. This does not include the use of wheelchairs. Wheelchairs will be authorized in recommended wilderness for those individuals whose disability requires this use, consistent with provisions provided by the Wilderness Act for designated wilderness.

Guidelines

1. Treatment of non-native invasive species should use methods consistent with maintaining, restoring, or enhancing apparent naturalness.
2. New trail construction or existing trail realignment should only occur where it facilitates protection of wilderness characteristics or protects public health and safety. These trails or trail

segments should be designed, built, and maintained as minimally to moderately developed.[62] Existing trails designed for wilderness non-conforming uses, such as mechanized or motorized vehicle use, should be rehabilitated and maintained to meet trail standards for non-motorized, non-mechanized travel.

3. Competitive and group recreation events should not be permitted in recommended wilderness areas to protect the wilderness characteristics of solitude and primitive and unconfined recreation.
4. Fire operations within recommended wilderness areas should minimize effects to wilderness characteristics with minimum impact suppression tactics. Fire camps, helispots, and other temporary facilities associated with fire management activity should be located outside of recommended wilderness unless there are no other practicable options.

Management Approaches

Wilderness Characteristics and Relationships

Forest leadership and staff seek opportunities to work with volunteers and partners in a manner like that described for designated wilderness. Threat mapping, vegetation inventories, non-native invasive species inventories, comprehensive vegetation inventories, and use-capacity studies are also valuable tools for protecting and enhancing wilderness characteristics. Where non-conforming uses are likely to encroach on recommended wilderness areas, forest leadership and staff are likely to apply the same tools and techniques used in similar situations where there are intrusions into designated wilderness. When the Forest Supervisor or designated agent exercises the exceptions allowed in standards, a minimum requirements analysis could be a useful tool if desired. If designation by Congress occurs, the forest will promptly develop an implementation plan to bring newly designated areas into compliance to be managed as wilderness according to law, policy, regulations, and forest plan direction.

Outreach and Education

Interpretation and education can be used to encourage visitors to adopt techniques, equipment, and ethics specific to wilderness characteristics within recommended wilderness. News releases, postings, and individual visitor contacts can be used to inform visitors of restrictions and encourage them to avoid areas of overuse. Forest leadership and staff seek opportunities to expand partnerships to increase awareness of wilderness values and etiquette.

Trails

Please refer to the Collaborative Sustainable Recreation Strategy and Relationships management approach in the Sustainable Recreation section of chapter 2. When evaluating and prioritizing work on recommended wilderness trails, forest leadership, staff and partners will need to consider administrative needs, impacts on wilderness characteristics, recreation opportunities, and level of use.

[62] Minimally and moderately developed are intended to reference trail classes 1 and 2. Trail classes reflect the level of challenge provided by a trail, including the corresponding level of user skill and experience needed to negotiate it. The lower the number, the more challenging the trail.

Accessibility

The provisions for wheelchair use by individuals whose disability requires them does not mean the agency, forest leadership or staff are required to provide any additional accommodation, facilities, or modification of the land to facilitate wheelchair use. The intent of forest leadership and staff is to provide consistency with the accessibility provisions included in the Wilderness Act.

Recreation Special Uses

Outfitter-guide capacity studies are likely to be conducted to help inform decision making regarding issuing outfitter-guide special-use permits within each recommended wilderness area. This may be accomplished in coordination with existing wilderness if the recommended area is designated. When implementing the exceptions provided in Recommended Wilderness standard 4, the same approach described in the Designated Wilderness management approach Recreation Special Uses is likely to be applied.

Inventoried Roadless Areas

Background Information

Inventoried roadless areas were established under the 2001 Roadless Area Conservation Rule (36 CFR Part 294). The “inventoried” part of the name comes from two Roadless Area Review and Evaluation (RARE) inventories the national forests conducted in the 1970s (RARE) and 1980s (RARE II). Approximately 22 percent of the Gila National Forest’s land mass (733,836 acres) is located within 29 inventoried roadless areas as detailed in the following table.

Table 11. Gila National Forest inventoried roadless areas

Inventoried Roadless Area Name	Official Acres
1978 Administratively Endorsed Wilderness Proposal	4,286
Apache Mountain	17,506
Aspen Mountain	23,783
Brushy Mountain	7,199
Brushy Springs	5,735
Canyon Creek	9,824
Contiguous to Black & Aldo Leopold Wilderness	111,811
Contiguous to Blue Range Wilderness	1,980
Contiguous to Gila Wilderness and Primitive Area	79,048
Devils Creek	89,915
Dry Creek	26,719
Eagle Peak	34,016
Elk Mountain	6,550
Frisco Box	38,977
Gila Box	23,759
Hell Hole	19,553
Largo	12,730
Lower San Francisco	26,459
Meadow Creek	34,167
Mother Hubbard	5,895

Inventoried Roadless Area Name	Official Acres
Nolan	13,050
Poverty Creek	8,770
Sawyers Peak	59,743
Stone Canyon	6,801
T Bar	6,823
Taylor Creek	16,639
The Hub	7,498
Wagon Tongue	11,411
Wahoo Mountain	23,121
TOTAL	**733,836**

This plan does not contain a lot of direction for managing these areas because much of their management is already decided by law and agency policy direction. The Roadless Area Conservation Final Rule (Roadless Rule) prohibits road construction, reconstruction, and thereby, timber harvest in inventoried roadless areas except under certain circumstances, because those actions have the greatest likelihood of altering and fragmenting landscapes, resulting in immediate long-term loss of roadless area values. Some existing roads may be present within inventoried roadless areas. The Roadless Rule does not prohibit motorized travel on existing roads or motorized trails.

The Regional Forester has the authority to review and authorize the cutting, sale, or removal of generally small-diameter timber when needed for one of the following purposes:

- To improve threatened, endangered, proposed, or sensitive species habitat;
- To 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; or,
- For administrative and personal use, as provided for in 36 CFR 223, where personal use includes activities such as Christmas tree and fuelwood cutting, and where administrative use includes providing materials for activities such as construction of trails, footbridges, and fences.

The regional forester reviews all projects involving road construction or reconstruction and the cutting, sale, or removal of timber in inventoried roadless areas, except for the following management activities, which are reviewed by the Forest Supervisor with optional review by the regional forester:

- Any necessary timber cutting or removal or any road construction or reconstruction in emergency situations involving wildfire suppression, search and rescue operations, or other imminent threats to public health and safety in inventoried roadless areas.
- Timber cutting, sale, or removal in inventoried roadless areas incidental to the implementation of an existing special-use authorization. Road construction or reconstruction is not authorized through this re-delegation without further project-specific review.

Desired Conditions

1. The roadless characteristics of all inventoried roadless areas identified by the 2001 Roadless Area Conservation Rule are maintained or enhanced.

2. Inventoried roadless areas are large, relatively undisturbed landscapes that contribute to biological diversity and the long-term survival of at-risk species. They serve as safeguards against the spread of invasive plant species and provide reference areas for study and research.
3. Inventoried roadless areas appear natural, have high scenic quality, and provide opportunities for dispersed recreation.

Standard

1. All management activities conducted within inventoried roadless areas must maintain or improve roadless characteristics.

Guidelines

1. Inventoried roadless areas should be managed for primitive, semi-primitive non-motorized, and semi-primitive motorized recreation opportunity settings.
2. Management activities conducted within inventoried roadless areas should be consistent with a high scenic integrity objective.

Management Approaches

Road Decommissioning

When developing the proposed action and alternatives for a project, forest leadership and staff consider incorporating decommissioning of roads within the within inventoried roadless areas, while involving affected stakeholders.

Corrections to Cartographic Errors

Forest staff and leadership are aware of some cartographic errors in the inventoried roadless area mapping. Cartographic errors are inaccuracies caused by poor spatial data or human error. Unfortunately, we are stuck with these errors because Congress has reserved the authority to adjust inventoried roadless area boundaries and there is no exception for correcting cartographic errors. If such authority was ever granted by Congress, forest leadership would likely direct staff to make those corrections.

Research Natural Areas

Background Information

Forest Service research natural areas are designated for the purpose of permanently protecting and maintaining natural conditions for the conservation of biological diversity, conducting non-manipulative research, and monitoring, and fostering education. They are designated to "maintain a wide spectrum of high-quality representative areas of the major forms of variability found in forest, shrubland, grassland, alpine, and natural situations that have scientific interest and importance that, in combination, form a national network of ecological areas for research, education, and maintenance of biological diversity" (Forest Service Manual 4063.02). Included in this research natural areas network are:

- High-quality examples of widespread ecosystems.
- Unique ecosystems or ecological features.
- Rare or sensitive species of plants and animals and their habitat (USDA FS RMRS 2016).

Research natural areas are managed to maintain the natural features for which they were established and natural processes. Because of the emphasis on natural conditions, they are excellent areas for studying ecosystems or their component parts and for successional processes and other long-term ecological change. The Gila National Forest has one designated research natural area—the Gila River Research Natural Area—which appears on the map showing both designated and proposed research natural areas in appendix C.

Gila River Research Natural Area

The Gila River Research Natural Area was established in 1972. It covers 402 acres near the Gila River Bird Area in the northern Burro Mountains on the Silver City Ranger District. The area provides a well-developed example of the riparian ecosystem in New Mexico and provides habitat for rich and unique birdlife. In the Gila River Bird Area, 231 species of birds, which represents 43 percent of the bird species verified in New Mexico, have been detected (Shook 2015). Some of these species are at the northern edge of their natural range. Federal or state threatened or endangered species using the area include the bald eagle, common blackhawk, peregrine falcon, Gila woodpecker, southwestern willow flycatcher, Bell's vireo, and Abert's towhee (Shook 2015). The Gila River in the Cliff-Gila Valley, including the Gila River Research Natural Area, is an important habitat area for native fish, including the federally listed loach minnow and spikedace.

Desired Conditions

1. The ecological features and values for which the research natural area was established are protected. Genetic diversity in established research natural areas is preserved and maintained.
2. Research natural areas serve as areas for the observation and study of ecosystems and ecological processes, and as baseline areas for measuring ecological change due to disturbances or stressors, such as climate change.
3. Research natural area lands are generally natural-appearing. Ecological processes such as plant succession and fire, insect, and disease activity function with limited human influences. Visitor access and use does not impact natural features of the research natural area.

Standards

1. Salable mineral materials and locatable minerals extraction must not be authorized within research natural areas.
2. The removal of wood products for any purpose must not be permitted or authorized in the research natural area unless it contributes to the research natural area's desired conditions and management objectives described in the establishment record.
3. Special uses must not be authorized except those that support approved research or education to minimize potential impacts to ecological values.

Guidelines

1. All management activities should be consistent with the scenic integrity objective of very high.
2. Management measures and controls such as fencing and other barriers should be used as necessary to prohibit unauthorized cross-country travel and to protect the features of for which the area was established.
3. Vegetation management activities should be authorized only when necessary to achieve or maintain the ecological conditions for which the area was designated.

4. Naturally ignited wildfires occurring under fuel moisture and weather conditions that promote characteristic severity should not be suppressed, providing first for human safety. Those that occur under unfavorable fuel moisture and weather conditions should be suppressed, again, providing first for human safety.
5. In established and proposed research natural areas, fire management activities should be designed and implemented to mimic natural fire processes and should be compatible with ongoing research. When conditions near a research natural area do not support natural fire spread through the research natural area, prescribed fire may be conducted within prescription windows that promote characteristic severity.
6. Fire management activities should protect the resources for which the area was established.
7. Collection of rocks should be only for approved scientific purposes and carried out under the appropriate authorization to preserve any unique geological formations and maintain the values for which the area was designated.

Management Approaches

Outreach, Education and Relationships

Forest leadership and staff coordinate with site stewards, appropriate agencies, partners, and universities regarding scientific opportunities in research natural areas, and to help educate the public about their designated purposes and uses. Signage can assist with educating the public about the research natural area purpose, its boundaries, and permitted and prohibited activities.

Reference

Shook, R. 2015. The Gila River Bird Habitat Management Unit: An Analysis of Avian Populations Mid-May 1996–August 2015. Report to the U.S. Forest Service, Gila National Forest. pp. 141.

Eligible Wild and Scenic Rivers

Background Information

In 1968, Congress passed the Wild and Scenic Rivers Act to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. To be designated, rivers or sections of rivers must be free-flowing and possess at least one “outstandingly remarkable” value. Scenic, recreational, geologic, fish, wildlife, historic, cultural, or “other features of value” were established under the act.

As a required part of the forest plan revision, the Gila National Forest undertook a process for identifying and determining or reviewing the eligibility of potential additions to the National Wild and Scenic Rivers System. Rivers required to be studied or reviewed for eligibility include all rivers named on a standard U.S. Geological Survey 7.5-minute quadrangle map but could also include rivers identified in the Nationwide Rivers Inventory and by other sources. A 7.5-minute quadrangle map shows an area that spans 7.5 minutes of latitude and 7.5 minutes of longitude, which is a scale where 1 inch on the map represents 24,000 inches on the ground.

A 2002 court-ordered inventory of eligible wild and scenic rivers determined the following eight river segments were eligible at that time. These river segments are Whitewater Creek, Spruce Creek, Middle Fork Gila River, West Fork Gila River, Diamond Creek, South Diamond Creek, Holden

Prong, and Las Animas Creek. The 2012 Planning Rule directives require that any river segments included in this previous study affected by changed circumstances be reevaluated for ineligibility or eligibility. Changed circumstances are any events that have occurred to the river or the river corridor, or new information obtained that could affect outstandingly remarkable values. Examples of changes include the listing of a species within the river, broad recognition of the river for certain recreational opportunities, new geological studies, or changes that now make the river's values more unique. For more information on the process undertaken during the plan revision to determine eligibility, please refer to the environmental impact statement appendices.

The Gila National Forest is required by law, policy, and regulation to manage all eligible wild and scenic rivers under interim protection measures until a suitability study concludes that the river may be eligible but is not suitable for designation, or a congressional decision is made on the future use of the river and adjacent lands. Table 12 provides a list of river segments and miles that were determined eligible for wild and scenic status and their interim classification as wild, scenic, or recreational.

Table 12. Updated plan revision study identified eligible wild and scenic rivers on the Gila National Forest with classifications and segment lengths

River Name	Outstanding Remarkable Values	Total Miles	Classification (# of miles)
Diamond Creek	Fish, Historic	23.80	Wild (22.12) Scenic (1.68)
Middle Box of the Gila River	Wildlife, Scenic, Recreation, Fish, Historic	8.90	Recreational (1.34) Wild (7.56)
Middle Fork Gila River	Scenic	35.54	Wild (35.54)
West Fork Gila River	Scenic, Historic	30.01	Wild (30.01)
Wilderness Run of the Gila River	Geologic, Scenic, Recreation, Historic, Wildlife	40.39	Wild (33.67) Recreational (6.72)
Holden Prong	Fish	7.27	Wild (7.27)
Iron Creek	Fish	3.53	Wild (3.53)
Las Animas Creek	Fish, Historic	7.35	Wild (2.53) Scenic (4.82)
Mineral Creek	Fish, Recreation	8.71	Wild (8.71)
Mule Creek	Geologic	4.33	Scenic (4.33)
Lower Box of the San Francisco River	Scenic, Recreation, Wildlife	17.02	Scenic (2.43) Wild (14.59)
Upper Box of the San Francisco River	Scenic, Recreation	5.70	Scenic (3.78) Wild (1.92)
South Diamond Creek	Fish	8.05	Wild (8.05)
Spruce Creek	Fish	3.74	Wild (3.74)
Whitewater Creek	Recreation, Historic	14.73	Wild (11.79) Recreational (2.94)
Willow Creek	Recreation	4.95	Recreational (4.95)
Total Eligible River Miles:		**224.11**	

At the time this plan was being finalized, a citizen's proposal that identified approximately twice as many miles for designation as this study found eligible was being heard for the second time by Congress. Should that bill be passed, the Gila National Forest would most likely initiate a plan

amendment to establish direction for designated wild and scenic rivers. Otherwise, the following plan direction will apply to the river segments identified in the preceding table until Congress orders a suitability study or agency leadership decides to exercise their discretion to complete a suitability study on their own.

Desired Conditions

1. The outstandingly remarkable values, free-flowing condition, and classifications of eligible wild and scenic river corridors are preserved until they are congressionally designated as a wild and scenic river or are released from consideration though a suitability study determination or by direction of Congress.
2. Roads and trails provide access consistent with the river segment classifications, while protecting and enhancing the river's outstandingly remarkable values.
3. Activities in eligible wild and scenic rivers and associated corridors are primarily nature-based, are consistent with the river's classification, and maintain the outstandingly remarkable values.

Standards

1. Projects and activities must be designed to protect and enhance their free-flowing nature and the outstandingly remarkable values that qualified them as eligible until a suitability study is completed determining otherwise or a decision from Congress to designate or release from further consideration and returned to other uses is made.
2. When proposed management activities may compromise the outstandingly remarkable values, potential classification, or free-flowing nature of an eligible wild and scenic river segment, a suitability study must be completed for that eligible river segment prior to approving activities.
3. All proposed water resources projects within the eligible wild and scenic rivers corridor must undergo a free-flow analysis and decisions must ensure the segment's free-flowing nature and outstandingly remarkable values remain intact as a condition of project approval.
4. Within the corridors of eligible rivers with interim classifications of "wild," the cutting of trees and other vegetation must not be authorized except when needed in association with a primitive recreation experience, to protect outstandingly remarkable values, or for the safety of users. Safety issues include hazard trees and other trail maintenance activities.
5. No temporary or permanent facilities will be constructed within eligible river corridors with interim classifications of "wild." Facilities constructed within eligible "scenic" or "recreational" segment corridors must be located and designed to protect river values, be screened from view to the extent possible, and complement scenic values.

Guidelines

1. Recreation and other activities at eligible rivers and associated corridors should be restricted at appropriate locations and intensities consistent with the classification to protect or enhance the free-flowing condition, and the outstandingly remarkable values.
2. Fish barriers or other minor structures or vegetation management intended to protect or enhance riparian and aquatic habitat within river corridors with interim classifications of "wild" should harmonize with the area's essentially primitive character and maintain or enhance outstandingly remarkable values.

3. Within eligible wild and scenic river corridors classified as “recreational” or “scenic,” vegetative treatments, including timber harvest, may be authorized if needed to maintain or restore the values for which the eligible river was identified.
4. Management activities should be consistent with the scenic integrity objective of “very high” in eligible wild and scenic rivers classified as “wild”; “high” in eligible rivers classified as “scenic”; and “moderate” in eligible rivers classified as “recreational.”
5. Management activities should be consistent with the recreation opportunity spectrum class of “primitive” or “semi-primitive non-motorized” in eligible wild and scenic rivers classified as “wild”; “semi-primitive non-motorized” to “semi-primitive motorized” in eligible rivers classified as “scenic”; and “semi-primitive non-motorized” to “roaded natural” in eligible rivers classified as “recreational.”
6. New roads or motorized trails should not be constructed within 0.25 mile of an eligible river segment classified as “wild.”
7. When motorized use is necessary in any eligible segments, conditions for that use should be carefully defined and impacts mitigated.
8. Permitted livestock grazing that occurs within eligible wild and scenic river segments should be managed to protect outstandingly remarkable values.
9. All management activities within an eligible wild and scenic river corridor should consider opportunities for enhancing outstandingly remarkable values.

Management Approaches

Outreach and Education

Forest leadership and staff develop educational materials and interpretation of eligible wild and scenic rivers, utilize existing materials, or both to encourage widespread and common understanding of the values, philosophy, resources, and benefits of wild and scenic rivers. Appreciation and understanding can result in increased stewardship, ecological awareness, partnerships, and volunteerism.

Relationships

Forest leadership and staff are likely to collaborate with neighboring forests and agencies on the management of eligible wild and scenic rivers because of the nature of flow and the upstream and downstream effects that may occur with any alteration of flow.

Suitability Studies

A wild and scenic rivers suitability study is undertaken to determine if eligible wild and scenic rivers are suitable to be recommended to Congress as potential additions to the National Wild and Scenic Rivers System. In other words, an eligibility study evaluates if a river segment could be wild and scenic, and a suitability study evaluates if it should be. Suitability studies were not conducted during the plan revision process but may be undertaken at any time following the outcome of the eligibility study based on agency discretion or congressional direction.

If a management conflict should arise due to any river’s eligible status, it may be resolved by conducting a suitability study. If the river segment or any portion of it is not found to be suitable, the conflict may be resolved by releasing the river segment or portion of that segment to other forest uses. However, if the river is found suitable, the only resolution is to preserve its free-flowing nature

and outstandingly remarkable values until such time that Congress designates the river or releases it to other uses through legislation.

Restoration of Native Fishes

Nothing in this plan should be construed as prohibiting fish barriers for the purposes of restoring native fishes to rivers with wild and scenic status. The Wild and Scenic Rivers Act contains provisions for these structures if they are designed to pass a free-flow analysis and maintain or enhance outstandingly remarkable values. Indeed, forest leadership and staff recognize that in some cases, fish barriers are the only means by which outstandingly remarkable fisheries values can be maintained or enhanced. Investing in structures that do not substantially alter free flow may have multiple benefits.

Continental Divide National Scenic Trail

Background Information

The National Trails System Act of 1968 as amended, established a system of congressionally designated, long-distance trails located to provide for maximum outdoor recreation potential and promote the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the lands through which such trails pass. Congress designated the Continental Divide National Scenic Trail (or Trail) in 1978.

The Continental Divide National Scenic Trail is a 3,100-mile continuous path that follows the spine of the Rocky Mountains from Mexico to Canada, traversing some of the most scenic terrain in the country and areas rich in the heritage and life of the Rocky Mountain west. The Continental Divide National Scenic Trail is the highest and most rugged of the national scenic trails, reaching the 14,270-foot summit of Grays Peak in Colorado, and connecting a diversity of landscapes from desert to glacier and remote wilderness to working lands across portions of New Mexico, Colorado, Wyoming, Idaho, and Montana.

The nature and purposes of the Continental Divide National Scenic Trail are to provide for high-quality, scenic, and primitive hiking and horseback riding opportunities and to conserve the natural, historic, and cultural resources along the trail corridor. Activities that would substantially interfere with that management should be avoided to the extent practicable (16 United States Code [U.S.C.] 1246). The Continental Divide National Scenic Trail is managed for its nature and purposes, cooperatively among agencies and multiple partners, following the overarching management direction outlined in the most current Continental Divide National Scenic Trail Comprehensive Plan (USDA Forest Service 2009). Activities that would substantially interfere with that management should be avoided to the extent practicable (16 U.S.C. 1246). The Gila National Forest contains 254 miles of the existing Continental Divide National Scenic Trail corridor, which is generally defined as within 0.5 mile on either side of the trail.

New motorized vehicle uses by the public are prohibited on the Continental Divide National Scenic Trail, unless such use is consistent with the applicable policy set forth in the comprehensive plan. In general, established motorized uses, both summer and winter, are allowed to continue, but new motorized uses will not be designated on the trail. In other words, if the trail's route was co-located with a road or motorized trail when the legislation was passed, motorized use on those segments may continue. However, the trail or the road or motorized trail should be realigned as soon as possible so that they are not co-located. Further, once the motorized and non-motorized uses are no longer co-located, they should remain that way. If new trail segments are constructed where there was no

previous trail, motorized use on those new segments isn't consistent with the legislation or policy direction.

The Continental Divide Trail Coalition, volunteers, and forest staff have been working to complete trail maintenance and realignments that address co-location with roads. One of these important collaborations was completed in 2021 when the forest trail crew completed a realignment in the Burro Mountains. The gap between Burro Mountains segment of the trail and the rest of the forest remains an issue important to the Coalition and trail users. Forest leadership has made several attempts to acquire the rights-of-way that would allow trail construction to bridge this gap. Additional cooperators and partners will be critical to making future progress on this front.

Desired Conditions

1. The Continental Divide National Scenic Trail is a well-defined trail that provides for high-quality, primitive hiking and horseback riding opportunities, and other compatible non-motorized trail activities, in a highly scenic setting along the Continental Divide. The significant scenic, natural, historic, and cultural resources along the trail's corridor are conserved.
2. Viewsheds from the Continental Divide National Scenic Trail have high scenic values. The foreground of the trail (up to 0.5 mile on either side) is natural-appearing and generally unaltered by human activities. Where there are opportunities, the trail provides visitors with expansive views of the natural landscapes along the Continental Divide. The potential to view wildlife is high, and evidence exists of ecological processes such as fire, insects, and diseases.
3. The corridor's setting is consistent with or complements a primitive or semi-primitive non-motorized setting. The trail may intermittently pass through more developed settings to provide for a continuous route.
4. Multiple access points along the trail provide opportunities to select the type of terrain, scenery, and trail length, ranging from long-distance to day use.
5. Wild and remote backcountry segments provide opportunities for solitude, immersion in natural landscapes, and primitive outdoor recreation.
6. Easily accessible trail segments complement local community interests and needs and help contribute to their sense of place.
7. Use conflicts among trail users are rare and easily resolved.
8. The trail is well-maintained, signed, and passable. Alternate routes are made available in the case of temporary closures resulting from natural events, such as fire or flood, or land management activities.
9. Visitors are aware of the Continental Divide National Scenic Trail and the nature and purpose of the trail designation.

Objective

1. Restore or relocate at least 5 miles of the Continental Divide National Scenic Trail within 5 years of plan approval, and every 5-year period thereafter until desired conditions are achieved.

Standards

1. No surface occupancy for geothermal energy leasing activities will be authorized within the corridor.

2. No salable mineral extraction will be authorized within the corridor.
3. Motorized uses will not be authorized on newly constructed segments.
4. Motorized events will not be authorized on the trail.

Guidelines

1. To retain or promote the character for which the trail was designated, new or relocated trail segments should be located primarily within settings consistent with or complementing primitive or semi-primitive non-motorized recreation opportunity spectrum classes. Road and motorized trail crossings and other signs of modern development should be avoided to the extent possible.
2. To protect or enhance the scenic qualities of the Continental Divide National Scenic Trail, management activities should be consistent with scenic integrity objectives of high or very high within the visible foreground of the trail. This is generally 0.5 mile on either side of the trail unless topographic features like cliffs block and reduce the visible distance from the trail.
3. If vegetation management activities result in short-term impacts to the scenic integrity of the trail, mitigation measures should be included, such as screening, feathering, and other scenery management techniques to minimize visual impacts within and adjacent to the trail corridor (within visible foreground of the Continental Divide National Scenic Trail at a minimum).
4. To promote high-quality scenic and primitive hiking and horseback riding opportunities, the minimum trail facilities necessary to safely accommodate the amount and types of use anticipated on any given segment should be provided.
5. To protect scenic values, special-use permits for new communication sites, utility corridors, and renewable energy sites should not be authorized within foreground (up to 0.5 mile) and sites should not be visually dominant in the middle-ground viewshed (up to 4 miles).
6. To maintain the integrity of the trail and the values for which it was designated, new linear utilities associated with special-use authorizations should be avoided. Where unavoidable, these should be limited to a single crossing of the trail per user authorization unless additional crossings are documented as the only prudent and feasible alternative.
7. To promote a natural-appearing setting, any new temporary or permanent roads or motorized trails should only be considered if new routes are (a) required by law to provide access to private lands, (b) necessary for emergency protection of life and property, or (c) determined to be the only prudent and feasible option. In such circumstances, the project should be designed in such a manner that minimizes impacts to the scenic, natural, and experiential values of the trail.
8. To provide a high-quality, non-motorized trail in a natural-appearing setting, use of the Continental Divide National Scenic Trail for landings or as a temporary road for any purpose should only be authorized where the trail is currently located on an open road; to address hazard tree removal; or when no other haul route or skid trail options are available. In these circumstances, the project should include design criteria to minimize impacts.
9. To promote natural-appearing settings, unplanned fires in the foreground (up to 0.5 mile) of the Continental Divide National Scenic Trail should be managed using minimum impact suppression tactics or other tactics appropriate for the protection of national scenic trail values. Prescribed fires in the foreground of the Continental Divide National Scenic Trail should be managed to incorporate national scenic trail values. Construction of fire lines with heavy equipment should not be authorized within the visible foreground unless necessary for emergency protection of life and property.

Management Approaches

Plans, Projects, and Relationships

In addition to the Comprehensive Plan, the forest plan, and the trails strategy within a collaborative sustainable recreation strategy action plan, a forest-level master plan to guide management and development associated with the trail is required by policy direction. That master plan is supposed to be completed within 5 years of revised forest plan approval. Forest leadership and staff look forward to furthering working relationships with partners and volunteers in the planning, development, maintenance, and monitoring of the trail and its uses.

One of the considerations in future planning and monitoring is the establishment of appropriate carrying capacities for specific trail segments. Forest leadership and staff recognize that the Continental Divide Trail Coalition, citizen scientists, and recreation ecologists could be key monitoring partners, helping us gather the information necessary to determine where adaptive management is necessary to maintain a trajectory toward desired conditions.

Adjacent jurisdictions like the Bureau of Land Management and private landowners are also important partners in management of the trail. We seek opportunities to engage them in cooperation and collaboration. Forest leadership and staff continue to identify and pursue opportunities to acquire the necessary rights-of-way to address management issues, especially the gap between the Burro Mountains and the rest of the forest.

With the aid of our invaluable partners, forest leadership and staff strive to provide consistent signage along the trail corridor at road and trail crossings to adequately identify the trail. Interpretive signs at key trail entry points and appropriate cultural and historic sites also orient visitors and enhance the experiences. We evaluate proposed trail relocations or new trail segment locations using Continental Divide National Scenic Trail optimal location criteria and consider minor realignments of the trail or identify minor route diversions to provide user access to reliable water sources. We recognize that there may be opportunities to coordinate with grazing permittees and our wildlife program staff to develop water sources within or near the trail corridor that might serve multiple uses.

Forest leadership and staff are very aware of the importance of informing fire management teams about the Continental Divide National Scenic Trail resource and making sure it is a priority and given appropriate consideration during suppression, rehabilitation activities, and emergency response actions. Further, the most recent versions of The Continental Divide National Scenic Trail Vegetation Treatments Best Practices and Management Tool: Managing Recreational Uses can help inform management of the Trail.

Reference

USDA Forest Service. 2009. *The 2009 Continental Divide National Scenic Trail Comprehensive Plan*. Washington, DC.

National Recreation Trails

Background Information

Like the Continental Divide National Scenic Trail, national recreation trails are authorized under the National Trails System Act of 1968. The Gila National Forest manages three national recreation trails, all of which are non-motorized. These trails are the Catwalk National Recreation Trail,

Sawmill Wagon Road National Recreation Trail, and Woodhaul Wagon Road National Recreation Trail.

Desired Conditions

1. National recreation trails provide a variety of opportunities for recreation as well as a diversity of experiences with different levels of solitude, remoteness, and development.
2. Designated national recreation trails are well-maintained, signed, and passable. Alternate routes are made available in the case of temporary closures resulting from natural events (for example, fire or flood) or land management activities.
3. Conflicts among trail users are infrequent and visitors can experience the scenic qualities of the area.
4. Scenic integrity and broad views of the surrounding landscapes are retained within areas that contain national recreation trails.
5. The integrity of cultural and natural resources, scenery, and recreational experiences is maintained along designated national recreation trails.
6. National recreation trails may be more accessible and highly developed near towns and developed recreation facilities. Connector trails provide convenient access to amenities.
7. Signs, while unobtrusive, are present to help travelers find nearby developed sites, trailheads, recreation facilities, drinking water sources, and other points of interest.
8. The historic routes, features, and associated values along national recreation trails are preserved.

Guidelines

1. National recreation trails should not be used use as fire line unless there are no other reasonable and prudent options, and it is necessary for emergency protection of life and property.
2. Recreational facilities on or adjacent to national trails should be designed to interpret and highlight associated points of interest.
3. Management activities within foreground views (up to 0.5 mile) from the trail should meet a scenic integrity objective of at least high.
4. Management activities in the middle ground (up to 4 miles) and background (from middle ground to horizon) should meet or exceed a scenic integrity objective of at least moderate.
5. Special-use permits that affect national recreation trails should include requirements intended to protect scenery management objectives associated with the values for which the trail was designated.
6. Management activities should maintain safe public access to national recreation trails.
7. Management of national recreation trails should be consistent with management direction in the trail establishment reports as well as the maintenance standards for trail class and use.

Management Approaches

Relationships

Please refer to the Collaborative Sustainable Recreation Strategy and Relationships management approach in the Sustainable Recreation section of chapter 2. Forest leadership and staff look for

opportunities to work with volunteer groups, partners, local governments, and adjacent landowners to maintain trail corridors and the condition and character of the surrounding landscape, promote Leave No Trace® principles, and reduce user conflict.

National Scenic Byways

Background Information

A national scenic byway is a road designated by the United States Department of Transportation for possessing one or more of six "intrinsic qualities": archeological, cultural, historic, natural, recreational, and scenic. Congress established this program in 1991 to preserve and protect the nation's scenic, but often less-traveled roads, and promote tourism and economic development.

Two scenic byways travel through the forest—the Trail of the Mountain Spirits traces a loop in the southern half of the forest, while the Geronimo Trail creates a longer tour encompassing portions of the eastern edge of the forest along with large tracts of land outside the forest boundary. The primary uses along the scenic byway routes are driving for pleasure, cycling, sightseeing, birdwatching, and accessing developed recreation sites. The New Mexico Department of Transportation manages most of the designated road miles.

Desired Conditions

1. The intrinsic qualities identified for each national scenic byway remain intact, and viewsheds along national scenic byways provide natural-appearing landscapes and enhance recreation tourism that supports local communities.
2. National scenic byways provide roaded, natural recreation opportunities.
3. Viewsheds from scenic byways are consistent with desired conditions for scenery. The immediate foreground (300 feet on either side) of these travelways is natural-appearing, and generally appears unaltered by human activities.
4. Structures on or along scenic byways harmonize with the surrounding features to the extent possible without compromising safety standards for the type of travel route.

Guidelines

1. Visual impacts from vegetation treatments, recreation uses, range developments, and other structures should be mitigated to blend with the overall scenic character along scenic byways.
2. To maintain and protect the scenic quality of scenic byways, management activities planned and implemented within the foreground (up to 0.5 mile on either side) should be consistent with the scenic integrity objective of "high."
3. Features along scenic byways such as signs, guardrails, and landscaping should be designed to maintain the desired scenic character along the route.

Management Approaches

Outreach, Education and Relationships

Forest leadership and staff seek opportunities to work closely with the Federal Highway Administration, New Mexico Department of Transportation, local communities, scenic byway advisory committees, and other interested groups to promote and improve services and interpretive opportunities along scenic byways. Signs, kiosks, exhibits, brochures, websites, social media and

other tools and techniques can be used to provide information along scenic byways, in adjacent recreation sites, and at visitor contact points such as ranger stations. The national scenic byway corridor management plan contains important guidance and direction for the conservation and enhancement of the byway's intrinsic qualities, the promotion of roadside interpretive services and other amenities along scenic byways that can inform messaging and management. Forest leadership and staff recognize the need and continue to work closely with the New Mexico Department of Transportation and county highway departments to manage hazard trees and scenic integrity. We look for opportunities to assist with efforts to promote regional tourism and economic development related to national scenic byways.

Utilities Management Area

Background Information

The utilities management area includes linear corridors under special-use authorizations that provide for those private uses of forest lands necessary to serve a local, regional, or national public benefit such as reliable electric, natural gas, water, and communication networks. Generation of power from solar and wind energy may also be included in the future. See appendix B for a map that illustrates known utility lines.

Desired Conditions

1. Utility corridors accommodate existing utility facilities and related access for maintenance and repair and accommodate co-location of new utilities.
2. Utility corridors retain low-growing vegetation, which conforms to the evolving safe operating requirements of the utility and can deviate from the desired range for the individual ecological response unit desired conditions given in chapter 2. Taller-growing vegetation that could interfere with utility clearances does not exist, to reduce fire and electrical hazard.
3. Utility corridors have minimal impacts on heritage resources and ecological sustainability, including biodiversity and habitat connectivity.

Standard

1. A special-use permit or easement is required for uses and corridor width within the utilities management area.

Guidelines

1. Each utility corridor should be developed and used to its greatest potential to reduce the need to develop additional corridors. Where possible, existing corridors should expand as needed, rather than creating additional corridors.
2. Special-use permits should include provisions for proper erosion controls for repair and maintenance activities to minimize soil loss.
3. Special-use permits should include provisions for the treatment of any non-native, invasive plant species within these corridors.
4. Special-use permits should include specifications to reduce bird collisions and electrocution such as those recommended by the Avian Power Line Interaction Committee

Management Approach

Minimizing the Footprint

Existing linear special-use authorizations for transmission lines and pipelines for water and natural gas occur within this management area. Whenever possible, forest leadership and staff are likely to encourage compatible uses be co-located to reduce the overall footprint and ecological impact of utility special uses, consistent with applicable plan direction provided in the Lands and Realty section of chapter 2. The linear areas within the management area can be up to approximately 1,000 feet wide, although local distribution lines may be included in this management area at a lesser corridor width.

Wildland-Urban Interface

Background Information

The wildland-urban interface is the area or zone where structures and other human development meet and intermingle with undeveloped wildland or vegetative fuels. Generally, this interface is a buffer around communities, private lands, or other infrastructure, though the buffer size may vary based on topography, fuels, and values at risk. Although wildland-urban interface areas are physically delineated places (see figure 14), it may be helpful to think of the wildland-urban interface not as a place, but rather as a set of conditions that can exist in and around nearly every community and surrounding many other types of infrastructure. These conditions are defined by the amount, type, and distribution of vegetation; the flammability of the structures (homes, businesses, outbuildings, decks, fences) in the area, and their proximity to fire-prone vegetation and other combustible structures; weather patterns and general climate conditions; topography, hydrology, road construction; and more.

The wildland-urban interface is always changing, and mapping is not perfect. Management area direction for the urban interface still applies to areas not shown on the map in appendix B.

Desired Conditions

1. Wildland fires in the wildland-urban interface result in reduced risk of fire moving across ownerships and no loss of life and property. The near absence of ladder fuels results in low-intensity surface fires and provides the opportunity for firefighters to suppress wildfires safely and efficiently.
2. In forest and woodland vegetation types, the area occupied by grass-forb-shrub interspaces is on the upper end of, or above the range given in the relevant desired conditions for the vegetation type. Trees within groups are more widely spaced with less interlocking of crowns than desirable outside of wildland-urban interface. Tree basal area is on the lower end or below the desired range (see Chapter 2. Forestwide Plan Content).
3. In shrubland vegetation types, the live and dead fuel loading is on the lower end or below the desired range (see Chapter 2. Forestwide Plan Content).
4. Snags and coarse woody debris may be present, but at the lower end or below the range given in the relevant vegetation type's desired conditions.
5. Access, including easements, provides the ability to implement fuel treatments, including removal of material.

Objective

1. Treat at least 16,480 acres up to the total number of urban interface acres per decade using any combination of mechanical and prescribed fire methods.[63]

Standard

1. Reducing risk to life and property must be the primary consideration for vegetation management decisions in the urban interface management areas.

Management Approach

Community Wildfire Protection Plans and Relationships

Forest leadership and staff continue to work with partners and stakeholders involved in the community wildfire protection plans to meet the broad intent and goals of those plans. We prioritize hazardous fuels treatments in the wildland-urban interface and strive to monitor and evaluate at least 10 percent of the wildland-urban interface annually. We hope that partners can help us accomplish more. Fuel reduction projects in the wildland-urban interface are designed in collaboration with communities and affected property owners. Environmental justice, especially climate justice is something we strive for and build consideration of those issues into the development of the hazardous fuels program of work (see also Air Quality, Wildland Fire and Fuels Management and Community and Tribal Relationships sections in chapter 2 for more on related environmental justice issues).

[63] Some acres may need more than one entry per decade. Acres may be counted toward this objective as many times as they are treated during the 10-year period.

Chapter 4. Suitability and Estimated Vegetation Management Practices

This chapter describes the suitability of lands for timber production in the Gila National Forest, estimated vegetation management practices expected to occur over the next two decades, and the corresponding projected timber sale program.

Timber Suitability

National Forest System lands were reserved with the intent of providing goods and services to satisfy public needs over the long term, which includes a sustainable supply of forest products. The National Forest Management Act of 1976 requires the agency to determine the suitability of national forest system lands for timber production. The act has specific requirements for timber production suitability analyses in land management plans. These requirements are supported by the 2012 Planning Rule and associated Forest Service directives, which bring additional analysis requirements and considerations. Under the 2012 Planning Rule and directives, land management plans now focus on desired conditions (outcomes) rather than the production of goods and services (outputs) to better provide for multiple use on a sustained-yield basis, in perpetuity.

Timber harvest may be considered a resource use (timber production) or a tool (an activity to improve or restore healthy forest conditions). As a resource use, the timber production objective is defined as growing, tending, harvesting, and regenerating crops of trees on a regulated basis to produce logs or other products for industrial or consumer use. Under the timber production objective, regular, periodic timber harvest is predictable and supports the achievement and maintenance of non-timber-related desired conditions; it does not require or imply that timber yields be maximized.

Lands may be identified as suited for timber production based on the following criteria:

1. Congress, the Secretary, or the Chief of the Forest Service has not withdrawn it from timber production.
2. The technology to harvest timber without causing irreversible damage is available.
3. There is reasonable assurance that lands can be adequately restocked within 5 years after final regeneration harvest.
4. The land is a forest (timber) vegetation type.
5. Timber production is compatible with desired conditions or objectives for the land.

Table 13 displays the results of the timber suitability analysis for the Gila National Forest. The analysis process is described in more detail in the Timber, Forest, and botanical products section of the environmental impact statement and an accompanying appendix.

Table 13. Timber production suitability classifications for the Gila National Forest

Land Classification Category	Acres
A. Total area within the administrative boundary of the Gila National Forest	3,392,112*
Area within the administrative boundary that is not National Forest System land (private property or other ownership)	119,972
B. Lands not suited for timber production due to legal or technical reasons	2,589,050
B1. Lands not suited for timber production because it is prohibited	822,995
B2. Lands not suited for timber production because the technology to harvest timber without causing irreversible damage is not available	0
B3. Lands not suited for timber production because there is no reasonable assurance of adequate restocking within 5 years of final regeneration harvest	338,694
B4. Lands not suited for timber production because they are not forested	1,427,361
C. Lands that may be suited for timber production (A–B)	683,090
D. Total lands suited for timber production because timber production is compatible with the desired conditions and objectives established by the plan	353,079
E. Lands not suited for timber production because timber production is not compatible with the desired conditions and objectives established by the plan (C – D)	330,011
F. Total lands not suited for timber production (B+E)	2,919,218

*Acreages of National Forest System lands may vary slightly over time due to factors such as resurvey, improved mapping technology, and updates to corporate geospatial information systems data.

Figure 6 displays this information spatially.

Logs in Cutting Area 11 of the John Freany timber sale. USDA Forest Service photo by unknown photographer, 1927. FS # 49219

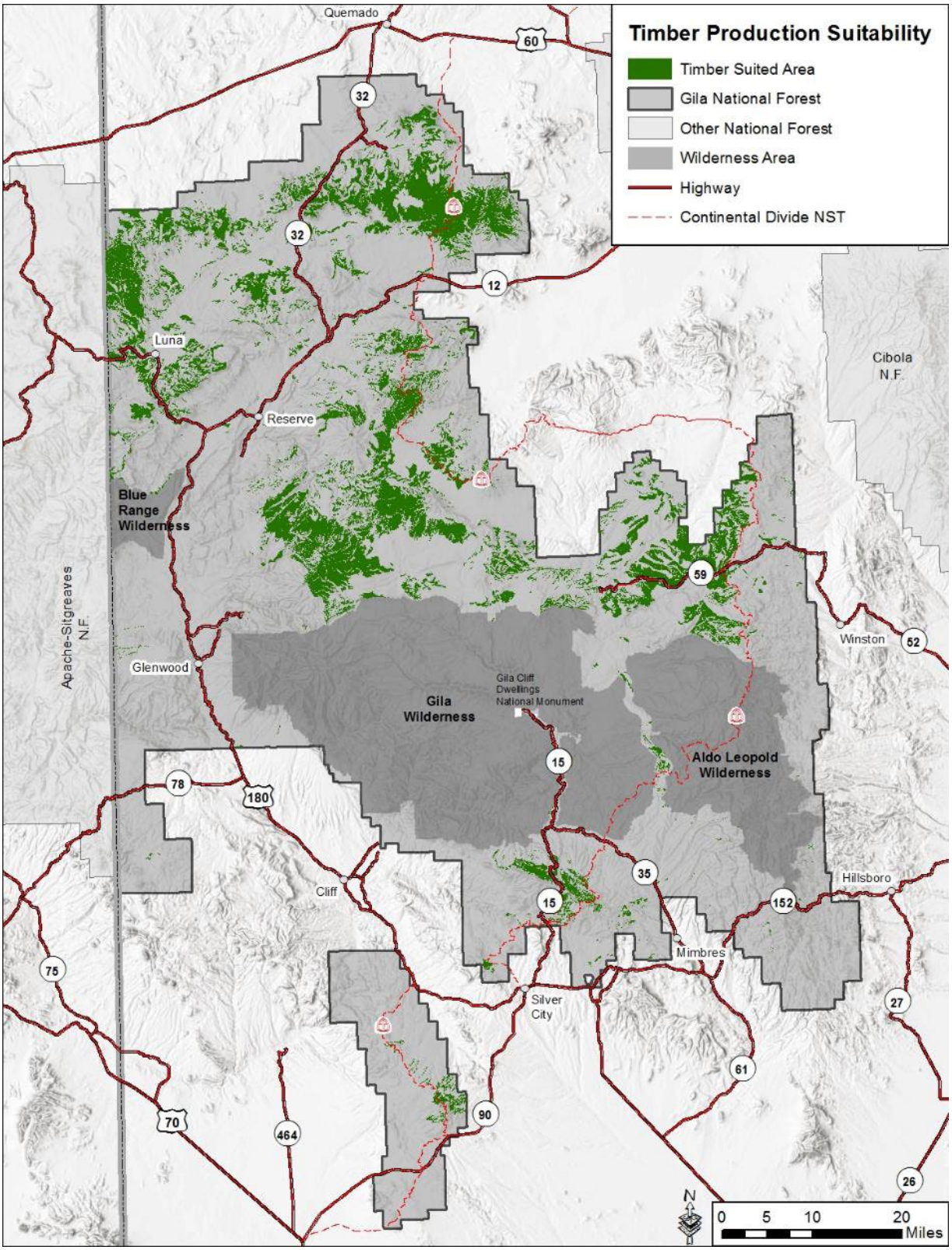


Figure 6. Map of the suitable timber base

Estimated Vegetation Management Practices

The estimated vegetation management practices displayed in table 14 were derived from the analysis supporting the final environmental impact statement. The analysis process is described in more detail in the timber, forest, and botanical products section of the final environmental impact statement and appendix C of the same document. Acres are estimates based solely on what could be accomplished by the forest using only reasonably foreseeable congressionally allocated dollars and recent costs per acre. Please see the discussion about objective development in the introduction section of chapter 2 of the plan as it relates to reasonably foreseeable budgets. If budgeted dollars change substantially from that time, or the agency priorities shift to other program areas, these acre values could change. If partnerships and associated funding make additional treatment possible, acre values will change. Changes are also likely depending on project locations, site-specific conditions, and correspondingly appropriate silvicultural prescriptions. These practices are not a "proposal" as defined by the Council on Environmental Quality regulations for implementing the National Environmental Policy Act, nor are they a commitment to do work.

Table 14. Summary of estimated forestwide vegetation management practices for the Gila National Forest, annual average acres per decade

Forest Cover Types/ Vegetation Management Practices	1st Decade	2nd Decade
Ponderosa pine treatments		
Regeneration* (even-aged harvest)	579	327
Thinning (even-aged intermediate harvest)	1,676	1,726
Selection (uneven-aged harvest)	6,702	6,905
Wet mixed conifer/spruce-fir treatments		
Regeneration* (even-aged harvest)	24	66
Thinning (even-aged intermediate harvest)	66	57
Selection (uneven-aged harvest)	263	230
Dry mixed conifer treatments		
Regeneration* (even-aged harvest)	529	593
Thinning (even-aged intermediate harvest)	1,325	1,312
Selection (uneven-aged harvest)	5,298	5,247
Total treatments		
Regeneration* (even-aged harvest)	1,133	986
Thinning (even-aged Intermediate harvest)	3,067	3,095
Selection (uneven-aged harvest)	12,263	12,382

*Regeneration harvest is any removal of trees intended to assist in establishing a new age class or making regeneration of a new age class possible. Regeneration may be through even-aged or uneven-aged methods.

Projected Harvest Levels

The sustained yield limit displayed in table 15 is an estimate of the amount of timber that could be sustainably harvested from lands suited for timber production in perpetuity. It represents the maximum volume of timber that could be sold, except under certain circumstances defined by

National Forest Management Act (16 U.S.C. 1600, 36 CFR 219.11(d)(6)). The projected timber sale quantity and projected wood sale quantity also displayed in table 15 were calculated based on plan objectives, which are based on what could be accomplished by the forest using congressionally designated dollars only and recent costs per acre. The analysis process is described in more detail in the timber, forest, and botanical products section of the final environmental impact statement and appendix C of the same document.

If budgeted dollars change substantially from the 2007 to 2017 time period, or agency priorities shift to other programs, these volumes could change. If partnerships and associated funding make additional treatment possible, volumes will change. Changes are also likely depending on project locations, site-specific conditions, and correspondingly appropriate silvicultural prescriptions. These harvest levels are not a "proposal" as defined by the Council on Environmental Quality regulations for implementing the National Environmental Policy Act, nor are they a commitment to do work.

Volumes projected here do not include wood products removed by personal use permit (see table 16). Between 2005 and 2017, permitted personal use volumes of post, poles and stays, dead and down fuelwood, and green fuelwood averaged 14.4 million cubic feet per decade. This volume is projected to remain relatively stable but may vary in the future based on the permits purchased by the public. Supply of these products is projected to exceed demand under any reasonably foreseeable scenario.

Table 15. Sustained yield limit for the Gila National Forest of 583 million board feet (MMBF), 130 million cubic feet (MMCF) per decade on lands suitable and not suitable for timber production

Timber Products (Volumes other than salvage or sanitation that meet timber product utilization standards)	First decade MMCF	First decade MMBF	First decade Tons	Second decade MMCF	Second decade MMBF	Second decade Tons
A1. Sawtimber (industrial softwoods, over 9 inches)	8	35	115,153	5	24	78,972
A2. Other Products (industrial softwood, 5 to 9 inches - roundwood, commonly pulpwood, mostly in the form of fuelwood)	3	na*	22,497	1	na	15,093
Lands not suitable for timber production						
B1. Sawtimber (over 9 inches)	0.4	2	6,061	0.3	1	4,156
B2. Other Products (5 to 9 inches)	0.1	na	1,184	0.1	na	794
C. Projected Timber sale quantity (A1+A2+B1+B2)	11	37	144,894	7	25	99,016

* na = not applicable

Table 16. Other estimated wood products yield (fuelwood, biomass, and other volumes that do not meet timber product utilization standards) in million cubic feet (MMCF) and million board feet (MMBF)

Other estimated wood products	First decade MMCF	First decade MMBF	First decade Tons	Second decade MMCF	Second decade MMBF	Second decade Tons
D1. Non-industrial softwood fuelwood (over 5 inches)	1	na*	0.3	1	na	0.2
D2. Hardwood fuelwood (over 5 inches)	0.4	na	0.2	0.2	na	0.1
D3. Aspen (over 5 inches)	1	na	0.1	0.3	na	0.1
E. Projected wood sale quantity (C+D1+D2+D3)	13	na	144,895	8	na	99,016

* na = not applicable

Photos from top to bottom, left to right: Autumn stream corridor (USDA Forest Service photo); photos by Andrew Tree—Northern bog violet, Metcalfe's penstemon, Wheeler's thistle; Mexican spotted owlets (USDA Forest Service photo); Northern goshawk by Jim Rogers

Chapter 5. Monitoring Program

Introduction

Plan-level monitoring comprises two parts: (1) the national forest monitoring program; and (2) the Regional Forester's Broad-Scale Monitoring Strategy. The Regional Forester's Broad-Scale Monitoring Strategy will evaluate all the national forest plans in Arizona and New Mexico. This chapter describes the Gila National Forest plan-level monitoring program, which only evaluates this forest plan, but may contribute to the Regional Forester's Broad-Scale Monitoring Strategy. Subsections include:

Program Purpose—explains the intent of plan-level monitoring.

Requirements—identifies monitoring program content requirements under the 2012 Planning Rule.

Types of Monitoring—describes general types of monitoring.

Leader's Intent—provides leadership's intent for program development.

Coordination, Collaboration and Capacity Building—provides vision and intent for multiparty monitoring and citizen science.

Prioritization—identifies monitoring priorities and explains the prioritization process.

Reporting—outlines reporting process and timeframes, data management and access.

Monitoring Program—identifies plan components to be monitored and links those components to monitoring questions and indicators.

Program Purpose

This monitoring program serves two primary purposes: accountability and adaptive management. The desired conditions, objectives, standards, and guidelines contained in the plan are commitments forest management makes with stakeholders. The monitoring program provides one mechanism by which management can demonstrate accountability to those commitments, as they are the drivers of plan-level monitoring.

Adaptive management allows management to adjust to changing conditions and incorporate new science and technology. It is a learning process enabled by monitoring. Without it, the adaptive management process breaks down. This monitoring program must provide enough information for the Forest Supervisor to determine whether change is needed. The sooner a need for change is identified, the more often a wider suite of management options is available. The longer it takes to identify a need for change, the fewer options may be available.

In keeping with adaptive management principles, the 2012 Planning Rule establishes plan-level monitoring programs as "other plan content," rather than "plan components." This means that changes to this monitoring program do not require a plan amendment but can be done with an administrative change. This allows for a more streamlined National Environmental Policy Act process.

Requirements

The 2012 Planning Rule requires, at a minimum, at least one monitoring question and associated indicator to address the status of:

1. Select watershed conditions;
2. Select ecological conditions;
3. Focal species to assess ecological conditions;
4. Select ecological conditions that contribute to the recovery of at-risk species;
5. Visitor use, visitor satisfaction, and progress toward meeting recreation objectives;
6. Measurable changes related to climate and other stressors;
7. Progress toward desired conditions and objectives, including for providing multiple-use opportunities; and
8. Effects of management systems so that they do not substantially and permanently impair the productivity of the land.

An additional requirement was incorporated in the final agency directives in response to comments received from the federal advisory committee that was convened to help develop planning guidance. The Federal Advisory Committee Act is the law governing these committees. It was passed to help ensure fair and open government. Specifically, that the public knows about and has an opportunity to participate in meetings between federal agencies. are groups the agency has established, manages or controls for the purpose of obtaining that group's advice and recommendations regarding the agency's operations or activities. Federal advisory committees are given certain duties and rights in a written document. Their meetings must be announced in advance and open to the public and their work products must be available to the public. The additional monitoring requirement is related to the planning rule requirement number 7 above but adds specificity.

9. Plan contributions to communities, social and economic sustainability of communities, multiple-use management in the plan area, or progress toward meeting the desired conditions and objectives related to social and economic sustainability (Forest Service Handbook 1909.12 Chapter 30 Section 32.13(f)).

Monitoring questions are based on one or more plan components, but not every plan component is required to have a corresponding monitoring question. Indicators are variables that can be measured or described periodically to assess trends in conditions relevant to a monitoring question.

Types of Monitoring

This monitoring program recognizes three distinct, interrelated types of monitoring as described by Derr and others (2005) and Egan (2013): (1) implementation; (2) effectiveness; and (3) validation monitoring.

Implementation

This type of monitoring addresses accountability by answering the question **"Did we do what we said we would do?"** It tracks project and activity compliance with standards and guidelines, as well as progress toward and achievement of objectives.

Effectiveness

Effectiveness monitoring provides the information that fuels the adaptive management process. It seeks to answer questions like: **"Did our actions have the outcomes we intended or expected?" "Are we moving toward desired conditions?"** Effectiveness monitoring information and data can also be used for compliance and validation monitoring.

Validation

Validation monitoring tests our understanding and application of the science the plan is based on. It seeks to answer questions like: **"Why did our actions have the outcomes they did?" "Did our assumptions prove valid?"** This type of monitoring helps us determine whether our basic thinking about relationships between desired conditions and management is sound. Often the forest relies on research institution partners for this type of monitoring.

Leaders Intent

The Forest Supervisor has provided the following principles to guide the development and implementation of this monitoring program.

Relevancy—there must be a compelling reason to ask each monitoring question. The answer must speak directly to whether there is a need to change the plan and help discern the difference between an issue with plan direction and an issue with plan implementation. This is important because there is not the capacity to chase questions and answers that will not substantially inform decision making.

Capacity—given the reality that the Forest Service is continually being asked to do more with less, faster, the monitoring program should not create additional, unnecessary burdens on the workforce; nor should it create public expectations, or the appearance of commitments to do work that the forest staff cannot keep.

Efficiency—if monitoring data collected for other reasons or purposes can be used to answer plan-level monitoring questions, or if plan-level monitoring data can inform monitoring required for other reasons or purposes, it should. The monitoring program capitalizes on opportunities to avoid duplication of efforts. However, plan-level monitoring questions should not be engineered around existing data sources. First and foremost, the question needs to be relevant.

Coordination, Collaboration, and Capacity Building

Working together across professional disciplines, walks of life, differences in perspectives, and jurisdictional boundaries can create efficiencies, promote shared learning, leverage expertise, build trust, and increase capacity. Collaboration and coordination in the development and implementation of this monitoring program is a prerequisite for success.

Reporting

There is a reporting requirement associated with plan-level monitoring programs that facilitates adaptive management, accountability, and transparency. Handbook direction requires the national forest to prepare a formal monitoring report using the data collected as part of this monitoring program every 2 years following the record of decision. However, not every monitoring item need be in every biennial report. The entire report may be postponed for 1 year if there are urgent,

extenuating circumstances that require a delay. The report must indicate whether a change to the plan, management activities, or the monitoring program is warranted, or if a new assessment is warranted, based on new information. This report will be available to the public.

Monitoring and Evaluation Program

This section identifies the plan components to be monitored, associated monitoring questions and indicators, monitoring type, priority ranking, reporting frequency, and what 2012 Planning Rule requirements each question addresses. All the monitoring questions identified in this chapter are important, which is why they are included. However, to address the "capacity" guiding principle, a small subset of questions is identified as the "minimum required monitoring" with the remaining questions being addressed when and if time, funding, priority of work, and stakeholder support allow.

The questions and indicators established to meet the minimum requirements of the 2012 Planning Rule, including a brief rationale describing why these questions and indicators were selected are discussed in the next subsection followed by capacity-dependent monitoring. Data sources, analysis methodologies, and other information can be found in the Monitoring and Evaluation Program Implementation Guide. The implementation guide is a stand-alone document that is not part of the revised forest plan so that it can be updated easily as science and technology change. It will be developed after plan approval.

Some abbreviations are necessary in this discussion. For desired conditions where scale is applicable, the first letter of the scale name followed by the letter S is used. For example, the watershed-scale would be abbreviated as "WS," and the fine-scale would be "FS." This is followed by a similar abbreviation of component type, followed by corresponding number. For example, LS-DC1a refers to the landscape-scale desired condition number 1a. Planning rule requirements are identified by using the numbering system presented in the requirements section of this document.

Minimum Required Monitoring

Question 1: Are our management activities sufficient to maintain or generate progress toward desired conditions for physical and biological watershed processes?

Indicator(s): Watershed Condition Classification overall score and individual condition indicator scores. This includes condition indicators for water quality, water quantity, aquatic habitat (including fragmentation, large woody debris, channel shape and function attributes), aquatic biota (including life form presence, native species and exotic or aquatic invasive species attributes), riparian/wetland vegetation condition, roads and trails (including open road density, maintenance, proximity to water and mass wasting attributes), soil condition (including productivity, erosion and contamination attributes), fire regime or wildfire effects, forest cover, rangeland vegetation condition, terrestrial invasive species and forest health.

Plan Components: Watersheds DC1a-g, S2 and G1; Riparian and Aquatic Ecosystems 6th Level WS-DCs, S1 and G5; Wildlife, Fish, and Plants DCs 1-3, 5, 6 and 11, G6; Soils DC1a-e; Water Quality DC1; Roads DCs4 and 5, O1, Gs1-6; Non-Native Invasive Species DC1, Os1, 3 and 4; Wildfire and Fuels Management DC5-8, Livestock Grazing DC3

Planning Rule Requirements: 1, 2, and 4

Reporting Frequency: 2 to 6 years depending on data availability relative to reporting cycles

Rationale: Question 1 and associated indicators were selected because the watershed condition classification represents an efficient way to evaluate management's success in providing the watershed and ecological conditions necessary to support ecosystem service delivery and biodiversity, including the riparian and aquatic habitat essential for many of the Gila National Forest's at-risk species. It uses available data, field experience, and professional judgement and is already periodically revisited as part of other forest management business. It has the advantage of using all available information and allows the field experience and professional judgement of specialists to substitute for quantitative data where it is lacking, thus eliminating the requirement for additional data collection and processing. Recent developments in satellite data processing and interpretation are likely to provide supporting information for field observations and professional judgement that was not available prior to 2020.

Question 2: Are riparian and aquatic ecosystems moving toward desired conditions?

Indicator(s): Condition rating and trend for select riparian management zones

Plan Components: Riparian and Aquatic Ecosystems FS-DCs1a-f and 2, S1, G5; Wildlife, Fish, and Plants DCs1-3, 11 and 12

Planning Rule Requirements: 1, 2, and 4

Reporting Frequency: 2 years

Rationale: Question 2 and its associated indicator were selected to supplement monitoring requirements for watershed and ecological conditions, including those that support the recovery of at-risk species. Fine-scale, qualitative assessments such as those using the proper functioning condition protocol are already a routine part of field work conducted to support project-level proposal development and design criteria.

Question 3: Are our management activities sufficient to maintain or generate progress toward defining structural components for each upland ecological response unit?

Indicator(s): Trend in seral state proportion, coarse woody debris density, snag density, and area expected to be dominated by old trees for each ecological response unit

Plan Components: All Upland Ecological Response Units LS-DC1-3, 6-8 and G1; Spruce-Fir Forest LS-DCs3 and 4b; Mixed Conifer with Aspen LS-DCs 3, 4 and 5b; Mixed Conifer-Frequent Fire LS-DC3 and MS-DC5; Ponderosa Pine Forest LS-DC4 and MS-DC5, Ponderosa Pine-Evergreen Oak LS-DC4 and MS-DC5, Madrean-Pinyon Oak Woodland LS-DC2 and MS-DC5b, Pinyon Juniper Woodland LS-DC2 and 3c; Pinyon Juniper Grass and Juniper Grass Woodlands LS-DC2 and MS-DC1c; Soils DC1c; Wildland Fire and Fuels Management DC5 and G3; Timber, Forest, and Botanical Products DC1a-c and G3; Wildlife Fish, and Plants DCs1-3, 5, 6, and 12

Planning Rule Requirements: 2 and 4

Reporting Frequency: 2 to 6 years depending on data availability

Rationale: Question 3 and its associated indicators were selected to meet the 2012 Planning Rule requirement for select ecological conditions for three reasons: (1) it inherently includes several important ecological conditions that support both at-risk species and common species; (2) it uses regionally supported monitoring indicators; and (3) it supports risk-based management. Most

financial advisors will tell their clients that diversity distributes risk. Using a similar analogy, seral state diversity can be viewed as ecological "insurance." The ecological characteristics seral state proportion includes for forests and woodlands are dominant life form, such as grass/forb, shrub or tree; tree canopy cover class; and tree size class. These indicators can be evaluated with regionally provided datasets and coefficients that are updated periodically and might also be supplemented by additional project-level data.

Question 4: Are our management activities sufficient to maintain or generate movement toward desired conditions for mixed conifer and ponderosa pine-Gambel oak vegetation communities?

Indicator(s): Occupancy status of select Mexican spotted owl protected activity centers. The Mexican spotted owl is a focal species.

Plan Components: DCs for Mixed Conifer with Aspen, Mixed Conifer-Frequent Fire and Ponderosa Pine Forest (Gambel oak subclass only)

Planning Rule Requirements: 3

Reporting Frequency: 2 years

Rationale: Questions 4 and 5 and their associated indicators were selected to meet the 2012 Planning Rule requirement for focal species. The rationale and supporting information for choosing Mexican spotted owl as a focal species is provided in appendix C.

Question 5: Are our management activities sufficient to maintain or generate movement toward desired conditions for ponderosa pine vegetation communities?

Indicator(s): Occupancy status of select northern goshawk post-fledging areas. Northern goshawk is a focal species.

Plan Components: DCs for Ponderosa Pine Forest and Ponderosa Pine-Evergreen Oak

Planning Rule Requirements: 3

Reporting Frequency: 2 years

Rationale: Question 5 and its indicator were selected to meet the 2012 Planning Rule requirement for focal species. The rationale and supporting information for choosing northern goshawk as a focal species is provided in appendix C.

Question 6: Is management for aquatic ecosystems sufficient to restore and maintain native fish assemblages?

Indicator(s): Native fish density in select stream reaches; native versus non-native ratio in select stream reaches; native fish species richness and assemblage composition in select stream reaches

Plan Components: Riparian and Aquatic Ecosystems 4th and 5th Level WS-DCs1 and 6, and 6th Level WS-DC8a and b; Wildlife, Fish, and Plants DCs1-4, 5-7, 9 and 10; Watersheds DC1b and d; Non-Native Invasive Species DC1

Planning Rule Requirements: 4

Reporting Frequency: 2 years

Rationale: Question 6 and its associated indicators were selected to meet the 2012 Planning Rule requirement for select ecological conditions that contribute to the recovery of at-risk species because this is already being accomplished as a matter of fisheries program delivery and partner research. There are existing permanent monitoring sites along several streams or rivers that are already tracking the indicators. This provides for efficiency because there is already a long period of record for trend analysis that will continue to provide valuable information to evaluate plan direction with little to no additional data collection or processing.

Question 7: Is management providing equitable, high-quality recreation opportunities reflective of the demand?

Indicator(s): Trends in visitor use and satisfaction as indicated by National Visitor Use Monitoring survey responses; recreation inequity index

Plan Components: Sustainable Recreation DCs1-4

Question 8: Is management sufficient to maintain or make progress toward desired conditions and objectives for recreation?

Indicator(s): Indicators include those listed for question 7; acres maintained or trending toward desired recreation opportunity spectrum settings; partner and volunteer accomplishments; progress toward plan objectives.

Plan Components: Sustainable Recreation DCs1-3, 4, and 5 and all objectives; Community and Tribal Relationships

Planning Rule Requirements: 5 and 9

Reporting Frequency: 1 to 5 years depending on survey method and data availability

Rationale: Questions 7 and 8 and their associated indicators were selected to meet the 2012 Planning Rule requirement for visitor use, visitor satisfaction, and progress toward meeting recreation objectives. Most of this work is already conducted as part of other Forest Service business and requires very little additional data collection or processing. There is an established, peer-reviewed process to calculate the recreation inequity index using census data and the National Visitor Use Monitoring data (Flores et al. 2018) that could be automated in a spreadsheet or similar tool.

Question 9: Are temperature and precipitation patterns supporting movement toward desired conditions for livestock grazing?

Indicator(s): Trends in herbaceous production season start, peak, and end; trends in annual herbaceous productivity

Plan Components: Livestock Grazing DCs1-3

Planning Rule Requirements: 6, 7, and 8

Reporting Frequency: 2 years

Rationale: Questions 9 through 11 and their associated indicators were selected to meet monitoring requirements for climate change and other stressors. Question 9 was selected because climate change is predicted to threaten the sustainability of livestock grazing in the Southwest. The data to support

the evaluation of indicators are satellite-derived data processed by other entities and publicly available in online formats. Data may also be requested from the Rocky Mountain Research Station Human Dimensions Program or their partners in additional formats. Evaluation of the data will need to include both indicators due to management factors that may decouple annual productivity from climate (Wood et al. 2021).

Question 10: How is streamflow changing over time?

Indicator(s): median monthly streamflow; median annual stream flow; low flow periods (base flow); flood frequency

Plan Components: Watersheds, DCs1b and d; Riparian and Aquatic Ecosystems 4th and 5th Level WS-DC2b; Water Uses DC1; Wildlife, Fish, and Plants DCs1-3, 5, and 6.

Planning Rule Requirements: 1, 2, 4, and 6

Reporting Frequency: 2 years

Rationale: Questions 9 through 11 and their associated indicators were selected to meet monitoring requirements for climate change and other stressors. Question 10 and the associated indicators were evaluated as key characteristics as part of the assessment phase of revision. The data is collected by other entities, is easily downloaded from the web, and the assessment spreadsheet tools can serve as the basis for automating analysis. It was chosen as part of the minimum required monitoring because ultimately, climate change is hydrologic change and water availability is directly related to management's ability to maintain or move toward ecological, biodiversity, multiple uses, and socioeconomic desired conditions.

Question 11: How is the probability and distribution of stand-replacement fire changing across the forest and over time? What are the dominant drivers of change?

Indicator(s): Forestwide probability distribution; probability distribution for tree-dominated ecological response units with historically frequent, low-severity fire regimes; probability distribution in wildland-urban interface areas; probability distribution within fire perimeters; probability distribution within mechanically thinning treatment units; probability distribution by 6th level watershed

Plan Components: All Upland Ecological Response Units LS-DC1; Mixed Conifer-Frequent Fire LS-DC6; Ponderosa Pine Forest LS-DC7; Ponderosa Pine-Evergreen Oak (perennial grasses subtype) LS-DC7; Pinyon Juniper Grass and Juniper Grass Woodlands LS-DC3; Wildland Fire and Fuels Management DCs1,3 and 5-8; Timber, Forest, and Botanical Products DCs1a and c; Watersheds WS-DC1c; Wildland-Urban Interface DC1

Planning Rule Requirements: 1, 2, 4, and 6

Reporting Frequency: 2 years

Rationale: Questions 9 through 11 and their associated indicators were selected to meet monitoring requirements for climate change and other stressors. Question 11 and its associated indicators were also selected to meet the 2012 Planning Rule requirements for climate change and other stressors because stand-replacement fire is an immediate threat to some ecosystems, many watersheds, and the wildland-urban interface. It also allows evaluation of whether mechanical treatments, prescribed fire,

or naturally ignited fire are sufficient to maintain or move toward desired conditions. Products are already available from the Rocky Mountain Research Station's Aldo Leopold Research Institute; annual or biennial updates are relatively inexpensive and can be produced by the research institute or the Fire Modeling Institute.

Question 12: What economic contributions are forest-based activities making to local communities and how are those contributions changing over time?

Indicator(s): Trend in annual volume of wood products sold annually; trend in annual number of animal unit months authorized; trend in volume of salable mineral materials; number of user days related to hunting, fishing, wildlife viewing and other specific recreational activities; trend in local agency expenditures; inflation adjusted gross receipts by source

Plan Components: Timber, Forest, and Botanical Products DCs2a-f and G2; Livestock Grazing DC1; Sustainable Recreation DC4; Wildlife, Fish, and Plants DCs9 and 10; Community and Tribal Relationships and Use DC2

Planning Rule Requirements: 7 and 9

Reporting Frequency: 2 to 6 years depending on indicator and data availability

Rationale: Question 12 and its associated indicators were selected to meet the 2012 Planning Rule requirements for progress toward desired conditions and objectives for socioeconomic contributions and multiple uses. Data are collected by other entities and are readily available. Some data processing and interpretation are involved, but many stakeholders, including county governments have expressed the importance of monitoring trends in economic contributions.

Question 13: How is the extent of bare soil changing over time? What are the contributing factors?

Indicator(s): Trends in percent bare soil; trends in soil redistribution class for select sites; modeled soil loss for select sites relative to soil loss thresholds

Plan Components: All Upland Ecological Response Units LS-DC5; Soils DCs1c.d, S1 and 3; Watersheds DCs1a-b and g and 2

Planning Rule Requirements: 6 and 8

Reporting Frequency: 2 to 6 years depending on data availability

Rationale: Question 13 and its associated indicators were selected to meet the 2012 Planning Rule requirements related to the effects of management systems so that they do not substantially and permanently impair the productivity of the land. The extent of bare soil is a powerful indicator of ecologic and hydrologic function, the sustainability of ecosystem service delivery, and the long-term productivity of the land. It is a regionally approved monitoring indicator. Percent bare soil can be derived from statistical analysis of satellite data processed by other entities. Data may be requested from the Rocky Mountain Research Station Human Dimensions Program, as it is one of the data elements in the technology supporting Question 9's indicators. Because these data are only available for areas with less than 25 percent tree cover, it may be beneficial to supplement it with field-collected data elements such as the soil redistribution class and modeled soil loss that are part of soil quality monitoring. Soil quality monitoring is a more comprehensive and holistic approach to assessing the productivity of the land, but it is time consuming and requires a substantial amount of

specialized expertise. The information gathered to assess the first part of this monitoring question, considered alongside management activity information, will help assess the second part of the monitoring question.

Question 14: Is plan direction implementable? What opportunities and challenges have been discovered during project development, design, and implementation?

Indicator(s): Brief narrative summary of annual "after-action" or "lessons-learned" reviews of select projects or activities

Plan Components: all

Planning Rule Requirements: none

Reporting Frequency: 2 years

Rationale: Question 14 is intended to identify opportunities and challenges presented by plan direction during implementation. While the Forest Supervisor, planning, and reviewing staff have spent substantial time trying to ensure plan direction is implementable and achievable, there may be projects, activities, and circumstances that are unforeseeable and may identify a need for further clarification or change in plan direction. This process would include an annual review of new environmental analysis for select projects for compliance with the plan. The format would be an "after-action" or "lessons learned" review with the narrative or summary included in the biennial monitoring report.

Question 15: Are projects involving herbicide use compliant with all applicable plan direction, including requirements for public notification and disclosure? Were additional or more restrictive constraints necessary to support the use. If so, why, and what were they?

Indicator(s): Brief narrative and supporting documentation demonstrating compliance with plan direction

Plan Components: All Upland Ecological Response Units LSl-DC3a and S5; Wildland-Urban Interface DCs1-3 and S1; Non-Native Invasive Species DC1, Ss3 and 7-19 and Gs1-5

Planning Rule Requirements: none

Reporting Frequency: 2 years

Rationale: Herbicide can be an indispensable tool for integrated pest management and restoring native plant community composition. It can also have unintended impacts that are serious and sometimes irretrievable if the appropriate design criteria are not implemented. There are some stakeholders that support its wise use. Others are adamantly against it no matter what safeguards are put in place. It has been a divisive topic throughout plan revision and in separate, project-level proposals that have been circulated for public comment during the same time frame. Project-level activities that involve herbicide use will continue to be proposed in the future. This monitoring question was selected to provide transparency and demonstrate accountability. It is hoped that building a track record of transparency and accountability will in turn, build trust and cultivate the social license to use herbicide in the instances where we cannot meet a purpose and need for action efficiently without it, or at all.

Capacity-Dependent Monitoring

The next three subsections contain additional monitoring that could be undertaken when and if time, funding, priority of work, and stakeholder support allow. Questions are organized in subsections around three themes.

Relationships and collaboration monitoring questions and indicators are specific to plan direction for inclusive stakeholder engagement, and collaborative education or information sharing. It also includes plan direction related to management issues for which forest staff have identified social license as an important variable. Social license refers to the public's acceptance of management practices. These questions and indicators are included in this section because relationships and trust are viewed as critical to the long-term sustainability of these practices.

Social, cultural, and economic sustainability monitoring questions and indicators are specific to plan direction regarding the benefits people derive from the forest. However, there are implications or inferences for social, cultural, and economic sustainability that may be obtained from ecological validation monitoring.

Ecological sustainability and biodiversity monitoring questions and indicators are specific to related plan direction.

Some abbreviations are used in reference to plan components. For desired conditions where scale is applicable, the first letter of the scale name followed by the letter S is used. For example, the watershed-scale would be abbreviated as "WS," and the fine-scale would be "FS." This is followed by a similar abbreviation of component type, followed by corresponding number. For example, LS-DC1a refers to the landscape-scale desired condition number 1a. Planning rule requirements are identified by using the numbering system presented in the requirements section of this document. Some of this monitoring is information that forest staff routinely collect or could easily document as part of other forest business. These questions are very likely to be included in the biennial monitoring and evaluation report unless regional or national monitoring priorities shift toward something else. These questions are identified by an asterisk.

Prioritization

Also included in the tables is a priority ranking. All the potential additional monitoring questions were run through a prioritization process designed to address the "capacity" guiding principle. Capacity is likely to fluctuate from year to year given budget, staffing, and partner and stakeholder interest. A prioritization process with well-defined criteria enables management to ask all the questions that should be asked (not necessarily all that *could* be asked) and be transparent about what is likely to be the focus given finite capacity—that is the minimum required monitoring identified in the previous section. This transparency is also hoped to act as a signal to potential partners, volunteers, and the research community where the gaps might be and how their interest and expertise might align, or not, with the monitoring need.

It is important to note that the process outlined subsequently was not intended to be inflexible. It is expected that the process and ranking scores can and will be reevaluated periodically to reflect new science or other information and changing conditions. Priority rank for each question is based on the total score for each question using the following criteria. Higher scores correspond to higher priority ranking.

1. **Legal or regulatory compliance:** the question will provide information required by law or regulation. This includes the regulatory requirements of the 2012 Planning Rule.
    a. Ranking terms: question provides information relevant to more than one legal or regulatory requirement (value equals 10); question provides information relevant to a legal or regulatory requirement (value equals 8); question does not provide information relevant to any legal or regulatory requirements (value equals 0).
2. **Regional monitoring indicators:** the question uses monitoring indicators approved by the Regional Leadership Team. These indicators include regional technical support for implementation.
    a. Ranking terms: yes (value equals 6); no (value equals 0).
3. **Stakeholder input:** the question reflects stakeholder input.
    a. Ranking terms: yes (value equals 6); no (value equals 0).
4. **Difficulty:** the question can be answered with little time investment in data collection and analysis.
    a. Ranking terms: data or information already acquired by others or as part of other forest business (value equals 6); data collection and analysis require relatively little time investment (value equals 3); data collection and analysis require substantial time investment (value equals 0).
5. **Multiple benefits:** the question informs the management of more than one resource or topic area.
    a. Ranking terms: one point assigned for each resource or topic area.
6. **Vulnerability of the resource:** the question may provide detection of climate-facilitated vegetation shifts and impacts to sensitive resource uses. Vulnerability is determined by science-based vulnerability assessments such as the one provided by Triepke (2016) or Borchers and others (2021). Criterion 7 applies to those resources not specifically addressed in a science-based vulnerability assessment.
    a. Ranking terms: The question provides information directly relevant to vegetation shifts or vulnerable resource uses (value equals 6); Indirect (value equals 3); the question does not provide information directly tied to vegetation shifts and vulnerable resource uses (value equals 0).
7. **Information gap:** the question provides information about resources where information gaps identified in scientific literature, or Forest Service or other agencies' publications, may compromise management's ability to provide for the sustainability of those resources.
    a. Ranking terms: high (value equals 6); moderate (value equals 3); no (value equals 0).

Relationships and Collaboration

Questions 16*[64]: What efforts have forest leadership and staff made to engage the public, including youth and historically under-represented communities, in project activity planning, implementation and monitoring? How has stakeholder input helped shape project planning and

[64] Questions identified by asterisks are very likely to be included in the biennial monitoring and evaluation report unless regional or national monitoring priorities shift toward something else.

design? What is the public response to engagement opportunities? Are we reaching youth and under-represented communities?

Indicator(s): Brief narrative summarizing engagement type by project phase for the reporting period; methods used to reach youth and under-represented communities; number of participants per project and demographics; modifications made to proposals in response to comments

> **NOTE: This does not include any information subject to the confidentiality of government-to-government consultation with the tribes. Disclosure would violate legal and trust responsibilities to the tribes.**

Plan Components: Community and Tribal Relationships DCs1 and 3-6 and G1

Priority Rank: 7

Question 17*: Have partners and volunteers added to capacity?

Indicator(s): Number of volunteers and partnerships; dollars per year; hours per year

Plan Components: Community and Tribal Relationships DC4; Sustainable Recreation DC5; Cultural Resources and Archeology DC10

Priority Rank: 14

Question 18*: What efforts have been made to support collaborative education programs? What has the public response been to these efforts? Are youth and under-represented communities engaging?

Indicator(s): Number of events per year by topic; hours per year by topic; number of participants per event; demographics

Plan Components: Community and Tribal Relationships DCs1 and 5, Air Quality DC3, Wildland Fire and Fuels Management DC4a-c, Non-Native Invasive Species DC2; Sustainable Recreation DC3, Cultural Resources and Archeology DCs7-11

Priority Rank: 12

Question 19: How have interactions during project planning, implementation, monitoring, collaborative education, partnerships, and volunteerism impacted stakeholder's views of their relationships with forest leadership and staff?

Indicator(s): Survey responses

Plan Components: All the those identified for questions 16-18

Priority Rank: 15

Question 20*: What progress has been made toward wildland-urban interface objectives?

Indicator(s): Acres

Plan Components: Wildland-Urban Interface O1; Wildland Fire and Fuels Management DC3

Priority Rank: 20

Question 21: What progress has been made toward desired conditions for the wildland-urban interface?

Indicator(s): Pre- and post-treatment modeled fire behavior; percent fuels reduction

Plan Components: Wildland-Urban Interface DCs1-4, G1; Wildland Fire and Fuels Management DC3

Priority Rank: 17

Question 22*: How is ambient air quality in Catron, Hidalgo, Grant and Sierra airsheds changing over time?

Indicator(s): Time meeting regulatory requirements per year; timing of any pollutant exceedances relative to Gila National Forest fire management activities

Plan Components: Air Quality DCs1 and 2

Priority Rank: 21

Question 23*: How are visibility conditions in class I and II areas on the forest changing over time?

Indicator(s): Trends in annual haze index

Plan Components: Air Quality DCs1 and 4

Priority Rank: 21

Social, Cultural and Economic Sustainability

Question 24*: Have wood and other botanical products been made available to people?

Indicator(s): Volume of product by type

NOTE: This does not include tribal use.

Plan Components: Timber, Forest, and Botanical Products DC2a-f and G2; Community and Tribal Relationships DCs2 and 3

Priority Rank: 14

Question 25*: What is the status and trend of roads in terms of access and condition?

Indicator(s): Miles of open road; miles of roads built; miles of roads decommissioned; miles of roads maintained by maintenance level annually

Plan Components: Roads DC1

Priority Rank: 13

Question 26*: What is the status of wilderness character in congressionally designated wilderness areas?

Indicator(s): Trend in wilderness character from established baseline

Plan Components: Wilderness DCs and O2

Priority Rank: 22

Question 27: What is the status of wilderness characteristics in areas recommended to Congress for designation?

Indicator(s): Trend in wilderness characteristics from established baseline

Plan Components: Recommended Wilderness DCs

Priority Rank: 7

Question 28: What is the status of the free-flowing nature and outstandingly remarkable values identified in eligible wild and scenic river segments?

Indicator(s): Changes to the status of flow or outstandingly remarkable values

Plan Components: Eligible Wild and Scenic Rivers DCs1-3

Priority Rank: 7

Question 29: Is the network of vacant allotments being used as swing allotments or forage reserves adequate to support existing permittees in drought years?

Indicator(s): Number of active permits in non-use due to drought

Plan Components: Livestock Grazing DC1 and G6; Community and Tribal Relationships DCs2 and 3

Priority Rank: 11

Question 30*: How is the availability of water for livestock changing over time?

Indicator(s): Trend in percent of surface water sources dry; duration of dry period; change in surface area occupied by surface water sources; number of new wells installed

Plan Components: Livestock Grazing DC1; Community and Tribal Relationships DCs2 and 3; Water Uses DCs1 and 3

Priority Rank: 18

Question 31*: What is the trend in groundwater availability?

Indicator(s): Number of wells requiring deepening

Plan Components: Water Uses DCs1 and 3, Livestock Grazing DC1

Priority Rank: 20

Question 32*: Are cultural resources evaluated for their eligibility to the National Register?

Indicator(s): Percentage of known sites evaluated

Plan Components: Cultural Resources and Archeology DC2

Priority Rank: 7

Question 33*: Does the public have opportunities to learn about and appreciate cultural resources?

Indicator(s): Number of interpretive, scientific research efforts or presentations completed or ongoing per year

Plan Components: Cultural Resources and Archeology DC7

Priority Rank: 10

Question 34*: Does the public have opportunities to participate in the identification, protection and preservation of cultural resources?

Indicator(s): Number of hours of volunteer service within the heritage program stewardship opportunities

Plan Components: Cultural Resources and Archeology DC8

Priority Rank: 7

Question 35*: What progress has been made toward accomplishing objectives for social, cultural and economic sustainability?

Indicator(s): Acres; number of projects

Plan Components: All objectives in the Multiple Uses and Social, Cultural and Economic Sustainability section of the plan except Sustainable Recreation which is addressed in the minimum required monitoring

Priority Rank: 34

Question 36*: If the letter of the guideline was not followed, why and what was done to meet the intent?

Indicator(s): Brief narrative including supporting documentation and alternative design criteria

Plan Components: All guidelines in the Multiple Uses and Social, Cultural and Economic Sustainability section of the plan

Priority Rank: 34

Ecological Sustainability

Question 37*: What progress has been made toward accomplishing objectives for ecological sustainability and biodiversity?

Indicator(s): Acres; number of projects

Plan Components: All objectives in the Ecological Sustainability and Biodiversity section of the plan

Priority Rank: 34

Question 38*: If the letter of the guideline was not followed, why and what was done to meet the intent?

Indicator(s): Brief narrative including supporting documentation and alternative design criteria

Plan Components: All guidelines in the Ecological Sustainability and Biodiversity section of the plan

Priority Rank: 34

Questions 39*: How often does site-specific analysis trigger the exceptions provided in the plan standards establishing slope restrictions for ground-based mechanical thinning treatments? How did the analysis determine those conditions were present? Were additional design criteria established? If so, what were they?

Indicator(s): Number of instances per year; description of analysis method(s) used to identify presence or absence of conditions necessary to trigger the exception; description and rationale for any additional design criteria

Plan Components: All Upland Ecological Response Units Ss2-4; Soil DCs; Watershed DCs; Wildland-Urban Interface DCs and S1, Wildland Fire and Fuels Management DCs1-3

Priority Rank: 34

Question 40*: Have recommended best management practices been implemented? Are these practices effective?

Indicator(s): Percent compliance and percent effective for select projects or activities

Plan Components: Soil DC1c and S2; Water Quality DC1; Watersheds DC1a and S1; Riparian and Aquatic Ecosystems S1; Livestock Grazing S2; Timber, Forest, and Botanical Products S3 and S5; Wildland Fire and Fuels Management S2 and S5; Sustainable Recreation S3; Roads S2; Facilities Ss1 and 2

Priority Rank: 24

Question 41*: Is management sufficient to maintain or move toward desired conditions for water quality?

Indicator(s): Miles of 303(d) listing by impairment; other standard, accepted quantitative assessments based on the parameter being measured

Plan Components: Water Quality DC1; Soils DC1c; Watersheds DC1a; Riparian and Aquatic Ecosystems 6th Level WS-DC8c and FS-DC1c; Wildlife, Fish, and Plants DCs1-3, 6 and 11 and S4

Priority Rank: 31

Question 42: Is management moving toward desired conditions for patch size?

Indicator(s): Mean patch size; median patch size; patch size range

Plan Components: Spruce-Fir Forest LS-DC1a; Mixed Conifer with Aspen LS-DC1a; Mixed Conifer-Frequent Fire MS-DC3; Ponderosa Pine Forest MS-DC3; Ponderosa Pine-Evergreen Oak MS-DC2; Madrean-Pinyon Oak Woodland MS-DC2; Pinyon Juniper Woodland MS-DC2; Wildlife, Fish, and Plants DCs 1-3, 5 and 6

Priority Rank: 20

Question 43: How is the species composition of vegetation communities changing over time?

Indicator(s): Similarity to site potential at permanent select sites

Plan Components: All Upland Ecological Response Units LS-DC3a and 7; Soils DC1b; Wildlife, Fish, and Plants DC1-3, 5 and 6

Priority Rank: 39

Question 44: What is the status of functional group representation within vegetation communities changing over time?

Indicator(s): Similarity to site potential by functional group at permanent select sites

Plan Components: All Upland Ecological Response Units LS-DC1 and 2; Soils DC1b; Wildlife, Fish, and Plants DC1-3, 5 and 6

Priority Rank: 33

Question 45*: What progress has been made to inventory, characterize and assess the condition of riparian areas, including those with springs and seeps?

Indicator(s): Brief narrative description

Plan Components: Riparian and Aquatic Ecosystems FS-DC3

Priority Rank: 22

Question 46: How is the composition of riparian and wetland vegetation communities changing over time?

Indicator(s): Similarity to site potential, species richness, age class diversity and functional group diversity at permanent select sites

Plan Components: Riparian and Aquatic Ecosystems 4th and 5th Level WS-DC1-3 and 5, 6th Level WS-DCs1, 2, 4-7, 8e and f, FS-DCs1c, d and f; Wildlife, Fish, and Plants DCs 1-3 and 11; Soils DC1b; Watersheds DC1b and e

Priority Rank: 28

Question 47: Is the Gila National Forest a carbon source or a sink?

Indicator(s): Trend in carbon stocks

Plan Components: All Upland Ecological Response Units LS-DC5; Soils DC1e

Priority Rank: 10

Question 48: Is management moving toward desired conditions for coarse or large woody debris and snags in riparian management zones?

Indicator(s): Coarse woody debris and snag density for select riparian management zones

Plan Components: Riparian and Aquatic Ecosystems 6th Level WS-DC1 and 8e, FS-DC1f; Wildlife, Fish, and Plants DC11

Priority Rank: 27

Question 49: What is the status and trend of large trees in the timber producing vegetation types?

Indicator(s): Number of trees in large to very large size classes

Plan Components: Spruce-Fir Forest LS-DC4; Mixed Conifer with Aspen LS-DC4; Mixed Conifer-Frequent Fire MS-DC7; Ponderosa Pine Forest MS-DC7; Ponderosa Pine-Evergreen Oak MS-DC7; Wildlife, Fish, and Plants DCs1-3

Priority Rank: 22

Question 50: How is soil quality changing over time in response to management?

Indicator(s): Soil condition assessment ratings for select sites

Plan Components: Soils DC1 and O1; Watersheds DC1g; Riparian and Aquatic Ecosystems 4th and 5th Level WS-DC1 and 2; 6th Level WS-DC1-3, 5, 6, 8a, 8c-g and FS-DC1a-b and 2; All Upland Ecological Response Units LS-DCs1-3 and 5-7; Wildlife, Fish, and Plants DCs1-3 and 11

Priority Rank: 26

Question 51: How are soil temperature patterns changing over time?

Indicator(s): Trends in monthly or seasonal soil temperature at select sites[65]

Plan Components: All Upland Ecological Response Units DC2; Soils DC1

Priority Rank: 21

Question 52: How are soil moisture patterns changing over time?

Indicator(s): Trends in monthly or seasonal soil moisture at select sites[64]

Plan Components: All Upland Ecological Response Units DC2; Soils DC1

Priority Rank: 21

Question 53: How is natural groundwater discharge to springs, seeps and wetlands changing?

Indicator(s): Change in duration of groundwater discharge to select springs, seeps, and wetlands

Plan Components: Watersheds DC1b and DC2-3; Riparian and Aquatic Ecosystems 4th and 5th Level WS-DCs2 and 2b, and 6th Level WS-DC8d, f and g, FS-DC2; Wildlife, Fish, and Plants DC1-3

Priority Rank: 18

Question 54*: How are insect infections and disease outbreaks changing over time?

Indicator(s): Trends aerial detection survey

Plan Components: LS-DC1 and LS-DC7; Watersheds DC1c; Wildlife, Plants and Fish DCs1-3; Timber, Forest, and Botanical Products DC1c, DC2d, S5 and G2

Priority Rank: 31

Question 55: What is the trend in tree mortality?

Indicator(s): Trend in percent mortality all causes for timber producing forest types

Plan Components: All Upland Ecological Response Units LS-DCs1 and 7; Watersheds DC1c; Wildlife, Fish, and Plants DC1-3; Timber, Forest, and Botanical Products DCs1c, 2d, S5 and G2

Priority Rank: 23

[65] There is already an established network of soil temperature and moisture monitoring sites on the southern portion of the forest with over 20 years of data. This network was established to support the Terrestrial Ecological Unit Inventory mapping and could be leveraged for this monitoring program.

Question 56: What is the status and trend in natural tree regeneration?

Indicator(s): Number of trees in seedling/sapling size classes in timber producing forest types

Plan Components: All Upland Ecological Response Units LS-DC1 and 7; Soils DC1; Watershed DC1c; Wildlife, Fish, and Plants DCs1-3; Timber Forest and Botanical Products DC1, S7 and G7

Priority Rank: 24

Question 57: What is the trend in fire rotation?

Indicator(s): Mean and median rotation by Ecological Response Unit and spatial distribution

Plan Components: Spruce-Fir Forest LS-DC6; Mixed Conifer with Aspen LS-DC7; Mixed Conifer-Frequent Fire LS-DC6; Ponderosa Pine Forest LS-DC7; Ponderosa Pine-Evergreen Oak LS-DC7; Madrean Pinyon-Oak Woodland LS-DC3; Pinyon Juniper Woodland LS-DC4; Pinyon Juniper Grass and Juniper Grass Woodlands LS-DC3; Mountain Mahogany Mixed Shrubland LS-DC3; Grasslands LS-DC3; Wildland Fire and Fuels Management DC5; Watersheds DC1c

Priority Rank: 32

Question 58: What is the trend in fire severity?

Indicator(s): Severity trends by ecological response unit; severity trends by fire type (prescribed, naturally ignited not full suppression, naturally ignited-full suppression)

Plan Components: Spruce-Fir Forest LS-DC6; Mixed Conifer with Aspen LS-DC7; Mixed Conifer-Frequent Fire LS-DC6; Ponderosa Pine Forest LS-DC7; Ponderosa Pine-Evergreen Oak LS-DC7; Madrean Pinyon-Oak Woodland LS-DC3; Pinyon Juniper Woodland LS-DC4; Pinyon Juniper Grass and Juniper Grass Woodlands LS-DC3; Mountain Mahogany Mixed Shrubland LS-DC3; Grasslands LS-DC3; Wildland Fire and Fuels Management DC5; Watersheds DC1c

Priority Rank: 40

Question 59*: Is extreme fire weather impacting management's ability to move toward desired conditions?

Indicator(s): Trend in 90th and 97th percentile fire weather conditions or number of days per season above 90th and 97th percentile

Plan Components: Wildland Fire and Fuels Management DCs3 and 5a-c; Wildland-Urban Interface DCs1-5

Priority Rank: 8

Question 60*: How is the number of natural ignitions changing?

Indicator(s): Trend in number of natural ignitions detected per year

Plan Components: Wildland Fire and Fuels Management DC5

Priority Rank: 8

Question 61*: What is the trend in natural ignitions being managed under full suppression?

Indicator(s): Trend in percent of natural ignitions with a management objective of full suppression

Plan Components: Wildland Fire and Fuels Management DCs1-5 and 5a-c; Wildland-Urban Interface DCs1-5

Priority Rank: 14

Question 62*: What measures are being taken during fire incidents to prevent the introduction or spread of invasive or noxious species and diseases?

Indicator(s): Measures taken; percent of incidents

Plan Components: Wildland Fire and Fuels Management DC6 and S4; Non-Native Invasive Species DC1 and S1; Wildlife, Fish, and Plants DCs1-3 and 11, G8; All Upland Ecological Response Units DCs 2, 3a and 7; Soils DC1b; Watersheds DC1c; Riparian and Aquatic Ecosystems 4th and 5th Level WS-DCs1, 2b and 5, 6th Level WS-DCs2 and 7, and FS-DC1c

Priority Rank: 27

Question 63: What is the status and trend of noxious plant species?

Indicator(s): Species presence, abundance and distribution

Plan Components: Non-Native Invasive Species DC1 and Ss 5 and 16; All Upland Ecological Response Units DCs1, 3a and 7; Soils DC1b; Watersheds DC1c; Riparian and Aquatic Ecosystems 4th and 5th Level WS-DCs1, 2b and 5, 6th Level WS-DCs1, 2 and 7, and FS-DC1c; Wildlife, Fish, and Plants DCs 1-3 and 11

Priority Rank: 27

Question 64: How are monitored conditions different in identified refugial areas (low vulnerability to climate change) compared to the forest as a whole?

Indicator(s): Depends on other ecological sustainability and biodiversity monitoring questions

Plan Components: All Upland Ecological Response Units LS-DCs7 and 8; Riparian and Aquatic Ecosystems 4th and 5th Level WS-DC6; Wildlife, Fish, and Plants DCs1, 2 and 4; Soils DC1

Priority Rank: 19

Question 65: What is the status and trend of rare plants across the forest?

Indicator(s): Species abundance and distribution, habitat and life history requirements, responses to management

Plan Components: Wildlife, Fish, and Plants DC4; All Upland Ecological Response Units LS-DCs1 and 7; Riparian and Aquatic Ecosystems 4th and 5th Level WS-DCs 7 and 9

Priority Rank: 21

Question 66*: What is the status and trend of federally listed species populations across the forest?

Indicator(s): Recovery plan and Section 7 consultation monitoring

Plan Components: Wildlife, Fish, and Plants DCs1-3 and S5

Priority Rank: 33

Question 67: What is the status and trend of stream temperature regimes in native trout streams?

Indicator(s): Various trends in stream temperature depending on partner network capacity and technical capability of temperature sensors that are deployed.

Plan Components: Wildlife, Fish, and Plants DCs1-3 and 11, Water Quality DC1, Riparian and Aquatic Ecosystems 4th and 5th Level Watershed Scale DCs1 and 2, 6th Level Watershed Scale DCs8a and g, Watersheds DCs1a and b, 2 and 3.

Priority Rank: 22

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Photos from top to bottom, left to right: Taking a stance by Viktoriea Thomas; Swallowtail butterfly by Elizabeth Sorrells; Chipmunk (USDA Forest Service photo); Flame skimmer dragonfly by Elizabeth Sorrells; Black bear tracks (USDA Forest Service photo); Mountain tree frog by Elizabeth Sorrells

Appendix A. Proposed and Possible Management Practices

The 2012 Planning Rule requires forest plans to:

> "(iv) Contain information reflecting proposed and possible actions that may occur on the plan area during the life of the plan, including: the planned timber sale program; timber harvesting levels; and the proportion of probable methods of forest vegetation management practices expected to be used (16 U.S.C. 1604(e)(2) and (f)(2)). Such information is not a commitment to take any action and is not a "proposal" as defined by the Council on Environmental Quality regulations for implementing NEPA" (40 CFR 1508.23, 42 U.S.C. 4322(2)(C)). (36 CFR 219.7(f)(1)).

Chapter 4 of the plan contains the proposed and possible actions related to the planned timber sale program, harvesting levels and proportion of probable methods of forest vegetation management practices. Both of which include statements that they do not constitute a commitment to action or a "proposal" as defined by the Council on Environmental Quality.

The Forest Service directives state:

> "Do not place a 'to do' list of projects and expected dates in the plan. If management approaches are included as optional content in the plan (sec. 22.4 of this Handbook); they may be used to inform future proposed and possible actions" (Forest Service Handbook 1909.12 Chapter 20 section 22.34).

This forest plan makes extensive use of management approaches and clearly states in chapter 1 under the heading Content of a Forest Plan and Other Content subheading that management approaches are not direction, not a commitment, and not a proposal. Rather, those management approaches describe the proposed, possible, and probable things that forest leadership and staff will do to move toward desired conditions and objectives. They are not reiterated here.

Coming down from Signboard. USDA Forest Service photo.

Appendix B. Maps

Designated Wilderness and Wilderness Study Areas

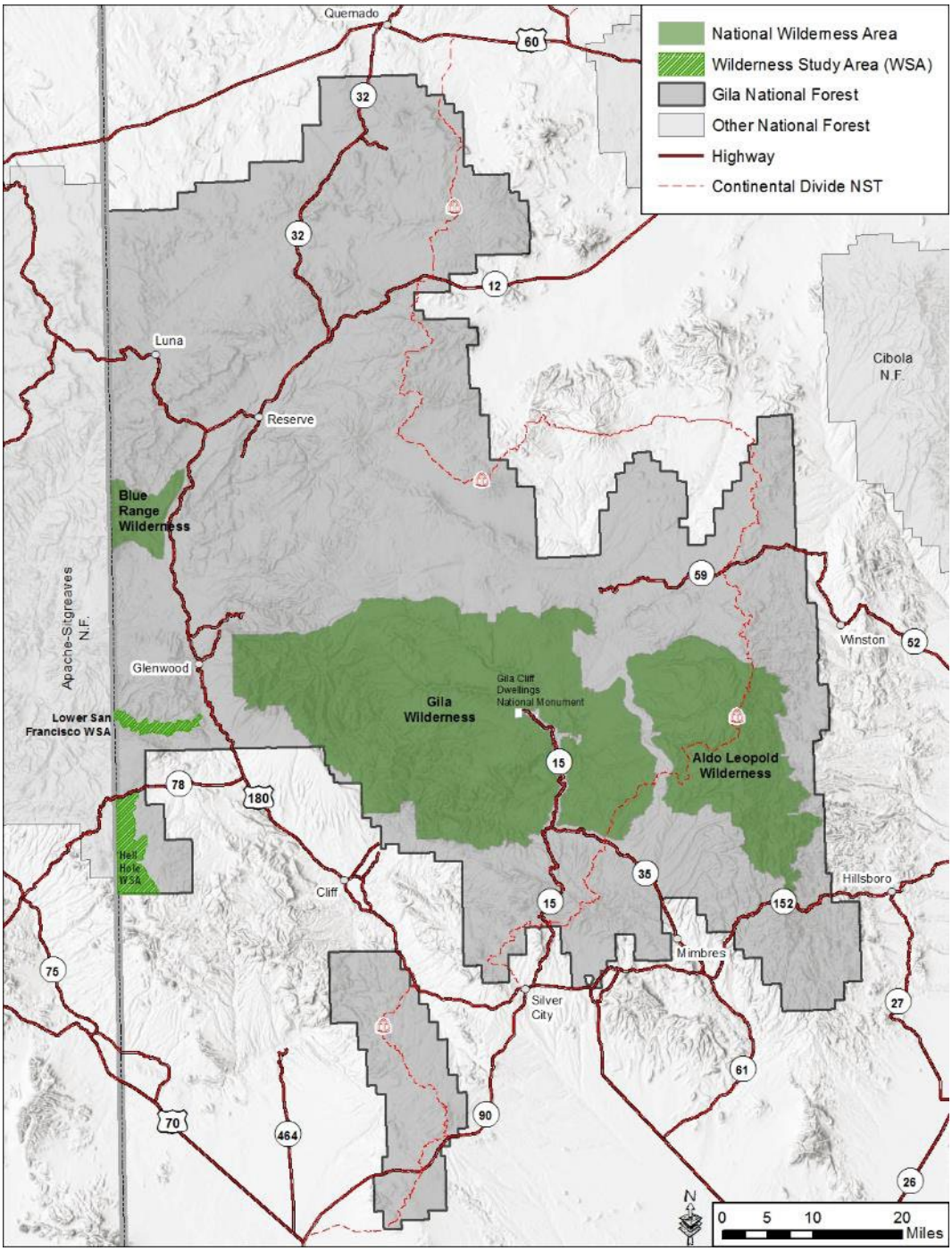

Figure 7. Designated wilderness and wilderness study areas, Gila National Forest

Inventoried Roadless Areas

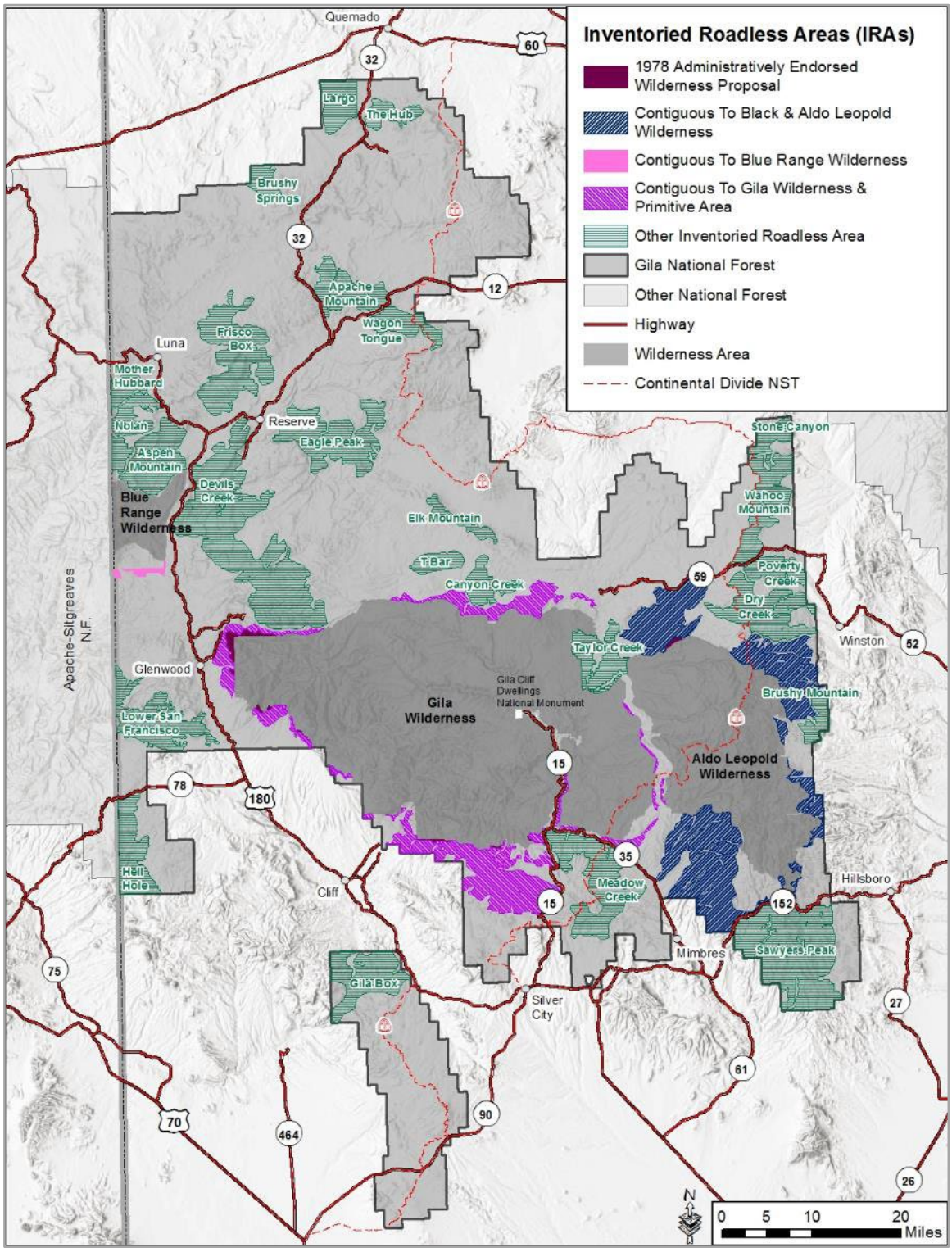

Figure 8. Inventoried roadless areas, Gila National Forest

Recommended Wilderness

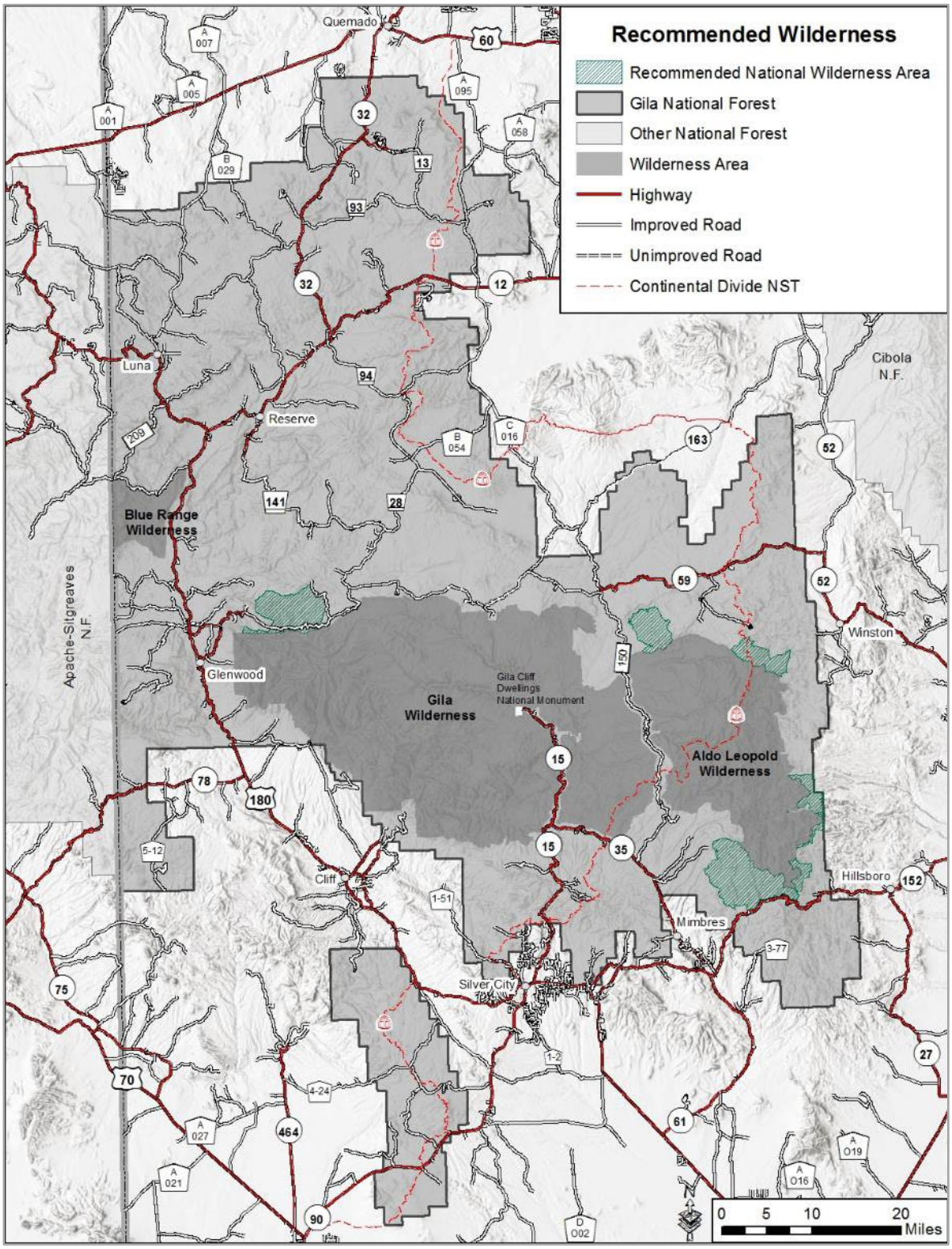

Figure 9. Recommended wilderness, Gila National Forest

Research Natural Area

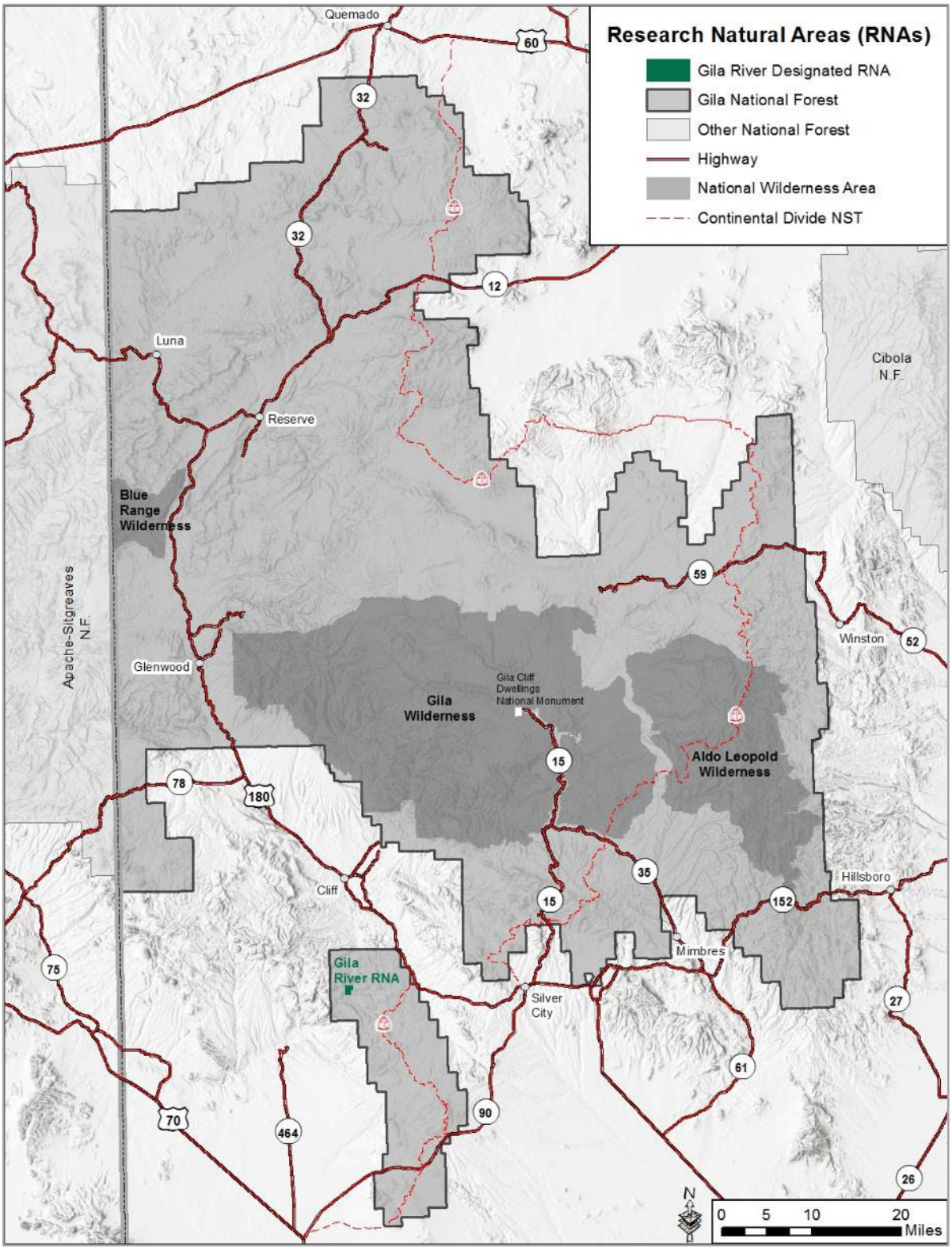

Figure 10. Established research natural area, Gila National Forest

Continental Divide National Scenic Trail and National Recreation Trails

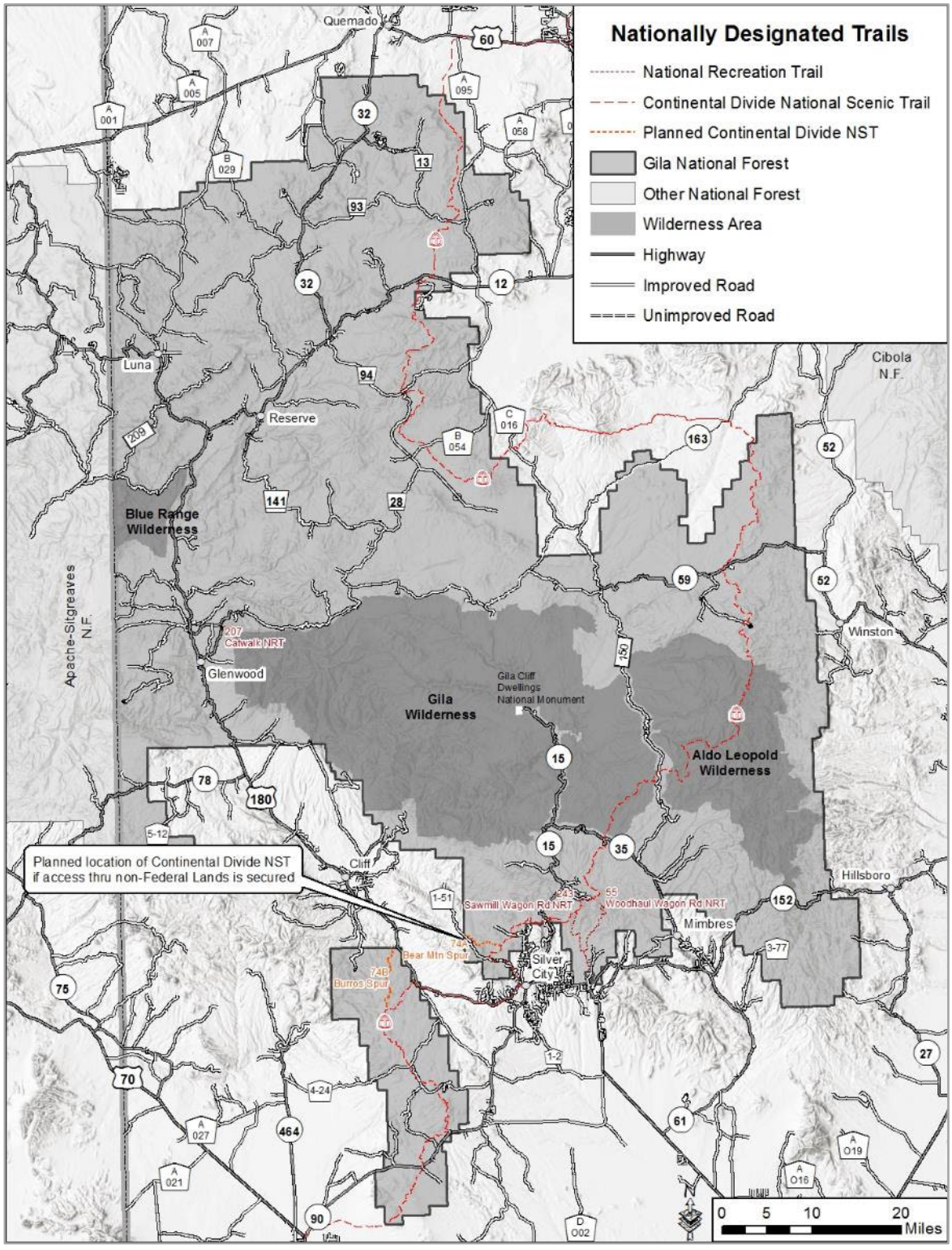

Figure 11. Continental Divide National Scenic Trail and national recreation trails, Gila National Forest

National Scenic Byways

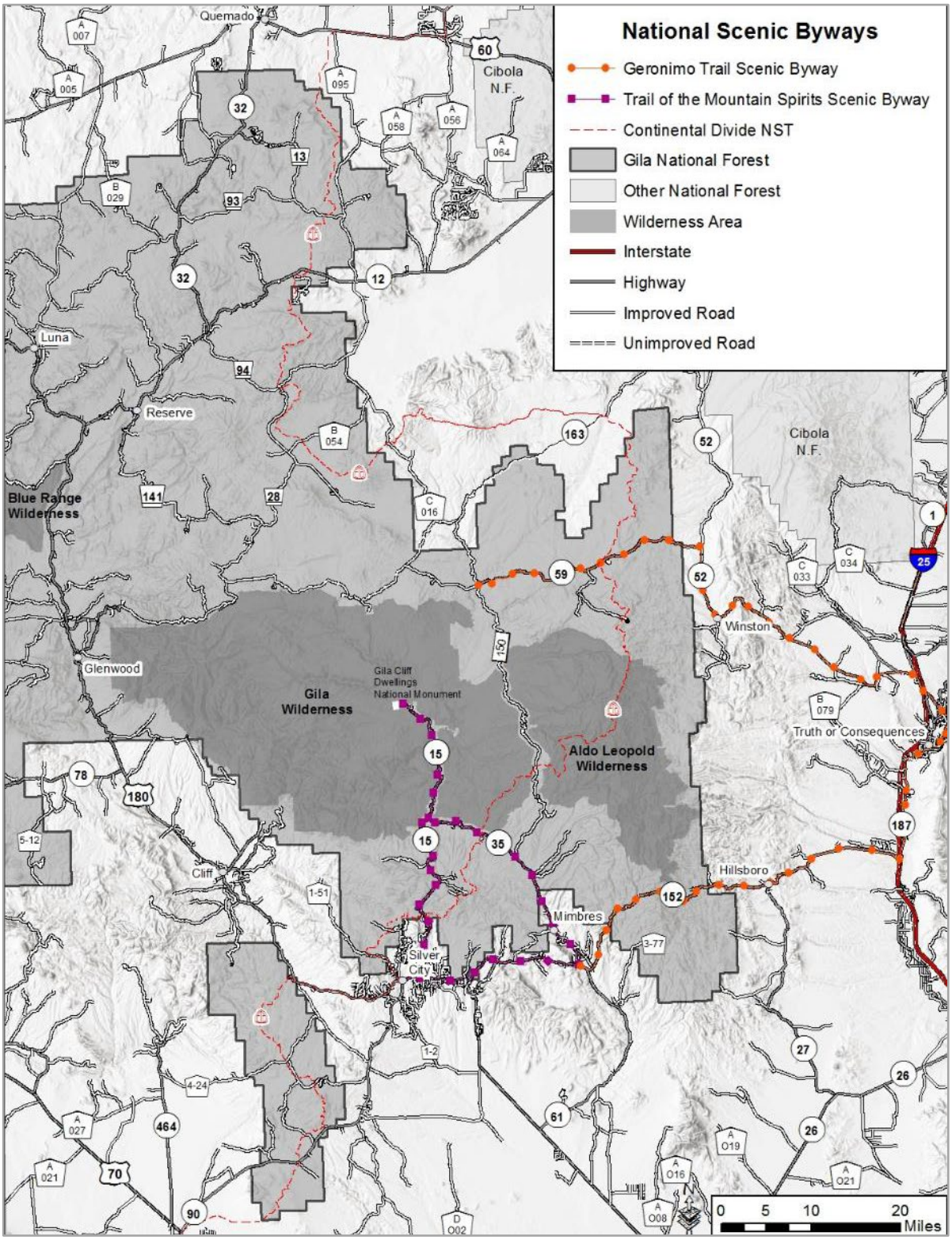

Figure 12. National scenic byways, Gila National Forest and vicinity

Eligible Wild and Scenic Rivers

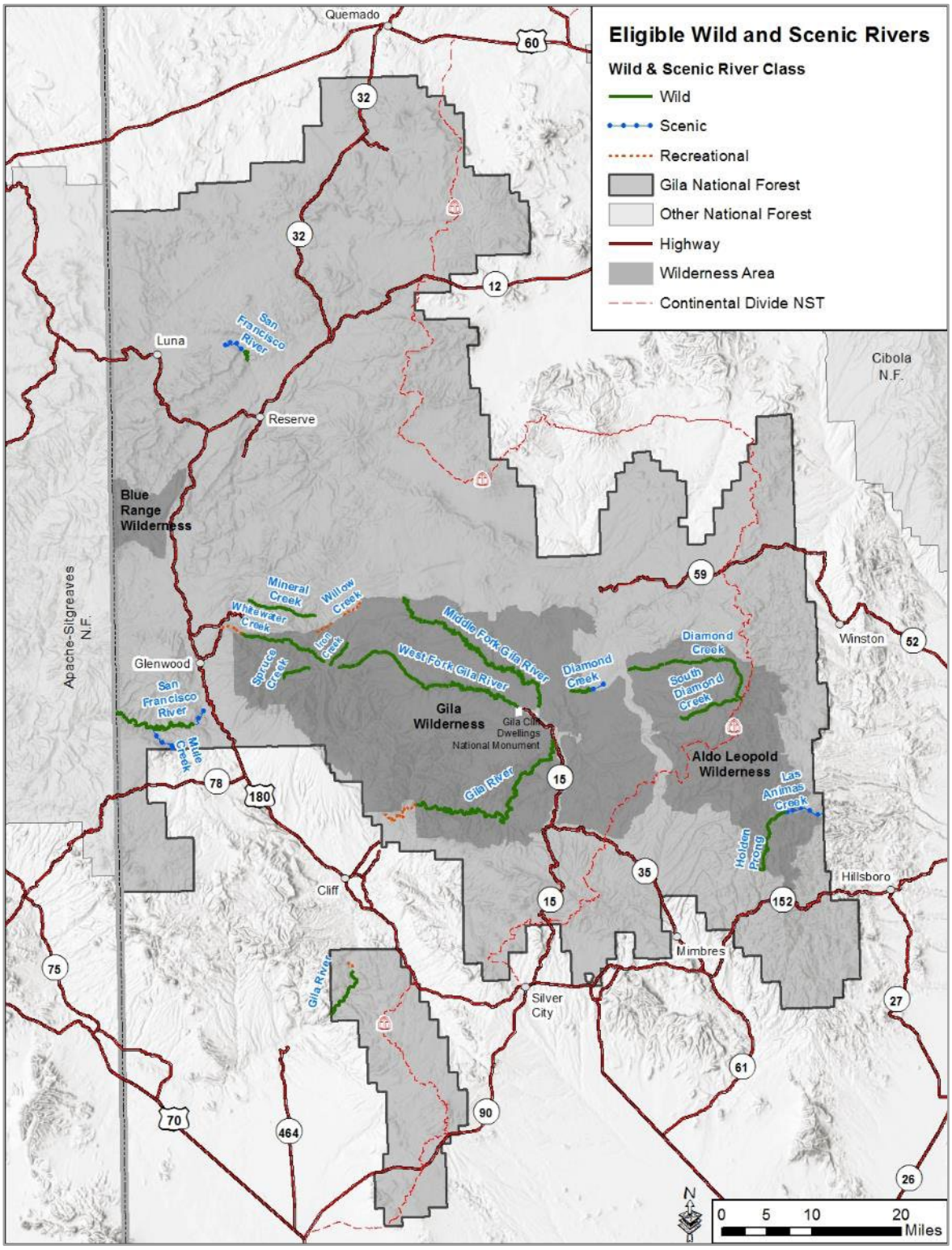

Figure 13. Eligible wild and scenic rivers, Gila National Forest

Wildland-Urban Interface as Identified by Community Wildfire Protection Plans for the Gila National Forest and Vicinity

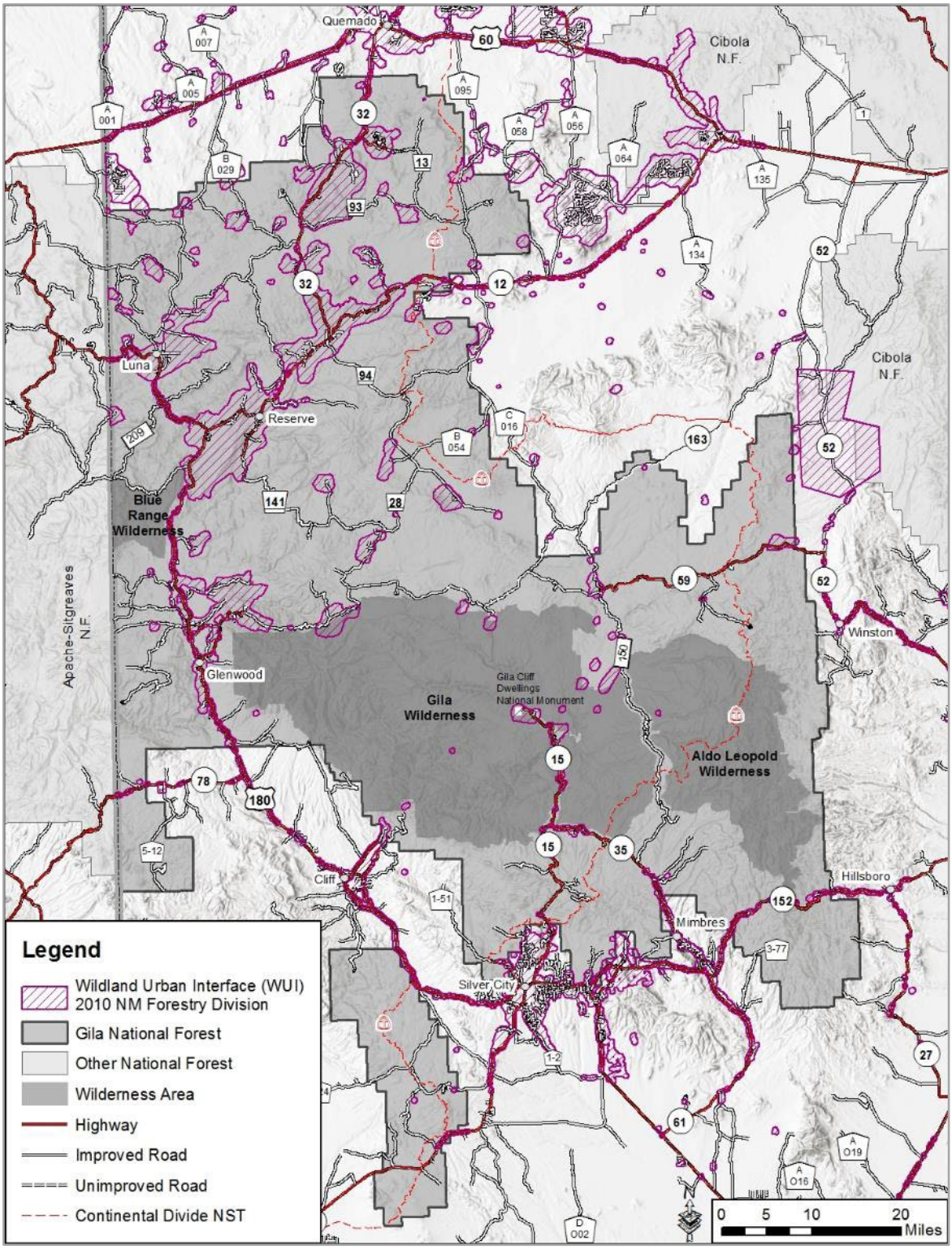

Figure 14. Wildland-urban interface, Gila National Forest and vicinity. Note: Error in external dataset does not display existing wildland-urban interface in the Big Burro Mountains portion of the forest.

Utility Corridors Management Area

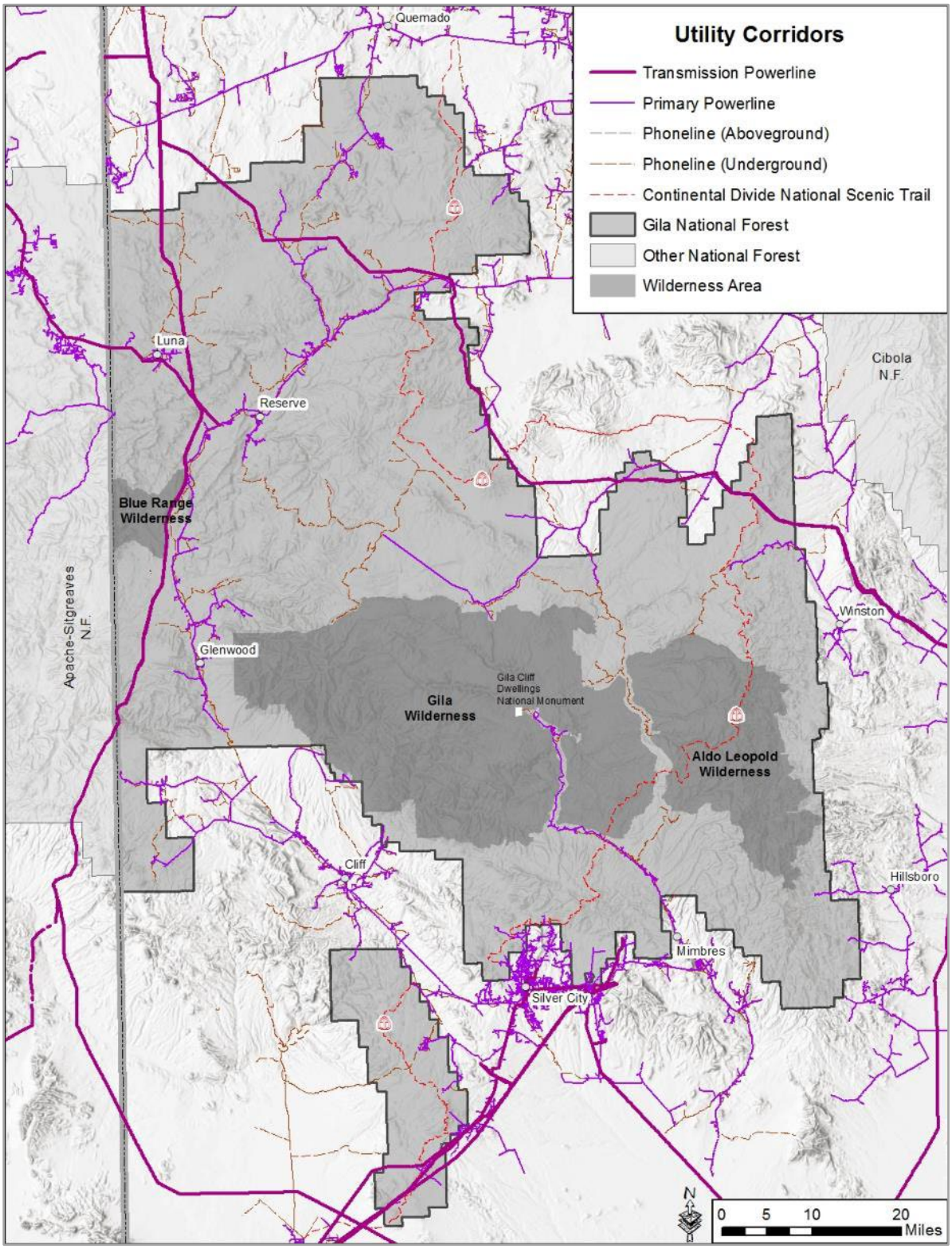

Figure 15. Utility corridors, Gila National Forest

Desired Recreation Opportunity Spectrum Settings

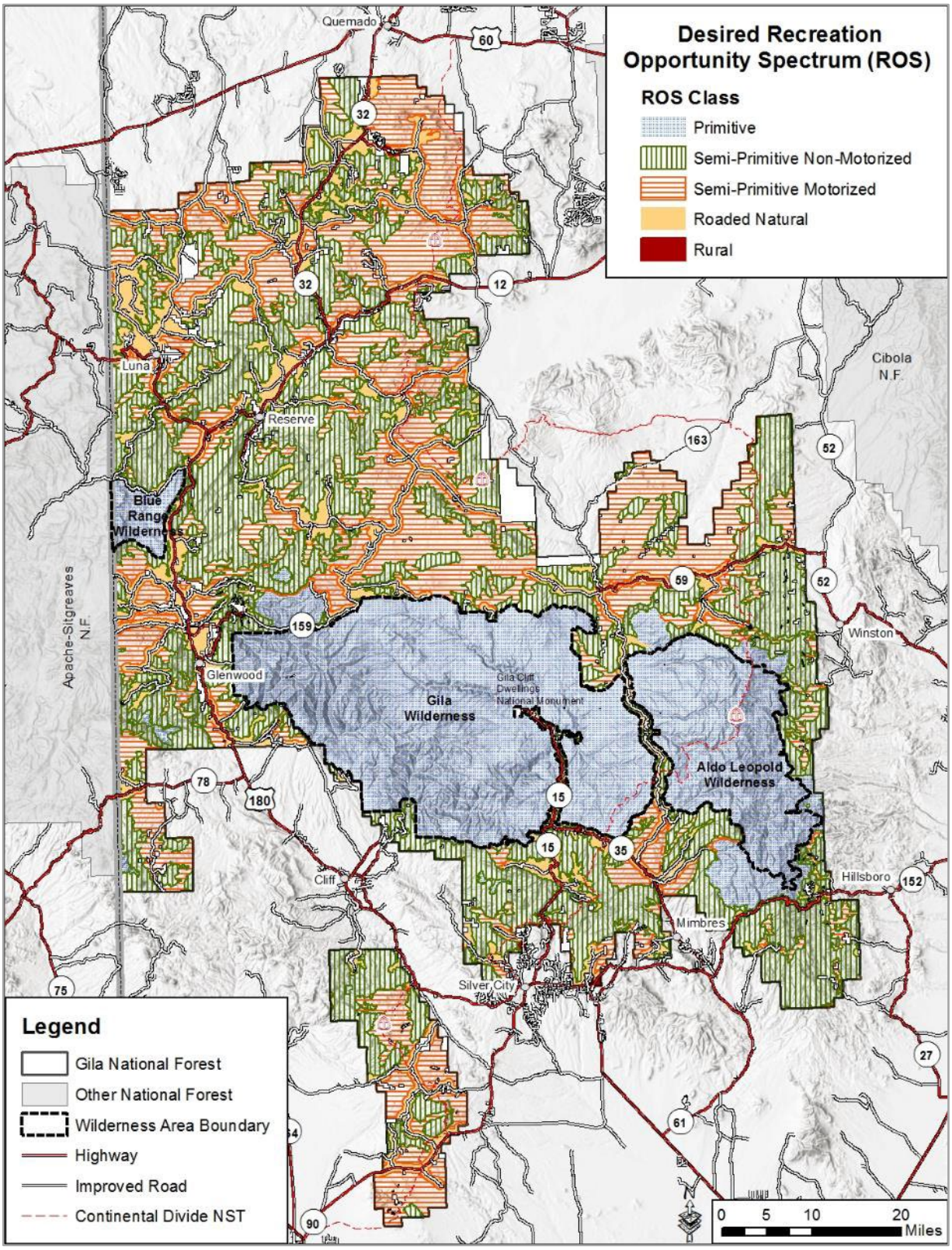

Figure 16. Desired recreation opportunity spectrum settings, Gila National Forest

Scenery Integrity Objectives

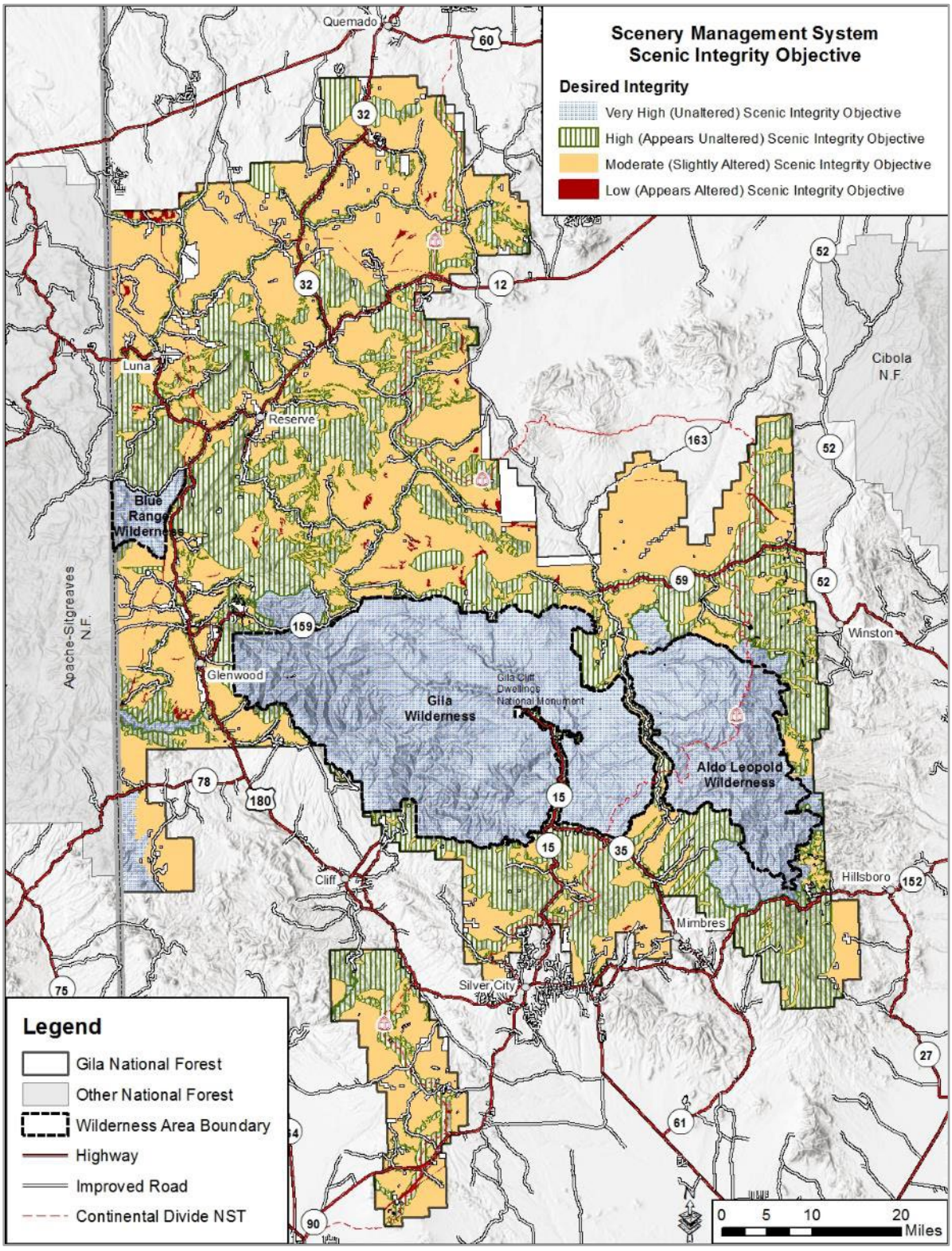

Figure 17. Scenic integrity objectives, Gila National Forest

Appendix C. Focal Species Selection Process and Rationale

Background

Focal species are defined by the 2012 Planning Rule as "A small subset of species whose status permits inference to the integrity of the larger system to which it belongs and provides meaningful information regarding the effectiveness of the plan in maintaining or restoring ecological conditions to maintain the diversity of plant and animal communities…commonly selected based on their functional role in ecosystems" (36 CFR section 219.19).

Focal species are not surrogates for the status of other species. Focal species monitoring provides information regarding the effectiveness of the plan in providing the ecological conditions necessary to maintain the diversity of plant and animal communities and the persistence of native species in the plan area. Agency directives provide guidance for considering the selection of a focal species (Forest Service Handbook 1909.12 Chapter 30 Section 32.13c). Criteria for selection may include: the number and extent of relevant ecosystems in the plan area; the primary threats or stressors to those ecosystems, especially those related to predominant management activities on the plan area; the sensitivity of the species to changing conditions or their utility in confirming the existence of desired ecological conditions; the broad monitoring questions to be answered; factors that may limit viability of species; and others. This does not preclude the use of an invasive species as a focal species, whose presence is a major stressor to an ecosystem.

The rule does not require managing habitat conditions for focal species, nor does it confer a separate conservation requirement for these species based on their selection as focal species. Neither does it require or prohibit monitoring of population trends of focal species. Instead, it allows the use of any existing or emerging approaches for monitoring the status of focal species that are supported by current science.

Monitoring methods for evaluating the status of focal species may include measures of abundance, distribution, reproduction, presence or absence, area occupied, survival rates, or others. The objective is not to choose the monitoring technique(s) that will provide the most information about the focal species, but to choose a monitoring technique(s) for the focal species that will provide useful information regarding the purpose for which the species is being monitored. The expectation is that monitoring key ecosystem and watershed conditions along with monitoring the status of at least one well-chosen focal species will provide timely information regarding the effectiveness of plan components related to plant and animal diversity. Focal species are not selected to make inferences about other species. Focal species are selected because they are believed to be responsive to ecological conditions in a way that can inform future plan-related decisions. Forest Service handbook direction for focal species further specifies that every plan monitoring program must identify one or more focal species and one or more monitoring questions and associated indicators addressing the status of the focal species.

The purpose for monitoring the status of focal species over time is to provide insight into the following:

1. Integrity of ecological systems on which focal species depend,
2. Effects of management on those ecological conditions,
3. Effectiveness of the plan components to provide for ecological integrity and maintain or restore ecological conditions, and
4. Progress toward achieving desired conditions and objectives for the plan area. It is not expected that a focal species be selected for every element of ecological conditions.

Focal species represent a part of the monitoring requirements for ecological sustainability and diversity of plant and animal communities. “It is not expected that a focal species be selected for every element of ecological conditions” (77 FR 21233, April 9, 2012). Focal species should be selected to monitor when doing so is feasible and they are the best way to track whether ecological integrity and ecosystem diversity is being maintained or improved. Monitoring focal species is intended to address situations where they provide more useful information or are more efficiently monitored than monitoring other potential indicators. Focal species are to be carefully selected and monitored when the key ecological indicators of composition, structure, function, and connectivity are either unavailable or difficult to monitor. There may be situations where key ecological indicators could be monitored directly but monitoring focal species as an overall measure of composition, structure, function, and connectivity may be a more appropriate indicator of integrity.

The requirement for the responsible official to monitor focal species allows discretion to determine the most appropriate method and geographic scale for monitoring, within the financial and technical capabilities of the unit. Some focal species may be monitored at scales beyond the plan area boundary, while others may be more appropriately monitored and assessed within the plan area. Monitoring focal species is intended to address situations where they provide more value than monitoring other potential indicators. The following section describes the Gila National Forest’s recommended focal species and how they will inform the integrity of the ecological systems on which they depend.

Focal Species Selection

Focal species were selected based on the core issues identified from the Need for Change document and national initiatives to direct future management for the resiliency and sustainability of national forests. The monitoring of focal species will provide insight on the ecological integrity of mixed conifer and ponderosa pine ecosystems. These ecosystems are likely to see the most mechanical thinning and prescribed fire activities because of the plan’s objectives for vegetation communities. These ecosystems are some of the most highly departed from reference conditions, the highest priorities for restoration treatments, and are vulnerable to climate change impacts. Focal species that are highly dependent on forest structural components such as tree size; canopy cover; canopy layers; snag size and density; the character, amount, and distribution of downed woody material; forest age; and patch size, can help evaluate whether plan direction and management is moving toward the desired conditions for these vegetation types (see desired conditions for Mixed Conifer with Aspen (Wet Mixed Conifer), Mixed Conifer-Frequent Fire (Dry Mixed Conifer), Ponderosa Pine Forest, and Ponderosa Pine-Evergreen Oak). The following subsections describe the reasoning behind the Forest

Supervisor's choice to include northern goshawk and Mexican spotted owl as focal species in the plan monitoring program.

Northern Goshawk

The principal forest type utilized by the goshawk in the Southwest is ponderosa pine; however, they also occur in mixed species forests and spruce-fir. Northern goshawk is a forest habitat generalist that uses a wide variety of forest ages, structural conditions, and successional stages, most of which are departed from the reference condition because of fire suppression activities and in some cases, stand-replacing fire. Although the departure from reference in ponderosa pine forests has created closed-canopy conditions beneficial to northern goshawks, they are extremely vulnerable to stand-replacement fire, which can greatly alter or reduce optimal habitat. Nest sites are found in all the local zones surrounded by post-fledging family areas. Several nest sites and post-fledging family areas have been lost or abandoned because of stand-replacing fires.

Goshawks are found in various forest types. Snags (standing dead trees) provide critical resources for many birds, mammals, invertebrates, and plants that goshawks prey or forage on. Large, downed logs provide cover, feeding, and nest sites for a variety of vertebrates. Among goshawk prey, downed logs are important feeding sites for woodpeckers and as denning sites for chipmunks, ground squirrels, and cottontail rabbits. The character, amount, and distribution of woody debris (material between 3 and 12 inches diameter) may affect the abundance of goshawk prey. Large trees (larger than 18 inches diameter) provide critical nesting, denning, feeding, and roosting sites for goshawk prey as tassel-eared squirrel, and large woodpeckers. Large trees also are good cone producers, providing seed for many prey species. Large trees also provide hunting perches and nest trees for goshawks. Forest openings with their associated grassy, herbaceous, or shrubby vegetation, provide important food and cover for several goshawk prey.[66]

Northern goshawk nesting habitat consists of mature and old-growth forest stands with relatively high degree of canopy closure. Foraging habitat for the northern goshawk primarily consists of early, more open seral stages that provide habitat for key prey species including small mammals and passerine birds. Selection of the northern goshawk as a focal species is based on the species association with ponderosa pine forests and tree features for every aspect of its life history from nesting, to roosting, to foraging.

Because northern goshawks require specific structural requirements, they will serve as an excellent indicator for ponderosa pine forest health. A survey protocol is established and securely in place.

Mexican Spotted Owl

The Mexican spotted owl inhabits mixed coniferous and pine-oak forests, canyons, desert caves, cliff faces, and riparian areas throughout the Southwest. In the Gila National Forest, mixed conifer and pine-oak habitat is considered either protected or recovery habitat in the recovery plan for this species. Protected activity centers are protected habitat, and unoccupied mixed conifer and pine-oak is considered recovery habitat (USDI FWS 2012). Preliminary prey base data being taken on the Lincoln National Forest suggest that the owl uses three main food

[66] Reynolds, R.T., W.M. Block, and D.A. Boyce, Jr. 1996. Using Ecological Relationships of Wildlife as Templates for Restoring Southwestern Forests. In USDA Forest Service General Technical Report RM-GTR-278. Conference on Adaptive Ecosystem Restoration and Management: Restoration of Cordilleran Conifer Landscapes of North America. Flagstaff, Arizona.

sources: wood rats, deer mice, and voles. Canopy cover and herbaceous ground story materials are important prey habitat conditions. Foraging habitat occurs throughout several forest types from pinyon juniper to spruce-fir. Mixed conifer forests with old-growth stands are most used, particularly for nesting and roosting. These forests are dominated by Douglas-fir, white fir, or both with understory consisting of other coniferous species and broad-leafed species such as Gambel oak, maples, box-elder, and New Mexico locust. These forests are also usually uneven-aged, multi-storied, and have high canopy closure. The Mexican spotted owl nests and roosts primarily in closed canopy mixed conifer and ponderosa pine-Gambel oak forests or rocky canyons. Mexican spotted owls are territorial in the sense that mated pairs defend a breeding territory within a larger home range (or use area). Fidelity to these territories is relatively high in Mexican spotted owls, with most owls remaining in the same territory year after year (Ganey 1988 and Gutiérrez et al. 1995 as cited in: U.S. Fish and Wildlife Service 2012). Mexican spotted owls use relatively large home ranges, and home-range size appears to vary among geographic areas and habitats (Ganey and Balda 1989a, Zwank et al. 1994, Willey 1998b, Ganey et al. 2005, Willey and Van Riper 2007, and Bowden 2008 as cited in: U.S. Fish and Wildlife Service 2012).

As federally listed species under the Endangered Species Act, a great deal of information has been acquired regarding effects of forest conditions and management activities on these owls, thus the species' relationship to ecological conditions on the ground is relatively well understood. Because Mexican spotted owls have specific structural requirements, they will serve as an excellent indicator for mixed conifer and ponderosa pine-Gambel oak forest health within the Gila National Forest.

Mexican spotted owlets. Photo by Sandy Taylor.

Appendix D. Relevant Laws, Regulations, and Policy

The operating environment for managing National Forest System lands comes from a variety of sources. This appendix contains a partial listing of relevant statutes, regulations, policies, and agreements that provide management direction but are not restated in this plan. The Gila National Forest develops projects and activities to be consistent with the direction found in the plan, as well as applicable laws, regulations, and Executive orders. Other relevant sources that provide varying levels of guidance include Forest Service handbooks and manuals, programmatic agreements, memoranda of understanding, memoranda of agreement, and existing decisions.

Federal Statutes

The following is a partial list of relevant laws enacted by the United States Congress. A federal statute or law is an act or bill that has become part of the legal code through passage by Congress and approval by the President or congressional override. Although not always specified, many of these laws have been amended.

American Indian Religious Freedom Act (AIRFA) as amended (42 U.S.C. 1996)

Protects and preserves for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use, and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.

Americans with Disabilities Act of 1990

Provides a clear and comprehensive national mandate for eliminating discrimination against individuals with disabilities; for clear, strong, consistent, and enforceable standards addressing discrimination against individuals with disabilities; to ensure that the federal government plays a central role in enforcing the standards established in this act on behalf of individuals with disabilities; and to invoke the sweep of congressional authority, including the power to enforce the 14th amendment and to regulate commerce, to address the major areas of discrimination faced by people with disabilities.

Anderson-Mansfield Reforestation and Revegetation Act of October 11, 1949

Provides for the reforestation and revegetation of National Forest System lands and other lands under the administration or control of the Forest Service.

Antiquities Act of 1906 (16 U.S.C. 431–433)

Prevents the appropriation, excavation, injury, or destruction of any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the United States, without permission. Provides for permits, for misdemeanor-level penalties for unauthorized use, and authorizes the President to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon lands owned or controlled by the United States to be national monuments, and to reserve as a part thereof parcels of land needed for the proper care and management of the objects to be protected. The Archaeological Resources Protection Act has replaced the Antiquities Act as the authority for special-use permits if the resource involved is 100 years old or older.

Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469)

Also known as the Archaeological Recovery Act, this act amended and expanded the Reservoir Salvage Act of 1960 and was enacted to complement the Historic Sites Act of 1935 by providing for the preservation of significant scientific, historical, and archaeological data that might be lost or destroyed as the result of the construction of a federally authorized dam or other construction activity. This act also allows for any federal agency responsible for a construction project to appropriate a portion of project funds for archaeological survey, recovery, analysis, and publication of results.

Archaeological Resources Protection Act of 1979 as amended (16 U.S.C. 470 aa et seq.)

The act establishes permit requirements for removal or excavation of archaeological resources from federal and Indian lands. Provides criminal and civil penalties for the unauthorized excavation, removal, damage, alteration, defacement, or the attempted unauthorized removal, damage, alteration, or defacement of any archaeological resource more than 100 years of age found on federal or Indian lands. Prohibits the sale, purchase, exchange, transportation, receipt, or offering of any archaeological resource obtained from public lands or Indian lands. The act further directs federal land managers to survey land under their control for archaeological resources and create public awareness programs concerning archaeological resources.

Bald and Golden Eagle Protection Act of 1940, as amended

The act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald and golden eagles, including their parts, nests, or eggs. The act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Disturbance includes impacts that result from human-induced alterations in the nesting area even when eagles are not present. Sections 22.26 to 28 allow take of bald and golden eagles or their nests where it is unavoidable and where it is compatible with the continued preservation of the eagle. Permits for take are issued based on certain criteria such as, but not limited to, certifications, reporting, and monitoring.

Clean Air Act of August 7, 1977, as amended (1977 and 1990) 42 U.S.C. section 7401 et seq. (1970)

Enacted to protect and enhance the quality of the nation's air resources; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to state and local governments in connection with the development and execution of their air pollution prevention and control programs; and to encourage and assist the development and operation of regional air pollution prevention and control programs.

Clean Water Act

(See Federal Water Project Recreation Act of July 9, 1965, Federal Water Pollution Control Act and Amendments of 1972 (Clean Water Act))

Common Varieties of Mineral Materials Act of July 31, 1947

Authorizes the Secretaries of the Interior and Agriculture, under such rules and regulations as they may prescribe, to dispose of common variety mineral materials (including but not limited to sand, stone, gravel, pumice, pumicite, cinders, and clay) and vegetative materials (including but not limited to yucca, manzanita, mesquite, cactus, and timber or other forest products) on public lands of the United States, if the disposal of such materials is not otherwise expressly authorized by law, is not expressly prohibited by laws of the United States, and would not be detrimental to the public interest.

Cooperative Forestry Assistance Act of July 1, 1978

Authorizes the Secretary of Agriculture to assist in establishing a coordinated and cooperative federal, state, and local forest stewardship program for managing non-federal forest lands and forest lands in foreign countries.

Emergency Flood Prevention Act (Agricultural Credit Act) of August 4, 1978

Authorizes the Secretary of Agriculture to undertake emergency measures for runoff retardation and soil erosion prevention, in cooperation with landowners and users, as the Secretary deems necessary to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood, or other natural occurrence is causing or has caused a sudden impairment of that watershed.

Endangered Species Act of 1973, as amended

Authorizes the determination and listing of species as endangered and threatened; prohibits unauthorized taking, possession, sale, and transport of endangered species; authorizes the assessment of civil and criminal penalties for violating the act or regulations; and authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the act or any regulation issued thereunder. Section 7 of the act requires federal agencies to use their authorities to carry out programs for the conservation of endangered and threatened species and to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or adversely modify their critical habitat.

Energy Independence and Security Act of December 19, 2007

Reinforces the energy reduction goals for federal agencies put forth in Executive Order 13423, as well as introduces more aggressive requirements. The three key provisions enacted are the corporate average fuel economy standards, the renewable fuel standard, and the appliance or lighting efficiency standards.

Energy Policy Act of 2005

Requires the Secretary of Agriculture to ensure timely action on oil and gas permits, improve collection and retrieval of oil and gas information, and improve inspection and enforcement of permit terms (section 362).

Energy Security Act of June 30, 1980

Authorizes the Secretary of Agriculture to make available timber resources of the National Forest System, in accordance with appropriate timber appraisal and sale procedures, for use by biomass energy projects.

Federal Advisory Committee Act of October 6, 1972

Sets standards and uniform procedures to govern the establishment, operation, administration, and duration of advisory committees.

Federal Cave Resources Protection Act of November 18, 1988

Established requirements for the management and protection of caves and their resources on federal lands, including allowing land managing agencies to withhold the location of caves from the public, and requiring permits for any removal or collecting activities in caves on federal lands.

Federal Insecticide, Rodenticide, and Fungicide Act of October 21, 1972

Requires the administrator of the Environmental Protection Agency to prescribe standards for the certification of individuals authorized to use or supervise the use of any pesticide that is classified for restricted use; regulates the sale of restricted use pesticides; and provides penalties for the unauthorized use or sale of restricted use pesticides.

Federal Land Policy and Management Act of October 21, 1976

Requires that public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use. Also states that the United States shall receive fair market value of the use of the public lands and their resources unless otherwise provided for by law.

Federal Noxious Weed Act, 1974, as amended

Authorizes the Secretary of Agriculture to designate plants as noxious weeds by regulation; to prohibit the movement of all such weeds in interstate or foreign commerce except under permit; to inspect, seize and destroy products, and to quarantine areas, if necessary to prevent the spread of such weeds; and to cooperate with other federal, state and local agencies, farmers associations, and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds.

Federal Water Pollution Control Act and Amendments of 1972 (Clean Water Act)

Enacted to restore and maintain the chemical, physical, and ecological integrity of the Nation's waters. Provides for measures to prevent, reduce, and eliminate water pollution; recognizes, preserves, and protects the responsibilities and rights of states to prevent, reduce, and eliminate pollution, and to plan the development and use (including restoration, preservation, and enhancement) of land and water resources; and provides for federal support and aid of research relating to the prevention, reduction, and elimination of pollution, and federal technical services and financial aid to state and interstate agencies and municipalities for the prevention, reduction, and elimination of pollution. Established goals for eliminating water pollution; required all municipal and industrial wastewater to be treated before being discharged into waterways; increased federal assistance for municipal treatment plant construction; strengthened and streamlined enforcement policies; and expanded the federal role while retaining the responsibility of states for day-to-day implementation of the law.

Federal Water Project Recreation Act of July 9, 1965

Requires that recreation and fish and wildlife enhancement opportunities be considered in the planning and development of federal water development.

Fish and Wildlife Conservation Act of September 15, 1960

Requires the Secretaries of the Interior and Agriculture, in cooperation with state agencies, to plan, develop, maintain, and coordinate programs for the conservation and rehabilitation of wildlife, fish, and game on public lands under their jurisdiction.

Fish and Wildlife Coordination Act of March 10, 1934

Authorizes the Secretaries of Agriculture and Commerce to aid and cooperate with other federal and state agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes, and other polluting substances on wildlife.

The act also authorizes the preparation of plans to protect wildlife resources, the completion of wildlife surveys on public lands, and the acceptance by federal agencies of funds or lands for related purposes if land donations receive the consent of the state in which they are located.

Food, Conservation and Energy Act of 2008 (2008 Farm Bill) Public Law 110-246 Title VIII – Forestry, Subtitle A, B, and C

Subtitle A: Amendment to the Cooperative Forestry Assistance Act of 1978. Establishes national priorities for private forest conservation, a community forest and open space conservation program, and a Secretary-level forest resources coordinating committee.

Subtitle B: Cultural and Heritage Cooperation Authority. Authorizes the Secretary of Agriculture to provide forest products to Indian tribes for traditional and cultural purposes; to protect the confidentiality of certain information, including information that is culturally sensitive to Indian tribes; to utilize National Forest System land for the reburial of human remains and cultural items, including human remains and cultural items repatriated under the Native American Graves Protection and Repatriation Act; to prevent the unauthorized disclosure of information regarding human remains or cultural items reburied on National Forest System land; to ensure access to National Forest System land, to the maximum extent practicable, by Indians and Indian tribes for traditional and cultural purposes; to increase the availability of Forest Service programs and resources to Indian tribes in support of the policy of the United States to promote tribal sovereignty and self-determination; and to strengthen support for the policy of the United States of protecting and preserving the traditional, cultural, and ceremonial rites and practices of Indian tribes, in accordance with the American Indian Religious Freedom Act (42 U.S.C. 1996).

Subtitle C: Amendments to Other Forestry Related Laws. Amends the Lacey Act to include the illegal taking of plants, establishes an Emergency Forest Restoration Program, and renews authority and funding for the Healthy Forest Reserve Program.

Forest Highways Act of August 27, 1958

Requires that funds available for forest development roads and trails be used by the Secretary of Agriculture to pay for the costs of construction and maintenance thereof, including roads. Relevant Laws, Regulations, and Policies, and Other Sources of Information trails on experimental and other areas under Forest Service administration, or for adjacent vehicular parking areas and sanitary, water, and fire control facilities. Authorizes the Secretary of Agriculture to enter contracts with a state or civil subdivision thereof, and issue such regulations, as he or she deems desirable. See also Highways (23 U.S.C. Chapter 205 Forest development roads and trails).

Forest and Rangeland Renewable Resources Planning Act of August 17, 1974

Directs the Secretary of Agriculture to prepare a renewable resource assessment every 10 years; to transmit a recommended renewable resources program to the President every 5 years; to develop, maintain, and, as appropriate, revise land and resource management plans for units of the National Forest System; and to ensure that the development and administration of the resources of the National Forest System are in full accord with the concepts of multiple-use and sustained yield.

Freedom of Information Act of November 21, 1974

Governs which government records are released to the public, either automatically or upon request.

Granger-Thye Act of 1950

Authorizes range improvements from appropriated funds and allows the Forest Service to authorize grazing advisory boards and to issue grazing permits for periods not exceeding 10 years.

Healthy Forests Restoration Act of 2003 (H.R. 1904)

Purposes are to reduce wildfire risk to communities and municipal water supplies through collaborative hazardous fuels reduction projects; to assess and reduce the risk of catastrophic fire or insect or disease infestation; to enhance efforts to protect watersheds and address threats to forest and rangeland health (including wildfire) across the landscape; to protect, restore, and enhance forest ecosystem components such as biological diversity, threatened or endangered species habitats, and enhanced productivity.

Historic Sites Act of 1935 (16 U.S.C. 461)

Establishes a policy to preserve for public use historic sites, buildings, and objects of national significance for the benefit of the people. Authorizes the National Park Service's National Historic Landmarks Program.

Intergovernmental Cooperation Act of October 16, 1968 (31 U.S.C. 6505)

The act permits federal agencies to provide specialized or technical services to state and local units of government.

Land Acquisition Act of March 3, 1925

Authorizes the Secretary of Agriculture to purchase land for national forest headquarters, ranger stations, dwellings, or other sites required to effectively perform the authorized activities of the Forest Service.

Land and Water Conservation Fund Act of September 3, 1964

Authorizes the appropriation of funds for federal assistance to states in planning, acquisition, and development of needed land and water areas and facilities and for the federal acquisition and development of certain lands and other areas to preserve, develop, and assure accessibility to outdoor recreation resources.

Migratory Bird Treaty Act of 1918

Makes it unlawful to "take" migratory birds, their eggs, feathers, or nests. A migratory bird is any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle. Presidential Executive Order number 13186 additionally directs federal agencies to integrate bird conservation into agency activities and to design migratory bird habitat and conservation principles and practices into agency environmental planning.

Mineral Leasing Act of February 25, 1920

Provides that the deposits of certain minerals on land owned by the United States shall be subject to lease to citizens of the United States, provided royalties on such deposits are paid to the United States.

Mining Claims Rights Restoration Act of August 11, 1955

States that all public lands belonging to the United States that are withdrawn or reserved for power development or power sites shall be open to entry for location and patent of mining claims and mineral development, subject to certain conditions. Mining and Minerals Policy Act of December 31, 1970 states that it is the policy of the federal government to foster and encourage the development of

economically sound and stable domestic mining, minerals, metal, and mineral reclamation industries; the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction of industrial, security, and environmental needs; mining, mineral, and metallurgical research to promote the wise and efficient use of our natural and reclaimable mineral resources; and the study and development of methods for the disposal, control, and reclamation of mineral waste products and the reclamation of mined land.

Multiple-Use Sustained-Yield Act of June 12, 1960

States that it is the policy of Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes, and authorizes and directs the Secretary of Agriculture to develop and administer the renewable surface resources of the national forests for the multiple use and sustained yield of products and services.

National Environmental Policy Act of January 1, 1970

Directs all federal agencies to consider and report the potential environmental impacts of proposed federal actions and established the Council on Environmental Quality.

National 1990 Farm Bill (Title XII – Forest Stewardship Act) Act of November 28, 1990

Directs the Secretary of Agriculture to establish a competitive forestry, natural resources, and environmental grants program, and provides for other research programs.

National Forest Management Act of October 22, 1976

The National Forest Management Act reorganized, expanded, and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on National Forest System lands. The National Forest Management Act requires the Secretary of Agriculture to assess forest lands; develop a management program based on multiple-use, sustained yield principles; and implement a resource management plan for each unit of the National Forest System. It is the primary statute governing the administration of national forests.

National Forest Roads and Trails Act of October 13, 1964

Authorizes the Secretary of Agriculture to provide for the acquisition, construction, and maintenance of forest development roads within and near the national forests using appropriated funds, deposits from timber sale purchasers, cooperative financing with other public agencies, or a combination of these methods. The act also authorizes the Secretary to grant rights-of-way and easements over National Forest System lands.

National Historic Preservation Act of 1966 as amended (16 U.S.C. 470)

Sets forth the federal government's policy to preserve and protect historical and cultural resources. This act states that the historical and cultural foundations of the Nation should be preserved as a living part of the Nation's community life and development to give a sense of orientation to the American people. Directs all federal agencies to consider the effects of their undertakings (actions, financial support, and authorizations) on properties included in or eligible for the National Register. Establishes inventory, nomination, protection, and preservation responsibilities for federally owned historic properties. As amended, extends the policy in the Historic Sites Act to state and local historical sites as well as those of national significance, expands the National Register of Historic Places, establishes the Advisory Council on Historic Preservation and the State Historic Preservation Officers, and requires agencies to designate federal preservation officers. Establishes criteria for

designating tribal historic preservation officers to assume the functions of a State Historic Preservation Officer on tribal lands.

National Trails System Act of October 2, 1968 (16 U.S.C. 1241-1251)

Created a series of national trails "to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the Nation." The act and its subsequent amendments authorized a national system of trails and defined four categories of national trails. National scenic trails provide outdoor recreation and the conservation and enjoyment of significant scenic, historic, natural, or cultural qualities; national historic trails follow travel routes of national historic significance; national recreation trails are in, or reasonably accessible to, urban areas on federal, state, or private lands; and connecting or side trails provide access to or among the other classes of trails.

Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (25 U.S.C. 3001)

Provides a process for federal agencies to return Native American human remains, funerary objects, and sacred objects to the ancestors and appropriate Native American tribe. Includes provisions for the intentional excavation and unanticipated discovery of Native American cultural items on federal and tribal lands, and penalties for noncompliance and illegal trafficking. The act requires agencies to identify holdings of such remains and objects and to work with appropriate Native American groups toward their repatriation.

Oil and Gas Leasing Reform Act of 1987

Amended the Mineral Lands Leasing Act of 1920 regarding competitive leasing of oil and gas for onshore federal lands. Sets forth guidelines for implementing laws or regulations regarding lease sales and prohibits the issuance of oil or gas leases upon certain lands allocated or designated as wilderness.

Organic Administration Act of June 4, 1897

Authorizes the President of the United States to modify or revoke any instrument creating a national forest; states that no national forest may be established except to improve and protect the forest within its boundaries, for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States. Authorizes the Secretary of Agriculture to implement rules and regulations to regulate the use and occupancy of the national forests.

Pipelines Act of February 25, 1920

Authorizes the Secretary of the Interior or appropriate agency head to grant rights-of-way through any federal lands for pipeline purposes to transport oil, natural gas, synthetic liquid or gaseous fuels, or any refined product produced therefrom to any applicant possessing the qualifications provided in the act.

Public Buildings Cooperative Use Act of 1976

Authorizes the federal government to acquire and use space in suitable buildings of historic, architectural, or cultural significance, unless use of such space would not prove feasible and prudent compared with available alternatives. It encourages the location of commercial, cultural, educational, and recreational facilities and activities within public buildings. It provides and maintains space, facilities, and activities, to the extent practicable, which encourages public access to and stimulates

public pedestrian traffic around, into, and through public buildings, permitting cooperative improvements to and uses of the area between the building and the street, so that such activities complement and supplement commercial, cultural, educational, and recreational resources in the neighborhood of public buildings. Finally, it encourages the public use of public buildings for cultural, educational, and recreational activities.

Public Rangelands Improvement Act of October 25, 1978

Establishes and reaffirms the national policy and commitment to (1) inventory and identify current public rangeland conditions and trends; (2) manage, maintain, and improve the condition of public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process; (3) charge a fee for public grazing use that is equitable; and (4) continue the policy of protecting wild free-roaming horses and burros from capture, branding, harassment, or death, while at the same time facilitating the removal and disposal of excess wild free-roaming horses and burros that pose a threat to themselves, their habitat, and to other rangeland values.

Rehabilitation Act of 1973, as amended

States that it is national policy that the federal government plays a leadership role in promoting the employment of individuals with disabilities, and in assisting states and providers of services in fulfilling the aspirations of such individuals with disabilities for meaningful and gainful employment and independent living.

Religious Freedom Restoration Act (RFRA) (42 U.S.C. section 2000bb)

Government shall not substantially burden a person's exercise of religion even if the burden results from a rule of general applicability, except when the government demonstrates that application of the burden to the person is in furtherance of a compelling governmental interest; and is the least restrictive means of furthering that compelling governmental interest.

Rescissions Act of 1995

Directs the Forest Service to establish and adhere to a schedule for analysis and decisions on all grazing allotments where National Environmental Policy Act of 1969 compliance is required. Notwithstanding any other law, term grazing permits that expire or are waived before the National Environmental Policy Act analysis and decision pursuant to the schedule developed by individual Forest Service System units, shall be issued on the same terms and conditions and for the full term of the expired or waived permit. Upon completion of the scheduled National Environmental Policy Act analysis and decision for the allotment, the terms and conditions of existing grazing permits may be modified, if necessary, to conform to such National Environmental Policy Act analysis and subsequent decision.

Secure Rural Schools and Community Self-Determination Act of 2000

A portion of Forest Service funds generated through multi-use activities, such as grazing, timber production, and special use permits, is distributed to rural counties whose tax base was limited by the growing amount of federal land to help maintain local roads and schools. By the year 2000, after decades of declining agency revenues, Congress passed the Secure Rural Schools and Community Self Determination Act to help stabilize the funds available to rural counties. Payments (termed Payments in Lieu of Taxes) are divided into three distinct categories, or Titles: Title I for roads and schools, Title II for projects on federal lands, and Title III for county projects. Through this law, the Forest Service gives rural communities the means to build and improve schools, and provide road

maintenance, emergency services, and conservation programs for their citizens. Thus, communities are no longer dependent on federal timber sales from national forests to improve local schools and roads.

Sikes Act of October 18, 1974, as amended

Authorizes the Secretary of the Interior and the Secretary of Agriculture, in cooperation with state agencies, to develop, maintain, and coordinate programs on public lands under their jurisdiction for the conservation and rehabilitation of wildlife, fish, and game. Provides that no individual will be permitted to hunt, trap, or fish on any public land within the state, which is subject to a conservation and rehabilitation program under this section, unless he or she has a valid public land management stamp. Makes provisions for the issuance and sale of such stamps.

Small Tracts Act of January 22, 1983

Authorizes the Secretary of Agriculture to sell, exchange, or interchange by quitclaim deed all right, title and interest, including the mineral estate, of the United States in and to certain lands within the national forest when he or she determines it to be in the public interest.

Surface Mining Control and Reclamation Act of August 3, 1977

Authorizes the Secretary of Agriculture to enter into agreements with landowners, providing for land stabilization, erosion, and sediment control, and reclamation through conservation treatment, including measures for the conservation and development of soil, water, woodland, wildlife, and recreation resources, and agricultural productivity of such lands.

Timber Exportation Act of April 12, 1926

Authorizes the exportation of lawfully cut timber from the state or territory where grown if the supply of timber for local use will not be endangered and authorizes the Secretary to issue rules and regulations to carry out the provisions of the act.

Transfer Act of February 1, 1905

Transferred the management and control of the Forest Reserves from the General Land Office in the Department of the Interior to the Bureau of Forestry in the Department of Agriculture.

Tribal Forest Protection Act of 2004 (Public Law 108-278)

Authorizes the Secretary of Agriculture and the Secretary of the Interior to enter into an agreement or contract with Indian tribes meeting certain criteria to carry out projects to protect Indian forest land or rangeland.

U.S. Mining Laws (Public Domain Lands) Act of May 10, 1872

Provides that all valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are free and open to exploration and purchase, and the lands in which they are found to occupation and purchase by citizens of the United States and those who have declared their intention to become such, under regulations prescribed by law, and according to the local customs or rules of miners, so far as the same are applicable and not inconsistent with the laws of the United States. There are several acts that modify the mining laws as applied to local areas by prohibiting entry altogether or by limiting or restricting the use which may be made of the surface and the right, title, or interest which may pass through patent.

Wild Free-Roaming Horses and Burros Act of December 15, 1971 (As amended by Federal Land Policy Management Act of 1976 and Public Rangelands Improvement Act of 1978)

Protects wild free-roaming horses and burros from capture, branding, harassment, or death; and states they are to be considered in the area where presently found an integral part of the natural system of the public lands.

Wild and Scenic Rivers Act of October 2, 1968

Instituted the National Wild and Scenic Rivers System by designating the initial components of that system, and by prescribing the methods by which and standards according to which additional components may be added to the system from time to time.

Wilderness Act of September 3, 1964

Established the National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wildernesses" and administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness. Provides for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness. States that no federal lands shall be designated as "wildernesses" except as provided for in the act or by a subsequent act.

Youth Conservation Corps Act of August 13, 1970

Establishes a Youth Conservation Corps whom the Secretaries of the Interior or Agriculture may employ without regard to the civil service or classification laws, rules, or regulations for the purpose of developing, preserving, or maintaining the lands and waters of the United States.

Executive Orders

This section presents a partial listing of relevant Executive orders. Executive orders are official documents by which the President of the United States provides instructions to executive departments and agencies. An Executive order may be used to reassign functions among executive branch agencies. It may adopt guidelines, rules of conduct, or rules of procedure for government employees or units of government. It can also establish an advisory body or task force.

Executive Order 11593 Protection and Enhancement of the Cultural Environment, 1973

States that the federal government shall provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the Nation, and that federal agencies shall administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations. It initiates measures necessary to direct their policies, plans, and programs in such a way that federally owned sites, structures, and objects of historical, architectural, or archaeological significance are preserved, restored, and maintained for the inspiration and benefit of the people. Finally, in consultation with the Advisory Council on Historic Preservation, it institutes procedures to assure that federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures, and objects of historical, architectural, or archaeological significance.

Executive Order 11990 Protection of Wetlands, 1977

Requires each federal agency to provide leadership and to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for acquiring, managing, and disposing of federal lands and facilities; providing federally undertaken, financed, or assisted construction and improvements; and conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Executive Order 12862 Setting Customer Service Standards, 1993

Requires all executive departments and agencies that provide significant services directly to the public to provide those services in a manner that seeks to meet the customer service standard established in the order, and requires agencies to identify customers; survey customers and front-line employees to determine the kind and quality of services needed and barriers to those services; benchmark customer service performance against the best in the business; make information, services, and complaint systems easily accessible; and provide a means to address customer complaints.

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 1994)

Addresses environmental justice in minority and low-income populations and is designed to focus federal attention on the environmental and human health conditions in minority communities and low-income communities with the goal of achieving environmental justice. The order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority communities and low-income communities' access to public information on, and an opportunity for public participation in, matters relating to human health or the environment.

Executive Order 13007 Indian Sacred Sites, 1996

Requires each executive branch agency with statutory or administrative responsibility for the management of federal lands, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of sacred sites.

Executive Order 13112 Invasive Species, 1999

Ensures that federal programs and activities to control and prevent invasive species are coordinated, effective, and efficient. It defines invasive species as "…an alien (or non-native) whose introduction does or is likely to cause economic or environmental harm or harm to human health."

Executive Order 13175 Consultation and Coordination with Indian Tribal Governments, 2000

Promotes regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, strengthens the United States government-to-government relationships with Indian tribes, and reduces the imposition of unfunded mandates upon Indian tribes.

Executive Order 13186 Responsibility of Federal Agencies to Protect Migratory Birds, 2001

Directs federal agencies, as practicable, to support the conservation of migratory birds; restore and enhance the habitat of migratory birds; prevent or abate pollution or detrimental alteration of the environment for the benefit of migratory birds; ensure agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts such as Partners-in-Flight; ensure that environmental analyses of federal actions required by the National Environmental Policy Act evaluate effect on migratory birds; and promote research, education, and training related to conservation of migratory birds.

Executive Order 13195 Trails for America in the 21st Century, 2001

"Federal agencies will… protect, connect, promote, and assist trails of all types… This will be accomplished by… protecting the trail corridors associated with National Scenic Trails… to the degree necessary to ensure that the values for which [the] trail was established remain intact."

Executive Order 13287 Preserve America, 2003

Advances the protection, enhancement, and contemporary use of the historic properties owned by the federal government and promotes intergovernmental cooperation and partnerships for the preservation and use of historic properties. Directs federal agencies to increase their knowledge of historic resources in their care and to enhance the management of these assets. Encourages agencies to seek partnerships with state, tribal, and local governments and the private sector to make more efficient and informed use of their resources for economic development and other recognized public benefits. Better combines historic preservation and nature tourism by directing agencies to assist in the development of local and regional nature tourism programs using the historic resources that are a significant feature of many state and local economies.

Executive Order 13352 Facilitation of Cooperative Conservation, 2004

Ensures that the Departments of the Interior, Agriculture, Commerce, and Defense and the Environmental Protection Agency implement laws relating to the environment and natural resources in a manner that promotes cooperative conservation, with an emphasis on appropriate inclusion of local participation in federal decision-making, in accordance with their respective agency missions, policies, and regulations.

Executive Order 13423 Strengthening Federal Environmental, Energy, and Transportation Management, 2007

Directs federal agencies to conduct their environmental, transportation, and energy-related activities in support of their respective missions in an environmentally, economically, and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.

Executive Order 13443 Facilitation of Hunting Heritage and Wildlife Conservation, 2007

Directs federal agencies with programs and activities that have a measurable effect on public management, outdoor recreation, and wildlife management, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance, 2009

Expands on the energy reduction and environmental performance requirements for federal agencies identified in Executive Order 13423. The goal is to establish an integrated strategy toward sustainability in the federal government and to make reduction of greenhouse gas emissions a priority for federal agencies. Lays out numerical targets for agencies, sets non-numerical targets that agencies must reach, and calls for specific management strategies to improve sustainability.

Executive Order 13604 (Improving Performance of Federal Permitting and Review of Infrastructure Projects)

An initiative to modernize decision-making processes throughout the federal government through improved efficiency and transparency. On May 17, 2013, in following up on the Executive order, President Obama issued a Presidential Memorandum: "Modernizing Federal Infrastructure Review and Permitting Regulations, Policies, and Procedures" (The White House 2013). The memorandum highlighted the need for improved mitigation policies that provide project developers with greater predictability, facilitate landscape-scale mitigation and interagency mitigation plans (where appropriate), and enhance accountability, transparency, and effectiveness. The administration has charged the Forest Service with participating in this modernization effort.

Code of Federal Regulations

This section presents a partial listing of relevant regulations. Federal executive departments and administrative agencies write regulations to implement laws. Regulations are secondary to law. However, both laws and regulations are enforceable.

36 CFR 60 National Register of Historic Places

Establishes procedural requirements for listing properties on the National Register.

36 CFR 63 Determinations of Eligibility for Inclusion in the National Register of Historic Places

Developed to assist agencies in identifying and evaluating the eligibility of properties for inclusion in the National Register, and to explain how to request determinations of eligibility.

36 CFR 62 National Natural Landmarks Program

The procedures in this part establish the processes and criteria for identifying, evaluating, designating, and monitoring national natural landmarks.

36 CFR 65 National Historic Landmarks Program

Establishes criteria for establishing national significance and the procedures used by the Department of the Interior for conducting the National Historic Landmarks Program.

36 CFR 212 Travel Management

Establishes requirements for developing and administering the forest development transportation system.

36 CFR 219 Planning

Establishes a process for developing, adopting, and revising land and resource management plans for the National Forest System.

36 CFR 221 Timber Management Planning

Establishes requirements for management plans for national forest timber resources.

36 CFR 222 Range Management

Establishes requirements for range management on the national forests, and for the administration of wild and free-roaming horses and burros and their environment. See Subpart B (Management of Wild Free-Roaming Horses and Burros).

36 CFR 223 Sale and Disposal of National Forest System Timber

Establishes requirements relating to the sale and disposal of National Forest System timber.

36 CFR 228 Minerals

Establishes rules and procedures through which use of the surface of National Forest System lands, in connection with mining and mineral operations, shall be conducted to minimize adverse environmental impacts on National Forest System surface resources.

36 CFR 241 Fish and Wildlife

Establishes rules and procedures relating to the management, conservation, and protection of fish and wildlife resources on National Forest System lands.

36 CFR 251 Land Uses

Establishes rules and procedures relating to the use and occupancy of National Forest System lands.

36 CFR 254 Landownership Adjustments

Establishes rules and procedures relating to exchange and conveyance of National Forest System lands.

36 CFR 261 Prohibitions

Establishes general prohibitions relating to the use and occupancy of National Forest System lands.

- 36 CFR 261.7 Unauthorized Livestock

36 CFR 293 Wilderness-Primitive Areas

Establishes requirements for the administration of wilderness and primitive areas.

36 CFR 294 Special Areas

Establishes requirements for designation of inventoried roadless areas, providing lasting protection for landscapes within the National Forest System under multi-use management.

36 CFR 295 Use of Motor Vehicles Off Forest Development Road

Establishes rules and procedures relating to the administrative designation and location of specific areas and trails of National Forest System lands on which the use of motor vehicles traveling off national forest development roads is allowed.

- 36 CFR 295 Parts 212, 251, 261, 295 Travel Management, Designated Routes and Areas for Motor Vehicle Use; Final Rule

36 CFR 296 Protection of Archaeological Resources: Uniform Regulations

Implements the Archaeological Resources Protection Act by establishing the uniform definitions, standards, and procedures for federal land managers to follow in providing protection for archaeological resources located on public lands and Indian lands, including definitions of prohibited acts and penalties. The regulations also provide requirements for issuing permits under the authority of the Archaeological Resources Protection Act to any person proposing to excavate or remove archaeological resources from public lands or Indian lands.

36 CFR 297 Wild and Scenic Rivers

Establishes rules and procedures relating to federal assistance in the construction of water resources projects affecting wild and scenic rivers or study rivers on lands administered by the Secretary of Agriculture.

36 CFR 800 Protection of Historic Properties

Establishes provisions for the administration of the National Historic Preservation Act.

40 CFR 51.300-309 Regional Haze Rule

The primary purposes of this subpart are to require states to develop programs to assure reasonable progress toward meeting the national goal of preventing any future, and remedying any existing, impairment of visibility in mandatory class I areas which impairment results from human-made air pollution. It also establishes necessary additional procedures for new source permit applicants for states and federal land managers to use in conducting the visibility impact analysis required for new sources under section 51.166. This subpart sets forth requirements addressing visibility impairment in its two principal forms: “reasonably attributable” impairment (that is, impairment attributable to a single source or small group of sources), and regional haze (that is, widespread haze from a multitude of sources which impairs visibility in every direction over a large area).

40 CFR Parts 121-135 Water Programs

Establishes provisions for the administration of water programs including state certification of activities requiring a federal license or permit, Environmental Protection Agency-administered permit programs, state program requirements, procedures for decision making, criteria and standards for the National Pollutant Discharge Elimination System, toxic pollutant effluent standards, water quality planning and management, water quality standards, water quality guidance for the Great Lakes System, secondary treatment regulation, and, prior notice of citizen suits. See Title 40 (Protection of Environment), Chapter 1 (Environmental Protection Agency), subchapter D (Water Programs).

40 CFR 1500 Council on Environmental Quality

Council on Environmental Quality regulations implementing the National Environmental Policy Act.

43 CFR 3 Preservation of American Antiquities

Implements provisions of the Antiquities Act of 1906.

43 CFR 10 Native American Graves Protection and Repatriation Act Regulations

Implements provisions of the Native American Graves Protection and Repatriation Act of 1990.

49 CFR 24.102, 103, 104 Basic Acquisition Policies, Criteria for Appraisals, Review of Appraisals

Real property acquisition.

50 CFR 402 Regulations Governing Interagency Cooperation—Endangered Species Act of 1973, as amended

Interprets and implements the Endangered Species Act. Addresses forms of consultation (early, formal, informal, and emergency), conferencing, preparation of biological assessments, designation of lead agency, responsibilities of federal agency following issuance of a biological opinion, reinitiation of formal consultation, and irreversible or irretrievable commitment of resources.

State Regulations

New Mexico Administrative Code, Title 20, Chapter 2, Part 3. Ambient Air Quality Standards

New Mexico Administrative Code, Title 20, Chapter 2, Part 65. Smoke Management

New Mexico Administrative Code, Title 20, Chapter 6, Part 2. Ground and Surface Water Protection

New Mexico Administrative Code, Title 20, Chapter 6, Part 4. Standards for Interstate and Intrastate Surface Water

Forest Service Directives

The directives system is the primary basis for the management and control of all internal programs and serves as the primary source of administrative direction for Forest Service employees. The system sets forth legal authorities, management objectives, policies, responsibilities, delegations, standards, procedures, and other instructions. The Forest Service Manual contains legal authorities, goals, objectives, policies, responsibilities, instructions, and the necessary guidance to plan and execute assigned programs and activities. Forest Service Handbooks are directives that provide instructions and guidance on how to proceed with a specialized phase of a program or activity. Handbooks either are based on a part of the Forest Service Manual, or they incorporate external directives. Forest Service Manuals and applicable Forest Service Handbooks provide guidance only and do not provide required direction. A complete listing can be found in Forest Service Manuals and Forest Service Handbooks at http://www.fs.usda.gov/im/directives/.

References for Appendix D

Ganey 1988 and Gutiérrez et al. 1995 as cited in: U.S. Fish and Wildlife Service. 2012. Final Recovery Plan for the Mexican Spotted Owl (*Strix occidentalis lucida*), First Revision. U.S. Fish and Wildlife Service. Albuquerque, New Mexico, USA. 413 pp.

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