A GUIDE TO ADVOCATING FOR BEAVER RESTORATION IN NATIONAL FOREST PLANS

A GUIDE TO ADVOCATING FOR BEAVER RESTORATION IN NATIONAL FOREST PLANS

Suggested citation: Bates, S., T. Simpson, T. Heggen and L. Chandler. 2021. *A Guide to Advocating for Beaver Restoration in National Forest Plans.* Washington, DC: National Wildlife Federation.

Contributors: Sarah Bates (National Wildlife Federation), Taylor Simpson and Taylor Heggen (University of Montana Alexander Blewitt III College of Law), and Lowell Chandler (University of Montana W.A. Franke College of Forestry & Conservation).

Acknowledgments: This guide benefited from the involvement and input of a number of individuals and organizations. We would particularly like to thank the students engaged in the University of Montana Natural Resources Law Clinic under the supervision of Professor Sandi Zellmer for conducting much of the research on which the guide was based. We are also grateful for review and suggestions from the following individuals: Michael Anderson (The Wilderness Society), Prof. Martin Nie (University of Montana), Jon Haber (U.S. Forest Service, ret.), Lizzy Mckeag (Idaho Wildlife Federation), and Andrew Jakes (National Wildlife Federation). This guide complements, and is organized similarly to, the publication *A Guide to Advocating for Climate-Smart Restoration in National Forest Plans*, available at https://www.nwf.org/ClimateSmartForestPlans.

Cover: Incorporating beaver restoration into national forest plans will help ensure resilient watersheds in a warming West (Lolo National Forest, Montana). Photo: Sarah Bates

Available online at: NWF.org/BeaverForestPlans

National Wildlife Federation
1200 G Street, NW
Washington, DC 20005
www.nwf.org

TABLE OF CONTENTS

National forests provide more than 60 percent of the water supporting people living in the western U.S., along with fish and wildlife habitat, livestock forage, timber, recreation opportunities, and other valuable resources. Photo: Forest Service photo by Will Pattiz

INTRODUCTION

The National Forest System, which includes 175 national forests and grasslands spread across 193 million acres, is a vitally important network of public lands that plays a key role in sustaining wildlife, providing water resources, offering recreational opportunities, producing timber, forage, and other products, and offering economic and social benefits to local communities. Sustaining these lands and waters, while balancing multiple use objectives and evolving societal needs and expectations, requires careful planning and continued investment in responsible stewardship. To accomplish this, the U.S. Forest Service is required to prepare a national forest plan (also known as a *land management plan*) for each forest. These plans set the overall management direction for the forest and provide guidance for the design and execution of specific management actions.

In 2012, a new forest planning rule was adopted that replaced an outdated rule crafted in 1982. The new rule was designed to help the Forest Service proactively meet current and future needs, including by improving the agency's ability to respond to the growing risks from climate change. With an emphasis on restoring and maintaining healthy and resilient ecosystems, the new rule requires consideration of both climate adaptation (i.e., efforts to address the impacts of climate change on forests) and climate mitigation (i.e., efforts slow the pace of climate change) as well as use of best available science throughout the planning process. Forest plan revisions are expected to integrate measures to ensure ecological integrity through adaptive management in forest plans, including more agile agency responses to changing conditions, new scientific information, and experience gained through project implementation and monitoring.

The 2012 Planning Rule also provides for public involvement throughout the planning process. Revising and updating national forest plans represents a major investment of time and effort by Forest Service staff, partners, and stakeholders, and there are opportunities for public engagement during the three major phases of the planning process: assessment, plan development,

and monitoring. Although a few national forests already have updated their plans under the 2012 rule, most have yet to do so. As a result, many national forests are undergoing or will soon undergo comprehensive forest plan revisions.[1] Because forest plans typically are in effect for at least 15 years, stakeholder engagement and input in the planning process can have an enduring impact on the future of our national forests and our planet.

HOW TO USE THIS GUIDE

The purpose of this document is to help individuals and organizations effectively engage in the forest planning process to ensure that newly revised national forest plans incorporate affirmative and proactive language around beavers and beaver habitat restoration (collectively referred to in this guide as *beaver restoration*) into forest planning documents. And while there are many components and outcomes of national forest plans, our particular focus is on how these plans can help protect and restore ecological integrity by expanding the range of existing beaver populations in national forests, encouraging nonlethal controls to address conflicts with culverts and other human-built structures, and—where appropriate and supported by best available science—reintroducing beavers in suitable habitat. This guide provides both resources and sample language for individuals and organizations wishing to ensure that beaver restoration is included in ongoing forest plan revisions. We focus in particular on the western forests where beavers provide "natural climate solutions" by building dams that restore groundwaters, connect floodplains, and expand wetlands and riparian habitat—in short, creating a more resilient landscape in a warming West.

Public involvement can and should occur throughout the planning process, but this guide focuses especially on one particularly important phase: public review and comment on draft plans. Nonetheless, we cannot overemphasize the importance of early stakeholder engagement in the forest planning process—particularly during the scoping or assessment phase—to help ensure that planning teams have access to all relevant climate-related information and fully consider the risks posed by climate change to the forest and its many services. Importantly, collaboration across jurisdictional or ownership boundaries is critical for addressing climate risks. Engaging early and often can help stakeholders, Forest Service staff, and partners better understand each other's values, and facilitate the development of plans that address potential trade-offs, have stronger support, and lead to more effective implementation.

This guide starts with a brief summary of the benefits of beaver restoration, with which we assume most readers will already be familiar (additional resources at the end of the guide are available for those wishing to learn more). We then provide an overview of the laws and regulations that govern national forest planning, and discusses how beaver restoration can help the Forest Service achieve its legal mandates. This background will help you understand the process of forest planning and the context within which your participation will take place.

Following the legal and policy background, the guide provides recommendations for providing comments on particular plan components. Planning documents for individual forests will be different and may not have the exact components described here, but the materials in this guide will suggest appropriate places to include language pertaining to beavers and watershed health. At the start of each resource area is a brief overview of relevant science and literature pertaining to the positive impacts of beavers. These overviews provide relevant information to incorporate and cite for citizen comments and should be used to provide context for the suggested language that follows. Following each overview, we provide suggested language regarding beaver restoration to include in the forest plan's various plan components. Plan components are the specific sections of the planning documents that guide agency actions in the future and are discussed in more detail below.

[1] See the Land Management Plan Revision Schedule (current as of February 26, 2021) or Land Management Revision story map.

The final section of the guide describes appendices and environmental impact statements that accompany forest plan revision processes and suggests how to provide input to strengthen them.

Throughout the guide you will find citations to resources, many of which include links to the documents. All resources cited in the guide in short form are listed in full in the "Suggested Resources" section in Appendix A.

Although the language provided in this document is broadly applicable, it is important to frame your comments around the particular values and concerns in your forest planning process, and your priorities and concerns for beaver restoration.

Reviewing and commenting on a forest plan can be intimidating, given the document's size, complexity, and breadth of topics. But you don't need to be an expert to provide meaningful feedback, nor should you feel the need to comment on each and every plan element. By sharing your values and concerns, and by flagging parts of the plan where you feel beaver restoration should be given additional attention and consideration—as well as providing positive feedback where it has been well addressed—you will advance and inform a dialogue that helps support the development and implementation of more effective forest plans, supporting better management decisions for years to come.

Beaver dam on pond. Photo: Shutterstock

Beaver dam complexes provide year-round habitat for diverse birds, fish, and wildlife, and help sustain late-season stream flows for downstream water users. Photo: Dick Hutto

WHY ADVOCATE FOR BEAVER RESTORATION?

The North American Beaver (*Castor canadensis*) may be our most important partner in protecting and restoring western streams and watersheds. By building temporary dams on small streams, beavers slow down rainwater runoff and snowmelt. Among the many benefits, this replenishes groundwater and provides essential streamflows during the dry months in the late summer and fall to sustain year-round habitat for fish and wildlife, as well as downstream water users. In areas subject to flooding, beaver dams help hold water back and spread it across the floodplain. And, importantly, the "emerald refuges" created by beaver activity in arid lands protect valuable wildlife habitat when wildfires burn with increased intensity across western landscapes.

It's likely that North America was once home to 100–200 million beavers, who literally shaped the landscape in which they lived. Intensive market-driven trapping starting in the 1700s reduced these numbers dramatically, and today there are only about 10–15 million beavers in this historic range.

Keystone species are species whose influence on their environment is greatly disproportionate to their relative population size. Without beavers, the overall ecological integrity—including connectivity, structure, and function of the riparian zone—changes dramatically and ecosystem services become deeply impoverished. In the absence of beavers and their inherent knack for holding back water, runoff occurs

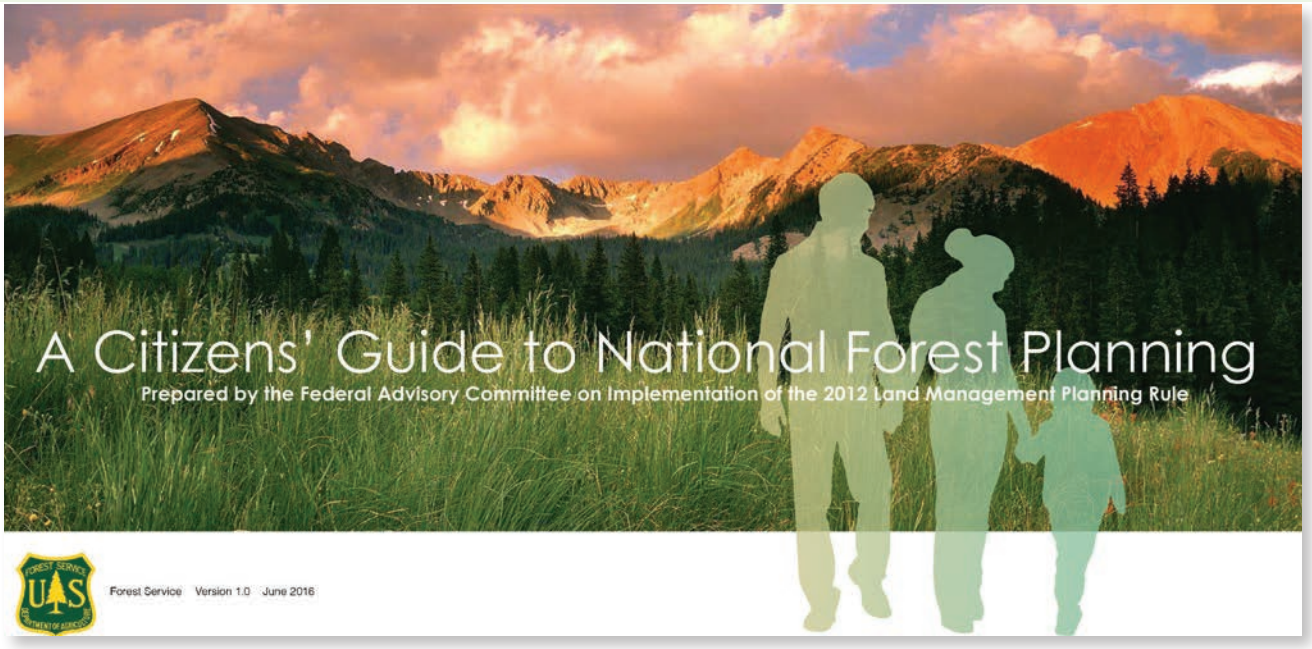
at a faster rate, causing stream channels to deepen and narrow, eventually cutting them off from their natural floodplain. This in turn negatively impacts fish, birds, amphibians, and other wildlife that depend on the regeneration and ecological integrity of wetlands and riparian areas. Beavers are often referred to as "ecosystem engineers" in recognition of their ability to shape their environment.

Fortunately, over the past several decades, public interest and scientific understanding of beavers' role in riparian and watershed health has expanded tremendously. In turn, public resource agencies, including the U.S. Forest Service and the U.S. Bureau of Land Management, are looking for opportunities to restore beavers—sometimes starting with using "beaver mimicry" or low-tech process-based restoration to create conditions that can support expanded beaver populations. In other cases, agency officials are working with state and tribal wildlife managers to relocate beavers into watersheds prioritized to achieve restoration goals. And in some cases, where beavers are present and creating problems by damming culverts or cutting trees adjacent to recreation sites, managers are working with experts in non-lethal controls to reduce conflicts and allow beavers to remain in the area, doing their good work.

This guide aims to support and encourage such actions by encouraging strong, proactive language in forest plans, which guide management actions over multiple decades. We created this guide after engaging productively in forest plan revision processes in Montana, Colorado, and New Mexico, and finding that the comment letters and materials we submitted were of interest and value to people engaged in revision processes elsewhere in the West.

Although forest plan revisions appear to be a slow means of achieving change, we have seen the benefit of recently revised language empowering innovative work on the ground by Forest Service hydrologists and fisheries biologists. Setting the stage for this support and direction is an important strategy in long-term beaver restoration on our public lands.

Close up of a beaver lodge sitting on a still lake surrounded by Water Lilies, Teton National Forest, Wyoming. Photo: Moment of Perception



The Forest Service's A Citizen's Guide to National Forest Planning *provides an overview of the forest planning process and opportunities for public input and engagement.*

PUBLIC INVOLVEMENT IN FOREST PLANNING

The 2012 Planning Rule requires opportunities for public involvement at each stage of the forest planning process. Opportunities for public involvement are well described in *A Citizens' Guide to National Forest Planning (Citizens' Guide),* a document created to "demystify" the planning process and provide interested stakeholders with helpful context and resources.[2] In addition to providing an excellent overview of the public involvement process, the *Citizens' Guide* reviews the goals of national forest planning efforts, discusses basic plan structure, and provides topical sections with key discussion points to consider. The *Citizens' Guide* also details how the forest planning process aligns with the National Environmental Policy Act process.[3] We strongly encourage you to review that guide and engage early and often in national forest planning efforts.

The forest planning process begins with an assessment phase, followed by plan development, a public comment period, revision and publication of the final plan, and then ongoing plan monitoring. Although there are opportunities for engagement throughout the planning process, our beaver restoration–focused guidance is oriented toward the plan development phase, with the intent of helping members of the public—both individuals and organizations—to provide substantive comments on draft forest plans. Such comments can play an important role in improving forest plans and ensuring that they reflect stakeholder expectations and values. While public involvement can, and ideally

In addition to providing an excellent overview of the public involvement process, the Citizens' Guide reviews the goals of national forest planning efforts, discusses basic plan structure, and provides topical sections with key discussion points to consider.

2 Federal Advisory Committee on Implementation of the 2012 Land Management Planning Rule. 2016. A Citizens' Guide to National Forest Planning. Washington, DC: U.S. Department of Agriculture, Forest Service.

3 See figure on p 25 of the *Citizens' Guide.*

The forest planning process is an opportunity for diverse stakeholders to provide input to the Forest Service and help shape management decisions for decades to come. Photo: Skip Kowalski

should, begin much earlier in the process, the public comment period can be a more accessible or feasible first level of engagement for many interested parties. Although this guide focuses on the review and comment phase, the information and principles presented here are also relevant to engagement in other aspects of the planning process.

ASSESSMENT

Engagement and input during the assessment phase can help forest planners identify sources of relevant information about beaver restoration as it relates to aquatic, watershed, and forest ecological integrity and connect with partners with relevant expertise to contribute to successful management direction. This engagement and relationship building can promote improved understanding among all participants and has the potential to lead to stronger draft plans that proactively address stakeholder concerns and interests. To meet the specific challenges of restoring the diversity and function of forest ecosystems, the assessment should account for past and ongoing monitoring and integrate the contributions of previous management strategies. Perhaps the most important role for public input in this phase is to ensure that the Forest Service is considering the best available scientific information regarding beaver restoration and related resource values, including projections of future climatic conditions and ecological change. Once brought to the agency's attention, they must take this information into account in the planning process. A robust climate vulnerability assessment is especially important to inform the assessment phase and serve as the basis for development of a climate-smart plan that includes natural climate solutions such as beaver restoration.[4]

PLAN DEVELOPMENT

Early in the plan development phase, the Forest Service must identify a "need for change" statement, which explains what parts of the existing plan should be revised, linking those changes to conditions and trends described in the assessment, and the desired future conditions for the national forest. As described in the

[4] See the Forest Service's Climate Change Vulnerability Assessments Across the Nation webpage for links to available assessments. USDA Climate Hubs and U.S. Geological Survey Climate Adaptation Science Centers are other key sources for relevant information and expertise on climate projections and vulnerability.

Citizens' Guide referenced above, "the need for change is a tool for focusing the planning phase on issues and resources that may need different direction than what is in the current plan." With ecological integrity and watershed resilience firmly embedded in the "need for change," plan components are more likely to support beaver restoration among priority strategies. The Forest Service must share a draft "need for change" statement for public comment prior to its finalization. This provides an important opportunity for the public input to ensure this foundational plan element adequately recognizes and incorporates these considerations.

To ensure that your expertise and interests are given full consideration, we recommend seeking opportunities to provide input throughout the plan development phase, which can take many forms, such as sharing key resources, engaging in field trips and discussions, and offering specific suggestions and recommendations. A simple phone call or note early on to the forest planning team leader can ensure you are on the contact list developed by the agency to share plan-related activities as they occur. From a procedural and legal perspective, however, submitting formal comments in response to the draft plan is key since such comments require a formal response by the Forest Service. After the Forest Service addresses all comments received on the draft plan and submits a revised plan and draft "record of decision," there is an opportunity to object (if necessary) before the plan is finalized. Importantly, only those who submitted substantive comments on the draft plan may object at this stage of the process, and those objections must relate to substantive comments previously submitted, unless the objections pertain to newly available information that was not part of the draft plan.

MONITORING

Once the plan is finalized and approved, the plan monitoring phase begins. The 2012 Planning Rule requires that plan revisions include both a "plan monitoring program" and a "broader-scale monitoring strategy." The plan monitoring program is intended to test assumptions made during the forest plan development process, and to assess progress in reaching the desired conditions described in the plan. To do so, forest plans are expected to pose monitoring questions that address eight required elements, including the status of watershed conditions, the status of focal and at-risk species, as well as "measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area."[5] The broader-scale monitoring strategy is intended to answer questions best addressed at larger geographic scales (broader than a single forest plan area), and typically are developed by the regional forester with input from the individual forests. Over the life of the forest plan, the Forest Service must collect data to evaluate and report on the plan's effectiveness and the need for possible plan amendments or adjustments. Required biennial monitoring is a key component of the adaptive management cycle and is expected to indicate whether changes may be warranted to the management actions, the monitoring program, or the plan itself. The monitoring reports also provide an important opportunity for ongoing public input and engagement during the plan implementation phase.

Required biennial monitoring is a key component of the adaptive management cycle and is expected to indicate whether changes may be warranted to the management actions, the monitoring program, or the plan itself. The monitoring reports also provide an important opportunity for ongoing public input and engagement during the plan implementation phase.

[5] See Box 1 on p. 13 for a list of all eight required elements for the plan monitoring program.

North American Beaver eating in Alaska. Photo: Frank Fichtmueller

LEGAL AND REGULATORY FRAMEWORK

Effectively commenting on national forest plan revisions requires at least a basic understanding of the legal and regulatory framework underpinning the development, revision, and use of these plans. Our intent here is not to provide an exhaustive review of the laws and regulations of national forest planning, but rather to highlight specific language from the National Forest Management Act (NFMA) and the 2012 Planning Rule that may be useful in advocating for climate-smart forest restoration during the plan revision process. Directly citing supporting language from NFMA and the 2012 Planning Rule strengthens public comments and provides a clear and direct legal basis for the Forest Service to address the values and concerns that you identify. For an overview of the laws governing wildlife conservation in the National Forest System and how beaver restoration helps fulfill those mandates, see "Restoring Beavers to Enhance Ecological Integrity in National Forest Planning" (Zellmer et al. 2018), listed in the resource list in Appendix A.

NATIONAL FOREST MANAGEMENT ACT

The NFMA of 1976 is the primary law governing administration and management of national forest lands and requires the development of forest plans. As a result, the Forest Service must abide by the foundational forest planning objectives described in this statute when developing or revising forest plans (16 U.S.C. § 1604(a)). In developing forest plans, the Forest Service is mandated to use a "systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences" (16 U.S.C. § 1604(b)). The Forest Service "shall provide for public participation in the development, review, and revision of land management plans" (16 U.S.C. § 1604(d)(1)) and revise plans "at least every fifteen years" (16 U.S.C. § 1604(f)(5)). The NFMA's consistency provision (16 U.S.C. § 1604(i)) requires that actions and projects undertaken by a forest be consistent with that forest's plan, highlighting

the importance of clear, substantive plan language pertaining to climate change in forest restoration. The Forest Service implements these requirements according to administrative regulations, the most recent being the 2012 Planning Rule (36 CFR Part 219).

2012 FOREST PLANNING RULE

Rules for implementing the planning requirements under NFMA were first formalized in 1982, with an update and revision finally adopted in 2012. Commonly referred to as the *2012 Planning Rule*, the agency's current regulations for implementing NFMA's planning requirements are found under 36 CFR Part 219. The planning rule was formalized during a period of heightened attention and interest in climate change within the agency, and among the explicit intentions of the rule is to allow "the Forest Service to adapt to changing conditions, including climate change" (36 CFR § 219.5(a)). The regulations contain several references that relate to and support the incorporation of climate considerations in forest restoration, summarized below.

- The regulation's preamble lists eight "purposes and needs," the first among these being to "emphasize restoration of natural resources to make our [National Forest System] lands more resilient to climate change, protect water resources, and improve forest health" (77 FR 21162, 21164).

- The purpose statement explains that "plans will guide management of [National Forest System] lands so that they are ecologically sustainable and contribute to social and economic sustainability; consist of ecosystems and watersheds with ecological integrity and diverse plant and animal communities; and have the capacity to provide people and communities with ecosystem services and multiple uses that provide a range of social, economic, and ecological benefits for the present and into the future" (36 CFR § 219.1(c)).

- The rule requires planners to "use the best available scientific information to inform the planning process" (36 CFR § 219.3).

- Assessments "shall identify and evaluate existing information relevant to…(3) System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of terrestrial and aquatic ecosystems in the plan area to adapt to change…(4) Baseline assessments of carbon stocks…(7) Benefits people obtain from the [National Forest System] planning area (ecosystem services)…[and] (10) Renewable and nonrenewable energy and mineral resources" (36 CFR § 219.6(b)).

- The rule provides mandates for both sustainability of ecosystems and the diversity of plant and animal species in the forest (36 CFR § 219.8 & 219.9). Accordingly, each plan must include components to maintain and restore ecosystem integrity and to maintain and restore the diversity of ecosystems and habitat throughout the plan area (36 CFR § 219.8).

    - Section 219.8 requires that plans "provide for social, economic, and ecological sustainability" and include components that "maintain or restore the ecological integrity of terrestrial and aquatic ecosystems…including plan components to maintain or restore structure, function, composition, and connectivity, taking into account…(IV) system drivers…and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of terrestrial and aquatic ecosystems in the plan area to adapt to change…(V) Wildland fire and opportunities to restore fire adapted ecosystems… (VI) Opportunities for landscape scale restoration" (36 CFR § 219.8(a)).

    - Section 219.9 mandates that plans "include plan components, including standards or guidelines, to maintain or restore the diversity of ecosystems and habitat types throughout the plan area" (36 CFR § 219.9(a)(2)).

Beaver restoration helps the Forest Service meet its regulatory requirements to achieve ecological integrity and increase resilience to climate change, as well as other adaptive management goals. The 2012 Planning Rule facilitated beaver restoration by providing increased attention to ecological integrity and, in particular, riparian areas dependent on beavers as a keystone species that provide for improved ecosystem function and health of riparian areas (USFWS 2018).

Several other statutes, regulations, and executive orders relate to and expand on the NFMA and 2012 Planning Rule, including the *Forest Service Manual*, Chapter 1920 (FSM 1920) and *Forest Service Handbook*, Section 1909.12 (FSH 1909.12).[6] However, language contained in the NFMA and 2012 Planning Rule is generally sufficient to support comments advocating for beaver restoration.

Moose and other big game benefit from riparian habitat created by beaver dams. Photo: Shutterstock

6 See Appendix A for a list of relevant statutes, regulations, and formal guidance.

Restoring beavers and expanding beaver habitat helps improve stream function and thus ecological integrity throughout the forest. Photo: Shutterstock

REVIEWING FOREST PLANS FROM A BEAVER RESTORATION PERSPECTIVE

The following section provides guidance for reviewing and commenting on draft forest plans from a beaver restoration perspective. Specifically, we focus on elements of the plans that are key to supporting management actions to expand the presence of beavers on the national forest in suitable habitats and address conflicts through non-lethal means when practical.

Forest planning documents have several required components, which together guide future projects, activities, and monitoring in the plan area. Plan components guide what future site-specific projects and activities may take place, where they can occur, and under what conditions. Required components include desired conditions, objectives, standards, and guidelines (see Box 1). The structure of plans can vary considerably from region to region and forest to forest. Plans generally offer *forest-wide* direction, describing desired conditions and management direction that applies to the entire plan area. Such forest-wide directions are complemented by plan components that apply to specific *geographic areas* and/or *management areas.*[7]

[7] *Geographic areas* are spatially contiguous areas within the planning area. *Management areas* are defined based on shared issues, management needs, and plan components (e.g., riparian habitats), but are not necessarily contiguous. A management area may occur in a single geographic area or across multiple geographic areas.

Box 1. Required Forest Plan Components

Desired Condition. Description of specific social, economic, or ecological characteristics toward which management of the land and resources should be directed. A vision for what the forest should look like as a result of plan implementation.

Objectives. Concise, measurable, and time-specific statements of a desired rate of progress toward achieving desired conditions.

Standards. Mandatory constraints on project and activity decision-making, established to help achieve or maintain the desired conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Guidelines. Mandatory constraints on project and activity decision-making that provide flexibility for different situations as long as the purpose of the guideline is met.

Goals. Optional broad statements of intent, other than desired conditions, that are usually related to process or interaction with the public.

Suitability of Land. Identification of land areas as suitable or not suitable for specific uses (such as timber or range production), based on the applicable desired conditions. Identification of suitability is not required for every resource or activity or for every acre of the plan area.

Source: Adapted from ***A Citizens' Guide to National Forest Planning*** (2016).

Plan components are typically provided for specific resources found within the specified areas. Forest plan organization varies, but resources are typically divided into two main categories: ecological sustainability and diversity, and social and economic sustainability. Below we provide relevant resource areas and their subcategories that may arise in forest planning revisions, along with recommended sample language from actual comment letters or recent national forest plan revision documents (the latter include links to the source).

WATERSHEDS AND AQUATIC RESOURCES

National forests provide essential water, much of which originates as snowpack and flows downstream to serve municipal, agricultural, and other human needs. Fish and wildlife depend on water directly for survival, and on the riparian habitat supported by water flowing through forest streams and stored underground. These important values are addressed in forest plan sections on watersheds and aquatic resources, both of which address the impacts of land management practices on water.

Watersheds are spatial units within landscapes that are defined by hydrology (how the various bodies of groundwater and surface water connect). The Forest Service has completed a baseline assessment of watershed conditions and has prioritized management actions to improve those conditions through a system called the Watershed Condition Framework. This information should appear in the forest plan Watershed section, with analysis of how to achieve desired conditions that will achieve identified watershed restoration priorities.

Beavers are keystone species whose primary influence is on aquatic and riparian habitats. Some of the benefits worth emphasizing in comments related to watersheds and aquatic resources include: "higher water tables; reconnected and expanded floodplains; more hyporheic exchange; more diversity and richness in the populations of plants, birds, fish, amphibians, reptiles, and mammals; and overall increased complexity of the riverine ecosystems," which contributes to high levels of species diversity (USFWS 2018, *Beaver Restoration Guidebook*, p vii, 4–5). As an example, the Custer-Gallatin National Forest documented two decades of ecological improvement attributable to beaver activity, including contributions to stream channel recovery and floodplain function (Scrafford 2017).

Further, beavers have proven to be a valuable tool for addressing the impacts of climate change on ecosystems, including increasing drought resiliency of streams (USFWS 2014) and providing refugia for wildlife during wildland fires and heat waves (Morelli 2016). It is these benefits which prompted the interagency Climate Change Adaptation and Beaver Management Team to conclude and recommend that the Forest Service should increase recognition of beavers in planning revisions (USFWS 2014). Additionally, in response to plan language about native fish–beaver interactions, the overwhelming scientific evidence is that native fish evolved in aquatic habitats shaped by beaver activity, and, in fact, beaver dams "might even provide a competitive advantage to certain native fish species relative to non-natives" and, regardless, "any detrimental effects of beaver dams on the [native fish] population[s] as a whole were negligible," and "at most" negative effects are "short-lived and localized, and have negligible long-term impacts" (USFWS 2018). (See also p 22–23 of *Caring for the Green Zone: Beaver—Our Watershed Partner.*)

The following are example categories with suggested language for desired conditions, goals, guidelines, and objectives, with references to language in recent forest plan documents, where applicable (other quotes are from comment letters submitted by the National Wildlife Federation on various national forest plan revisions):

Watershed

Desired Conditions

- "Beaver habitat (including wetlands and riparian areas), which benefit and enhance groundwater, surface water, and floodplain and riparian complexity, is present forestwide in suitable areas."

- "Beaver reintroduction, and the persistence of beaver habitat, contributes to channel recovery and floodplain function."

- "Physical channel characteristics are in dynamic equilibrium and are commensurate with the natural ranges of discharge and sediment load provided to a stream. Streams have the most probable form and the expected native riparian vegetation composition within the valley landforms they occupy; they function correctly without management intervention. Historically disturbed and degraded stream channels recover through floodplain development and establishment of riparian vegetation, and demonstrate stable channel geomorphic characteristics. Beaver reintroduction, and the persistence of beaver habitat, can contribute to channel recovery and floodplain function. As a result, roads, trails, and impervious surfaces minimally affect hydrologic processes within watershed."

Goals

- "To help improve instream flows and attenuate late summer flows, recolonization by beavers in the watershed is encouraged."

- "Federal, tribal, and state governments cooperate to identify possible stream areas for beaver reintroduction."

Guidelines

- "To support aquatic habitat quality and resiliency, beaver complexes (including wetlands and riparian areas) should be enhanced or maintained unless their activities directly threaten roads/other human developments, and where such is the case, non-lethal techniques are explored first."

- "To maintain ecological integrity and enhance climate resiliency, restoration of beavers to currently unoccupied but suitable habitat (either through translocation or natural recolonization) is facilitated in cooperation with national, state, and local partners."

- "Where conflicts with beaver habitat and roads and other human development arise in a watershed, resolution will be addressed through management strategies such as pond levelers, beaver deceivers, fencing, and other non-lethal strategies, including live-trapping and relocation. Lethal removal will only be considered after non-lethal strategy options have been exhausted."

- "Pursue collaboration with state wildlife management agencies to ensure that trapping in minimized in areas prioritized for beaver restoration."

- "Conduct a beaver restoration assessment in watershed drainages throughout the plan area."

Objectives

- "Allow and encourage beavers to recolonize in new areas throughout suitable watersheds, particularly in prioritized watersheds."

- "Over the next decade, occupied beaver habitat in priority watersheds will be expanded by 50%."

Riparian Management Zones

Desired Conditions

- "Riparian ecosystem composition, structure, and function is restored and enhanced by beaver habitat."

- "Riparian areas and wetlands are healthy, fully functioning ecosystems. Vegetation consists of desirable native species and age classes. Populations of riparian vegetation are diverse, vigorous, and self-perpetuating. Invasive species, including plants and animals, in riparian and wetland ecosystems are rare. There is sufficient vegetative cover to provide bank stability, trap and retain sediment, regulate temperature, and contribute to floodplain function. Riparian ecosystem composition, structure, and function can generally be restored and enhanced by beaver habitat."

Goals

"Through the use of beavers as keystone species, riparian vegetation is improved and diversified."

Guidelines

"Activities in riparian management zones should protect key riparian processes, including maintenance of stream bank stability, input of organic matter, temperature regimes, water quality, and beaver habitat."

Aquatic Habitat

Objectives

"Improve the habitat quality and hydrologic function of at least 20 miles of aquatic habitat during the life of the plan with a focus on streams with listed species or species of conservation concern. Activities include, but are not limited to, berm removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, channel reconstruction, beaver restoration and reintroduction, where possible."

FISHERIES

Several government agencies have endorsed beaver restoration a means of recovering native fish populations. For example, the National Marine Fisheries Service's recovery plan for coho salmon (*Oncorhynchus kisutch*) in northern California and southern Oregon includes a goal of increasing beaver abundance to ultimately increase channel complexity to benefit salmon. The plan states that "a beaver conservation plan could significantly enhance coho habitat in watersheds" (National Marine Fisheries Service 2014). The U.S. Fish and Wildlife Service lists

Half frozen ponds created by beavers on the Mohawk Lakes trail near Breckenridge, Colorado in the Rocky Mountains. Photo: Shutterstock

and then goes into great depth on many of the potential positive impacts of beavers on fish species in *The Beaver Restoration Guidebook.* Some of these impacts specifically mentioned in this document include: increased fish productivity/abundance, increased habitat, increased rearing and overwintering habitat, enhanced growth rates, and cold-water refuge during the warm summer months and low flows. This research is especially beneficial for commenters hoping to promote beaver restoration in regions like the Pacific Northwest where efforts to protect native salmon populations historically included the eradication of beavers. In addition to the U.S. Fish and Wildlife Service documents, numerous studies have determined and demonstrated similar impacts. A meta-analysis of available literature and expert opinion showed that benefits toward fish species were cited more than negative impacts. Other case studies have broken down the impacts of beavers on various fish species and determined that beavers have positive impacts for all cutthroat trout subspecies and many salmon species found in the Pacific Northwest region (Kemp 2012).

The 2012 Planning Rule states that "the responsible official shall identify and evaluate the existing information relevant to the plan area for the following: …(5) Threatened, endangered, proposed and candidate species, and potential species of conservation concern present in the plan area." Despite this language, beaver restoration is not often mentioned as a method to enhance native fish habitat restoration in forest plans. As such, responsibility falls on advocates to ensure that national forests are encouraged to seriously examine beaver restoration as means for conservation of native, often threatened salmonid species.

The following sample language exemplifies how to express these values:

Fisheries and Aquatic Habitats

Objectives

"Improve the habitat quality and hydrologic function of at least 20 miles of aquatic habitat during the life of the plan with a focus on streams with listed species or species of conservation concern. Activities include, but are not limited to, berm removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, channel reconstruction, and beaver restoration and reintroduction, where possible."

WILDLIFE

Beavers are a keystone species, meaning their importance to their environment is disproportionate to their general abundance. In other words, beavers provide foundational support to the biodiversity generally associated with riparian habitats. In particular, beavers provide critical support to fish by adding depth to shallow streams and slowing flow (Fitch 2016). Beaver ponds also moderate water temperatures through the release of cool groundwater, which provides critical flow when water temperatures begin to warm. For all these reasons, and because they actively shape their environment and the habitat for other species, beavers are also referred to as "ecosystem engineers."

The positive role that beavers play in improving the aquatic and riparian ecosystems of areas also has a significant effect on terrestrial animals, including terrestrial invertebrates, birds, and mammals. Numerous studies have shown "higher bird abundance and diversity associated with beaver activity" when compared with areas without beavers (WildEarth Guardians 2011). For example, beavers also "enhance habitat for other semi-aquatic mammals" such as muskrats and otters, and "create food for large mammals," such as elk and moose, as well as providing wildlife with drinking water during a drought (WildEarth Guardians 2011). Moreover, beaver habitat has been found to provide refugia for wildlife during wildland fires and heat waves (Morelli 2016).

The following are example categories with suggested language for goals and guidelines:

Goals

"Intergovernmental collaboration occurs to ensure that in priority watersheds or areas of high ecological importance where beaver expansion is prioritized or where beaver restoration efforts are in the preliminary stages, trapping beavers is closely regulated so as to not undermine restoration and ecological integrity efforts."

Guidelines

- "Pursue collaboration with state wildlife management agencies to ensure that trapping is minimized in beaver restoration areas."
- "Management actions should avoid disturbance to beaver habitat and beaver activity."
- "Conduct a beaver restoration assessment in watershed drainages throughout the plan area."
- "To reduce the negative impacts of fire on wildlife, reintroduction of beavers and persistence of beaver habitat should be employed to create natural firebreaks, increased humidity of drainages, and offer firefighters dispersed water storage reservoirs while fighting wildland fires."

INFRASTRUCTURE - ROADS AND TRAILS, BRIDGES, AND FACILITIES

While beavers bring with them a host of ecosystem benefits, they also have potential to present conflicts with infrastructure (culverts, power lines, roads, trails, facilities, etc.). Where conflicts are present or likely to occur, local managers should be trained in non-lethal conflict resolution techniques. (See *MTFWP Living With Beavers*). Further, where conflicts with new roads, trails, or facilities may occur with beaver-inhabited streams, the local manager should seek to avoid or mitigate those conflicts.

The inclusion of beavers in the planning phase of national forest infrastructure facilitates these positive management practices by ensuring best management practices such as culvert exclusions or pond levelers are considered before resorting to lethal means, which is likely a temporary measure and more expensive over time.

The following are example categories with suggested language for desired conditions, guidelines, and objectives related to infrastructure:

Desired Conditions

"The transportation system and its use have minimal impacts on resources including threatened and endangered species, species of conservation concern, heritage and cultural sites, water quality, and aquatic species and their habitat."

Objectives

"The [name of National Forest] cooperates with highway and other landowners to implement wildlife management tactics that allow for coexistence."

Guidelines

"Where a beaver and its damming practices have created a nuisance issue with a road, a trail, bridge, or facility, management must first exhaust non-lethal coexistence tools prior to issuing kill or relocation permits."

BENEFITS TO PEOPLE: MULTIPLE USES AND ECOSYSTEM SERVICES

In this section of a forest plan, you can advocate for inclusion of language that highlights the many ecosystem and watershed resiliency benefits of beavers. See the graphic below and more details at USFWS 2014 for examples of benefits such as groundwater recharge and connected floodplains, water quality improvements, and more. See also p 16–17 of *Caring for the Green Zone: Beavers—Our Watershed Partner*.

The following are example categories with suggested language for desired conditions and guidelines:

Cedar waxwings and other birds feed on insects in streamside willows. Photo: Shutterstock

Desired Conditions

"Water quality and quantity is sustained through maintenance or enhancement of ecosystem biodiversity and function, including through increased beaver activity, and watersheds are resilient to natural disturbance processes and changing climates."

Guidelines

"Encourage and restore beavers in watersheds to improve water quality and flows."

OTHER PLAN ELEMENTS OF INTEREST

Plan Monitoring Program

One of the major changes in the 2012 Planning Rule is the emphasis on adaptive planning and adaptive management. This process recognizes that uncertainty abounds in natural resource management, particularly when attempting to manage at the ecosystem level, and this is particularly important in an era of climate change. The 2012 Planning Rule requires a plan monitoring program that, at a minimum, addresses eight required elements (see Box 2). Several of these requirements support special attention to beavers in forest management.

Beavers provide for an excellent indicator of ecological integrity and watershed health, and therefore are appropriate to identify as focal species in this context. Focal species are to be "selected on the basis of their functional role in ecosystems" (36 CFR § 219.19). As noted in the 2012 Planning Rule and discussed by the 2012 Planning Rule Committee of Scientists, further criteria for selecting focal species include "the species' functional roles in the ecosystem and sensitivity to changing conditions, management activities, particular threats, or desired ecological conditions" (77 FR 21162-02; Schultz et al. 2013). As an ecosystem engineer, the beaver clearly fits this definition.

For example, in naming beavers as a focal species in its Forest Plan, the Rio Grande National Forest stated that beavers are "complementary" to other goals and desired conditions including gathering "information

Box 2. Required Elements of Plan Monitoring Program

Forest plans are expected to contain one or more monitoring questions that address the following topics.

- The status of watershed conditions
- The status of ecological conditions, including key characteristics of terrestrial and aquatic ecosystems
- The status of focal species, as defined in the forest plan
- The status of the ecological conditions necessary to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern
- The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives
- Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area
- Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities and social, economic, and cultural conditions
- The effects of management activities to determine that they do not substantially and permanently impair the productivity of the land

on trends in sedimentation, streamflow, riparian cover, and stream temperature [which] are all particularly relevant for the management and conservation of many aquatic and riparian species of conservation concern" (USDA 2017). Additionally, the Rio Grande National Forest Draft Plan provided a set of adaptive management questions for monitoring ecosystems, including: "Where other aquatic ecosystem indicators suggest potential restoration needs, are beavers absent, and if so, would beaver relocation be beneficial?" (USDA 2017).

In reviewing the plan monitoring program, consider whether the questions posed are likely to produce informative and management-relevant information, and whether they are sufficiently ambitious, and whether the approach for conducting the monitoring fully engages appropriate partners in other agencies, academia, and the private sector.

Plan Appendices

In addition to the areas listed above, it is important to review forest plan appendices for additional areas where language supporting beaver restoration can be encouraged, particularly appendices related to management approaches, possible actions, and vegetation management practices. Verify that relevant information in the appendices aligns with and does not contradict the main body of the plan. Importantly, language in the appendices does not carry the same weight as language in the actual planning document. As such, we advise advocating for language supportive of beaver restoration to be moved from the appendix into the actual planning document, if it is not already there. Such a statement in an actual comment letter might look similar to the following:

While the [specific directive] in Appendix X contains positive language, we do not believe that the appendices are an appropriate place for such commendable language that promotes beaver restoration. As such, we suggest that this directive be moved into the [specific section or sections] of the Draft Forest Plan.

Environmental Impact Statements

Where issues related to beaver restoration are mentioned in the draft forest plan, ensure that they are also mentioned in the accompanying environmental review document (Environmental Impact Statement, or EIS). If they are not, it could indicate that there is no actual intent to take the actions/approaches indicated in the plan. For example, where there is a desired condition for beavers to be present in historically occupied habitats to improve riparian habitat and watershed health, one should find corresponding language in the EIS that discusses management actions intended to expand beaver occupation in the plan area and to address conflicts with non-lethal means. In preparing your comments, always take the time to ensure that the EIS contains language that is consistent with, complements, and reinforces forest plan components.

Like the appendices, strong and substantive language included in the EIS will carry more weight if it is also included in the plan. As such, we advise advocating for language supportive of beaver restoration to be included in the actual planning document as well as in the EIS.

HOW TO FORMAT COMMENT LETTERS

Be assured that there is no right or wrong way to format comment letters. Although the planning process has formal requirements for the agency to follow, all timely comments received through the proper channels are taken into account. Nonetheless, with thousands of comment letters arriving for review, submitting a clear, well-supported letter is strategic and helpful. The Forest Service is required to base planning decisions on the best available science, so clear, consistent citations (ideally accompanied by easily copy–pasted URLs) are helpful and influential.

Beaver habitat provides natural firebreaks and refuge for fish and wildlife during heat waves and drought. Photo: Alec Underwood

CONCLUSION

This guide provides resources for offering public input and comments on national forest plan revisions, with a specific focus on beaver restoration. While the document focuses on commenting on prepared plans, the effect and influence of public involvement can be amplified by getting involved as early as possible in the planning process, well before the plan is written. This guide is by no means comprehensive, and it is important to note that each plan will be different. However, in general, most plans will likely include similar categories and opportunities to advocate for beaver restoration on national forest lands for the long-term benefit of forest health. We encourage you to peruse the suggested resources in Appendix A.

Effective participation in the forest plan revision process can be daunting, but it is a timely and valuable opportunity to make a difference. Although the National Forest Management Act requires that forest plans be revised at least every 15 years, this virtually never happens, and many plans remain in effect for decades. Thus, by engaging in the plan revision process when it does happen, and expressing your values and concerns to the Forest Service, your input will help shape management and conservation actions for many years into the future,

This document is intended to help you better understand the planning process as it relates to beaver restoration and turn your interests into strong, substantive comments. We caution you not to let the scale of this task nor the desire for perfection prevent you from getting involved with the process. And, after you contribute to the forest plan revision, we hope you will be motivated to stay involved as the plan is implemented, becoming part of a collaborative process for learning and adaptation. As climate change, expanding user pressures, and other influences continue affecting our national forests, your involvement in the forest planning process can truly make a difference in sustaining these vitally important lands now and into the future.

APPENDIX A: SUGGESTED RESOURCES

STATUTES, REGULATIONS, AND GUIDANCE

National Forest Management Act (NFMA). 1976. 16 U.S.C. §§ 1600–1687. Washington, DC: U.S. Department of Agriculture, Forest Service, Ecosystem Management Coordination (accessed May 10, 2021). https://www.fs.fed.us/emc/nfma/includes/NFMA1976.pdf and https://www.fs.fed.us/emc/nfma/includes/RPA_amended_by_NFMA_USCver.pdf

U.S. Department of Agriculture. 2016. USDA Building Blocks for Climate Smart Agriculture and Forestry: Implementation Plan and Progress Report. Washington, DC: U.S. Department of Agriculture (accessed May 10, 2021). https://www.usda.gov/sites/default/files/documents/building-blocks-implementation-plan-progress-report.pdf

U.S. Department of Agriculture. 2018. Strategic Plan FY 2018–2022. Washington, DC: U.S. Department of Agriculture (accessed May 10, 2021). https://www.usda.gov/sites/default/files/documents/usda-strategic-plan-2018-2022.pdf

U.S. Forest Service. 2012. National Forest System Land Management Planning, 36 CFR Part 219 [2012 Planning Rule]. Federal Register 77: 21162–21276. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5362536.pdf

U.S. Forest Service. 2015. Forest Service Manual (fsm) 1900, Chapter 1920—Land Management Planning Handbook. Washington, DC: U.S. Department of Agriculture (accessed May 10, 2021). https://www.fs.fed.us/cgi-bin/Directives/get_dirs/fsm?1900

U.S. Forest Service. 2015. Strategic Plan: 2015–2020. Washington, DC: U.S. Department of Agriculture (accessed May 10, 2021). https://www.fs.usda.gov/strategicplan

SELECTED FOREST PLAN REVISIONS

U.S. Department of Agriculture, Forest Service. 2017. Rio Grande National Forest: Draft Revised Land Management Plan. Monte Vista, CO: U.S. Department of Agriculture, Forest Service (accessed June 7, 2021). https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd560186.pdf

U.S. Department of Agriculture, Forest Service. 2018. Flathead National Forest Land Management Plan. U.S. Department of Agriculture, Forest Service, Northern Region (accessed May 10, 2021). https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd603502.pdf

U.S. Department of Agriculture, Forest Service. 2018. Helena - Lewis and Clark National Forest: Draft Revised Forest Plan. Helena, MT: U.S. Department of Agriculture, Forest Service (accessed June 7, 2021). https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd575231.pdf

BEAVER AND FOREST–RELATED LITERATURE

Baker, B.W., and E.P. Hill. 2003. Beaver (*Castor canadensis*). p 288–310. In: G.A. Feldhamer et al., eds. Wild Mammals of North America: Biology, Management, and Conservation, 2nd ed. Baltimore: Johns Hopkins University Press. https://www.beaverinstitute.org/wp-content/uploads/2021/03/Beaver-Wild-Mammals-of-North-America-Biology-Management-and-Conservation-Second-Edition.pdf

Baldwin, J. 2013. Problematizing beaver habitat identification models for reintroduction application in the western United States. Yearbook of the Association of Pacific Coast Geographers 75: 104–120. https://www.jstor.org/stable/24043391

Baldwin, J. 2015. Potential mitigation of and adaptation to climate-driven changes in California's highlands through increased beaver populations. California Fish and Game 101(4): 218–240. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=113244&inline

Baskin, Y. 1997. Work of Nature: How the Diversity of Life Sustains Us. Washington, DC: Island Press. https://asknature.org/strategy/habitat-mosaics-stop-fires/#.W7rHTJNKjPA

Boyles, S.L. 2006. Report on the Efficacy and Comparative Costs of Using Flow Devices to Resolve Conflicts with North American Beavers along Roadways in the Coastal Plain of Virginia. Newport News, VA: Christopher Newport University. https://martinezbeavers.org/wordpress/wp-content/docs/VAReport2006-1.pdf

ECONorthwest. 2011. The Economic Value of Beaver Ecosystem Services: Escalante River Basin, Utah. Eugene, OR: ECONorthwest. https://www.beaverinstitute.org/wp-content/uploads/2017/08/BeaverEconomicValue2011.pdf

Fitch, L. 2016. Caring for the Green Zone: Beaver—Our Watershed Partner. Lethbridge, AB: Cows and Fish - Alberta Riparian Habitat Management Society. https://cowsandfish.org/wp-content/uploads/BeaverOurWatershedPartnerWEB.pdf

Fouty, S. 2008. Climate change and beaver activity: How restoring nature's engineers can alleviate problems. Beaversprite (Spring 2008): 4, 5, 13. http://nebula.wsimg.com/caccb19b864c7fc9fe4b4dbab1721636?AccessKeyId=2CD06EEF7CF6FD29860F&disposition=0&alloworigin=1

Goldfarb, B. 2018. Eager: The Surprising, Secret Life of Beavers and Why They Matter. White River Junction, VT: Chelsea Green Publishing.

Goldfarb, B. 2018. Beavers, rebooted. Science 360(6393): 1058–1061. https://doi.org/10.1126/science.360.6393.105

Kemp, P.S., T.A. Worthington, T.E.L. Langford, A.R.J. Tree, and M.J. Gaywood. 2012. Qualitative and quantitative effects of reintroduced beavers on stream fish. Fish and Fisheries 13(2): 158–181. https://doi.org/10.1111/j.1467-2979.2011.00421.x

Maughan, R. 2013. Beaver Restoration Would Reduce Wildfires. The Wildlife News (accessed June 9, 2021). http://www.thewildlifenews.com/2013/10/25/beaver-restoration-would-reduce-wildfires/

Montana Fish, Wildlife & Parks. 2021. Living With Beavers: Management. Helena: Montana Fish, Wildlife & Parks (accessed June 9, 2021). https://fwp.mt.gov/conservation/living-with-wildlife/beavers

Morelli, T.L., C. Daly, S.Z. Dobrowski, et al. 2016. Managing climate change refugia for climate adaptation. PLoS One 11(8): e0159909. https://doi.org/10.1371/journal.pone.0159909

National Advisory Committee for Implementation of the National Forest 2012 Planning Rule. 2016. Programmatic Overview of Implementation of the Rule – Measuring Success (accessed June 9, 2021). https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd545142.pdf

National Marine Fisheries Service. 2014. Final Recovery Plan for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of Coho Salmon (Oncorhynchus kisutch). Arcata, CA: National Marine Fisheries Service. https://repository.library.noaa.gov/view/noaa/15985

Schultz, C.A., T.D. Sisk, B.R. Noon, and M.A. Nie. 2013. Wildlife conservation planning under the United States Forest Service's 2012 Planning Rule. Journal of Wildlife Management 77(3): 428–444. https://doi.org/10.1002/jwmg.513

Scrafford, M.A., D.B. Tyers, D.T. Patten, and B.F. Sowell. 2017. Beaver habitat selection for 24 yr since reintroduction north of Yellowstone National Park. Rangeland Ecology & Management 71(2): 266–273. https://doi.org/10.1016/j.rama.2017.12.001

Stabler, F. 1985. Increasing summer flow in small streams through management of riparian areas and adjacent vegetation: A synthesis. p 206–210. In: R.R. Johnson et al., technical coordinators. Riparian Ecosystems and Their Management: Reconciling Conflicting Uses. General Technical Report RM-120. Fort Collins, CO: U.S. Department of Agriculture,

Forest Service, Rocky Mountain Forest and Range Experiment Station (accessed June 9, 2021). https://www.fs.fed.us/rm/pubs_rm/rm_gtr120/rm_gtr120_206_210.pdf

U.S. EPA. 2016. Wetland Protection and Beaver Habitat Restoration as Climate Adaptation Tools in New Mexico (accessed June 9, 2021). https://www.epa.gov/sites/production/files/2016-12/documents/nm_wetlands_and_beaver_12_16_16_final.pdf

U.S. Fish and Wildlife Service. 2014. Report of the Climate Change Adaptation and Beaver Management Team to the Joint Implementation Working Group Implementing the National Fish, Wildlife, and Plant Climate Change Adaptation Strategy (accessed June 9, 2021). https://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Documents/BeaverClimateReportJIWG.pdf

U.S. Fish and Wildlife Service. 2018. The Beaver Restoration Guidebook 2.01: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Portland, OR: U.S. Fish and Wildlife Service (accessed June 9, 2021). https://www.fws.gov/oregonfwo/Documents/2018BRGv.2.01.pdf

Wade, A.A., C. Brick, S. Spaulding, T. Sylte, and J. Louie. 2016. Watershed Climate Change Vulnerability Assessment: Lolo National Forest. Publication R1-16-05. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Region and Lolo National Forest (accessed June 9, 2021). https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd506291.pdf

Weber, N., N. Bouwes, M.M. Pollock, et al. 2017. Alteration of stream temperature by natural and artificial beaver dams. PLoS One 12(5): e0176313. https://doi.org/10.1371/journal.pone.0176313

WildEarth Guardians. 2011. Beaver and Climate Change Adaptation in North America: A Simple Cost-Effective Strategy. Santa Fe, NM: WildEarth Guardians (accessed June 9, 2021). http://pdf.wildearthguardians.org/site/DocServer/Beaver_and_Climate_Change_Final.pdf

Wurtzeback, Z., and C. Schultz. 2016. Measuring ecological integrity: History, practical applications, and research opportunities. BioScience 66(6): 446–457. https://doi.org/10.1093/biosci/biw037

Zellmer, S.B., S.F. Bates, and J. Brown. 2018. Restoring beavers to enhance ecological integrity in National Forest planning. Natural Resources and Environment 33: 1–7. https://www.beaverinstitute.org/wp-content/uploads/2020/02/NRE-Beaver-Article-2019.pdf

APPENDIX B: SAMPLE COMMENT LETTER

[excerpted from full letter submitted in 2019]

BEAVER RESTORATION TO ENSURE WATERSHED AND RIPARIAN HEALTH

The National Wildlife Federation (NWF) applauds the Santa Fe National Forest (SF NF) Draft Land Management Plan (the Plan)[8] for including recognition of beaver restoration as an important part of its watershed and aquatics strategy; however, there are several areas of the planning document that could be improved to more fully comply with the 2012 National Forest Planning Rule's requirements for climate resiliency and ecological integrity, as well as to reflect current scientific research and practical experience. Accordingly, NWF recommends modification of the Plan to strengthen the attention given to the ecological and economic value[9] that beavers have on the SF NF ecosystem, as well as downstream users. Specifically, the Plan should more explicitly facilitate and prioritize restoration of beavers to unoccupied but suitable habitat.

The North American beaver (*Castor canadensis*) has immense influence over its environment—beavers' extensive instream structures create and enhance habitats for native fish, birds, amphibians, and mammals by contributing to ecological integrity, including connectivity, structure, and function of riparian zones and watersheds—while at the same time mediating the impacts of climate change on mountain snowpack and runoff. As a result of these influences, beavers are referred to as "ecosystems engineers" and considered to be a "keystone species."[10] After European settlement of North America, beavers were nearly extirpated from their relatively ubiquitous distribution across the continent by the fur trade. While populations have recovered throughout North America, they remain absent in much of their historically occupied territory.[11] In the absence of this keystone species, overall ecological integrity changes dramatically and ecosystem services are deeply impoverished: water runs off faster, streams become narrower and more channelized, and the water table drops—reducing the availability of water for fish, birds, amphibians, and other wildlife.[12] The impact has been aptly characterized as "an aquatic Dust Bowl."[13] NWF's focus

8 Santa Fe National Forest, Draft Land Management Plan. 2019. MB-R3-10-28. USFS, Southwestern Region. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd640112.pdf

9 For an example of economic value, see ECONorthwest. 2011. The Economic Value of Beaver Ecosystem Services: Escalante River Basin, Utah. Eugene, OR: ECONorthwest. p 49–51, tables 22–24. https://www.beaverinstitute.org/wp-content/uploads/2017/08/BeaverEconomicValue2011.pdf

10 Baker, B.W., and E.P. Hill. 2003. Beaver (Castor canadensis). In: Wild Mammals of North America: Biology, Management, and Conservation, 2nd ed. Baltimore: Johns Hopkins University Press. p 297. A keystone species is one that greatly influences the species composition and physical appearance of ecosystems and whose effects on ecosystem structure and function are both large overall and disproportionately large relative to its abundance. An ecosystem engineer is a species that directly or indirectly controls resource availability by causing "physical state changes in biotic or abiotic materials." The beaver is a definitive example of both a keystone species and an ecosystem engineer.

11 Baker, B.W., and E.P. Hill. 2003 Beaver (Castor canadensis). In: Wild Mammals of North America: Biology, Management, and Conservation, 2nd ed. Baltimore: Johns Hopkins University Press. p 288–289. https://www.beaverinstitute.org/wp-content/uploads/2021/03/Beaver-Wild-Mammals-of-North-America-Biology-Management-and-Conservation-Second-Edition.pdf

12 See generally, U.S. Fish and Wildlife Service. 2018. The Beaver Restoration Guidebook 2.01: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Portland, OR: U.S. Fish and Wildlife Service. https://www.fws.gov/oregonfwo/Documents/2018BRGv.2.01.pdf

13 Goldfarb, B. 2018. Eager: The Surprising, Secret Life of Beavers and Why They Matter. White River Junction, VT: Chelsea Green Publishing.

on encouraging beaver restoration and reintroduction is grounded in these profound positive impacts of beavers on ecological integrity on our National Forests.

Restoring beavers—and the function of their activity through a variety of mimicry techniques—is an increasingly widespread restoration practice, especially in the American West. Ultimately, these mimicry dams can lure beavers back to suitable habitat.[14] Both non-government groups as well as government agencies have successfully employed this practice. The Big Hole Watershed Committee, based in Divide, Montana, has installed over 300 beaver mimicry structures on California Creek to return the creek to a perennial system.[15] The U.S. Forest Service has also embraced this approach in many locations, citing benefits to fisheries, water quality and climate resilience. We encourage the SF NF to also embrace this approach and reflect this in the planning documents.

In addition to areas of the Draft Revised Forest Plan that NWF supports, we request that the SF NF affirmatively adopt substantive plan components that prioritize and set specific goals for restoring beavers and beaver habitat, as outlined below. The beneficial and self-sustaining contributions of beavers should be an essential element of climate adaptation and watershed restoration and management in the SF NF Forest Plan. Beaver should be included as the "coarse filter" component to ensure ecological conditions within the SF NF recover and maintain viable populations of wildlife species. We request that the SF NF analyze and include the following recommendations in the SF NF Revised Forest Plan.

A. Background on Regulatory Requirements

The 2012 Planning Rule requires an explicit focus on maintaining ecological integrity through restoration of natural resources and making National Forests more resilient, particularly in response to the impacts attributed to climate change. Specifically, the 2012 Planning Rule states: "[A] planning rule must… Emphasize restoration of natural resources to make our NFS lands more resilient to climate change, protect water resources, and improve forest health."[16]

Ecological integrity is defined as the quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influences.[17]

The Federal Advisory Committee on the 2012 Planning Rule put forth a series of questions for the Forest Service to consider when determining whether revised forest plans meet the requirements and intent of the 2012 Planning Rule.[18] Regarding ecological integrity, the question is how well the plan provides for the maintenance and restoration of the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area, including structure, function, composition, and connectivity.

---

14 Peterson, C. 2019. Beaver Mimicry Projects Could Be Key to Restoring Wetlands. Arlington, VA: The Nature Conservancy. www.nature.org/en-us/about-us/where-we-work/united-states/idaho/stories-in-idaho/beaver-mimicry-projects-could-be-key-to-restoring-wetlands/

15 Big Hole Watershed Committee. 2018. California Creek Restoration. Divide, MT: Big Hole Watershed Committee. https://bhwc.org/project/california-creek/

16 National Forest System Land Management Planning (hereafter, "2012 Planning Rule"). 2012. Federal Register 77(68): 21162-01, 21164. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5362536.pdf

17 36 CFR § 219.19.

18 National Advisory Committee for Implementation of the National Forest 2012 Planning Rule. April 18, 2016. Programmatic Overview of Implementation of the Rule–Measuring Success. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd545142.pdf

The 2012 Planning Rule further says the plan must provide for social, economic, and ecological sustainability within Forest Service authority. This includes plan components applicable to the plan area, such as standards or guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area.[19]

The plan components must aim to "maintain or restore structure, function, composition and connectivity."[20] Key attributes of composition may be based on the presence and activity of a species, such as beaver, that provides essential structural or functional roles in the ecosystem (focal species).[21]

In addition to the 2012 Planning Rule, Forest Service guidance documents require managers to respond to climate change by taking proactive management actions to increase ecosystem adaptation and resiliency. The *Forest Service Strategic Framework for Responding to Climate Change* establishes a primary goal to increase ecosystem adaptation to climate change by "[e]nhanc[ing] the capacity of forests and grasslands to adapt to the environmental stresses of climate change and maintain ecosystem services."[22] A principal strategy to achieve this goal is through "facilitated adaptation," which takes "[a]nticipatory actions intended to prevent serious disruptions due to changing climate [which] may include… assisted migration of species to suitable habitat… or construction of new water storage facilities."[23] The *Forest Service Manual* also promotes ecological integrity and climate change resilience through collaborative, science-informed development, revision, or amendment of land management plans.[24] Between these three governing documents, it is abundantly clear that the Forest Service has a responsibility to manage National Forest lands so they are adaptive and resilient and have the ecological integrity necessary to ensure survival and essential ecosystems services.

B. The Role of Beavers

Overall, emphasizing beavers and beaver habitat in the SF NF Revised Plan serves to help the SF NF meet its regulatory requirements by promoting and enhancing ecological integrity and increasing the climate resiliency of habitats. The extensive, positive ecological impacts of beavers, supported by a growing body of literature, create complex and diverse environments that are more resilient to disturbance and better able to adapt to impacts of climate change. The contributions of beavers will aid the SF NF in meeting its obligations regarding ecological integrity and responding to climate change under the 2012 Planning Rule and Forest Service guidance documents.[25]

i. Ecological Integrity

By restoring beavers to suitable unoccupied habitat, ecological integrity will be restored to SF NF's riparian areas and watersheds. Some of the benefits include: "higher water tables; reconnected and expanded floodplains; more hyporheic exchange; more diversity and richness in the populations of plants, birds, fish,

19 36 CFR § 219.8(a)(1).

20 Ibid.

21 Wurtzeback, Z., and C. Schultz. 2016. Measuring ecological integrity: History, practical applications, and research opportunities. BioScience 66(6): 446–457. https://doi.org/10.1093/biosci/biw037

22 U.S. Department of Agriculture, Forest Service. 2008. Strategic Framework for Responding to Climate Change, Version 1.0. USDA, Forest Service, Climate Change Advisor's Office. p 7. https://www.fs.fed.us/climatechange/documents/strategic-framework-climate-change-1-0.pdf

23 Ibid., p 4.

24 U.S. Department of Agriculture, Forest Service. 2015. Forest Service Manual: FSM 1900 - Planning, 1921.02–1921.03. Washington, DC: USDA, Forest Service. https://www.fs.fed.us/im/directives/fsm/1900/wo_1920 - Land Management Planning.doc

25 See, e.g., Goldfarb, B. 2018. Beavers, rebooted. Science 360(6393): 1058–1061. https://doi.org/10.1126/science.360.6393.105; see also U.S. EPA. 2016. Wetland Protection and Beaver Habitat Restoration as Climate Adaptation Tools in New Mexico. https://www.epa.gov/sites/production/files/2016-12/documents/nm_wetlands_and_beaver_12_16_16_final.pdf; see also Fouty, S. 2008. Climate change and beaver activity: How restoring nature's engineers can alleviate problems. Beaversprite (Spring 2008): 4, 5, 13. http://nebula.wsimg.com/caccb19b864c7fc9fe4b4dbab1721636?AccessKeyId=2CD06EEF7CF6FD29860F&disposition=0&alloworigin=1

amphibians, reptiles, and mammals; and overall increased complexity of the riverine ecosystems."[26] Ultimately, the ecosystem engineering of beavers will result in higher levels of species diversity.[27]

Studies on beaver reintroduction conducted in the Custer-Gallatin National Forest have documented two decades of positive habitat changes attributable to the activity of this "ecosystem engineer" in the Absaroka-Beartooth Wilderness.[28] Twenty-four years of data following beaver reintroduction in the Absaroka-Beartooth Wilderness show that beaver habitat can contribute to channel recovery and floodplain function, among many other benefits.[29] The success of beaver reintroduction within the Absaroka-Beartooth Wilderness should serve as motivation for beaver restoration throughout the SF NF. This initiative will further increase ecological integrity and help SF NF manage for the protection of at-risk species.

ii. Climate Change

As previously mentioned, beavers are a valuable tool for addressing the impacts of climate change on ecosystems. Beaver dams help offset climate change impacts on watersheds by:

1. reducing peak streamflows and "spread[ing] flows over longer time periods";
2. improving drought resilience and water storage through increased water retention throughout the watershed, recharge of groundwater, and rehydration of degraded riparian ecosystems;
3. stabilizing water temperatures through "expand[ing] the presence of riparian plant communities and reduc[ing] sediment levels" and storing "groundwater that returns to streams," which contributes to water temperature stability;
4. improving water quality through "sediment reduction and retention of water within a watershed as part of surface water or groundwater."[30]

Resulting from climate change, snowmelt is occurring at higher rates in the Northern Rockies. Beaver dams are able to attenuate flood peaks by retaining water behind dams and in the subsurface, and can "reduce the magnitude of moderate flood events"[31] and "help dissipate the energy of large flood events." Another important factor to the ecological health and resiliency of the SF NF and New Mexico's economy as climate change's impacts are increasingly felt is the beavers' potential role in helping to augment late summer flows of streams. Although the scientific literature on hydrologic impacts of beaver structures is limited, case studies documenting enhanced flows date back to 1938.[32] One reference described how beaver ponds, which "store about six acre-feet and are built about one hundred meters apart in appropriate habitat" can "bank significant amounts of water, thus evening seasonal stream flows [citations omitted]."[33]

---

26 U.S. Fish and Wildlife Service. 2018. The Beaver Restoration Guidebook 2.01: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Portland, OR: U.S. Fish and Wildlife Service. p vii. https://www.fws.gov/oregonfwo/Documents/2018BRGv.2.01.pdf

27 Ibid., p 4–5.

28 See Scrafford, M.A., D.B. Tyers, D.T. Patten, and B.F. Sowell. 2017. Beaver habitat selection for 24 yr since reintroduction north of Yellowstone National Park. Rangeland Ecology & Management 71(2): 266–273. https://doi.org/10.1016/j.rama.2017.12.001

29 Ibid.

30 U.S. Fish and Wildlife Service. 2014. Report of the Climate Change Adaptation and Beaver Management Team to the Joint Implementation Working Group Implementing the National Fish, Wildlife, and Plant Climate Change Adaptation Strategy. Portland, OR: U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office. p 2–3. https://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Documents/BeaverClimateReportJIWG.pdf

31 U.S. Fish and Wildlife Service. 2018. The Beaver Restoration Guidebook 2.01: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Portland, OR: U.S. Fish and Wildlife Service. p 5, 36, 103. https://www.fws.gov/oregonfwo/Documents/2018BRGv.2.01.pdf

32 See Stabler, F. 1985. Increasing summer flow in small streams through management of riparian areas and adjacent vegetation: A synthesis. p 206–210. In: R.R. Johnson et al., technical coordinators. Riparian Ecosystems and Their Management: Reconciling Conflicting Uses. General Technical Report RM-120. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. https://www.fs.fed.us/rm/pubs_rm/rm_gtr120/rm_gtr120_206_210.pdf

Due to the numerous benefits, the interagency Climate Change Adaptation and Beaver Management Team has determined that the Forest Service should increase recognition of beavers in planning revisions because of the "climate change related benefits of expansion of beaver populations" and management units should "use beaver management practices and assessment tools in adapting to a changing climate."[34] Lolo National Forest's Watershed Vulnerability Assessment identified beaver restoration as a strategy to address climate change impacts on water supply.[35] Specifically, the Assessment cited beaver reintroduction as a method to improve base flows, increase habitat diversity as a tool for bull trout conservation, and to further increase resiliency of ecosystems.[36]

In addition to mitigating climate change's impacts on water, beavers also help to mitigate climate change impacts of wildfires and heat waves. Specifically for heat waves, beavers are able to maintain refugia as their "deep persistent pools…buffer aquatic species like trout from extreme drought and effects of wildfire."[37] The expanded riparian area and wetlands due to beavers lower stream temperatures and the accompanied increase in vegetation also "offers shade that helps to lower stream and pond temperatures."[38] These pools and ponds resulting from beavers may even help act as firebreaks.[39] This is because "the mosaic of aspen and willow stands, meadows, ponds, and wetlands they maintain amid the flammable spruce forests" help to keep "fires smaller than they would be in homogeneous landscapes."[40]

Expansion of riparian areas and wetlands by beavers can increase humidity of drainages and, importantly, offer firefighters dispersed water storage while fighting wildland fires.[41] After a fire occurs, beaver dams "help sequester sediment [and wildfire debris], very locally decrease seasonal stream temperatures, and enhance riparian revegetation."[42] Summer temperatures in New Mexico, "the sixth-fastest-warming state in the nation," are projected to increase resulting in greater frequencies of wildland fires and extreme heat events.[43] As such, beaver restoration is a vital tool for SF NF managers that should be used to enhance the SF NF's resilience to wildland fire and extreme heat events.

---

33 Baldwin, J. 2013. Problematizing beaver habitat identification models for reintroduction application in the western United States. p 105. Yearbook of the Association of Pacific Coast Geographers 75: 104–120. https://www.jstor.org/stable/24043391

34 U.S. Fish and Wildlife Service. 2014. Report of the Climate Change Adaptation and Beaver Management Team to the Joint Implementation Working Group Implementing the National Fish, Wildlife, and Plant Climate Change Adaptation Strategy. Portland, OR U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office. p 1, 6. https://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Documents/BeaverClimateReportJIWG.pdf

35 Wade, A.A., C. Brick, S. Spaulding, T. Sylte, and J. Louie. 2016. Watershed Climate Change Vulnerability Assessment: Lolo National Forest. Publication R1-16-05. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Region and Lolo National Forest. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd506291.pdf

36 Ibid., p 65–66.

37 Morelli, T.L., C. Daly, S.Z. Dobrowski, et al. 2016. Managing climate change refugia for climate adaptation. PLoS One 11(8): e0159909. p 5. https://doi.org/10.1371/journal.pone.0159909

38 U.S. Fish and Wildlife Service. 2018. The Beaver Restoration Guidebook 2.01: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Portland, OR: U.S. Fish and Wildlife Service. p 9. https://www.fws.gov/oregonfwo/Documents/2018BRGv.2.01.pdf

39 See Wernick, A. September 22, 2018. Living on Earth: 'Beaver Believers' say dam-building creatures can make the American West lush again. https://www.pri.org/stories/2018-09-22/beaver-believers-say-dam-building-creatures-can-make-american-west-lush-again

40 Baskin, Y. 1997. Work of Nature: How the Diversity of Life Sustains Us. Washington, DC: Island Press. p 168. https://asknature.org/strategy/habitat-mosaics-stop-fires/#.W7rHTJNKjPA

41 Maughan, R. 2013. Beaver Restoration Would Reduce Wildfires. The Wildlife News http://www.thewildlifenews.com/2013/10/25/beaver-restoration-would-reduce-wildfires/

42 Baldwin, J. 2015. Potential mitigation of and adaptation to climate-driven changes in California's highlands through increased beaver populations. California Fish and Game 101(4): 218–240. p 231. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=113244&inline

43 Funk, J., C. Barnett-Loro, M. Rising, and J. Deyette. 2016. Confronting Climate Change in New Mexico: Action Needed Today to Prepare the State for a Hotter, Drier Future. Cambridge, MA: Union of Concerned Scientists. p 2. https://www.ucsusa.org/sites/default/files/attach/2016/04/Climate-Change-New-Mexico-fact-sheet.pdf

As discussed above, the SF NF is required to manage the Forest to increase ecological integrity and resiliency to climate change. Expanding beaver presence is an ecological characteristic that will help achieve this outcome. Therefore, in addition to the current language, we recommend that the SF NF Revised Plan specifically identify beaver presence and activity (dams/impoundments/wetlands) as an ecological characteristic for the entire SF NF, as well as in specific geographic areas of the SF NF, and that the SF NF Revised Plan more explicitly prioritize beaver restoration, including conflict mitigation actions throughout unoccupied but suitable habitat.

C. Desired Conditions, Guidelines, Goals, and Objectives

i. Aquatic Species and Habitats Objective

While we encourage additional focus on the ecological value of beavers and beaver activity on the SF NF, we appreciate the attention given to beavers under Objectives for Aquatic Species and Habitats (FW-AQUASH-O): "Complete aquatic restoration on priority projects that restore 30 miles of aquatic habitat (e.g., increase pool quantity, provide stream cover, remove or install fish barriers, *restore beaver populations,* or treat invasive aquatic species" (emphasis added).[44] However, we recommend adding additional language to more clearly direct land management goals toward the achievement of beaver restoration. While NWF appreciates the inclusion of beaver restoration as an objective for aquatic restoration, we recommend adding more language to the desired conditions, guidelines, and objectives in order to emphasize the critical role beavers play in aquatic habitat restoration.

Adding specificity to the Objectives for Aquatic Species and Habitats regarding beaver restoration would be more consistent with the corresponding plan components for Aquatic Species and Habitats. As written, the Desired Conditions for Aquatic Species and Habitats fail to direct or limit management activities in regards to beaver restoration and habitat.

NWF suggests including the following language as an additional objective:

- *"Improve the habitat quality and hydrologic function of at least 20 miles of aquatic habitat during the life of the plan with a focus on streams with listed species, species of conservation concern. Activities include, but are not limited to, berm removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, channel reconstruction, and beaver restoration and reintroduction where possible."* (USFS HLC Forest Revision 2018 + Recommended language)
- *"Beavers play an important ecological role within suitable habitat by increasing water residence time and spatial extent of water on the landscape, and aquatic and riparian habitat complexity. Due to these benefits, beaver habitation is encouraged and present forestwide in suitable areas and existing beaver complexes are enhanced or maintained."*

Additional supplementary language can be found below under *iii. Recommended Desired Conditions, Guidelines, and Objectives.*

ii. Ecological Processes and Conditions for Terrestrial and Aquatic Ecosystems Table 5

We appreciate and support the proposed management strategy and approach in Chapter 5 of the SF NF Draft Land Management Plan, particularly the designation of the American beaver as a focal species under Wildlife Connectivity – Aquatic and Terrestrial Habitats.[45] We encourage the SF NF planning team to continue building on this language and to incorporate the following desired condition into the actual planning document:

- "To maintain ecological integrity and enhance climate resiliency, restoration of beavers to currently unoccupied but suitable habitat (either through translocation or natural colonization) is facilitated in cooperation with national, state, and local partners."

---

44 See SF NF Draft Land Management Plan, Objective 1, p 84. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd640112.pdf

45 See SF NF Draft Land Management Plan, Selected Plan Components, Wildlife Connectivity – Aquatic and Terrestrial Habitats, p 245. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd640112.pdf

iii. Other recommended Desired Conditions, Guidelines, and Objectives

In addition to the above recommendations of the SF NF existing desired conditions and guidelines, NWF recommends that SF NF add language from or include the following desired conditions and guidelines.

Desired Conditions:

- **Water Resources (FW-WATER-DC)**
  - NWF suggests the following language: *"Beaver habitat (including wetlands and riparian areas), which benefit and enhance groundwater, surface water, and floodplain and riparian complexity, is present forestwide in suitable areas."*
  - NWF suggests the following language: *"Beaver reintroduction, and the persistence of beaver habitat, contributes to channel recovery and floodplain function."*
  - NWF recommends adopting language used in the Rio Grande National Forest Draft Revised Land Management Plan: *"Physical channel characteristics are in dynamic equilibrium and are commensurate with the natural ranges of discharge and sediment load provided to a stream. Streams have the most probable form and the expected native riparian vegetation composition within the valley landforms they occupy; they function correctly without management intervention. Historically disturbed and degraded stream channels recover through floodplain development and establishment of riparian vegetation, and demonstrate stable channel geomorphic characteristics. Beaver reintroduction, and the persistence of beaver habitat, can contribute to channel recovery and floodplain function. Roads, trails, and impervious surfaces minimally affect hydrologic processes within watersheds.* (Forestwide)"[46]
  - As previously discussed, beavers provide important ecosystem services that strengthen the resiliency of watersheds from the impacts of climate change, such as drought. Because of the societal benefits of ecosystem climate resiliency, NWF suggests the following: *"Water quality and quantity is sustained through maintenance or enhancement of ecosystem biodiversity and function, including through increased beaver activity, and watersheds are resilient to natural disturbance processes and changed climates."*
- **Riparian and Wetland Ecosystems (FW-RWE-DC)**
  - NWF recommends adopting language used in the Rio Grande National Forest Draft Revised Land Management Plan: *"Riparian ecosystem composition, structure, and function is restored and enhanced by beaver habitat."*[47]
  - NWF suggests the following language: *"Riparian areas and wetlands are healthy, fully functioning ecosystems. Vegetation consists of desirable native species and age classes. Populations of riparian vegetation are diverse, vigorous, and self-perpetuating. Invasive species, including plants and animals, in riparian and wetland ecosystems are rare. There is sufficient vegetative cover to provide bank stability, trap and retain sediment, regulate temperature, and contribute to floodplain function. Riparian ecosystem composition, structure, and function can generally be restored and enhanced by beaver habitat.* (Forestwide)" [48]
- **Aquatic Species and Habitats (FW-AQUASH-DC)**
  - NWF suggests the following language: *"Beavers play an important ecological role within suitable habitat by increasing water residence time and spatial extent of water on the landscape, and aquatic and riparian habitat complexity. Due to these benefits, beaver habitation is encouraged and present forestwide in suitable areas and existing beaver complexes are enhanced or maintained."*
- **Roads (FW-ROADS-DC)**
  - NWF recognizes that with the restoration of beavers on the landscape, occasional conflict with human-built structures or activities is

46 U.S. Department of Agriculture, Forest Service. 2017. Rio Grande National Forest: Draft Revised Land Management Plan. Monte Vista, CO: U.S. Department of Agriculture, Forest Service. p 15. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd560186.pdf

47 Ibid., p 14.

48 Ibid.

likely to occur. Therefore, NWF recommends including the following language to address this potential conflict: *"The transportation system and its use have minimal impacts on resources including threatened and endangered species, species of conservation concern, heritage and cultural sites, water quality, and aquatic species and their habitat."*

Guidelines. The following are examples of suggested language for guidelines:

- **Water Resources (FW-WATER-G)**
  - *"To support aquatic habitat quality and resiliency, beaver complexes (including wetlands and riparian areas) should be enhanced or maintained unless their activities directly threaten roads/other human developments, and where such is the case, non-lethal techniques are explored first."*
  - *"To maintain ecological integrity and enhance climate resiliency, restoration of beavers to currently unoccupied but suitable habitat (either through translocation or natural recolonization) is facilitated in cooperation with national, state, and local partners."*
  - *"Where conflicts with beaver habitat and roads and other human development arise in a watershed, resolution will be addressed through management strategies such as pond levelers, beaver deceivers, fencing, and other non-lethal strategies, including live-trapping and relocation. Lethal removal will only be considered after non-lethal strategy options have been exhausted."*
  - *"Pursue collaboration with state wildlife management agencies to ensure that trapping is minimized in beaver restoration areas."*
  - *"Conduct a beaver restoration assessment in watershed drainages throughout the plan area."*
- **Riparian and Wetland Ecosystems (FW-RWE-G)**
  - NWF recommends the following language from the Helena-Lewis and Clark National Forest Draft Revised Forest Plan:[49] "*Activities in riparian management zones should protect key riparian processes, including maintenance of stream bank stability, input of organic matter, temperature regimes, water quality, and beaver habitat."*
- **Aquatic Species and Habitats (FW-AQUASH-G)**
  - With the restoration of beavers on the landscape, occasional conflict with human-built structures or activities is likely to occur; therefore, a guideline addressing how land managers are to resolve conflict to sustain and protect ecological integrity is necessary. Due to the value of beavers and beaver habitat on the ecosystem, management options should prioritize non-lethal techniques. Attention given to non-lethal conflict resolution management that sustains beavers should be added. NWF suggests the following language: *"To protect the ecological functions that beavers provide, management actions to reduce beaver threats to infrastructure and other human developments should use non-lethal techniques that sustain beavers (such as using pipes to reduce water levels, notching dams to restore streamflow, pond levelers, beaver deceivers, fencing, and other non-lethal strategies including live-trapping and relocation). Lethal removal will only be considered after non-lethal strategy options have been exhausted."*
- **Roads (FW-ROADS-G)**
  - NWF recognizes that with the restoration of beavers on the landscape, occasional conflict with human-built structures or activities is likely to occur. Therefore, NWF recommends including the following language: *"Where a beaver has created a nuisance issue with the road, a trail, bridge, or facility, management must first exhaust non-lethal coexistence tools prior to issuing kill or relocation permits."*
- **Objectives.** The following are examples of suggested language for objectives:
- **Water Resources (FW-WATER-O)**
  - *"Allow and encourage beavers to recolonize in new areas throughout suitable watersheds, particularly in high-priority watersheds."*
  - *"Over the next decade, occupied beaver habitat in priority watersheds will be expanded by 50%."*

[49] U.S. Department of Agriculture, Forest Service. 2018. Helena - Lewis and Clark National Forest: Draft Revised Forest Plan. Helena, MT: U.S. Department of Agriculture, Forest Service. p 21. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd575231.pdf

- *"Federal, tribal, and state governments cooperate to identify possible stream areas for beaver reintroduction."*
- *"To help improve instream flows and attenuate late summer flows, recolonization by beavers in the watershed is encouraged."*

- **Riparian and Wetland Ecosystems (FW-RWE-O)**
  - *"Through the use of beavers as keystone species, riparian vegetation is improved and diversified."*
- **Aquatic Species and Habitats (FW-AQUASH-O)**
  - NWF recommends language from the Helena-Lewis and Clark National Forest Draft Revised Forest Plan with one addition: *"Improve the habitat quality and hydrologic function of at least 20 miles of aquatic habitat during the life of the plan with a focus on streams with listed species, species of conservation concern. Activities include, but are not limited to, berm removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, channel reconstruction, and beaver restoration and reintroduction where possible."*

D. Monitoring

We applaud the planners' inclusion of American beaver as focal species under selected plan component Wildlife Connectivity – Aquatic and Terrestrial Habitats in Chapter 5, Forest Plan Monitoring Program. Under the 2012 Planning Rule, beavers, as both a "keystone species and an ecosystem engineer," should be selected as a focal species in the SF NF Final Plan.[50]

By increasing wetlands and riparian areas, beavers provide habitat for both terrestrial and aquatic plants and animals.[51] Consequently, the overall condition of riparian areas and aquatic ecosystems can be shown through the correlation between beaver presence and vegetation. As a focal species, the presence of beavers in the areas of the SF NF will help in determining whether the habitat provides for native species diversity and for determining the overall ecological integrity.

The role of beavers as a keystone species and ecosystem engineers is well-supported by science, which is why management teams throughout the country are encouraging and adopting beavers as focal species in their plans. As discussed above, the interagency Climate Change Adaptation and Beaver Management Team recommends that the Forest Service give expanded recognition of beavers as focal species under the 2012 Rule due to the role that beavers may play in climate adaptation and ecosystem restoration.[52] At the time of the Climate Change Adaptation and Beaver Management Team's recommendation in 2014, six National Forests already recognized beavers as Management Indicator Species due to their important role in the ecosystem.[53]

Recently, the Rio Grande National Forest Draft Plan included beavers as a proposed focal species because beavers are "complementary" to other goals and desired conditions including gathering "information on trends in sedimentation, streamflow, riparian cover, and stream temperature, [which] are all particularly

---

50 U.S. Fish and Wildlife Service. 2018. The Beaver Restoration Guidebook 2.01: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Portland, OR: U.S. Fish and Wildlife Service. p 22. https://www.fws.gov/oregonfwo/Documents/2018BRGv.2.01.pdf; Baker, B.W., and E.P. Hill. 2003. Beaver (Castor canadensis). In: Wild Mammals of North America: Biology, Management, and Conservation, 2nd ed. Baltimore: Johns Hopkins University Press. p 297. https://www.beaverinstitute.org/wp-content/uploads/2021/03/Beaver-Wild-Mammals-of-North-America-Biology-Management-and-Conservation-Second-Edition.pdf

51 U.S. Fish and Wildlife Service. 2018. The Beaver Restoration Guidebook 2.01: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Portland, OR: U.S. Fish and Wildlife Service. p 5–6. https://www.fws.gov/oregonfwo/Documents/2018BRGv.2.01.pdf

52 U.S. Fish and Wildlife Service. 2014. Report of the Climate Change Adaptation and Beaver Management Team to the Joint Implementation Working Group Implementing the National Fish, Wildlife, and Plant Climate Change Adaptation Strategy. Portland, OR: U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office. p 6. https://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Documents/BeaverClimateReportJIWG.pdf

53 Ibid.

relevant for the management and conservation of many aquatic and riparian species of conservation concern."[54] After the RF NG consulted with beaver and riparian system experts at Utah State University, the Forest decided to monitor beaver activity over time in their Hydrologic Unit Code-12 watersheds. RG NF cited this as "a cost effective strategy that allows the Forest to track beaver presence and range expansion, identify potential areas where beaver introduction may be appropriate, and provide opportunities for citizen science and outreach."[55] Included in the Rio Grande National Forest Draft Plan for monitoring ecosystem is a set of adaptive management questions that the SF NF should consider, such as: "Where other aquatic ecosystem indicators suggest potential restoration needs, are beaver absent, and if so, would beaver relocation be beneficial?"[56] The RG NF identifies beavers and indicators that answer the following two monitoring questions:

- MQ1: What is the status and trend of the aquatic ecosystem conditions, including those needed to sustain fish populations?
- MQ2: What is the status and trend of riparian and wetland vegetation and conditions across the Forest?[57]

The RG NF Draft Plan provides an example of beavers serving as a focal species for monitoring watershed health, water resources, and aquatic ecosystems.[58] We encourage the SF NF to incorporate and expand upon this approach.

E. Recommendations for Appendix D, Proposed Management Actions

We appreciate and support the proposed management actions and strategy in Appendix D[59] and we encourage the SF NF planning team to incorporate, where appropriate, this directive into the actual planning documents:

- *To support watershed quality and resiliency, beavers and their dams/complexes (including wetlands and riparian areas) could be enhanced or maintained. Introductions of beavers, in coordination with appropriate partners could be pursued. Where beavers are not socially or ecologically tolerable, beaver dam analogue structures could be installed to increase aquatic habitat or restore watersheds.*

This directive addresses beaver–human conflicts by suggesting that beaver mimicry structures could be used to achieve similar benefits of beaver dams. As stated previously, beaver mimicry is being used throughout the West as a widespread restoration practice that can benefit fisheries, water quality, and climate resiliency. As such, this directive could also be incorporated into the Desired Conditions for Aquatic Species and Habitats. NWF suggests that this directive could also be moved into the Desired Conditions for Aquatic Species and Habitats as the following (further NWF recommendations in bold):

- *To support watershed quality and resiliency, beavers and their dams/complexes (including wetlands and riparian areas) could be enhanced or maintained.* **Beavers play an important role within suitable habitat by increasing water residence time and spatial extent of water on the landscape, and aquatic and riparian habitat complexity.** *Introductions of beavers, in coordination with appropriate partners, should be pursued. Where beavers are not socially or ecologically tolerable, beaver dam analogue structures should be installed to increase aquatic habitat or restore watersheds.*

54 U.S. Department of Agriculture, Forest Service. 2017. Rio Grande National Forest: Draft Revised Land Management Plan. Monte Vista, CO: U.S. Department of Agriculture, Forest Service. p 94. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd560186.pdf

55 Ibid., p 97.

56 Ibid., p 97, 99.

57 Ibid., p 97 (table 13).

58 Ibid.

59 See SF NF Draft Land Management Plan, Appendix D. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd640112.pdf

Beaver dam on Willow Creek near Granby, Colorado. Photo: Shutterstock

National Wildlife Federation
1200 G Street, NW
Washington, DC 20005
www.nwf.org