

WILDFIRE RESILIENCE FUNDING:
**Building Blocks for a
Paradigm Shift**

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The Nature Conservancy (TNC) is a global environmental nonprofit working to create a world where people and nature can thrive.

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Along Klamath River, lands of Yurok Tribe in California.
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EXECUTIVE SUMMARY

On January 27, 2021, the Biden Administration issued an Executive Order on Tackling the Climate Crisis at Home and Abroad.¹ In his remarks prior to signing the EO, President Biden said that he was “signing today an executive order to supercharge our administration’s ambitious plan to confront the existential threat of climate change,” and highlighted last year’s wildfires as his first example of how communities are experiencing this threat.

Over millions of years, fire has shaped the landscapes of North America. Almost all of the continent’s ecosystems are fire adapted, meaning they need fire at regular intervals to be healthy and resilient. However, we know that wildfires each year cause loss of life and property and have enormous direct and indirect costs. The risks and costs of fire increase each year, causing ever greater harm: One recent study estimated that the 2018 wildfire season in California alone caused \$150 billion in direct and indirect economic losses—and the 2020 fire season was worse. These risks and harms are often disproportionately born by historically underserved and excluded communities, often low-income people of color, for whom recovering from wildfire and associated economic and public health concerns can take much longer.

But while the risks and costs of these fires have grown, our country’s investment in the fundamentals of wildfire resilience have been left behind. Addressing the ever-increasing threat of wildfires represents a critical down payment toward efforts to address climate change and will also impact economic recovery and environmental justice. **A paradigm shift is needed to address imminent needs—requiring a surge in investment in forest restoration and community resilience, new strategies for workforce and program deployment, cooperation across ownership boundaries, and complementary strategies to drive down costs and support continued maintenance of resilience investments over time.**

Investment in wildfire resilience should be considered a public good, rather than a land stewardship conundrum. This work must occur at a pace and scale that is dramatically faster and more coordinated across the landscape than we have seen in the past. A paradigm shift would recognize the enormous externalities and costs, direct and indirect, of not addressing this challenge at the needed pace and scale.

The USDA Forest Service (Forest Service) has developed new science and risk-mapping tools that are a game-changer in helping policymakers and land managers identify the highest priority acres for treatment to restore fire to the land and mitigate ever-growing risks to people, communities and ecological resources, including carbon, water and wildlife. According to the Forest Service, their models suggest that targeted treatments on about 51 million acres of federal, state, tribal and private lands would significantly reduce exposure in the highest risk areas.

If we were to address this challenge over the next 10 years and with an average cost of \$1,000 per acre treated, a minimum investment of approximately \$5 billion to \$6 billion per year is needed for the highest priority work to reduce wildfire risks and resources needed for community adaptation and infrastructure investments.

This paper examines potential building blocks for a fundamental paradigm shift in investment and program coordination, with a focus on federal programs. Our goal is to create a menu of program options for policymakers to build toward fully funding the cost of top-priority work over the next 10 years. Beyond the 10 years, additional investments will be required on an ongoing annual basis to maintain forest and wildfire resilience. These programs also support the workforce expertise and infrastructure that will be needed to successfully deliver the work at the pace and scale to get ahead of this challenge.

This paper identifies core federal programs that already support wildfire resilience as a priority outcome; complementary programs that target related work or provide threshold support for planning, workforce development and science; and programs that are currently underinvesting in wildfire risk reduction but could be tapped under a federal government contribution to a whole-of-society approach to support wildfire and climate resilience work. The paper also identifies options for financing structures that facilitate partner, private capital, and other nontraditional investments in wildfire resilience at scale and across ownership boundaries. Government leaders and partners must employ a more strategic and coordinated approach to deploying these programs to reduce wildfire risks and invest in wildfire resilience in ways that contribute to addressing climate change, advancing economic recovery, and supporting historically underserved and excluded communities.

These building blocks include:

- **The Forest Service's** Hazardous Fuels Program; Collaborative Forest Landscape Restoration Program (CFLRP), State and Private Forestry Programs, Forest Products and Wood Innovations Programs, Vegetation and Watershed Management Program, Water Source Protection Program, Land Acquisition Programs, Planning Program, and Conservation Corps programs.
- **Department of Agriculture's** Joint Chiefs' Landscape Restoration Partnership, Natural Resource Conservation Service conservation programs including the Regional Conservation Partnership Program (RCPP), Rural Development Programs, and multi-agency Science and Research programs.
- **Department of the Interior's** (DOI) Hazardous Fuels and Fuels Management Programs; Land Acquisition Programs; and Conservation Corps programs; Bureau of Indian Affairs' Reserved Treaty Rights Land Program and Tribal Resilience Program; Bureau of Land Management's Forest and Woodlands Management Program.
- **Cross-Departmental Funded Initiatives** including the Promoting Ecosystem Resilience and Fire Adapted Communities Together (PERFACT) Partnership and Community Planning Assistance for Wildfire (CPAW) Partnership.
- **Federal Emergency Management Agency's** (FEMA) Building Resilient Infrastructure and Communities Program (BRIC) and Hazard Mitigation Grant Program Post Fire associated with Fire Management Assistance Grants and U.S. Fire Administration support for Community Wildfire Protection Plans.
- **Department of Defense's** (DOD) Readiness and Environmental Protection Initiative (REPI) and Sentinel Landscapes Initiative.
- **Environmental Protection Agency's** (EPA) Drinking Water and Clean Water State Revolving Funds and Air Quality Program
- **Department of Energy** and other agency infrastructure programs.
- Opportunities for **public-private, private and nontraditional** investments that can leverage federal dollars, including through Environmental Impact Bonds/Funds, water funds and direct partnerships, including those that invest in historically underserved and excluded communities.

When evaluating an investment strategy for wildfire resilience comprised of these building blocks, analysis of the return on investment must include the economic value of avoided costs and capture the value of social, economic and ecological co-benefits. Those co-benefits include:

- job creation
- supporting community economic development
- advancing environmental justice
- protecting critical infrastructure
- providing healthy watersheds and water supply
- supporting land conservation and the protection of green space
- restoring wildlife habitat
- providing opportunities for outdoor recreation
- preserving forest and soil carbon
- advancing natural and working lands solutions to climate change

The current strategies and level of investment are not working and are leaving us further and further behind. It is time for bold and urgent action to change the future trajectory for how we manage and prepare for wildfire impacts on our country and our communities.

A paradigm shift toward additional annual investments of around \$5 billion to \$6 billion in wildfire risk reduction and resilience could be included as part of a stimulus, infrastructure and climate change legislative package. Progress can also be made by advancing component pieces through separate policy vehicles.

Having a broad understanding of the benefits of reducing fire risk and restoring wildfire resilience should inform a whole-of-society approach, which requires partnering with local communities, states, American Indian tribal governments, and public and private sectors to achieve priority outcomes. Using the building blocks identified in this report, we can begin to correct our history of underinvesting in resilience and then paying the bill for harm. **It is time to change the paradigm.**

INTRODUCTION



Niobrara Valley Preserve, Nebraska, after the July 2012 wildfire. © Chris Helzer/TNC

Over millions of years, fire has shaped the landscapes of North America. Almost all of the continent's ecosystems are fire adapted, meaning they need fire at regular intervals to be healthy and resilient. However, each year, the costs and impacts of wildfire grow in the United States. The costs that are often measured—firefighting expenses, structures damaged or lost, acres burned—are far outweighed by the human impacts and cumulative economic losses. Last year, those costs included lives lost, communities displaced in the midst of a pandemic, farms and ranches destroyed, health degraded by air pollution, and forest and soil carbon released into the atmosphere.

One recent study estimated that the California wildfires in 2018, during which more than 8,500 fires burned more than 1.9 million acres in the state, caused economic losses of nearly \$150

billion, including: the cost of burned buildings and homes (19%), health effects of air pollution (22%), and losses associated with the disruption of economic supply chains, including transportation and labor (59%).² The study found that approximately half of the economic impacts were indirect, including a projected 3,652 deaths attributed to fires and smoke as opposed to an official death toll of 106 associated with direct fire impacts.

At the time, 2018 was the most destructive fire year in California history. The 2020 fire season in California was worse: by early December, more than 9,200 fires had burned nearly 4.2 million acres in the state, including in five of the six biggest fires since the 1930s. Oregon and Washington also experienced historic levels of wildfire damage. More than 4,000 structures burned in Oregon alone,³ and many small towns were overtaken by rapidly spreading incidents. Hundreds of additional wildfires burned across other western states, including in Colorado, which experienced its three largest wildfires on record. Dense wildfire smoke produced hazardous air quality that affected millions of people across the nation for weeks, including many in major metropolitan areas.

We know these trends will continue to worsen. Over the past 40 years, 32% of the United States has gotten warmer and drier, primarily in the West.⁴ California's current dry winter is raising concerns that the state's 2021 fire season could be worse than 2020, and droughts are ongoing in other parts of the west.⁵ Climate change and forest conditions due to past land management and fire management practices across the West are intersecting with population and economic growth in the wildland-urban interface (WUI). More people, communities and assets are being exposed to fire risk and are more vulnerable to harm. At the same time, fires are increasing in frequency and intensity.⁶

The 2020 wildfire season highlights how our understanding of these risks has expanded beyond the WUI to include the concept of landscape scale fires, where fires can range across 10 or more miles. Megafires burn hundreds of thousands of acres: In 2020, California's August Complex Fire reached giga-fire size, covering more than 1 million acres. Smoke plumes from fire incidents routinely impact air quality and health across multiple states, with even the East Coast seeing haze from the 2020 western fires.



Wildfire Paradigm Shift Requires:

1. **Substantially increasing investments in all programs**
2. **Highlighting avoided costs, public good and co-benefits of wildfire resilience work (or, consider it a public good)**
3. **Taking a holistic, strategic approach across government to address scale of need, rather than an incremental and piecemeal approach**

In 2018, a wildland fire in Paradise, California, left 85 civilians dead and an entire community wiped out. Recent Forest Service research suggests that there are hundreds of communities that have a higher predicted fire risk than Paradise—disasters waiting to happen under the current wildland fire trajectory.⁷ Lives, health and property in these communities are at imminent risk, and even the estimates of cumulative economic harm represent only a portion of what's at stake. Also, at risk are the many ecological and social benefits forests provide, including the provision of clean water and wildlife habitat, recreational opportunities, and the capacity of the nation's forests to continue to serve as a critical buffer for greenhouse gas emissions.

But while the risks and costs of these fires have grown, our country's investment in the fundamentals of socio-ecological wildfire resilience have been left behind, including ecosystems that can be maintained with and recover from fire and communities that are empowered and prepared for wildfire. A paradigm shift is needed to address imminent needs—requiring a surge in federal, state, tribal, private and partner investment in forest restoration and community resilience; new strategies for workforce and program deployment; cooperation across ownership boundaries; and complementary strategies to support continued maintenance of resilience investments over time.

Many of these investments will also have co-benefits that can advance complementary objectives, including for creating jobs, supporting community economic development, protecting critical infrastructure, providing healthy watersheds and water supply, supporting land conservation and the protection of green space, creating wildlife habitat, providing opportunities for outdoor recreation, protecting forest and soil carbon stocks and advancing natural and working lands solutions to climate change.

“A paradigm shift is needed to address imminent needs, requiring a surge in investment in forest restoration and community resilience, new strategies for workforce and program deployment, and cooperation across ownership boundaries.”

New fire scenario modeling from the Forest Service suggests that targeted treatments on approximately 51 million acres of federal, state, tribal and private lands in the next 10 years will significantly reduce exposure in the highest risk areas.⁸

Land Ownership	Acres
National Forest System—western	20,000,000
National Forest System—eastern	650,000
All other lands (non-NFS federal, tribal, state, private, other)	30,000,000
Total	50,650,000

Resilience treatments would include the removal of hazardous fuels and the use of prescribed fire, with an average cost of \$1,000 per acre treated.⁹ Additional funding would be necessary over time to maintain treated areas and to treat new priority acres. Communities also need funding for capacity building, wildfire adaptation¹⁰ and recovery.

This work must occur at a pace and scale that is commensurate with the need and more coordinated across the landscape than we have seen in the past. There must be a whole-of-society approach to reducing fire risks and restoring wildfire resilience, especially considering the relevance to other cross-cutting challenges. Wildfires today risk worsening the climate crisis, impeding economic recovery and driving further economic harm, and displacing people during a pandemic in ways that could contribute to the spread of the virus and increase the stress on already strained health care systems. Harm from each of these challenges disproportionately falls on historically underserved and excluded communities. Further challenges include:

- Impacts to energy, transportation, telecommunications and national security infrastructure
- Loss of agricultural land
- Economic supply chain disruptions
- Health impacts from degraded air quality
- Mental health impacts from fire events
- Risks to healthy watersheds and safe drinking water supplies
- Loss of access to the outdoors
- Release of forest and soil carbon



Investments in wildfire resilience are a public good.

This paper examines potential building blocks for a fundamental paradigm shift in investment and program coordination, with a focus on federal programs. **A minimum investment of approximately \$5 billion to \$6 billion per year over the next 10 years is needed for the highest priority work to reduce wildfire risks across federal, tribal, state and private land ownerships, and for community and infrastructure investments.**

In the past, funding wildfire suppression has been consistently prioritized, at the expense of pre-fire risk mitigation or restoration. Resources to address the increasing costs of suppression were taken out of the U.S. Forest Service's general operating budget, which has left the agency without the people or resources it needs to manage the National Forest System and has contributed to the growth in underlying risks. This paradigm shift has to be different: The country must invest in mitigating fire risk and preventing loss, and must integrate those investments into a shared program of work at meaningful scales.

Investment in wildfire resilience should be considered as a public good—as part of the country's infrastructure system and community investment, rather than a land stewardship conundrum. This paradigm shift would recognize the enormous externalities and costs, direct and indirect, of not addressing this challenge at the necessary pace and scale. Economic analysis of the return on investment in wildfire resilience must consider the value of avoided costs and capture the value of the many social, economic and ecological co-benefits to this work. Importantly, these new investments must occur without further eroding the Forest Service and other land management agencies' ability to manage for multiple values including carbon storage, water, wildlife, timber, grazing and recreation.



Cedar waxwing in the Appalachian mountains of West Virginia. © Kent Mason

This paradigm shift will also need to transcend the past efforts by Congress and prior administrations to prioritize spending and improve program accountability. Those efforts have been marked by incremental improvements, but reflect a piecemeal approach to wildfire resilience that fails to reckon with the scale of the challenge, the rapid increase in risk factors, and the externalized and cumulative costs of disaster response and recovery to communities, state, local and tribal governments, and other federal agencies. These costs could be avoided with a greater shared investment in risk reduction and resilience.

This shift will require an integrated program of work across ownership boundaries, and partnerships with multiple agencies, governments, communities, industries, organizations and private landowners. It will also require a comprehensive management agenda that addresses workforce needs and cultural transformation, alongside cross-cutting reforms to business practices and budget performance criteria.

Foundations for this paradigm shift are already in place that can help facilitate needed policy and funding changes, including:

- The 2018 passage of a wildland fire funding suppression cap adjustment (the well-known “Fire Fix”) that for the first time helped curb the runaway costs of wildfire suppression from eroding federal agency budgets and temporarily prevents the need for annual fire borrowing that has proved disruptive to resilience work;
- A decade or more of experience in locally led, collaborative forest management efforts that have piloted and demonstrated a case for increasing the pace and scale of forest management and restoration across ownership boundaries, including building on Farm Bill authorities and programs such as the Collaborative Forest Landscape Restoration Program, the Joint Chiefs Restoration Initiative, and the Good Neighbor Authority;
- More experience with land use planning and development practices for fire adapted communities and infrastructure;
- Nearly 20 years of collective action and peer learning and exchange among community-based groups working to restore fire adapted landscapes and make communities safer from fire through the Fire Learning Network, its affiliates and associated strategies;¹¹
- New data and modeling of fire risks that for the first time gives policymakers a way to visualize and map the scope and scale of the problem, allowing for improved and consistent prioritization of efforts, and clarifying the need for changes in program delivery and funding levels.

This paper presents a menu of federal policy and budget options to scale resilience investments and create the building blocks for a federal government contribution to a whole-of-society approach to investing in wildfire resilience as a public good. These options reflect the increasing recognition that wildfire costs and the benefits of a paradigm shift are relevant for a much broader array of partners, agencies and programs than have previously been mobilized to address this challenge.

This paper focuses on potential building blocks that would:

1. Expand and better coordinate existing federal wildfire resilience investments;
2. Add wildfire resilience and risk reduction as a priority outcome for other existing funding sources across the federal budget; and
3. Expand public-private partnerships, private investment and other innovative strategies to leverage government investment in resilience, and strengthen communications on these strategies to alleviate the challenges posed to communities noted above.

Investing in these federal building blocks and in state, local, tribal and partner capacity will create jobs and advance efforts to address climate change. In increasing investments and deploying these building blocks, policymakers must evaluate and address historic inequities in access to resources and programs, including in access to priority technical and financial assistance to support resilience, as well as disparate impacts from wildfire disaster events and recovery that put historically underserved and excluded communities at greater risk of harm. Approaching this work through a foundational focus on racial equity and environmental justice will help address the disproportionate harm faced by historically underserved and excluded communities, while ensuring equitable access to the economic, social and ecologic co-benefits of these programs and investments in wildfire resilience.



An all-female led controlled burn in a Florida longleaf pine forest. © Carlton Ward Jr.

New fire scenario modeling from the Forest Service suggests that targeted treatments on nearly 51 million acres of federal, state, tribal and private lands in the next 10 years will significantly reduce exposure in the highest risk areas.

Identifying a menu of potential building blocks for investment in wildfire resilience will give policymakers a range of options to find the funding necessary for this paradigm shift to occur, so that there can finally be progress at the pace and scale needed to truly reduce risk and increase resilience over time. For each building block identified in Sections I-III, the paper outlines existing funding levels; provides

an assessment of program effectiveness, changes and needs; and identifies primary co-benefits that can help identify political coalitions and policy venues for advancing recommended executive and legislative changes and appropriations. In Section IV, the paper highlights the potential for near-term increases in funding using the building blocks, and suggests possible policy vehicles for advancing a longer-term paradigm shift in investment.

BUILDING BLOCKS

I. Current Federal Wildfire Resilience Funding:

This section focuses on the primary federal programs that currently fund investments in wildfire risk reduction and resilience. These programs include a set of core programs where wildfire resilience is a principal program objective, and a set of complementary programs where other management outcomes (e.g., timber production, insect and disease management, and watershed health) are the primary purpose of the programs, but wildfire resilience is also an outcome or a co-benefit of the program. Many complementary investments also provide threshold funding needed for the research, planning and workforce capacity to deliver wildfire resilience and risk reduction programs at scale over time.

Core Programs include:

- Forest Service's Hazardous Fuels and Department of Interior Fuels Management Programs
- Forest Service's Collaborative Forest Landscape Restoration Program (CFLRP)
- USDA's Joint Chiefs' Landscape Restoration Partnership
- Forest Service's State and Private Forestry Programs
- Bureau of Indian Affairs' Reserved Treaty Rights Land Program and Tribal Resilience Program
- Cross-Departmental Funded Initiatives including:
 - Promoting Ecosystem Resilience and Fire Adapted Communities Together (PERFACT) Partnership
 - Community Planning Assistance for Wildfire (CPAW) Partnership.



Measuring logs in Washington state for mills. © Zoe van Duivenbode/TNC

Complementary Programs include:

- Forest Service's Forest Products and Wood Innovations Programs
- Forest Service and Department of Interior's Land Acquisition Programs
- Bureau of Land Management's Forest and Woodlands Management Program
- Forest Service's Vegetation and Watershed Management Program
- Forest Service's Planning Program
- USDA's Multi-agency Research Capacity
- Conservation Corps, USDA Job Corps Program, Veterans Fire Corps and Climate Corps Investments
- Forest Service and US Geological Survey's fire science and Joint Fire Science.

Continuing current funding in these programs will be necessary to maintain current levels of work. In many instances, funding levels have not increased to address rising fixed costs facing federal agencies, resulting in diminishing outcomes amid flat funding trends.¹² **To move in the direction required for a paradigm shift, these programs would require significant new investments and expanded funding.**

Increasing funding for the core programs would build on existing knowledge and workforce capacity to deliver additional work. While these tried-and-true programs represent the foundation for an investment case, significant new investments would require changes in program management to deliver outcomes at scales necessary to address landscape resilience goals. These include, for example, new outcome-based performance metrics, the ability to commit to multi-year funding, landscape scale planning, and improved processes for partners and private dollars to leverage federal investments and capacity. Targeted investments in complementary programs can help to further institutionalize wildfire resilience goals, and help build the capacity, infrastructure and markets for wildfire resilience.

For each program, this paper provides a bottom-line assessment with possible funding levels and management reforms, and highlights the primary economic, social and environmental co-benefits of investments in wildfire resilience related to each program. These co-benefits can bring partners to the table to support increased investments, and can help align program opportunities to appropriate executive branch and legislative initiatives, such as infrastructure development, stimulus and economic recovery funding, climate change action, Farm Bill reauthorization, annual appropriations negotiations or others.

Co-benefits of wildfire resilience funding highlighted in this section include:

-  **Jobs and Rural Economic Opportunity**
-  **Community Resilience**
-  **Environmental Justice and Equity for Underserved Communities**
-  **Indigenous Leadership and Sovereignty**
-  **Outdoor Recreation Economy and Access to the Outdoors**
-  **Innovation in the Biobased Economy**
-  **Working Farms, Forests and Rangelands**
-  **Critical Infrastructure for National Security and Military Readiness**
-  **Clean Air and Community Health**
-  **Forest and Soil Carbon Sequestration**
-  **Healthy Watersheds and Secure Water Supply**
-  **Fish and Wildlife Habitat**

Additional future analysis on the return on investment for each building block could focus on capturing these co-benefits, as well as accurately valuing avoided costs due to investments that reduce the risk and severity of catastrophic fire events

A. Core Programs and Investments:

1. Forest Service Hazardous Fuels and Department of Interior Fuels Management Programs

Description: These programs fund one of the most important priorities identified in the National Cohesive Wildland Fire Management Strategy¹³ for fire risk reduction: hazardous fuels management through a mix of predominantly prescribed fire and mechanical vegetation treatments, as well as limited use of herbicides and targeted grazing in rangeland ecosystems. Strategically reducing fuels can help reduce a wildland fire's intensity, which in turn can help lower the risk fires pose to communities and other valuable assets and infrastructure, while also achieving ecological benefits. The Forest Service's new risk modeling tools can help inform treatment priorities and can also help predict how different treatments will impact different values at risk.

Five federal land management agencies support hazardous fuels projects: the Department of Agriculture's Forest Service and the Department of the Interior's Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Fish and Wildlife Service (FWS) and National Park Service (NPS).

(in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Forest Service Hazardous Fuels	375,000	390,000	430,000	435,000	445,310	180,388
DOI Fuels Management	170,000	180,000	184,000	189,000	194,000	219,964
Total	545,000	570,000	614,000	624,000	639,310	400,352

The Forest Service typically allocates its hazardous fuels reduction funds to its nine regional offices, which then allocate funds to individual field units (e.g., national forests and grasslands). DOI allocates its fuel reduction funds through its Office of Wildland Fire to the BIA, BLM, FWS and NPS. These agencies then allocate funds to their regional offices and then to individual field units, such as national parks or wildlife refuges. Once field units receive their allocations, they select fuel reduction projects to implement during the fiscal year.

Both the DOI and Forest Service typically rely on past year allocations to inform subsequent allocations. The Forest Service in recent years has allocated about 70% of the agency's total fuel reduction funds to the regions, withholding about 30%

to make available to regions and national forests on a competitive basis later in the fiscal year. The DOI Office of Wildland Fire has made allocations to Interior bureaus consistent with prior years, with each bureau relying on its own allocation model— often using a mix of risk assessment and past region and unit performance. BIA for instance, initially looks at wildfire hazard potential; the location of WUI and critical infrastructure; and the location, size, and frequency of previous wildfires as 70% of a regional allocation score. They then evaluate a series of performance and fiscal management inputs, including a 10-year rolling average percentage for the number of acres that received fuel reductions versus the number of acres that had been targeted for fuel reduction projects, information on the percentage of fuel reduction funds that were not spent within the fiscal year and were carried over into the next fiscal year, and information on the average number of acres that received fuel reductions in a given year, together comprising 30% of the region's score.¹⁴



Prescribed burning in Willamette Valley, Oregon, with partnership of TNC, US Forest Service, US Fish and Wildlife Service and Bureau of Land Management. © Jason Houston

The DOI and Forest Service have well established research programs that are designed to support agency managers' prioritization and implementation of fuel reduction projects (although fire science programs also need additional investment, as addressed in a later section). According to the U.S. Government Accountability Office (GAO),¹⁵ the agencies have relied primarily on a common national geospatial data set of wildfire risk developed by the Forest Service to estimate the relative probability a given area faces of experiencing a wildfire that would be difficult to suppress, and then to evaluate that area's proximity to communities, values and infrastructure at risk.¹⁶ Forest Service fire science research uses historic fire data to refine the scientific understanding of how wildfire burns across landscapes and the

anticipated effects of fuel reduction projects conducted at different scales, including assessments of past fires coinciding with treatments. Risk models can then take into account assets and values present on the landscape, combined with the likelihood of a fire reaching those assets and the efficacy of treatments based on historic data, in order to prioritize fuel reduction treatments on the ground.

More recently, Forest Service researchers, using a Scenario Investment Planning Tool, have developed ways to target treatments in areas that transmit fire to developed areas. Their findings indicate that a small proportion (<10%) of these fire prone areas are responsible for 80% of the risk to communities. Through simulations, the agency has identified that it is only necessary to treat half or less of the acres in a planning area (which can be referred to as a "fired" area) to treat 80% of the lands that expose communities to fire. While some fuel reduction projects may be completed with a single treatment method, other projects may require multiple treatment methods and may span several years. Fuel reduction projects are generally effective for three to five years in southeastern U.S. pine forests, given the high rate at which vegetation grows in that region. In contrast, projects are generally effective for eight to 12 years in dry conifer forests in the western United States.

Assessment of Effectiveness, Changes and Needs:

The hazardous fuels program must be dramatically scaled up to achieve outcomes at the pace and scale required for priority risk reduction.

To significantly reduce exposure in the highest risk areas, it will be necessary to treat 27 million acres on National Forest System (NFS) land and 30 million acres on other federal, state, tribal and private lands in the western United States within 10 years, with additional treatments to maintain resilience and reduce risk in new priority areas required on an ongoing basis thereafter.¹⁷ The Forest Service has estimated that these acres will cost \$1,000 per acre on average to treat, for a price tag of approximately \$5 billion to \$6 billion per year.

For comparison, in fiscal years 2009 through 2018, the Forest Service and DOI implemented fuel reduction projects that treated an average of approximately 1.4 million and 1.1 million acres, respectively, per fiscal year of lands they manage or administer. In fiscal year (FY) 2021, the Forest Service has had a target of treating 3.5 million acres but did not receive

a corresponding increase in funds that would support more than doubling its work. The DOI, as part of its strategy to shift to a year-round fire workforce, aimed to accomplish 1.4 million acres of fuels work at a funding level of \$228 million, but did not receive that amount in the final FY2021 budget (the proposal is also bolstered by a \$28 million increase in preparedness funding).¹⁸

Final appropriations in the FY2021 Omnibus and COVID Relief and Response Act included \$180.4 million for hazardous fuels management under the new budget structure, which moved large sums into a new agency-wide operations account (\$1.03 billion) and a new National Forest System wide salaries and expenses account (\$1.41 billion). The Forest Service and the House and Senate Appropriations Committees indicate that the new FY2021 funding level for the hazardous fuels reduction program is \$28 million above the adjusted FY2020 level.

The agencies continue to cite the scale of the problem as a huge stumbling block toward the effectiveness of their hazardous fuels programs. Agency specific performance and funding allocation criteria help meet the diverse program and mission objectives of the agencies, but often result in an incoherent cumulative strategy and the prevalence of “random acts of restoration.” The current DOI Hazardous Fuels Program lacks transparency and a strong constituency, and may benefit from having separate line items for each of the bureaus to increase accountability and help develop constituencies within a particular bureau for wildfire resilience funding.

For a paradigm shift to occur, these programs need a significant infusion of funding above current levels. In order to scale up treatments, the agencies will need to create a multi-year strategy, develop new and strengthen existing partnership agreements with states, tribes, and local partners to accomplish cross-boundary work, and invest in significant workforce development and training.

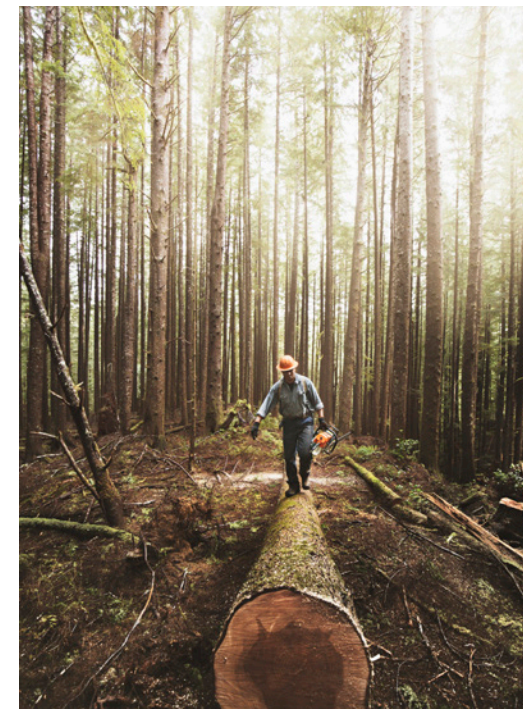
For many western landscapes, an integrated restoration approach using a combination of mechanical and fire treatments has been shown to be effective, and sustaining their resilience requires an enduring and healthy fire regime. Prescribed fire and Indigenous cultural burning have become widely advocated for use in management practices to restore and maintain fire regimes, yet their application has been inadequate in the western United States.¹⁹ Limited funding and workforce capacity are frequently cited as the most common barriers.²⁰ Shifting capacity for prescribed fire from a seasonal to year-

round workforce, along with dedicated multi-organizational, cross-jurisdictional workforce is needed to avoid scenarios where staff and budgets dedicated to prescribed fire are continually diverted to address mounting suppression needs. There is also interest in increasing partnerships with qualified conservation corps programs to augment the workforce demands for increased treatments, including the Biden-Harris Administration’s newly announced intent to create a Civilian Climate Corps spanning USDA and DOI.

The agencies will also need to overhaul current performance metrics, which are based on outputs, to create an integrated set of outcome-based measures to accurately capture risk reduction to life and property, avoided direct and indirect costs, the creation of jobs and economic opportunity related to treatments, and the delivery of co-benefits from resilient ecosystems, including carbon sequestration, clean water, clean air, wildlife habitat, recreation access, community well-being and more. Transparent, integrated performance evaluation and planning will be critical to advancing wildfire resilience funding strategies at scale.

Existing authorities offer some opportunities to advance treatments in coordination with neighboring landowners across a “firedhed.” For example, Farm Bill authorities like the Good Neighbor Authority, programs like the Joint Chiefs’ Restoration Initiative, and partnership agreements like shared stewardship and other agreements supported through the Forest Service’s State and Private Forestry Deputy Area are a good start. Building on these authorities and partnerships can help to ensure priorities are met and risk reduction occurs at scale. Additional emphasis may be needed to support prioritizing all-lands investments to achieve outcomes; for example, additional budget direction could help align cross-boundary efforts to jointly fund high-priority work. Fundamentally, agency leaders must create real and reasonable opportunities for a diversity of partners to coordinate, share responsibility and decision-making, and integrate qualified and available non-federal resources into their projects.

2. Forest Service Collaborative Forest Landscape Restoration Program (CFLRP)



Managing second-growth forest in Ellsworth Creek Preserve in Washington state. © Chris Crisman

Description: This program is one of the most supported and successful Forest Service programs for collaborative, multi-year funding of restoration projects on National Forest System lands. Projects achieve a range of benefits, including fire risk reduction. Because the program has a track record of achieving outcomes in a way that is informed and supported by partners, it will be an important building block for increasing the pace and scale of fire resilience work on federal lands. Other building blocks will be necessary complements to support planning costs for Collaborative Forest Landscape Restoration Program (CFLRP) projects and accomplish work on adjacent non-federal lands, including to help meet the increased needs for prescribed fire and workforce capacity.

Congress established the CFLRP with Title IV of the Omnibus Public Land Management Act of 2009 and reauthorized it in Section 8629 of the Agriculture Improvement Act of 2018 (Farm Bill). The purpose of the CFLRP is to:

- encourage the collaborative, science-based ecosystem restoration of priority forest landscapes;
- encourage ecological, economic, and social sustainability;
- facilitate the reduction of wildfire management costs, including through re-establishing natural fire regimes and reducing the risk of uncharacteristic wildfire;
- leverage local resources with national and private resources;
- demonstrate the degree to which various ecological restoration techniques achieve ecological and watershed health objectives; and
- encourage utilization of forest restoration byproducts to offset treatment costs, to benefit local rural economies and to improve forest health.

The 2018 Farm Bill reauthorization increased the funding authority for requests by the USDA Secretary of up to \$80 million annually for FY2019 through FY2023. Funding can cover up to 50% of the cost of carrying out and monitoring ecological restoration treatments on National Forest System (NFS) land for each proposal selected; up to \$4 million annually for any one project; up to two projects per year in any one Forest Service region; and up to 10 projects per year nationally. CFLRP funds may only be used on NFS lands and may not be used to cover planning costs. Funds are matched by goods for services, partner cash and in-kind contributions, and the use of other Forest Service budget line items.



Building Block Bottom Line:

- **The Forest Service and DOI Hazardous Fuels Programs require significant new investment to achieve treatments at the necessary pace and scale.**
- **The Forest Service’s new risk modeling tools should be used to identify the highest priority acres and to inform treatments.**
- **Accelerating the use of prescribed fire will be critical to drive down overall program costs and maintain resilience over time.**
- **There must also be greater national coordination for these programs to plan and set priorities, track and monitor progress, and facilitate cross-boundary partnerships using programs identified elsewhere in this report.**
- **A Phase 1 funding target could be for a 100% increase in funding, along with investments in project planning, monitoring and workforce development.**



Primary Building Block Co-Benefits: Community Resilience; Jobs and Rural Economic Opportunity; and Healthy Watersheds and Water Supply

(in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
CFLR	40,000	40,000	40,000	40,000	40,000	13,787

Assessment of Effectiveness, Changes and Needs:

CFLRP has demonstrated its effectiveness in achieving outcomes: between FY 2013 and FY 2019, CFLRP projects comprised 11% of the NFS treatable acreage and 9% of restoration-related spending, but accomplished 19% of the agency's total hazardous fuels treatments, 15% of the timber volume sold, 15% of terrestrial wildlife habitat enhanced, and 26% of vegetation improved.²¹

While CFLRP projects focus on a diversity of forest management and restoration challenges, they have proved effective in addressing wildfire risks. CFLRP projects have treated 3.8 million acres to reduce wildfire risk, including 1.6 million acres of mechanical treatments, 1.6 million acres using prescribed fire, and 0.6 million acres of managed wildfire for resource benefits. The amount of prescribed fire treatments in CFLRP projects has increased significantly over time: In 2019, CFLRP Projects provided 15% of the agency totals for prescribed fire treatments. In 2019, Forest Service researchers conducted a deeper analysis of fuels treatments on five CFLRP Projects (Southwest Jemez (NM), Southern Blues (OR), Northeast Washington (WA), Missouri Pine-Oak Woodlands (MO), and Accelerating Longleaf Pine (FL)). Analysts performed wildfire simulations and risk calculations on pre-treatment (2012) and post-treatment (2019) landscape conditions. In general, study sites showed a decrease in average burn probability, expected annual area burned, and predicted flame lengths.

Interviews conducted by the University of Oregon and Colorado State University with agency staff highlight that the most valuable aspect of CFLRP has been the long-term funding commitment and prioritization of a particular landscape. The authors found that these elements incentivized collaborators to invest their time and effort, helped to leverage resources, and allowed for a coordinated program of work across the landscape.²² The authors further found that CFLRP was most successful in places with:

- a strong history of collaboration, transparent communication strategies, and agreement about a restoration vision;
- strong line officer leadership and strategic thinking about both a restoration vision and how to find adequate capacity to implement projects;
- industry capacity and valuable forest products;
- a focus on less contentious landscapes; and
- supporting capacity in the form of professional facilitation and partners with scientific or legal expertise.

“Less successful projects generally suffered from poor collaboration and communication, limited agency capacity, line officer and staff turnover, unexpected ecological disturbances, and a lack of markets, wood products facilities, or strong industry partners.”²³

Taken together, these findings suggest the program continues to be among the most effective in fostering landscape scale restoration and wildfire resilience, but may not be suitable in all landscapes absent supporting capacity and investment. In July 2020, the CFLR advisory committee unanimously recommend funding one project in FY2020, 10 additional projects in FY2021 as funding is available, and extending two of the original projects from 2010. They also supported three alternate proposals and did not recommend CFLRP funding for one extension and five other projects. While funding for the program is authorized at up to \$80 million per year, the program continued to receive funding allocations at only around \$40 million per year.

In an analog to CFLRP, the DOI Wildland Fire Resilient Landscapes Program was first proposed in the FY2015 President's Budget. The program was intended to integrate and coordinate between Interior's four wildland fire management bureaus and their federal and non-federal natural resource counterparts on landscape-scale activities. The program sought to improve the integrity and resilience of forests and rangelands by restoring natural vegetation landscapes to specific conditions and to maintain fire resiliency. DOI established this program in FY2015 on a pilot basis, with 10 projects selected for funding. \$10 million was provided for the program in FY2015 and FY2016. However, DOI abandoned the program during the last administration.



Building Block Bottom Line:

- **At a minimum, current annual investment for CFLRP should be increased to the amount authorized starting in FY2022, from \$40 million to \$80 million (under prior budget conventions).**
- **That increase is not enough for a paradigm shift, but could be accomplished quickly while reviewing how additional investments could build on past successes and existing zones of agreement to support a more significantly increased program of work, including building on the program's success in using prescribed fire.**
- **The Forest Service could then work with partners to identify a Phase 2 request for additional increases to CFLRP: For example, a significant new authorization could be included in the next Farm Bill.**
- **An assessment of the Interior Wildland Fire Resilient Landscapes Program pilots should recommend initial and expanded funding levels for that program, and should consider restoring the program in FY2022 to at least the \$10 million initially authorized.**



Primary Building Block Co-Benefits: Jobs and Rural Economic Opportunity; Clean Drinking Water; and Fish and Wildlife Habitat

3. USDA Joint Chiefs' Landscape Restoration Partnership

Description: This program has exhibited highly successful examples of multi-agency cooperative investment across landscape ownership types to reduce wildfire risk and achieve co-benefits for water and wildlife. Using this joint agency partnership program as a means for connecting additional complementary agency programs and investments could create a solid foundation for a paradigm shift that would allow treatments across public and private land boundaries.

Launched in 2014, the Joint Chiefs' Landscape Restoration Partnership pairs resources from the Forest Service and the Natural Resources Conservation Service (NRCS), predominantly through the Environmental Quality Incentives Program (EQIP), to reduce wildfire threats to communities and landowners, protect water quality and enhance wildlife habitat in priority areas where public forests and grasslands connect to privately owned lands. Each selected project receives three years of implementation funding support.

USDA Joint Chiefs' LRP (in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Forest Service Component	23,091	12,784	11,367	14,473	16,127	TBD
NRCS (EQIP) Component	17,477	19,253	21,102	23,479	25,000	TBD
Total	40,568	32,037	32,469	37,953	41,127	TBD

Assessment of Effectiveness, Changes and Needs:

Like CFLRP, the Joint Chiefs' program has generally been effective in prioritizing work through a multi-year funding commitment model and through focusing resources in landscapes with high capacity for implementation. It marks one of the few programs effectively achieving landscape scale work across ownership boundaries. Benefits from the program model have not yet transferred beyond the selected projects to more uniformly drive agency collaboration. As a result, Joint Chiefs' and CFLRP highlight a trend towards a geographically competitive environment for resources, where partnerships and promotion are foundational to success— a trend that assures resources are applied to high-capacity landscapes, but requires that agencies provide pre-proposal capacity support for areas that are high-risk but not high-capacity.

Key questions and changes that would be needed to unlock this program's potential as a building block for fire resilience include:

- How can new fire risk scenario maps inform the location of these projects and the type of treatments that are prioritized?
- Can complementary programs (for example CFLRP and RCPP) and resources from the two lead agencies support broader projects at a bigger scale? and
- Can these projects bring other adjacent landowners, including federal, state and Indian and Alaska Native landowners, to the table through shared stewardship, good neighbor, or other agreements?



Building Block Bottom Line:

- **Increasing the work done to address fire risk through the Joint Chiefs' program could support shared stewardship agreements and be an important mechanism for cross-boundary work.**
- **As with CFLRP, starting with a doubling of the program from about \$40 to \$80 million in FY2022 would allow the agencies to build on current success and capacity, while developing a strategy to expand project delivery to more places at an increased pace and scale.**
- **Part of the potential is for increasing investment in fire risk reduction treatments from underlying NRCS Farm Bill programs in ways that provide mission-relevant ecologic benefits and support the sustainability and resilience of private working lands.**



Primary Building Block Co-Benefits: Working Farms, Forests and Rangelands; Clean Drinking Water; and Fish and Wildlife Habitat

4. Forest Service State and Private Forestry (S&PF) Resilience (Landscape Scale Restoration, Forest Health and Management, National Fire Capacity and Working Forest Lands)

Description: The Forest Service's State Forestry Assistance program under the Cooperative Forestry Assistance Act of 1978 provides financial and technical assistance to states and communities for wildland fire management. State foresters allocate State Forestry Assistance program funds according to the priorities identified through State Forest Action Plans— strategic plans for all forests in each state that include an analysis of forest conditions and trends and that identify priority forest landscape areas.



Western larch trees, Montana. © Steven Gnam

Forest Service S&PF (in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Landscape Scale Restoration	14,000	14,000	14,000	14,000	14,000	14,000
Forest Health Management (Fed and Cooperative)	170,000	180,000	184,000	189,000	194,000	219,964
National Fire Capacity (former State Fire Assistance)	99,600	94,500	96,500	98,000	100,000	15,485
Working Forest Lands	78,000	78,000	80,000	81,000	82,000	73,433
Total	40,568	32,037	32,469	37,953	41,127	11,902
	232,168	218,537	222,969	230,953	237,127	114,820

State forestry agencies work with Forest Service regional offices to draw from several agency resources to advance the objectives identified in State Forest Action Plans. For example:

- The Landscape Scale Restoration program provides for competitive grants that support collaborative, science-based restoration of priority forest landscapes, with wildfire risk reduction as one of the program objectives.
- Forest Health Management funds appropriate and timely responses that protect the nation's forests from insects and diseases on federal lands, while the cooperative lands component provides financial assistance to states to treat state and private lands for insect, disease, and invasive plant issues.
- Working Forest Lands funds support private and family forest lands management for public benefits that include wildland fire risk reduction, water security, and rural economic development.
- The National Fire Capacity program provides financial assistance through partnership agreements with state

foresters for the prevention, mitigation, control, and suppression of wildfires on non-federal lands. Hazardous fuels treatments in the wildland-urban interface (WUI), firefighter training, and prevention and education programs are also provided by this budget line item. Additionally, program funds aid in the purchase, maintenance, and rehabilitation of needed firefighting equipment for State agencies. These funds also support cooperating partners to advance similar work, for example the National Fire Protection Association, International Association of Fire Chiefs, Ad Council, and The Nature Conservancy, among others.

Assessment of Effectiveness, Changes and Needs:

State experiences are variable in implementing forest action plans and facilitating investment in wildfire resilience through cooperative agreements and S&PF funding sources. State forestry agencies play an important role in implementing all three tenants of the National Cohesive Wildland Fire Management Strategy: Resilient Landscapes, Fire Adapted Communities and Safe and Effective Wildfire Response—often without clear budget sources allocated to each initiative. For instance, National Fire Capacity helps support community engagement, capacity building and outreach for fire adapted communities, hazardous fuels reduction partnerships with local jurisdictions for fire-adapted landscapes, and local and state firefighting equipment expenses. While funding effectively meets a mix of state priorities, it fails to distinguish between resilience investments and other expenses more typically allocated to wildfire preparedness and suppression response needs. As the costs of preparedness and suppression rise, it is reasonable to expect that resilience funding will be negatively impacted under these structures.

The Forest Service’s Shared Stewardship Initiative endeavors to better align state priorities and spending across land ownerships with those of the National Forest System and to identify shared performance criteria. To date, 26 states have entered into Shared Stewardship Agreements²⁴ under diverse implementation strategies, and a few have integrated these policy objectives into State Forest Action Plan revisions. Some of these agreements have led to the allocation of specific resources for shared work. For example, the Utah Shared Stewardship Agreement helped secure an initial \$2 million investment from the Utah Legislature with a \$2 million Forest Service match, with a four-year plan for shared investment of \$6.5 million by the State, to be matched by \$14.5 million in federal funds. Those shared funds will be used for a mix of training, project work, and wood utilization/business development needs. In another example, the California agreement committed both the State and Forest Service to treating 500,000 acres per year each by 2025. California has made a \$1 billion, 5-year commitment to forest restoration and wildfire risk reduction, including on federal lands.

In Montana, shared stewardship was integrated into a revision of the State’s Forest Action Plan, building from collaboratives across the state, resulting in a set of online tools for tracking priorities and implementation strategies.²⁵ Proponents of shared stewardship have indicated that the effort has been productive for instilling a joint prioritization and shared decision-making approach and incentivizing federal agency staff in a way that creates positive cultural change. However, priority setting processes and public engagement have been inconsistent across states, and some have raised concerns about the potential for priorities to diverge from community-based and collaboratively developed priorities that had largely served to prioritize state-based work over the past decade.²⁶

	FY2016	FY2017	FY2018	FY2019	FY2020
USFS Forest Products	359,805	367,805	366,000	368,000	373,000

States are also increasingly playing a larger role in funding work on National Forest System lands through the Farm Bill’s Good Neighbor Authority (GNA). A few states have moved beyond the use of GNA as a project implementation tool, to establishing GNA programs, where staff capacity to augment planning and project implementation has been established through state legislatures. GNA allows for states to serve as the “agent” of the Forest Service and use state contracting procedures to conduct forest restoration and management activities on the ground, complementing traditional strategies. Program income, derived from timber sales, can be utilized for a host of activities, including treatment of insect and disease infected trees; reduction of hazardous fuels; and restoration and improvement of forest rangeland, and watershed health, including fish and wildlife habitat. Program income can also be utilized to fulfill needs such as contracting interdisciplinary team (ID team) specialists, funding seasonal timber or silviculture crews, or purchasing replacement culverts to improve fish passage, as long as those activities contribute to on-the-ground restoration activities. Current agency programs for wildfire resilience struggle to consistently and strategically prioritize and allocate resources under existing authorities and programs across landownership boundaries. Shared Stewardship Agreements, State Forest Action Plans, and GNA efforts offer opportunities to better align resources and performance tracking. These programs

and initiatives have allowed for the development of several models for prioritizing resources that to varying degrees effectively build and maintain local and state support. Efforts to establish new requirements for either Shared Stewardship Agreements or State Forest Action Plans could build from best practices and further advance integrated investments. These requirements could come with specific funding incentives to further bolster state, local and tribal governments support tied to the new requirements and include the needed flexibility to directly support other Indian and Alaska Native Nations and local and NGO partners.



Building Block Bottom Line:

- **The S&PF budget lacks sufficient transparency to fully map funding allocations to fire program objectives and geographic priorities, but nevertheless offers a set of budget tools for incentivizing priority work.**
- **A significant increase of funding through these programs could help get funding to state and local partners to accomplish resilience work. Funding could be restructured to better match key tenants of the cohesive strategy, helping to better target funding allocations to support wildfire adapted communities and landscapes.**
- **Programmatic evaluations of Good Neighbor Authority and Shared Stewardship could also serve to highlight how funding contributes to wildfire resilience objectives and how those programs could serve as a vehicle for federal funding increases that can leverage state and other partner matching contributions. For example, a new budget line item or block-grant program included as part of an infrastructure or climate change bill could support and expand shared stewardship by funding cross-boundary priority work, with a focus on wildfire resilience.**
- **Funding could better integrate priorities and performance measures for wildfire resilience through revised criteria for State Forest Action Plans.**
- **Thoughtful inclusion of state funding initiatives may prove critical to develop wildfire resilience funding coalitions.**
- **Recent changes to the GNA have also improved the Forest Service’s ability to work with Indian and Alaska Native Nations and funding increases should include a focus on increasing resources available to support this work.**



Primary Building Block Co-Benefits: Jobs and Rural Economic Opportunity; Community Resilience; and Working Farms, Forests and Rangelands

5. BIA Reserved Treaty Rights Land Program and Tribal Resilience Program

Description: The Reserved Treaty Rights Land Program (RTRL) is a BIA program that helps Indian and Alaska Native Nations participate in collaborative projects with other landowners supporting the health and resiliency of priority tribal resources at high risk of wildfire. The Tribal Resilience Program (TRP) supports tribes, tribal consortia, and authorized tribal organizations to build adaptation and resilience through competitive awards. The annual awards program is designed to reinforce preparedness through tribally designed resilience training, adaptation planning, vulnerability assessments, supplemental monitoring, capacity building, and youth engagement. BIA provides services, directly or through contracts or compacts, to federally recognized tribes comprising approximately 1.9 million American Indian and Alaska Natives, many of whom live on tribal lands held in trust by the BIA. Tribal forests provide a source of revenue and jobs for many tribal governments and their members, and play an important role in sustaining tribal cultures and traditions.

BIA (in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Reserved Treaty Rights Land Program	10,000	10,000	10,000	10,000	10,000	TBD
Tribal Resilience Program	8,600	12,700	12,700	8,700	14,400	TBD



Upper Klamath River in northern California, near lands that the Yurok tribe manages with controlled burns. © Kevin Arnold

Assessment of Effectiveness, Changes and Needs: Beginning in 2015, as much as \$10 million in the BIA RTRL budget has annually been appropriated for the purpose of treating and restoring tribal landscapes within or adjacent to reserved treaty right lands. This allocation is provided through the DOI's Wildland Fire Management appropriation. In 2017, the BIA reported that 276 jobs were created or supported, 178 partnership opportunities were facilitated, goals of the National Cohesive Strategy were advanced, and over 44 tribal and 54 partnership priorities were met.²⁷ In some instances, Tribes have leveraged RTRL resources with Tribal Forest Protection Act (TFPA) authority to propose and complete projects on adjacent federal lands and other partnerships to expand the scope of their resource management. With Tribes also receiving Good Neighbor Authority in the recent Farm Bill, additional opportunities exist to advance all-lands restoration, while meeting tribal land management goals and employment goals.

From 2011-2020, TRP has provided more than \$60.7 million in 703 awards to Indian and Alaska Native Villages for resilience activities, adaptation and coastal planning, student internships and youth engagement, and travel support for training. TRP investments have focused on building capacity and resilience through both financial and technical assistance, supporting delivery of data and tools, providing access to training and workshops and facilitating planning efforts. The program has been effective at developing guidance, including for integrating western science with traditional ecological knowledge, and could offer a platform for enhancing fire management practices to steward landscapes and to help further understanding of indigenous leadership in fire adapted and fire dependent practices. The program presently has a broad focus on resilience and climate issues and has only addressed forest restoration and wildfire resilience to the extent it has been driven through local planning efforts.

RTRL and TRP offer an opportunity for landscape-scale partnerships with other agencies such as NRCS and the Forest Service that could replicate the successes of the Joint Chiefs' Initiative or the Sentinel Landscapes Initiative (described below) while fostering opportunities for supporting and learning from Indian and Alaska Native Nation leadership and traditional knowledge in managing fire adapted landscapes.



Building Block Bottom Line:

- With additional resources to focus specifically on wildfire resilience, the RTRL and TRP could work together to support investments identified as priorities by Indian or Alaska Native Nations for risk reduction treatments and cultural management objectives alongside other co-benefits.
- Landscape scale partnerships should be explored to align RTRL and TRP wildfire resilience with other program investments (e.g. Joint Chiefs or Sentinel Landscapes) to achieve desired outcomes and align performance criteria.



Primary Building Block Co-Benefits: Indigenous Leadership and Sovereignty; Environmental Justice and Equity for Underserved Communities; and Community Resilience

6. Cross-Departmental and Agency Funded Programs

Promoting Ecosystem Resilience and Fire Adapted Communities Together (PERFACT)

Description: The Promoting Ecosystem Resilience and Fire Adapted Communities Together (PERFACT II) partnership invests in people and place-based efforts to change relationships with fire, helping foster co-management and shared risk of fire in landscapes and communities across the country. PERFACT has helped build robust local capacity for fire management while enabling more prescribed fire use and implementing treatments that support community safety and ecosystem health objectives. The partnership empowers community leaders to take action to address fuels mitigation and home hardening and go beyond basic fire preparedness practices to increase business resilience, coordinate community-wide resilience initiatives and manage post-fire recovery. PERFACT also brings together Native American people who are working to revitalize traditional fire cultures in a contemporary context. Vibrant peer learning networks - Fire Learning Network (FLN), Prescribed Fire Training Exchanges (TRES) Coaches Network, Fire Adapted Communities Learning Network (FAC Net) and Indigenous Peoples Burning Network (IPBN) - support practitioner action, spread ideas and innovations, mentor emerging leaders, and identify strategic leverage points. Through these networks, the partnership enables local and regional action, and supports the transfer and scaling of those impacts.

(in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Fire Networks	10,000	10,000	10,000	10,000	10,000	TBD

Assessment of Effectiveness, Changes and Needs:

Through a 19-year series of cooperative agreements between the USDA Forest Service, DOI or agencies and TNC, and in collaboration with staff from the Watershed Research and Training Center and University of California Cooperative Extension, this partnership has led the way in connecting the three goals now embodied in the National Cohesive Wildland Fire Management Strategy. Since 2002, 166 FLN landscapes in 40 states have engaged nearly 1,600 partners and leveraged more than \$84 million toward effective restoration and maintenance of healthy forests and grasslands; 100 TRES and cooperative burning events have provided 3,600 training opportunities and treated 135,000 acres with prescribed and cultural fire; FAC Net has engaged community leaders in 30 states, with 18 core members, 7 statewide networks and 154 affiliate members in communities from coast to coast; and a growing IPBN engages tribal members in 5 states.

PERFACT's model of working with people over a period of years, making small, sustained investments as they tackle their fire-related challenges, foster collective action, and develop relationships needed to meet shared goals has built

sustainable capacity, social capital and momentum for increased wildfire resiliency.^{28,29} These investments have positioned many fire network members and collaboratives to successfully compete for funding and support from federal programs such as CFLRP, Joint Chiefs' Landscape Restoration Partnership, FEMA National Pre-Disaster Hazard Mitigation and Secure Rural Schools Title III, or state programs such as California Climate Investments Forest Health Program.³⁰ While PERFECT does not fund government relations and advocacy work, the relationships and knowledge base built through the partnership have been used to inform policy changes through network members' engagement with decision makers, particularly at the state level.



Prescribed Fire Training Exchanges (TRES) like this one in Oregon provide valuable training for practitioners from many different agencies and organizations. © Mitch Maxson/TNC

PERFACT partners have centered work on diversity, equity, inclusion and justice (DEIJ) to broaden the range of perspectives that inform collective action, based on the recognition that achieving better fire-related outcomes for nature and people absolutely depends on more diverse fire workforces and more equitable local partnerships. Over the past five years, PERFECT has provided customized DEIJ training and peer support opportunities for members of the fire networks



Building Block Bottom Line:

- **PERFACT has demonstrated the ability to increase the capacity and social capital needed to make ecosystems and communities more resilient to wildfire.**
- **The local and regional leaders that have been supported through this partnership have pioneered models of cooperative burning and community wildfire adaptation, built successful local approaches, and are changing their risk and resilience.**
- **The fire networks leverage Shared Stewardship and serve as the glue that, in many places, are holding the goals of the National Cohesive Wildland Fire Management Strategy together -- addressing the needs of landscapes, communities and capacity for wildfire response in holistic ways.**
- **An increase in funding to \$4.5 million per year will deliver significant return on investment and leverage other existing and innovative funding opportunities.**



Primary Building Block Co-Benefits: Community Resilience; Indigenous Leadership and Sovereignty; Environmental Justice and Equity for Underserved Communities; Jobs and Rural Economic Opportunity

and TRES events; developed the Women-in-Fire Training Exchange program (WTRES) and other efforts to support women leadership skills, professional advancement and empowerment in fire; launched two peer learning groups that have helped fire practitioners interested in working with tribes enhance their cultural competence and partnering skills; and implemented a pilot project focused on engaging Latinx communities in central Washington in community-scale wildfire preparation.

- The partnership is funded primarily by hazardous fuels (Forest Service and DOI) and state fire assistance/national fire capacity (Forest Service) programs at about \$2.5 million per year; an increase to \$4.5 million per year is warranted to maintain the partnership's infrastructure, increase investment in local and regional action and match the potential for expanded private philanthropic support. Increased funding would provide support for: cooperative burning and training to assist local communities developing prescribed fire leadership, experience and qualifications;
- implementation projects designed by local groups to support integrated fire adaptation strategies, particularly those that reduce risk and increase community resilience;
- approaches that create greater engagement and build equitable fire partnerships with tribes; and
- initiatives that equip fire practitioners with the skills needed to act more inclusively, and nurture equitable relationships.

Community Planning Assistance for Wildfire (CPAW)

Description: The Community Planning Assistance for Wildfire (CPAW) Program is a small, but critical program that delivers planning support to build wildfire adapted communities. Established in 2015, CPAW works with communities to reduce wildfire risks through improved land use planning. Funded through a cooperative agreement from the Forest Service with Headwaters Economics and Wildfire Planning International, CPAW provides communities with technical assistance for land use planning recommendations to mitigate wildfire risk through land use codes, plans and ordinances; hazard mapping and assessments; and shared learning opportunities. Often the efforts have served to integrate siloed community wildfire protection plans with community comprehensive development plans.³¹ CPAW has been funded through a mix of Forest Service S&PF line items over the years, predominantly hazardous fuels (prior to its migration to NFS) and state fire assistance/national fire capacity. Limited private philanthropic funding has also supported the program, which has averaged approximately \$1 million per year in operating budget.

(in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
CPAW	1,000	1,000	1,000	1,000	1,000	TBD

Assessment of Effectiveness, Changes and Needs:

Since 2015, the program has reached 70 communities in 14 states, engaging more than 700 community leaders, and convening more than 60 workshops, conference and webinars. For example, in Taos, NM, CPAW supported the development of recommendations to strengthen regulations and use building standards in high hazard areas, leading to updates to land use regulations to require adequate access, water supply, defensible space, and ignition-resistant building materials in high hazard areas. In Chelan, WA, CPAW supported the development of hazard maps in partnership with the Forest Service Rocky Mountain Research Station, leading to adoption of the maps in the Community Wildfire Protection Plan. In Austin, TX, CPAW supported the development of recommendations to strengthen subdivision and building standards in high hazard areas and an online tool to identify vulnerable populations most at-risk to wildfires. These efforts led to adoption of a new WUI code and mitigation resources directed to vulnerable neighborhoods.

Federal agencies have wrestled with their appropriate role in local land use planning— a domain largely deferred to local jurisdictions under the guidelines identified by state subdivision laws. CPAW has proved an effective way to add technical capacity and assistance for planning and recommendations to support local officials in their decisions, create solutions that fit the unique needs and circumstances of individual communities, and share lessons learned among practitioners— creating more lasting and durable progress toward fire adaptive communities than outreach and education efforts alone.

Program leaders see opportunities to scale the program to approximately \$10 million per year, expanding offerings to communities, providing online technical resources and tools, and organizing convenings for communities and practitioners. With more funding, the program could hire dedicated planners to develop specialty expertise in wildfire mitigation provisions and to assess current plans and codes in target communities. The program could also expand training for planners, increase engagement with state legislatures and add risk assessment offerings.



Building Block Bottom Line:

- **Effective planning remains an important tool to reduce wildfire suppression risks and costs and inform community development.**
- **CPAW has developed slowly due to deference to local authorities on the topic of planning and the limited capacity of qualified experts to offer consulting services but has proved successful at bringing technical capacity to support community-led planning for wildfire resilience.**
- **CPAW would benefit from a dedicated BLI and initial funding of \$10 million, with perhaps more funding over the 10-year strategy envisioned in this plan.**
- **Adoption of CPAW into a new or modified budget-line item would help land use planning assistance become a well-supported, fully funded part of the Forest Service’s approach to fire risk reduction and community engagement.**
- **At expanded funding levels, CPAW assistance could offer support to hundreds of communities and could significantly reduce the impact of wildfires through local adoption, implementation, and enforcement of land use regulations.**
- **Coupled with the Forest Service’s new risk modeling tools, new program resources could be strategically deployed to high-risk and underserved communities to increase their resilience and avoid potential harm, with an emphasis on equitable access to assistance.**
- **Investments in CPAW could also help communities attract and strategically leverage other funding sources, including from private sources like utility and insurance companies.**



Primary Building Block Co-Benefits: Community Resilience; Outdoor Recreation Economy and Access to the Outdoors; and Fish and Wildlife Habitat

B. Complementary Programs and Investments:

1. Forest Service Forest Products and Wood Innovations

Description: In geographies with a marketable timber base and forest products industry, the Forest Service endeavors to integrate its hazardous fuels program work with forest product activities by planning, designing, and delivering projects that meet multiple objectives on the ground. Forest products include materials derived from a forest for commercial use, such as lumber and paper, and also “special forest products” such as medicinal herbs, fungi, edible fruits and nuts, and other natural products. The transaction can be structured as a traditional timber sale or as part of a stewardship contract, whereby timber receipts are retained by the national forest to support additional forest management such as additional fuel treatments. In some cases, combining treatments with well-designed timber harvests and thinning can reduce costs required for sale preparation and fuels treatments.

In many regions of the country, however, markets for timber are inconsistent, weak or nonexistent for small diameter timber from thinning for fuel treatments. The Forest Service Wood Innovations Grants Program evolved from the Woody Biomass Utilization Program to help support the development and commercialization of new forest products for lower value, small diameter forest products. The program has provided funding for wood energy projects that focus on the sustainable use of woody biomass for energy purposes such as thermal heat or combined heat and power, with the ultimate goal of developing markets for hazardous fuels and forest materials generated from thinning and other forest management activities. In recent years it has also focused on expanding markets for wood in commercial building construction, advancing mass timber technologies through new manufacturing, code revisions and work with architects and engineers to facilitate the adoption of new technologies.

(in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Forest Service Forest Products	359,805	367,805	366,000	368,000	373,000	37,017
Wood Innovations Grants	8,500	8,300	8,000	8,800	7,620	TBD

Assessment of Effectiveness, Changes and Needs:

Timber harvests can be an integral part of sustainable forest management and using timber sales to offset revenues for other forest management goals will continue to be an important part of achieving diverse management objectives and meeting rural economic development needs in many regions. However, timber volume is not a proxy for the outcome of wildfire resilience, and the acres that have marketable timber are often not a perfect match for the acres that are the highest priority for treatment based on risk models. Under the last administration, an over-emphasis on timber volume production targets has resulted in an underinvestment of resources and capacity for wildfire resilience in priority geographic areas where timber markets and volume are not present. There are few incentives in Forest Service performance and budget structures to prioritize high-cost management acres, which may be the highest priority for community protection, watershed function or other values at risk from uncharacteristic severe wildfire events.

The Forest Service’s supply functions governing the sale of forest products are presently undergoing a modernization effort to address changes in authorities and better reflect market conditions. This includes efforts to simplify contracts and appraisals to mitigate challenges associated with low-value material and increase timber sale outputs; deploy new technologies (handheld data recorders, tablets, and lasers); expand the use of geospatial and remote sensing (e.g., Light Detection and Ranging and unmanned aerial systems) for inventory, monitoring, boundary designation, and volume estimation; and formalize policies and direction pertaining to



Logs from sustainably managed Idaho forest awaiting processing.
© Megan Grover-Cereda/TNC



Trees leaving the yard at the Ellsworth Creek Preserve in Washington. © Chris Crisman

Designation by Prescription, 20-year stewardship contracts, GNA and authority for the use of forest products by Federally Recognized Indian Tribes. This includes changes to appraisal approaches when there is a track record of no bid sales due to price, and where competition or the number of previous sales are lacking for a reliable appraisal of fair market value.

While these changes are needed and should further reduce costs and enhance revenues tied to the Forest Products program, they may not do enough to shift from a paradigm where all timber products are considered assets, to a paradigm where many products actually constitute liabilities resulting in costs for removal, burning, prescribed fire and other treatments to avoid wildfire related suppression costs and impacts. The agency specifically struggles to find ways to meet the supply needs of an emerging industry focused on low value materials. Because markets for these materials remain unproven, these businesses tend to use timber mill byproducts or source materials from state and private lands that lack the high costs of often remote, public lands fuels treatments as they seek to prove out market revenues.

The impact it can have on the demand for forest products. The Wood Innovations Grants program plays an important role, alongside the Forest Products Laboratory and other research and development arms of the agency along the commercialization spectrum toward building sustained markets for wood products and low value materials. USDA Rural Development programs (discussed below) can offer low-cost capital to further buy down the risk in these emerging market contexts, and grants and agreements with industry partners and trade associations can help the agency support actors better suited to building market demand. Despite efforts to integrate, this work remains siloed within the agency, with NFS (supply), S&PF (demand through wood innovations and grants and agreements) and R&D (research) arms of the agency lacking coordination and shared goals and objectives. At the USDA level, RD programs struggle to finance novel business plans that compete with other financing needs in rural America where the agency understands risks and returns and can more readily place grants and loans. Complementary research efforts at land grant universities funded by the National Institute of Food and Agriculture and research by other USDA agencies in innovations for wood and biomass utilization could advance the field, but also need to be better coordinated. Federal Government procurement can be a powerful driver of market demand, as evidenced by agreements with USDA and the Department of Defense regarding biofuels, but would require clear mandates to support market segments derived from hazardous fuels treatments.

Taken as a whole, the Forest Service's current program of work delivers value for industry retention, but is a limited demonstrated contribution toward developing and expanding industry that furthers resilience objectives. New investments in research, development and commercialization of new industries tied to hazardous fuels removals in a 10-year strategy could help create the industry, workforce and markets to reduce the costs of treatments over time and may yield significant co-benefits over longer time horizons as markets mature and infrastructure is established. In addition to aligning federal programs, the Federal Government likely needs to do more to buy-down risks in these emerging markets through helping to guarantee market demand.

The Forest Service has some practical limits to



Building Block Bottom Line:

- Forest Products investments are not a proxy for wildfire resilience.
- The paradigm shift envisioned in this paper requires rethinking the contributions of this program as a tool that can help in specific landscapes, where there is an overlap of marketable material in an area that is a high priority for fire, to reduce the costs of fire treatments - rather than as a program that could, by itself, pay for the public good of creating wildfire resilience across the landscape.
- Investments should continue to focus on retaining existing market segments, and in efforts to align federal research, development, commercialization, and procurement programs in support of emerging markets for hazardous fuels materials.
- Changes to contracting conventions to treat this material as a liability in appropriate circumstances may be necessary for NFS Lands.
- Legislative efforts should look to tax policy, loan guarantees—including Rural Development Programs--and procurement requirements to buy down risks for emerging markets and ensure materials are sourced from hazardous fuel treatments.
- Investments may not decrease costs over the 10-year time horizon of the strategy envisioned in this paper but will be essential to reduce maintenance costs over time and should remain a priority.



Primary Building Block Co-Benefits: Jobs and Rural Economic Opportunity; Innovation in the Biobased Economy

2. Forest Service and DOI Land Acquisition Programs

Description: The Forest Service and DOI bureaus have numerous programs supporting land and conservation easement acquisitions through funding from the Land and Water Conservation Fund, through land exchanges and through other programs. These programs can play an important role in limiting development encroachment into the wildland urban interface and allowing for future management needed to build wildfire resilience, especially the use of prescribed fire.

The Forest Service's Community Forest and Open Space Conservation Program offers communities an opportunity to acquire and conserve forests that provide public access and recreational opportunities, protect vital water supplies and wildlife habitat, serve as demonstration sites for private forest landowners, and provide economic benefits from timber and non-timber products. Full fee title acquisition is required, and lands can be owned by local governments, tribal governments, and qualified nonprofit entities. The program pays up to 50% of the project costs and requires a 50% non-federal match, public access, and active management of the acquisitions.

The Forest Service's Forest Legacy Program is a conservation program administered by the Forest Service in partnership with state agencies to encourage the protection of privately owned forest lands through conservation easements or land

purchases. The program endeavors to retain “working forests” to protect water quality and provide wildlife habitat, forest products, opportunities for recreation and other public benefits.



Maidenhair fern carpet the forest floor in Itasca County, Minnesota. © Richard Hamilton Smith

Assessment of Effectiveness, Changes and Needs: These programs, alongside other federal, state and local conservation programs, can play an integral role in preventing further development in areas at high risk of wildfire, helping to ensure communities are more resilient to changing wildfire conditions and allowing for more consistent management of hazardous fuels across the landscape absent landownership fragmentation. While these wildfire resilience benefits are evident from past investments and acquisitions, they are not a priority focus of the programs and thus the program resources are currently not targeted to achieve wildfire resilience benefits.

As more and more communities begin to confront the challenges of the increase in the frequency, size and severity of wildfires, there are significant opportunities to integrate strategies for wildfire resilience with western land conservation. Efforts to develop local finance initiatives that integrate land protection and management could provide

alternative tools to land use planning while meeting other community objectives for open space and recreation. Federal programs like Community Forest and Open Space Conservation and the Forest Legacy Program could serve as matching funds for state and local programs and incentivize the creation and deployment of new programs. Land protection strategies may be especially important to allow for future use of prescribed fire in high risk areas where liabilities and impacts to private landowners serve as an impediment to fire management and use as a way to reduce the risk of catastrophic events.



Building Block Bottom Line:

- Passage of the Great American Outdoors Act affords new funding and opportunities to leverage the land acquisition programs for wildfire resilience, including fully funding the Land and Water Conservation Fund.
- Incorporation of wildfire and other climate criteria for program awards is an essential first step and may prove especially important toward unlocking additional conservation and local finance initiatives for wildfire resilience.



Primary Building Block Co-Benefits: Outdoor Recreation Economy and Access to the Outdoors; Clean Drinking Water; and Fish and Wildlife Habitat

3. BLM Forest and Woodlands Management

BLM (in thousands)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Forest and Woodlands Management	9,980	10,076	10,135	10,135	10,135	TBD

Description: The Bureau of Land Management (BLM) manages nearly 65 million acres of forests and woodlands across 12 western states and Alaska. The BLM is supposed to manage forests with the goal of maintaining healthy forest ecosystems while addressing threats such as insects, diseases, climate change, and destructive wildfires. This single budget line item at BLM funds forest products and insect and disease mitigation, conifer removal for wildlife habitat particularly in sage-brush steppe ecosystems, and other priorities.

Assessment of Effectiveness, Changes and Needs:

Nearly all of BLM’s wildfire resilience funding comes from Interior’s Fuels Management line item. Lack of transparency and accountability, and diverse applications of this funding source across BLM states make discerning its relevance to wildfire resilience difficult. Given that the agency is responsible for managing 65 million acres of forests and substantially greater rangeland acreage, it needs a more robust wildfire resilience program. Without dedicated budgets, BLM is left to compete for resilience project funding with three other DOI bureaus (NPS, FWS, BIA).



Building Block Bottom Line:

- This Budget Line Item requires significant additional transparency and probably should be disaggregated to reflect different program objectives within BLM, including wildfire resilience.
- BLM could be required to conduct program assessments of contributions to wildfire resilience in high-risk landscapes or for significant geographies such as the O&C Lands in Oregon.
- Overall funding for wildfire resilience must increase, as the funding for these diverse management needs is already underwhelming given BLM’s diverse forest and rangeland management responsibilities.



Primary Building Block Co-Benefits: Jobs and Rural Economic Opportunity; Fish and Wildlife Habitat

4. Forest Service Vegetation and Watershed Management

Description: The Forest Service’s Vegetation and Watershed Management program includes planting, forest thinning, and invasive species management activities to improve the growth and health of timber stands and to improve water quality. Program funding is used for reforestation and vegetation management to restore, maintain, and protect water and soil resources with an emphasis on post-wildfire restoration work to stabilize soils and restore appropriate forest cover and on precommercial treatment to timber stands to increase resilience to wildfires, insects and diseases and invasive species.³² The program is also critical to the Forest Service’s current efforts to track outcomes tied to multiple land management programs through the Terrestrial Condition Assessment, which identifies the ecological integrity and health of terrestrial ecosystems, and through the Watershed Condition Framework to focus watershed restoration work on priority areas.

Past investments have sought to integrate accomplishment of high priority timber stand improvement needs with opportunities for hazardous fuels reduction and community protection. Other priorities have included post-wildfire reforestation work to ensure soil stabilization and restoration of appropriate forest cover on impacted lands, rangeland management and control of invasive species, and work to protect, maintain, improve or restore water or soil resources. This latter category of work is guided by the agency's water strategy and includes emphasis on five areas of investment: surface water, soils, water rights and uses, riparian areas and wetlands, and ground water.

Forest Service (in thousands)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Vegetation and Watershed Management	184,716	184,716	180,000	180,000	182,000	28,683

Assessment of Effectiveness, Changes and Needs:

This budget line item's contribution to wildfire resilience before a fire event is limited but plays a more significant role in the agency's needs for post-fire recovery. Approaches to post-fire recovery will be critical to ensuring future landscape resilience and positioning forested landscapes for future management needs. The program's funding for the Terrestrial Condition Assessment and Watershed Condition Framework offers insights into key program outcomes and will be critical to measuring and monitoring progress on priority wildfire resilience investments in the future.



Building Block Bottom Line:

- **Maintaining funding in this BLI is critical to post fire recovery, which often impacts long term resilience, and to future budget performance criteria.**
- **Similar to the Forest Products Line Item, much of this funding is complementary in supporting the current accomplishments of hazardous fuels and community protection objectives.**
- **In addition, some watershed resilience investments can also support wildfire resilience.**



Primary Building Block Co-Benefits: Clean Drinking Water; Forest and Soil Carbon Sequestration; and Fish and Wildlife Habitat

5. Water Source Protection Program

Description: Section 8404 of Agriculture Improvement Act of 2018 (Farm Bill) authorized the Forest Service to develop a new Water Source Protection Program, designed to encourage partnerships with end water users and to encourage investment by water utilities and other partners in upper watershed restoration on Forest Service lands. Congress authorized the Forest Service to work with water users to develop and implement watershed restoration plans for national forests, including wildfire risk reduction activities. The intent was to create a cost-share program that would encourage water users to invest in healthy watersheds through federal matching funds. Unfortunately, the program has never been funded by Congress or implemented by the Forest Service. Implementing the WSPP would have multiple benefits for people and nature, including improving water quality and fish and wildlife habitat, reducing wildfire risk, and supporting jobs and a restoration economy in our rural communities. In addition, implementing the program could leverage significant funding in national forest restoration from water utilities and other end water users.

Forest Service (in thousands)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Water Source Protection Program	0	0	0	0	0	0



In Bedrock, Colorado, the Bureau of Land Management and the Youth Conservation Corps have removed invasive tamarisk (saltcedar) from the banks of the Dolores River. © Erika Nortemann/TNC

Assessment of Effectiveness, Changes and Needs: In addition to annually appropriating funds for the program at the \$10 million authorized funding level, there is significant potential to improve the program, which would attract additional end water user investment and provide multiple benefits. Changes to the program that should be considered include increasing the annual authorized appropriation significantly above \$10 million, reducing the existing match requirement (the current law requires a 50% water user match, which is too high to encourage investment), and including additional statutory direction to help the Forest Service prioritize projects that provide the greatest public benefit and return on investment. Additionally, there are opportunities for the Forest Service to partner with the Bureau of Reclamation on forest restoration and wildfire risk reduction projects on Forest Service lands that would benefit Bureau of Reclamation infrastructure and operations. The Forest Service should pursue such opportunities through executive action or, alternatively, there may be benefit in Congressional direction to encourage such partnerships.



Building Block Bottom Line:

- **Increasing the authorized funding level for WSPP to \$50 million would attract additional water users to partner with the Forest Service and invest in watershed projects with wildfire resilience activities.**
- **Improving and adding new criteria would further improve the WSPP, including decreasing the match requirement to increase partner participation and encourage investment and prioritizing projects with the greatest return on investment.**



Primary Building Block Co-Benefits: Clean Drinking Water Supplies; Community Resilience; Jobs and Rural Economic Opportunities; and Fish and Wildlife Habitat

6. Land Management Planning

Description: The Forest Service's capacity for land management planning, assessment and monitoring is a threshold investment that is necessary for planning, implementing and monitoring wildfire resilience projects in a timely and effective way. This program area also is responsible for developing land management plans for each of the forests and grasslands in the National Forest System. In 2012, the Forest Service released a new Land Management Planning Rule that highlighted the role of fire on the landscape and directed land managers to identify opportunities to restore wildfire resilience and work with neighboring landowners to achieve mutual objectives. Plan revisions or programmatic amendments could make it a lot easier to plan for landscape scale fire and support the use of prescribed fire, and would streamline project implementation.

(in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Land Management Planning, Assessment and Monitoring	184,996	182,928	179,263	180,000	180,000	16,544

Assessment of Effectiveness, Changes and Needs:

Without investing the staff and dollars necessary for planning, assessment and monitoring, the Forest Service will not be able to accomplish work at scale. Frequent complaints about National Environmental Policy Act (NEPA) slowing down work are due to the reduction in capacity for planning over the last 20 years. For example, the Forest Service's Fire Funding Report in 2015 highlighted a 64% reduction in funding for this program between FY2001 to FY2015. The chart above, meanwhile, shows that funding over the past five fiscal years is flat or slightly down, despite a more than 100% increase in targets for acres treated. This is not sustainable. Significant new investments in staff and funding for planning will be necessary to support the scale of work needed for wildfire resilience, as well as support for the monitoring necessary to assess and inform project effectiveness.



Building Block Bottom Line:

- Increasing funding levels for planning will be essential as a threshold investment for wildfire resilience work to support the annual and long-term planning required for a program of work for wildfire resilience.
- A surge in investment in planning of perhaps \$25 million per year could quickly institutionalize the use of the scenario-investment modeling prioritization criteria and other reforms envisioned in this report through appropriate system wide, regional or unit plan direction, handbook or policy guidance and/or plan amendments.
- Incorporation of these changes into land planning, implementation and monitoring ensures changes would need to be engrained across Forest Service workstreams moving forward, supported by sustained increases in investment for ongoing planning needs.



Primary Building Block Co-Benefits: Community Resilience; Clean Drinking Water; and Fish and Wildlife Habitat

7. Research and Joint Fire Science

Description: USDA has enormous research capabilities in multiple agencies, including the Forest Service, NRCS, the Economic Research Service (ERS), the National Agricultural Statistics Service (NASS), and the National Institute for Food and Agriculture (NIFA) that could be better deployed to support data, research and science delivery tools for wildfire resilience. Within the DOI, U.S. Geological Survey (USGS) also houses a wildfire science program capable of diverse research spanning areas, such as the hydrogeological impacts of wildland fire, geospatial applications of and economic impacts. Ten USDA Climate Hubs - co-led by the Forest Service, NRCS and the Agricultural Research Service (ARS) - support regionally specific climate science delivery that could better support wildfire resilience. In addition, the Joint Fire Science Program provides funding for scientific studies associated with managing wildland fire, fuels, and fire impacts to ecosystems to respond to emerging needs of managers, practitioners, and policymakers at local, regional, and national levels. The program was established by Congress in 1998 and is jointly funded by the DOI and the Forest Service and through approximately \$3 million per year from each the DOI and Forest Service.

Assessment of Effectiveness, Changes and Needs:

Currently, the Forest Service supports critical research for wildfire resilience, including the risk-based scenario planning that has led to breakthroughs in understanding where and how treatments should be prioritized on forest lands of all ownership types. The Joint Fire Science Program has begun work to pilot an interagency Fuel Treatment Decision Support System. This web-based, service-oriented framework architecture for fuels treatment planning is in development as an example and potential stepping stone towards a larger inter-connected (S-O-S) framework for wildland fire decision support, project planning and performance tracking.

The Forest Service is also supporting:

- research for fire adapted communities and infrastructure;
- market development of small diameter woody biomass; and
- improved understanding of forest carbon stocks.



A TNC scientist checks stream data near Boonville, California. © Bridget Besaw

However, more investments are needed to support social science research to support the ability to deploy prescribed fire and improve community resilience through better understanding of fire risks, and to invest in economic research related to assessing externalities from fire events, valuing avoided costs, and capturing the return on investment (ROI) for co-benefits of resilience work. We also need to invest in sociological research that can identify disproportionate impacts from catastrophic wildfires to underserved communities who often lack the ability to access information about fire risks and available resources to reduce risks, and to participate in community and forest planning or other interventions that can address risks. These investments could be significantly advanced by complementary work from other USDA research agencies.

For example, ERS could support research to identify a market value for different types of avoided costs, which could help bring private dollars (e.g. utilities, communities, insurers, health care companies, carbon banks) to the table to fund fire risk reduction treatments. ERS could also work with the Forest Service and NIFA to develop additional information about the cumulative costs of catastrophic fires to support the case for a 10-year infrastructure level surge in investment in fire risk reduction as a public service. NASS could issue surveys to get a better sense of how fires are impacting farmers, ranchers and private forest landowners, as well as rural communities, including short term disruptions of agricultural operations, health impacts to workers, short and long term economic impacts for agricultural operations, the long-term loss of productive agricultural land, tourism and other recreation-related impacts from fires, and impacts to small businesses. NASS could also work with ERS and other agencies to better understand environmental justice impacts from community harm, displacement, health impacts, and differential access to protection, prevention and recovery

resources experienced by socially disadvantaged groups and communities, and to better understand locally borne long term recovery costs, including from post-disaster events like flooding and water quality impacts. The Climate Hubs could support the delivery of fire science to regional partners, and better support landscape scale prioritization of work to reduce fire risk and create wildfire resilience across landownership boundaries.

However, USDA science capacity has been depleted and requires a significant increase in investment. Investing in capacity to support wildfire resilience research in the Forest Service and in other USDA agencies should be included in those conversations.



Building Block Bottom Line:

- Investing in USDA science capacity related to fire risk reduction, wildfire resilience, and associated data, research and science delivery will be critical to support this work, ensure evidence and data-driven decision-making and prioritization, and help make the case for increasing public and private investment at the pace and scale needed to truly address this challenge.
- The Forest Service and DOI should determine whether the interagency Fuel Treatment Decision Support System can be adapted to build transparency in project planning, implementation and budget performance.
- A minimum increase should double the funding level for Joint Fire Science from approximately \$3 million per year to \$8 million.
- Significant additional investments of up to \$60 million in USDA Climate Hubs, Forest Service fire research, and other USDA agencies including ERS, NIFA and NASS would help advance both wildfire and climate resilience, and would help more communities have access to the information from fire research.



Primary Building Block Co-Benefits: Community Resilience; Environmental Justice and Equity for Underserved Communities; Clean Air and Community Health

8. Conservation Corps, Job Corps, Veterans Fire Corps and Climate Corps Investments

Description: One key consideration for increasing the pace and scale of work for wildfire resilience is the need to invest in a workforce that can do the work. There are currently more than 230 member organizations in the 21st Century Conservation Service Corps (21CSC) supported by bipartisan legislation that passed as part of the Dingell Act. 21CSC member organizations provide more than 10,000 paid work experiences each year on national forests alone. Work is focused on a variety of resource outcomes but includes hazardous fuels treatments and fire prevention and response. 21CSC programs are funded out of traditional Forest Service program budgets, but there are multiple bills pending in Congress to build on the 21CSC and create new investments in a climate corps as part of economic stimulus and recovery packages. These efforts could be a significant source of new funding for high-priority wildfire resilience work that creates jobs and trains the next generation of stewards. An early Executive Order on climate issued by President Biden included direction for a Civilian Climate Corps, which will likely build on these existing partnerships to support climate and resilience work.

One example of a 21CSC program that is focused on fire is the Veterans Fire Corps (VFC), a collaborative initiative of the California Conservation Corps, Conservation Legacy and the Student Conservation Association run in partnership with state and federal agencies including the US Forest Service, the BLM and the Corporation for National and Community Service. Created in 2010 in cooperation with the Forest Service, it was expanded into an AmeriCorps program in 2012. The VFC trains and engages teams of military veterans in wildland fire mitigation. Projects include fuels reduction, fire effects monitoring, educational outreach, pre-fire preparation of burn units, and participation in prescribed fires. A significant possible source of funding for the VFC is the Veterans Employment and Training Service (VETS), a sub agency of the Employment and Training Administration of the Department of Labor. VETS received an appropriation of \$311 million in FY2020 and the FY2021 request is for \$312 million.

Job Corps is the largest nationwide residential career training program in the country and has been operating since its creation in 1964. The program helps eligible young people ages 16 through 24 complete their high school education, trains them for meaningful careers, and assists them with obtaining employment. In FY2020, operations funding for Job Corps totaled \$1.603 billion. The Forest Service has operated Job Corps centers on public land since the program was created in 1964 and currently operates 24 Job Corps Civilian Conservation Centers (CCCs) through an interagency agreement with the Department of Labor. Since 2013, the Forest Service has operated a Civilian Conservation Center Fire Program in partnership with the Fire and Aviation Management Branch. All 24 CCCs have a wildland fire and/or camp crew and a Forest Assistant Fire Management Officer. According to the Forest Service, at any one time, the program had the capacity to dispatch more than 1,000 Firefighter Type 2 (FFT2) qualified Job Corps students nationwide to support wildland fires, all-hazard emergencies, hazardous fuels, and forest health programs nationwide. Many CCC students participate in hazardous fuels and forest health work on both WUI and non-WUI lands.

The current administration's executive order on climate change calls for the creation of a Civilian Climate Corps to mobilize the next generation of conservation and resilience workers and maximize the creation of accessible training opportunities and career pathways. The initiative aims "to conserve and restore public lands and waters, bolster community resilience, increase reforestation, increase carbon sequestration in the agricultural sector, protect biodiversity, improve access to recreation, and address the changing climate," and holds great potential to align corps delivery capacity with wildfire resilience objectives.



A Conservation Corps member clears brush in Summerdale, Alabama, to prepare for a control burn as part of a forest restoration project. © John Stanmeyer



Building Block Bottom Line:

- Combined, these programs have the capacity to train, develop and deploy a significant workforce to advance wildfire resilience and accomplish high priority work.
- These programs enjoy bipartisan support and help create jobs and economic opportunity across the country.
- An early opportunity could be to use risk maps to identify where additional workforce investments would be necessary to accomplish outcome-based targets and use that information to make a case for investing in new corps capacity to support accomplishing the work.
- The need for economic recovery combined with the cost from wildfires could help make a strong case for dramatically scaling up investment in corps capacity, going from 10,000 opportunities to 100,000 a year.
- While corps do other types of work, highlighting the need for workforce investment in wildfire resilience could help make the case for investing in corps programs, and support for conservation corps opportunities could unlock resources needed for a fire resilience workforce.



Primary Building Block Co-Benefits: Jobs and Rural Economic Opportunity; Environmental Justice and Equity for Underserved Communities

BUILDING BLOCKS

II. Strengthening and Expanding Wildfire Resilience Across the Federal Budget:

New and Emergent Investment Opportunities Across the Federal Budget:

This section of the report identifies programs that are relatively new to supporting wildfire resilience outside the traditional budgets of land management agencies, and other funding streams that could be redirected to support wildfire resilience. Strong executive branch leadership is needed to better integrate these opportunities into a whole-of-government wildfire resilience strategy. The Wildland Fire Leadership Council can play an instrumental role in syncing programs of work, funding opportunities, and performance criteria and may require expanding representation from federal agency partners at the Federal Emergency Management Agency (FEMA) and Department of Defense (DOD) to ensure emergency response agency leadership is complemented by those who lead pre-disaster mitigation work. There is growing consensus that these efforts must also be elevated within the federal government to allow for transformative change. Coordinated budget strategy, policy development and stakeholder engagement through the Climate, Office of Management and Budget, Council on Environmental Quality, Domestic Policy Council and other relevant offices of the White House can support cross-federal evaluation and delivery of opportunities and benefits.



Mixed pine savannah, Brunswick County, North Carolina. © Mark Godfrey/TNC

New and emergent wildfire resilience opportunities include:

- FEMA's Building Resilient Infrastructure and Communities Program (BRIC)
- FEMA Hazard Mitigation Grant Program Post Fire associated with Fire Management Assistance Grants
- Department of Defense's (DOD) Readiness and Environmental Protection Initiative (REPI) and Sentinel Landscapes Initiative
- U.S. Fire Administration support for Community Wildfire Protection Plans
- USDA Regional Conservation Partnership Program (RCPP)
- USDA Rural Development Programs
- EPA Drinking Water and Clean Water State Revolving Funds
- EPA Air Quality Program
- Department of Energy and Infrastructure Resilience

1. FEMA Building Resilient Infrastructure and Communities Program (BRIC)

Each year FEMA spends billions of dollars in assisting federal, state, and local entities, as well as private individuals and entities in dealing with wildfire disasters. Yet, until recently, the agency spent very little on pre-disaster mitigation in general. The Disaster Recovery Reform Act, enacted in 2018 as part of Public Law 115-254, has a major focus on strengthening disaster mitigation and encourage greater federal, state, and local emphasis on mitigation, so as to save lives, minimize the damage to land and structures, and to reduce disaster costs.

Description: The Building Resilient Infrastructure and Communities (BRIC) program was authorized under the Disaster Recovery Reform Act of 2018 and replaced the previous National Pre-Disaster Hazard Mitigation program. BRIC funds mitigation projects designed to increase resilience and public safety; reduce injuries and loss of life; and reduce damage and destruction of property and critical services. One of the BRIC priorities is to incentivize projects that incorporate nature-based solutions.

(in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
FEMA BRIC (FY2020 est.) Pre-Disaster Mitigation Program	100,000	100,000	249,200	249,200	500,000	500,000

Assessment of Effectiveness, Changes and Needs:

Wildfire mitigation is already an authorized purpose under the BRIC program. However, wildfire mitigation projects compete for funding against mitigation projects dealing with such natural disasters as hurricanes, tornadoes, and flooding. The pot of money available has doubled in the last year making this program attractive to state and local communities in wildfire-prone areas. Limited interviews with state and local officials indicate that this program is not yet being effectively deployed to support wildfire resilience and that the current program delivery mechanisms may be cumbersome and ill-suited to align resources with other wildfire risk mitigation efforts.



Building Block Bottom Line:

- **BRIC may benefit from a dedicated wildfire resilience component.**
- **Program delivery and sponsors, often local governments working in concert with their state emergency services officials, may need reforms to ensure investments track with federal and state priorities defined through scenario investment planning, shared stewardship agreements or other efforts.**
- **Program set asides for wildfire resilience that encourage strong partnerships with state foresters and emergency service officials for awards could serve to address these challenges.**
- **Using data from National Oceanic and Atmospheric Administration’s (NOAA) Billion Dollar Climate Event data base, approximately 5.4% of all large-scale damages from climate events are attributed to wildfires.***
- **Initially, carving out this share of the BRIC program would dedicate about \$27 million to wildfire resilience annually and could be scaled over the course of the 10-year investment strategy.**



Primary Building Block Co-Benefits: Community Resilience; Critical Infrastructure for National Security and Military Readiness; Clean Drinking Water; Environmental Justice and Equity for Underserved Communities

* <https://www.ncdc.noaa.gov/billions/summary-stats>

2. FEMA Hazard Mitigation Grant Program Post Fire associated with Fire Management Assistance Grants

Description: In the 2018 Omnibus Appropriations Bill, Congress authorized FEMA to provide a share of funding for wildfire resilience by expanding the current hazard mitigation program associated with presidential emergency declarations to award grants following award of a Fire Management Assistance Grant (FMAG)—funds used to backfill state costs for suppression activities. The Hazard Mitigation Grant-Post Fire (HMGP-PF) is designed to help communities implement hazard mitigation measures following a wildfire disaster. To be eligible, states and communities must have received funding under a Fire Management Assistance Grant pursuant to a declared national disaster. Funding is prioritized for wildfire, post-fire flooding and stream bank stabilization, and includes pre-disaster mitigation measures such as thinning, defensible space and retrofit to non-combustible materials. The key purpose of this grant program is to enact mitigation measures that reduce the risk of loss of life and property from future disasters.

(in thousands)	FY2016	FY2017	FY2018	FY2019
FEMA FMAG	102,000	64,000	270,000	195,000
FMAG (State Component)	25,500	16,000	67,500	48,750
Total	127,500	80,000	337,500	243,750

(Note: funds outlined above are total Fire Management Assistance Grants and the associated state match to cover suppression needs—awards for the FMAG HMG program are only a small percentage of these amounts.)

The funding amount available is a set figure from FEMA and reflects a national aggregate calculation based on an average of historical Fire Management Assistance designations from the last 10 years.

For post-fire mitigation, FEMA already assumes a cost benefit of \$5,250.00 per acre treated based on risk reduction and ecosystem service benefits.



Aftermath of the Pines Fire, which burned nearly 100 square miles of eastern San Diego County, California, in 2002. © Richard Herrmann



Building Block Bottom Line:

- **FEMA FMAG and HMG Awards are new enough that there has not been a robust program assessment of effectiveness.**
- **FEMA has often encouraged use of the funds for direct investment in infrastructure hardening or for structure resilience such as wildfire resistant roof replacements. This approach needs to be assessed comparing the cost effectiveness of those investments as opposed to efforts to bolster landscape scale wildfire resilience that can offer risk reduction to multiple community assets**
- **These funds could be better spent directly through state foresters or Forest Service’s S&PF from FEMA with clear criteria for eligible expenditures.**
- **Further, there may be opportunities for these programs to be deployed in advance of FMAG events in areas that meet high risk criteria, perhaps derived from the Forest Service’s scenario investment modeling.**



Primary Building Block Co-Benefits: Community Resilience; Clean Drinking Water; Clean Air and Community Healthy

3. Department of Defense (DOD) Readiness and Environmental Protection Initiative (REPI) and Sentinel Landscapes Initiative

Description: The DOD’s Readiness and Environmental Protection Initiative (REPI) Program is a key tool for combating encroachment that can limit or restrict military training, testing, and operations. The REPI Program protects these military missions by helping remove or avoid land-use conflicts near installations and addressing regulatory restrictions that inhibit military activities. The REPI Program is administered by the Office of the Secretary of Defense. Congress expanded the Section 2684a authority in the John S. McCain National Defense Authorization Act for FY2019 (Public Law 115-232) to include agreements that enhance or improve military installation resilience. Military readiness depends upon the solid platform of training and testing capabilities of our nation’s installations, ranges and other training and testing spaces. This infrastructure is necessary for conducting daily operations, realistic live-fire training and effective weapon system testing.

The DOD, with the USDA and DOI, established the Sentinel Landscapes Partnership in 2013 through a Memorandum of Understanding. This nationwide federal, local, and private partnership is dedicated to promoting natural resource sustainability and the preservation of agriculture and conservation land uses in areas surrounding military installations. Agencies from DOD, USDA, and DOI coordinate the Sentinel Landscapes Partnership at the national level through the Sentinel Landscapes Federal Coordination Committee (FCC) to identify and designate shared interests within a Landscape in order to coordinate strategies to preserve, enhance or protect habitat and working lands near military installations in order to reduce, prevent or eliminate restrictions due to incompatible development that inhibit military testing and training.

(in thousands)	FY2016	FY2017	FY2018	FY2019	FY2020
DOD REPI	75,000	75,170	90,000	85,000	TBA

Assessment of Effectiveness, Changes and Needs:

The REPI Program has been tasked with interpreting and implementing the new National Defense Authorization Act (NDAA) guidance regarding resilience and based on early conversations with installation managers is focused on the core threats from coastal and inland flooding, water security and wildfire. Wildfire is one of the most significant concern for facilities, especially as the military is undertaking more and more training and testing on non-DOD land ownerships.³³ In January 2019, DOD released a report entitled “Report on the Effects of a Changing Climate to the Department of Defense.” This report was required by Section 335 of the National Defense Authorization Act for Fiscal Year 2018 (Public Law 115-91). One of the major topics discussed by the report was the current and future threats to military installations and operations posed by wildfires. The report found that out of 79 priority installations, 36 currently face threats from wildfires and 43 face potential threats from wildfires. The wildfire threat to installations is both a direct threat in terms of safety and security of personnel and damage to equipment and infrastructure, but an indirect threat as well— often tying up aircraft, personnel and staging for wildfire response when fires occur in proximity to bases and training areas.

In southeastern Arizona, the Sentinel Landscape partnership at Fort Huachuca, where the Coronado National Forest recently approved a special use permit revision to allow for training activities across some 300,000 acres, provides an early example of the potential for partnerships at larger scales. Training on the Coronado National Forests includes not just personnel resources, but significant electronics, technology and equipment that would all be at risk of wildfire or smoke damage. REPI has funded an interagency cooperative agreement with Coronado National Forest through the Arizona Department of Forestry and Fire Management, which had an existing cooperative agreement and experience implementing work on the Coronado National Forest. This project is also a recipient of Joint Chiefs Landscape Restoration Partnership funding and supplemented by REPI challenge funds. In addition to wildfire resilience, the effort has several road rehabilitation, watershed and wildlife objectives. Fort Huachuca entered into an agreement with the Forest Service for resilience work within the installation. Under this new partnership, they were able to open that agreement using the Sikes Act authority to allow for DOD funding to support work on NFS lands. Additionally, NRCS had easements in the area on private lands and has been using their contributions primarily to support water quantity improvements associated with irrigation operations. REPI program managers believe this partnership may offer a roadmap for other installations to address wildfire resilience objectives. Partners have produced guides to help outline pathways for installation partnerships to address resource concerns.³⁴ A “Commander’s Guide to Managing Wildfire Resilience” could be a worthy investment building from the Fort Huachuca model. REPI has also supported significant investments alongside the National Fish and Wildlife Foundation (NFWF), NRCS and other partners in the Southeast aimed at longleaf pine restoration.



Monitoring longleaf pine regeneration in the Fort Benning military reservation, part of the Georgia Sentinel Landscape established in 2017. © Mark Godfrey/TNC

In addition to REPI, DOD’s Office of Economic Adjustment was recently authorized to provide a new program for Community Economic Assistance for Responding to Threats to the Resilience of a Military Installation. It aims to provide technical and financial assistance to states and local governments to analyze and implement actions necessary to foster, protect, and enhance military installation resilience and sustainability. Military installation resilience is defined as “the capability of a military installation to avoid, prepare for, minimize the effect of, adapt to and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions, that do, or have the potential to, adversely affect the military installation.”³⁵ Funding was first provided in FY2020 and totaled \$5.7 million. DOD is estimating funding of \$9 million in FY2021.



Building Block Bottom Line:

- REPI and Sentinel Landscapes have proved very effective at building landscape partnerships and leveraging other programs and initiatives.
- These programs highlight the need and opportunity to bring bigger, better work projects to scale by stacking land ownership and programs.
- For example, efforts could be made to align these landscape programs such as Joint Chiefs and RTRL around all installations at risk between DOI, USDA and DOD.
- A whole-of-government approach should consider potential increases in DOD funding to address national security risks to installations and critical infrastructure (e.g. telecommunications, roads, energy) from wildfire.
- An economic assessment of past impacts and potential future risks could help unlock significant new investments in fire prevention and risk reduction.



Primary Building Block Co-Benefits: Critical Infrastructure for National Security and Military Readiness; Clean Air and Community Health; Fish and Wildlife Habitat



Reducing wildfire risk in Utah's wildland urban interface. © Brianna Binnebose

the WUI Toolkit, a website dedicated to disseminating information on how communities and local fire departments can prepare for and respond to WUI fires. Their website offers information on training, codes and standards, planning and research, but a major shortcoming is the lack information on funding opportunities available to state and local communities to assist with fighting wildfires, as well as funding for wildfire resilience.

4. U.S. Fire Administration support for Community Wildfire Protection Plans

Description: Community Wildfire Protection Plans (CWPPs) were authorized under the Healthy Forest Protection Act of 2003 and are administered by the U.S. Fire Administration, a sub-agency of FEMA. Communities are encouraged but not required to develop these CWPPs to help reduce their risk to wildfire loss as well as create healthier natural ecosystems. CWPPs identify and prioritize areas for hazardous fuel reduction treatments and recommends the types and methods of treatment on federal and non-federal land that will protect one or more at-risk communities and essential infrastructure and recommends measures to reduce structural ignitability throughout the at-risk community.

The U.S. Fire Administration also supports

Assessment of Effectiveness, Changes and Needs:

To incentivize the development and implementation of CWPPs, the federal government should provide a variety of financial and regulatory incentives. While the federal government provides some training and guides to communities to help prepare CWPPs, there is little in the way of financial assistance for these plans. A federal grant program in this area could yield significant benefits to communities looking to develop or update CWPPs, as financial considerations can often be a barrier to local participation. Further, federal incentives could be applied by providing that a community's grant application for a wide variety of federal programs could be given a higher priority, depending on whether they have a CWPP in place. The development and use of CWPPs could also be coordinated across different geopolitical scales to reflect cross-boundary efforts and risk-based priorities present in a region.

The WUI Toolkit should be strengthened to get more integrated planning and program information to communities on programs and strategies for supporting wildfire adapted communities and landscapes. Ultimately, tracking work tied to priority wildfire resilience would benefit from an interagency hub comparable to Inciweb, the system used to track wildfire response. Potentially the USDA Climate Hubs could help deliver information to communities. The Toolkit needs assists communities with finding the resources they need to invest in community resilience.



Building Block Bottom Line:

- CWPPs need dedicated funding and a program of support for updates and coordination with other planning efforts focused on wildfire adapted landscapes and communities.
- Reforms should include the significant opportunity to coordinate CWPPs with land use and comprehensive plans under fire adapted community initiatives, including Fire Adapted Communities Network and CPAW, to inform communities about broader progress under coordinated wildfire resilience strategies.



Primary Building Block Co-Benefits: Community Resilience; Critical Infrastructure for National Security and Military Readiness; Clean Air and Community Health; Environmental Justice and Equity for Underserved Communities

5. USDA Regional Conservation Partnership Program (RCPP)

Description: The Regional Conservation Partnership Program (RCPP) was first introduced in the 2014 Farm Bill and expanded in the 2018 Farm Bill to accomplish landscape-scale conservation priorities by bringing partners together and leveraging federal investments. Landowners receive technical and financial assistance through RCPP while NRCS and its partners help producers install and maintain conservation activities. These projects may focus on water quality and quantity, soil erosion, wildlife habitat, drought mitigation, flood control, and other regional priorities. Partners include producer associations, tribal, state or local governments, non-governmental organizations, and institutions of higher education. The program allows for landscape scale partnerships to apply a suite of Farm Bill conservation programs to achieve local priorities through enhanced coordination and complementary investments. The 2018 Farm Bill reauthorizes funding for RCPP, requires reporting on environmental outcomes, allows for partners to implement more of the work under a limited set of opportunities and creates two application pools: one for Critical Conservation Areas and one for states/multi-state efforts.

(in thousand dollars)	FY2016	FY2017	FY2018	FY2019	FY2020
NRCS RCPP	93,000	93,000	93,000	300,000	300,000

Assessment of Effectiveness, Changes and Needs:

RCPP helps to accomplish landscape scale conservation across jurisdictional boundaries, bringing partners together to support innovative solutions with measurable conservation outcomes, and provides technical and financial assistance to private landowners to implement conservation practices related to those outcomes. RCPP funded projects do not necessarily prioritize wildfire resilience but do include wildfire resilience as part of some projects.

There are multiple examples of RCPP funded projects that are forest-focused and centered around wildlife habitat for sensitive species and watershed conservation that complement but are independent of wildfire risk. For example, RCPP funding supports easement acquisitions and drought management in the Fort Huachuca Sentinel Landscape Conservation in Arizona. While not focused on wildfire resilience, these funds complement Forest Service and DOD investments focused on wildfire resilience in that same Arizona landscape.

There are also a few examples where RCPP supports projects focused on wildfire resilience. As one example, an RCPP project through the Utah Division of Forestry, Fire and State Lands is aimed at assisting private landowners to decrease invading juniper trees that provide high fuel loads during fires, restoring vegetative communities, creating fire breaks and managing grazing for healthy landscapes. Another example in northern New Mexico and southern Colorado, the 'Building Resiliency in the San Juan-Rio Chama Region' project, managed by East Rio Arriba Soil and Water Conservation District and twenty partners, complements recent water diversion structures with additional forest health and watershed treatments to increase landscape resilience to withstand stressors such as drought, wildfire and climate change.

Building upon these and other examples, RCPP remains a significant opportunity for advancing wildfire resilience. NRCS could recognize fire resilience more explicitly as a priority outcome for RCPP, both in selecting projects focused on fire resilience and better incorporating support for fire resilience practices into projects that are focused on connected outcomes, including for water. Adding a fire resilience lens for relevant Critical Conservation Areas and for state and multistate projects would help connect RCPP projects and partners in those states with other efforts to invest in fire resilience in those geographies, including past or current Joint Chiefs' projects, to better coordinate and improve conservation outcomes.



A partnership of state, federal and tribal entities are restoring key stretches of the San Juan River in New Mexico. © Erika Nortemann/TNC



Building Block Bottom Line:

- **There is significant opportunity to recognize fire resilience more explicitly as a priority outcome for RCPP.**
- **Increase selection of projects focused on fire resilience, and better incorporate support for fire resilience practices into projects that are focused on connected outcomes, including for water.**
- **Adding a fire resilience lens for relevant Critical Conservation Areas and for state and multistate projects would help connect RCPP projects and partners in those states with other efforts to invest in fire resilience in those same geographies.**
- **Link RCPP to other landscape work through the RTRL program, Sentinel Landscapes, Joint Chiefs, or the federal land management agencies.**



Primary Building Block Co-Benefits: Working Farms, Forests and Rangelands; Forest and Soil Carbon Sequestration; Clean Drinking Water; Fish and Wildlife Habitat

6. USDA Rural Development Programs

Description: The USDA Rural Development (RD) has more than 40 loan, grant and technical assistance programs that invest over \$33 billion annually in rural communities. RD delivers programs through a network of more than 400 area offices and 47 state offices. At the state level, RD staff may provide assistance with planning, financing and training projects. The Rural Business-Cooperative Service (RBS) supports business development and job training opportunities for rural residents. RBS programs help provide the capital, technical support, educational opportunities and entrepreneurial skills that can help rural residents start and grow businesses or access jobs in agricultural markets and in the bio-based economy. The Rural Utilities Service (RUS) administers programs that provide critical infrastructure or infrastructure improvements to rural communities, including water and waste treatment, electric power and telecommunications services. These services play a critical role in helping to expand economic opportunities and improve the quality of life for rural residents. The new Rural Development Innovation Center (IC) can also provide assistance with planning, financing and training resources for project development. The IC explores new and better ways of delivering programs to best serve rural America and is equipped with specialized expertise in data analytics, regulations management and partnerships.³⁶

Assessment of Effectiveness, Changes and Needs:

RD programs have not typically been considered as a complementary investment for wildfire resilience programs. However, RD programs can support many of the investments needed to increase community resilience and build the workforce, distribution and industry components that will be needed for success at scale across the country. For example, RUS water programs and source water protection program can support upstream investments in treatments that would protect rural drinking water supplies. There may also be a need to connect RUS investments in electric power, telecommunications and other infrastructure with treatments needed to reduce fire risks to those investments. RD business development programs can support access to capital for industry investments in the capacity and assets needed to be able to process small diameter wood or develop other business models for restoration services. Limited experiences with RUS and RD financing have supported wood to energy projects that contribute to wildfire resilience. However absent more robust market demand for these energy sources, those opportunities may be limited. Partnering with ERS to support the business case and market analysis for businesses related to fire resilience could help unlock RD financial and

technical support for business development. RD programs can also support distribution needs for wood products, training and workforce development, and more. The Community Facilities Programs, through its seven grants and loan guarantee programs, can help fund community investments in emergency response vehicles.



Building Block Bottom Line:

- Wildland fire creates risks to rural communities that range from loss of life and property, impairment of drinking water supplies, health impacts from smoke, and economic impacts to tourism and timber values.
- Reducing risks associated with wildland fire will be critical for the viability and well-being of rural communities.
- The IC could serve as a hub for working with the federal land management agencies to break down silos and identify opportunities for complementary investments to reduce the threat of wildfire to rural communities in a way that supports community economic opportunity and health.
- A phased approach could seek to establish how RD funding could better support the work and infrastructure needed for wildfire resilience through Community Facilities Programs and other RD programs with the goal of creating stand-alone direction and a funding set-aside in the next Farm Bill.



Primary Building Block Co-Benefits: Jobs and Rural Economic Opportunity; Community Resilience; Environmental Justice and Equity for Underserved Communities; Innovation in the Biobased Economy

7. EPA Clean Water State Revolving Fund and the Drinking Water State Revolving Fund

Description: EPA’s Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF) are financial assistance programs to help states and communities meet water quality and health protection objectives of the Clean Water Act and the Safe Drinking Water Act. EPA provides grants to all 50 states plus Puerto Rico and our other territories to capitalize state loan and financial assistance programs. The states contribute an additional 20% to match the federal grants. States have significant flexibility within the CWSRF/DWSRF to assist communities and leverage financial resources to address a wide range of water quality concerns. The DWSRF program includes a 15% set-aside for source water protection activities. The CWSRF program does not have a similar set-aside but among the eligible projects for funding are watershed protection and restoration projects.

CWSRF/DWSRF assistance can be used for adaptation and mitigation planning to address wildfire events and the EPA encourages incorporating resilience in the planning and design of projects. The EPA, in partnership with the Water Research Foundation, has developed a guide³⁷ that explains how wildfires affect water and wastewater services and includes information on how to mitigate risk including forest management strategies and hydrologic effects of wildfires.

(in thousands)	FY2016	FY2017	FY2018	FY2019	FY2020
Clean Water SRF	1,394,000	1,394,000	1,394,000	1,394,000	1,639,000
Drinking Water SRF	863,000	863,000	863,000	863,000	1,126,000

Assessment of Effectiveness, Changes and Needs:

Despite the flexibility in the use of CWSRF/DWSRF funds, most of the funding is used for traditional water and wastewater infrastructure. It is believed that many communities are not likely aware of the mitigation and green infrastructure funding opportunities that the CWSRF and DWSRF provide. States have considerable control over the application and prioritization of these funds, but often struggle with novel applications considering competition for infrastructure financing needs.



Building Block Bottom Line:

- The CWSRF and DWSRF have the potential to support significant investment in wildfire resilience in source watersheds.
- Prior to determining the scope and scale of new funding initiatives and barriers, the programs may benefit from pilot applications for wildfire resilience in concert with EPA and one or more supportive states.



Primary Building Block Co-Benefits: Clean Drinking Water; Community Resilience; Clean Air and Community Health

8. EPA Air-Quality Program

Description: While the EPA has overall authority for administering the federal Clean Air Act (CAA), much of the implementation of the CAA has been delegated to states. The EPA works closely with states on developing regulations, delineating authorities, and coordinating implementation and enforcement.

Assessment of Effectiveness, Changes and Needs:

EPA has carried out an air-quality research program on the impacts of wildfires and has produced or is developing research reports on wildfire smoke and Covid-19, the health effects of wildfire smoke, and the environmental, social and economic impacts of smoke in coordination with other federal agencies, including the Centers for Disease Control (CDC). EPA currently has an open Request for Proposals (RFP) as part of its Science to Achieve Results (STAR) program, seeking applications proposing research that will address behavioral, technical and practical aspects of interventions and communication strategies to reduce exposures and/



Research is ongoing in many realms to examine the health impacts of wildfire smoke. © Jason Houston

or health risks of wildland fire smoke. Research by EPA and other federal agencies and partners should also identify and make transparent how smoke-related health impacts disproportionately impact historically underserved communities and Black, Indigenous and people of color, compounding other health-related disparities.

EPA, using authority provided by Congress, has also developed grant programs targeting specific air-quality issues. One such program is the Diesel Emissions Reduction Act (DERA) Program, which funds grants and rebates that protect human health and improve air quality by reducing harmful emissions from diesel engines. The popular DERA program could serve as a model for the development of a similar program targeted at protecting human health and improving air quality by addressing wildfires.



Building Block Bottom Line:

- EPA’s research into smoke and air quality has been helpful in addressing regulatory barriers to the use of prescribed fire and in concert with the CDC, helping to understand the health impacts and long-term costs of prolonged wildfire smoke events that increasingly plague millions of Americans throughout the year.
- As research from the 2018 California wildfire season shows, wildfires often cause significant deaths through smoke impacts unaccounted for in official death tolls, which are often not considered as part of evaluating the costs and benefits of resilience interventions.*
- Future research priorities should model how optimal wildfire resilience investments supporting the 10-year strategy and scenario investment priorities would reduce health impacts and days of air-quality impairment to further support the investment case for wildfire resilience.
- This work requires an equity audit starting with an investigation of the health disparities of wildfire smoke on historically underserved communities and Black, Indigenous and people of color to support resilience investments that mitigate past harm and reduce disparities.



Primary Building Block Co-Benefits: Clean Air and Community Health; Environmental Justice and Equity for Underserved Communities; Forest and Soil Carbon Sequestration

*See note 1.

9. Department of Energy and Infrastructure Resilience

Description: There are more than 3,000 electric transmission and distribution lines authorized on 18,000 miles of agency-managed land through special-use permits—much of this infrastructure is at risk from wildfires and also poses threats in the form of ignitions often tied to high wind events. Dense smoke from wildfires can “trip” a circuit, causing it to go out of service, or outages can result from emergency line de- shut-downs to prevent future ignitions, prevent thermal damage to the line, to prevent a smoke-caused trip, or to meet the safety needs of firefighters.³⁸ Wildfires cause significant emergency response costs for electric utilities, additional costs tied to reliability and the need to disrupt service or acquire alternative power sources when available, and, perhaps most significantly, costs tied to liability when power lines are the cause of ignitions.

Assessment of Effectiveness, Changes and Needs:

Numerous efforts have sought mitigation measures to these potential costs ranging in a host of utility partnerships, but few have comprehensively facilitated appropriate investments in landscape scale risk management through hazardous fuel treatments. In the past, strict liability standards have limited willingness to enter into these partnerships beyond rights-of-way, while utilities are left to fund vegetation management needs as a course of business operations within rights-of-way in accordance with reliability standards and permits. DOE infrastructure resilience spending is limited to a few isolated grant programs, many focused on cybersecurity, infrastructure hardening and other issues outside of wildland fire risks.



Building Block Bottom Line:

- Recent fires have underscored the existential threat wildland fire risks pose to the electric utility industry.
- Use of regulatory tools at the state level are only a partial solution to resolving these issues. In the context of federal infrastructure investment initiatives, new programs dedicated to wildfire risk reduction could be used to help incentivize partnerships with state and federal land management agencies, and other landowners.
- Wildfires can also pose significant costs to other infrastructure, such as natural gas pipelines, roadways and water infrastructure tied to flooding and debris flow in post-fire storm events.
- In addition to exploring support for the compelling need to address risks to electric utilities, programs that finance local authorities to conduct mitigation measures comparable to other FEMA pre-disaster mitigation funding could be explored.
- Using a whole-of-government approach to this challenge should include inviting support and ideas for investment and collaboration from DOE and other agencies with key infrastructure responsibilities.



Primary Building Block Co-Benefits: Critical Infrastructure for National Security and Military Readiness; Community Resilience; Jobs and Rural Economic Opportunity



Aspen in autumn glory in San Juan Mountains of southwestern Colorado. © Harold E. Malde

BUILDING BLOCKS

III. Innovative Approaches to Support Private Investment and Partnerships for Wildfire Resilience:

Recent initiatives have succeeded in drawing private capital to protect forests and provide ecosystem services on private lands, especially around global efforts to protect biodiversity.³⁹ In the United States, green bonds have raised private capital for the acquisition and protection of private forest land with high conservation value.⁴⁰

This section addresses opportunities to deploy similar tools to expand the scale of forest restoration and wildfire resilience activities on public forests in the United States,⁴¹ either through Environmental Impact Bonds/Funds or direct partnerships with utilities.

These strategies offer financing structures that facilitate partner, private capital and other nontraditional investment in wildfire resilience, and thus are particularly well suited to operations at scale and across ownership boundaries. The other primary benefits are that they can create predictable, multi-year funding streams and performance accountability mechanisms that have proved difficult to establish through conventional federal appropriations cycles. Multi-year funding and performance accountability measures are two of the factors in the success and support of federal programs like the CFLRP and Joint Chiefs' Initiative highlighted in Section I. Innovative financing structures may be able to complement other federal programs to create similar benefits.

According to several estimates, green investing is a large and growing sector.⁴² Strong demand from ESG (Environmental, Social and Governance) and impact investors reflects increasing interest in sustainable finance and support for projects with positive environmental impacts when combined with an acceptable return on investment. To date, green investing has been dominated by energy, building, transportation, and water projects⁴³ with strong focus on improving energy efficiency/climate impacts and enhancing water quality. The growing demand for green, sustainability-focused investments and a growing awareness of wildfire hazards and cumulative costs could support demand for forest restoration investments and a willingness to pay for their benefits.

Forest restoration and fire resilience projects can be linked to a suite of environmental and social outcomes or ecosystem services. Forest restoration provides a means to deliver a stream of future ecosystem service benefits. Locally, projects might protect property assets from wildfire losses and reduce costs of wildfire suppression and provide a means to protect/stabilize the carbon stocks tied up in forests. Depending on the location and design of treatments, they may also provide revenue streams from harvesting timber for various products. Large, intense wildfires can also prove costly to municipal watersheds because of post-fire soil erosion and highly variable stream flows. Forest restoration investments, therefore, can provide tangible benefits through avoided costs to local governments, landowners, and water and electric utilities.⁴⁴ Wildfire resilience projects can enhance public health and safety, stabilize forest carbon stocks, protect water quality, and reduce wildfire suppression costs and property damage.

Bonds of various types are the most common instruments in conservation finance and are most likely to provide a scalable model for forest restoration and fire resilience work. Bonds are a fixed period income asset whereby the issuer owes the bond holder a debt plus interest (coupon) over a defined time. Restoration or resilience bond proceeds would be used to fund treatments, and those who benefit from the treatments would provide payments on interest and principal over the duration of the bond.

In addition to beneficiaries willing to pay for treatment, a successful investment requires: investors to purchase bonds; institutions to develop and issue the bonds; and technical specialists to design and conduct the forest restoration work, consistent with regulations governing federal forest management, planning and contracting.

Consider the participants in the implementation of a bond instrument to support public land management:

1. **Financial Institutions** package and issue the instruments. Federal land management agencies do not have the authority to issue bonds or contract directly with bond issuers.
2. **Investors/funders** purchase the bonds. These are expected to be institutional investors looking for large investments (> \$25 million)⁴⁵
3. **Payors** (beneficiaries) benefit from the outcomes of the project. These are institutions that would derive benefits (often an avoided cost) from the forest restoration or fire resilience treatment. These may be private entities, local governments or federal agencies (with some restrictions).
4. **Federal land management agencies** design specific management actions/treatments to restore and enhance the resilience of forests.⁴⁶ Projects are developed as a part of authorized planning processes including environmental impact/assessment work.

- 5. Implementor/service providers** contract for and do the work on the ground. A third party is required to connect bond issuers and the federal agencies and oversee the work on the ground. The National Forest Foundation, a congressionally chartered organization, has served in this capacity, working through the FS Partnership office. The arrangement with contractors is governed by federal contracting regulations.

The following sections first examine novel funding strategies to provide upfront funding of large restoration and fire resilience efforts, and then more traditional public-private interactions in the form of cost-sharing partnerships with utilities.

1. Environmental Impact Bonds / Funds

Environmental Impact Bonds (EIB) apply the structure of social impact bonds⁴⁷ to fund environmental outcomes.⁴⁸ EIBs provide a mechanism for investing in future cost savings related to the environmental outcomes achieved by a project. That is, they provide upfront funding for large projects that generate a long-term stream of benefits. EIBs are recent phenomena; the first EIB in the United States was issued in 2016.⁴⁹

The prototype for an EIB focused on public land restoration is the \$4 million Forest Resilience Bond (FRB) issued by Blue Forest Conservation⁵⁰ for restoration treatments on 14,545 acres of the Yuba Ranger District of the Tahoe National Forest. The Yuba Project has a time frame of 2018 to 2022. Management activities are principally focused on fuels reduction, but also provide co-benefits for meadow restoration, invasive species control and encouraging aspen regeneration.

The participants in the FRB for the Yuba Project are:

- 1. Financial Institutions**—Blue Forest Conservation developed and issued the bonds.
- 2. Investors/funders**—AAA Insurance, Rockefeller, Moore Foundation,⁵¹ Calvert Impact Capital purchased the bonds. Investors are focused on proof of concept with the foundations accepting PRI rates; AAA is interested in the effects of fuel treatments on portfolio risk.
- 3. Payors**—State of California, Yuba Water Agency, Forest Service. Utility contract contributes all the interest payments along with some of the payments of principal. This is essential because the government entities are precluded from paying interest on the bond.
- 4. Federal Land Management Agency**—The Forest Service designed the treatment activities with required environmental review.
- 5. Implementors/service provider**—Management is conducted through stewardship agreements.⁵² The National Forest Foundation provides a congressionally authorized mechanism for the Forest Service to interact with the FRB. They hold a Master Stewardship Agreement with the agency for the restoration work that serves as an umbrella agreement for several supplemental agreements for treatment activities within the watershed.⁵³

A subsequent project involving Blue Forest Conservation seeks to develop a substantially larger FRB for the North Yuba Forest Partnership, an effort involving nine entities, including The Nature Conservancy (TNC), to implement a program of forest health projects over 275,000 acres. This project anticipates issuing an FRB (or FRBs) valued at approximately \$100 million. This project would fund projects on multiple ownerships in the North Yuba River watershed to increase forest resilience, reduce high-intensity wildfire and in the process generate benefits for wildlife, watershed health and local communities. Blue Forest Conservation has also received funding from the National Forest Foundation to replicate the FRB approach to fuel treatment projects on other western national forests.⁵⁴

Additionally, EIBs are under development to support recreational infrastructure development in southwestern Ohio and in Washington. In Ohio, an EIB is being developed to support development of a mountain bike network on the Wayne National Forest. Payors would include a county and a municipality with payments derived from the anticipated increase in tourism expenditures and derivative tax revenue (economic capture concept) with a total project cost of \$2 million to \$4 million.⁵⁵ In Washington, an EIB is being designed to fund the development of tourism infrastructure with similar payment structures. Both projects support infrastructure investment on national forests and are being developed by the capital firm Quantified Ventures with support from the National Forest Foundation's Innovative Finance for National Forests Grant program.

Whereas an EIB provides outcomes-based capital for a single project, with all proceeds provided upfront, repaid over a fixed time period, and then closed out, an Environmental Impact Fund (EIF) allows outcomes-based financing to be more open-ended and can be maintained or expanded over the long term.

A Wildfire Mitigation Environmental Impact Fund is currently being developed in southwestern Colorado by Quantified Ventures, again with assistance from the National Forest Foundation's Innovative Finance for National Forests Grant program.⁵⁶ The project focuses on treating land adjacent to the San Juan National Forest to complement the treatments on the forest and on property in the WUI. The EIF would be funded by a combination of EIBs, grants and appropriated funding. The fund would provide "revolving impact loans" to pay for treatments that would be repaid on 20-year cycles by an anticipated "multi-jurisdictional coalition of outcomes payors." According to the prospectus, several local entities, including county and municipal governments,⁵⁷ water and electric utilities,⁵⁸ and tribal organizations, have indicated interest in participating in the EIF as payors. The EIF also anticipates generating revenues from biomass harvesting and includes a market development component.⁵⁹

The fund addresses fuel conditions on 351,464 acres mainly in La Plata county, including the city of Durango, and anticipates treating about 65,000 acres across nine ownership types. Total costs are estimated to be approximately \$44 million (about \$676 per acre) using several treatment strategies. Quantified Ventures identifies the Colorado Water Resources and Power Development Authority (CWRPDA) as a potential partner for issuing bonds. CWRPDA has long been responsible for issuing debt on behalf of local public entities and coalitions of public entities for water and power projects. Recently, the Authority received an expanded and unique mandate to allow financing of forest health projects.⁶⁰

Developing Innovative Insurance Products to Support Forest Conservation

TNC is working with partners in the insurance industry to explore how insurance might be used to contribute to funding or financing forest treatment. With funding assistance from the Innovative Finance in National Forests Grant Program and using the 28,000-acre French Meadows forest treatment project in the Tahoe National Forest in California as a test bed, work is under way to determine if the wildfire risk reduction benefit of at-scale forest management can be accounted for in property insurance modeling and pricing. One objective is to design "wildfire resilience insurance" whose pricing is lower due to lower expected losses because of the severe wildfire risk reduction benefit of forest management. The study is also examining how insurance premium savings from the wildfire risk reduction associated with forest management can be captured and used to contribute to the funding or financing of forest treatment.



Preparing drip torches for a prescribed burn in Willamette Valley, Oregon, with TNC, US Fish and Wildlife Service, US Forest Service and Bureau of Land Management. © Jason Houston

In a separate study, TNC is working with another insurance sector partner to determine if a new insurance product under development by insurers—community-based catastrophe insurance—can take into account the risk reduction benefits of forest treatment and wildfire buffers around a community, resulting in a lower-priced product. Community-based catastrophe insurance for wildfire risk would be purchased by a community to cover homes in the community. TNC and the insurance partner are exploring how community-based insurance premium savings due to wildfire risk reduction can be captured and used to help fund or finance forest management and acquisition of buffer land.

Assessment of Program Effectiveness, Needs and Changes:

The Forest Service has invested in exploring innovative approaches to support private investment and partnerships for wildfire resilience through the efforts of its Partnership Office at approximately \$1 million per year. In addition, the Innovative Finance Grant Program at the National Forest Foundation, with the support of the Forest Service and U.S. Endowment for Forestry and Communities, has funded 10 projects, with \$1.8 million to further explore and implement mechanisms for drawing private funding to forest management and restoration activities on public lands. All EIB/EIF projects described in this section were supported by this program. Current projects are in design or prototype phases of development, and while demonstrating proof of concept, they have also highlighted current constraints on accelerating their deployment.

Four major issues limit the current effectiveness of private investment instruments for wildfire risk reduction:

- 1) **Definition of Benefits:** Potential payors for fuel treatment investments need well-specified definitions of expected outcomes and benefits in terms of risk reduction, avoided costs and any other potential revenues accruing to the investment. While protocols for developing benefit estimates for watershed protection and timber revenues are well defined, similar protocols are needed for defining the expected benefits of protecting private property and human health, and avoiding fire-suppression costs. Precise estimates of treatment benefits are an essential predicate for designing investment instruments and for enlisting a group of payors for these investments.⁶¹
- 2) **Agency Commitments:** The Forest Service lacks the authority to make long-term commitments to outcome-based investments, limiting its ability to use these tools for avoiding suppression and other costs associated with large wildfires. Allowing the agency to obligate funding for investment projects beyond year one would enable long-term cost-sharing agreements and would likely signal federal commitment to other potential local payors for a larger investment in fuel treatments.
- 3) **Agency capacity:** Current funding of the partnership office defines the extent of conservation finance expertise/capacity within the Forest Service. Expanded funding, perhaps by an order of magnitude, may be needed to develop and service Environmental Impact Bonds, utility partnerships, and other conservation finance initiatives to expand forest-restoration activities. The agency may also lack on-the-ground capacity to design, lay out and administer large scale restoration projects.



Forestry hoses and valves are a small part of the tools for handling wildland fires and prescribed burns. © Jason Houston

- 4) **Transaction costs:** Establishing conservation finance approaches within existing authorities and regulations requires complex and costly institutional arrangements. Streamlined authorities could reduce transaction costs related to contractual relationships between funders, agency managers and project implementors.

Specific legislative changes may be necessary to facilitate these investments. One key change may be to authorize Wildfire Reduction Performance Contracts (WRPC) to allow the Forest Service (and DOI) to use private sector financing to fund large-scale fuel treatment projects. Annual payments would be committed from future annual appropriations and would not exceed the estimated cost savings of avoided future wildfire suppression expenditures. Payments could be augmented by commitments from other public sector beneficiaries.

Private sector investment in fuel reductions represents an unknown but potentially consequential source of funding for building forest resilience and reducing wildfire costs at meaningful scales. Within reasonable estimates of potential demand for these types of investments, treatments could be expanded by 25% to 50% of current levels. Several issues challenge bringing these efforts to scale, but perhaps the most important is the inability of public land agencies to make payments over time for up-front investments in forest resilience. Authorizing the use of private sector financing to fund fuel treatments would be a means to reduce public expenditures on wildfire suppression and public costs of wildfire damages over the long run. The authorization would allow the agencies to make long-term payments justified by the cost savings generated by the treatments either alone or in partnership with other beneficiaries of the treatments.

Energy Savings Performance Contracts (ESPC), authorized by the Energy Policy Act of 1992, provide an analogous authority to federal agencies for investing in energy-saving technology. In lieu of capital funds, private sector financing can be utilized to pay for the investments based on a guarantee of real cost savings from the replacement of obsolete equipment—payments are made from annual appropriations over the life of the ESPC. One key element of this type of arrangement is establishing credible estimates of the cost savings from the investment, in this case, savings accruing to avoided wildfire suppression activities resulting from the fuel treatments. Research programs and investments discussed in Sections I and II should prioritize establishing those estimates to support planning treatments for and certifying savings.

Under ESPCs, energy retrofits are designed by certified Energy Service Companies (ESCOs), which provide technically credible design and cost-savings estimates. In contrast, under WRPC, only the agency (Forest Service) can design the treatments to be consistent with multiple-use objectives implemented through the National Forest Management Act (NFMA) and evaluated under NEPA. To ensure credibility of estimates, a third-party entity would be required to certify treatment design and the savings of the fuel treatment investments.

The effectiveness of contracts may be enhanced in mixed-land ownership settings through joint development with states under Shared Stewardship approaches to coordinate landscape-level treatments. Projects would be implemented through payment for services contracts. In cases where treatments produce merchantable timber, stewardship agreements or contracts may be used to allow for retention of timber receipts to augment fuel reductions within the treatment area.

An additional legislative proposal that could prove effective to further the use of novel financing strategies is to establish a Conservation Finance Fund within the Forest Service or USDA [or authorize the use of Commodity Credit Corporation (CCC) funds] to expand funding for designing, managing, and monitoring conservation finance projects in support of fuel treatments. The Conservation Finance Fund would be supported by direct appropriations and would allow transfers/reprogramming from other line items (e.g., hazardous fuel treatments). Agencies currently lack capacity to expand the use of novel financing and other partnerships with the private sector. Expertise in conservation finance is limited to the national office and would need to be expanded to regional levels. Capacity to design and layout projects for implementation by contractors is also limited and would constrain ability to expand these approaches.

A Conservation Finance Fund would provide funding for:

1. Encouraging innovation through the development of pilot projects using competitive grants;
2. Providing ongoing support for developing and managing agreement involving private sector financing and other partnerships; and
3. Contracting for additional on-the-ground support to design, layout and monitor large fuel treatment projects.



Building Block Bottom Line:

- Innovative financing could have vast potential for expanding investments in wildfire risk reduction. Environmental Impact Bonds and other financing vehicles are a logical tool for coordinating treatment strategies across multi-owner, multi-stakeholder landscapes.
- The demand for environmental investments is estimated to be more than \$100 billion* but currently remains a niche investment opportunity.
- Realizing the potential for these types of investments requires addressing key structural issues that will likely require changes in agency authority to commit funds over the long run, agency capacity to engage in conservation finance, and agency capacity to design marketable projects for private sector funding.
- In the near term, efforts should focus on expanding funding for early-stage project development and incubation to expand the number of pilot efforts and continue to demonstrate proof of concept.
- Partners such as NFF, the Forest Service's National Partnership Office, Blue Forests and others should consider the development of a learning network.
- The Forest Service could also look to partners like the Conservation Finance Network to develop finance boot-camps for appropriate agency officials to develop capacity and share lessons learned.
- In the longer term, efforts should focus on addressing structural impediments to these investments, including new authorities to allow for commitment of federal funds to service bonds and agency capacity for conservation finance across Forest Service units.
- NRCS' experiences with conservation finance may also offer replicable models, including the use of a conservation innovation grant (CIG) to support a network of grantees and practitioners within and outside the agency, and the hiring of an independent group to evaluate possible policy changes necessary for the agency to further advance conservation finance principles.
- Given interest spanning the two agencies, there may be common needs related to pilot authorities or new initiatives worthy of legislative changes in the next Farm Bill reauthorization.
- For example, the new Farm Bill could grant authority for agencies to use private sector financing to fund fuel treatments through Wildfire Reduction Performance Contracts, and provide \$50 million of pilot funding to expand the capacity of the agencies to engage with the private sector through conservation finance and partnership initiatives through a national Conservation Finance Fund or a dedicated partnerships budget allocation.



Primary Building Block Co-Benefits: Jobs and Rural Economic Opportunity; Clean Air and Community Health; Clean Drinking Water; Maintaining Working Farms, Forests and Rangelands

*<https://www.rockefellerfoundation.org/report/conservation-finance-from-niche-to-mainstream-the-building-of-an-institutional-asset-class/>

2. Direct Partnerships with Utilities

In some settings, the benefits to wildfire risk reduction accrue disproportionately to one or few beneficiaries. Public utilities have considerable interest in forest health in their source watersheds. The possibility of exposure to massive liabilities for electric utilities was demonstrated in the Sierras in 2018 and led to the bankruptcy of Pacific, Gas and Electric Company (PG&E).⁶² The links between forest health and watershed health is becoming well established, and recent large wildfires have imposed considerable costs on water utilities. In other words, utilities are beneficiaries of forest health who can quantify the real returns to fire risk mitigation.⁶³

The Forest Service, through the National Partnership Office, has developed several Watershed Investment Projects with water utilities, corporations and other entities across the country.⁶⁴ Resulting Watershed Investment Plans can be structured under various authorities, including the 2018 Farm Bill's Water Source Protection Program.⁶⁵ The focus of these projects is on protecting watershed health, and activities often span ownerships and range from protecting stream-side buffers to fuel treatments.

The Forests to Faucet partnership in Colorado provides a model of how municipal utilities can support forest restoration activities across a multi-owner landscape. Denver Water has committed \$16.5 million to match outlays in forest restoration and wildfire resilience by the Forest Service, the Natural Resources Conservation Service, and the Colorado State Forest Service. Funded projects implement a variety of forest health treatments on 40,000 acres in Denver Water's source watershed.⁶⁶ Other great examples include the French Meadows Project (Placer County Water Agency) and the North Yuba Forest Partnership (Yuba Water Agency) in California, both of which involve significant water utility investment in forest restoration and wildfire risk reduction on National Forest lands.

Assessment of Program Effectiveness, Needs and Changes:

Unlike broad spectrum private sector investment vehicles, direct partnerships with utilities connects one or a few beneficiaries with an agency partner, thereby reducing transaction costs. Direct funding of agency initiatives by utilities and use of service contracts reduces contract complexity and associated costs. Establishing direct returns to beneficiaries from fuel treatments could be an incentive and would benefit from clear definitions of treatment benefits and enhanced protocols for project cost-benefit analysis.

Potential payors for fuel treatment investments need well specified definitions of expected outcomes and benefits in terms of risk reduction, avoided costs and any other potential revenues accruing to the investment. While protocols for developing benefit estimates for watershed protection and timber revenues are well defined, as discussed above, similar protocols are needed for defining the expected benefits of protecting private property and human health, and avoiding fire suppression costs. The ability to estimate treatment benefits can support the designing of investment instruments, for enlisting a group of payors for these investments, and for justifying use of federal funds.

The Forest Service should design a research initiative to develop valuation protocols that provide estimates of the impact of fuel treatments on specific benefits and beneficiaries. These protocols should focus on estimating the avoided costs resulting from large fuel treatment programs, including costs associated with 1) wildfire suppression activities, 2) damages to personal property, 3) loss of life and human health impacts, and 4) watershed impacts. The initiative would build upon past work, such as the Mokelumne Watershed Avoided Cost Analysis,⁶⁷ and integrate



The French Meadows Forest Restoration Project in Placer County, California, is a model partnership for increasing the pace and scale of forest restoration on national forest lands. © David Edelson/TNC

ongoing studies to measure the impacts of fuel treatments and model biophysical wildfire risks with economic valuation methodologies to estimate potential benefits of fuel treatment projects at useful spatial scales. Other USDA research agencies and university partners may be able to coordinate with the Forest Service to support this research initiative.

In addition to protocols for estimating the benefits of these projects, the Forest Service should design a protocol for estimating the costs of specific fuel treatments and for monitoring costs from future projects to refine those protocols.



Building Block Bottom Line:

- **These types of direct partnerships define a mechanism for bringing additional funding to fuel treatments in settings where substantial benefits clearly accrue to one or few beneficiaries.**
- **Based on previous and ongoing initiatives, demand for utility partnerships may range from \$10 million to \$100 million per year.**
- **In the short run, the Forest Service should continue to seek opportunities to develop partnerships with direct beneficiaries of fuel treatments through its Partnership Office utilizing various authorities, and should work to standardize and expand applications.**
- **In addition, as USDA stands up the new Agriculture Advanced Research and Development Authority (AGARDA) program authorized by the 2018 Farm Bill, USDA and the Forest Service should explore whether there are ways to invest in advancing wildfire resilience through that program.**



Primary Building Block Co-Benefits: Jobs and Rural Economic Opportunity; Clean Drinking Water Supplies; Clean Air and Community Health; Critical Infrastructure for National Security and Military Readiness

BUILDING BLOCKS

IV. Assembling the Building Blocks: Wildfire Resilience Investment Needs and Policy Vehicles

Trends in wildfire resilience spending are not keeping pace with the increasing costs of wildfire suppression or the far more substantial economic impacts associated with catastrophic wildfire events. From 2010 to 2020, federal suppression costs alone have grown by nearly 400%, while wildfire resilience investments have remained at relatively consistent funding levels, despite mounting fixed costs and without adjusting for inflation.

Present core funding programs comprise approximately \$778 million in annual funding, consisting of the following programs and funding levels (FY2020):

- Forest Service Hazardous Fuels Program (\$445 million)
- DOI Fuels Management Program (\$194 million)
- Forest Service's Collaborative Forest Landscape Restoration Program (\$40 million)
- USDA's Joint Chiefs Landscape Restoration Partnership (\$41 million)
- Forest Service's State and Private Forestry (S&PF) Programs (\$47 million⁶⁸)
- Forest Service's Community Planning Assistance for Wildfire Program (\$1 million)
- Bureau of Indian Affairs' Reserved Treaty Rights Land Program and Tribal Resilience Programs (\$10 million)

Support for a paradigm shift to significantly increase funding levels to the estimated \$5 billion to \$6 billion in new funding required annually for 10 years, along with sustained investments in maintaining resilience over time, will require the engagement of ongoing and new stakeholders and broader consensus around specific appropriations and authorization needs. As previously discussed, this investment case should be supported by a suite of performance and management reforms, demonstrating a coherent and coordinated program of work and measurable outcomes for multiple beneficiaries. This almost certainly requires a high-level strategic planning process to prompt transformative change, overcome agency cultural barriers, and ensure that an appropriate slate of management, executive action and legislative proposals are advanced in concert. The creation of such an initiative within the new administration should be the highest priority in advancing the paradigm shift.

Strategies to meet aggregate funding levels for the paradigm shift should begin with immediate increases to core programs, which are better equipped to scale and address staffing and other needs associated with delivering a larger program of work. In the near term, based on the analysis in this report, we estimate that program funding levels for these programs could rapidly increase to the following levels, comprising a total of \$1.75 core billion:

- Forest Service Hazardous Fuels Program (\$890 million)
- DOI Fuels Management Program (\$388 million)
- Forest Service's Collaborative Forest Landscape Restoration Program (\$80 million)
- USDA's Joint Chiefs Landscape Restoration Partnership (\$82 million);
- Forest Service's State and Private Forestry Programs (\$94 million⁶⁹)
- Water Source Protection Program (\$50 million)
- Bureau of Indian Affairs' Reserved Treaty Rights Land Program and Tribal Resilience Programs (\$20 million)
- Cross-Departmental Funded Partnerships (funded from above programs):
 - Promoting Ecosystem Resilience and Fire Adapted Communities Together (\$4.5 million)
 - Partnership and Community Planning Assistance for Wildfire (\$10 million)
- Forest Service and DOI fire science and Joint Fire Science program (\$8 million for each Forest Service and DOI) and USDA Climate Hubs (\$40 million)

In order for this surge in program funding to be effective, efforts to maintain or increase funding levels for key complementary programs should remain a priority, alongside the suite of management and performance reforms identified in this report. Key programs for funding include:

- Forest Service's Forest Products Program
- BLM's Forest and Woodlands Management and Seeds of Success Programs

- Forest Service's Vegetation and Watershed Management Program
- USDA's Multi-agency Research Capacity

In addition, several complementary programs are ripe for investments in the near term that would institutionalize new business practices and build infrastructure and capacity to drive down the costs of wildfire resilience spending over time. These are essential down payments for future initiatives to maintain resilient landscapes and communities. These include surges of near-term investments of an estimated additional \$325 million to \$475 million in:

- Forest Service's Planning Program—to support incorporation of scenario modeling, priority criteria and monitoring into program and policy at appropriate regions and units (\$25 million per year).
- Forest Service and Department of Interior's Land Acquisition Programs—to dedicate a portion of funding to climate resilience and land protection, including protecting at-risk wildland areas from encroaching development (\$50 million per year).
- A suite of coordinated investments in research, commercialization and market demand/guarantees for fuel treatments aimed at developing and supporting market creation over the next 10 years in areas such as engineered mass timber wood products, wood energy and aviation biofuels and other advanced products. Federal procurement investments, including direction for using bio-preferred products, can also be a complementary source of funding (\$150 million to \$250 million per year).
- Dedicated investment in a Civilian Climate Corps, building on the 21st Century Conservation Service Corps, to create jobs and support the workforce needed for fire resilience work (\$100 million to \$150 million per year).

Looking across the federal budget, initial funding opportunities should likely focus on the following, comprising \$64 million to \$89 million in known additional funding:

- Working with FEMA and Congress to ensure that the Building Resilient Infrastructure and Communities program dedicates an appropriate share to wildfire resilience—initially consistent with disaster data from the National Oceanic and Atmospheric Administration (NOAA) indicating that wildfires constitute approximately 5.4% of all high-cost disasters nationally—the equivalent of at least \$27 million per year. Over time, these figures should account for indirect damages, particularly those associated with wildfire smoke in assessing appropriate funding levels.
- Exploring whether FEMA's Hazard Mitigation Grant Program Post Fire associated with Fire Management Assistance Grants can be authorized to conduct grants in high-risk areas in advance of declarations, adding an additional \$25 million to \$50 million per year. As Congress and the administration evaluate the initial effectiveness of this program, consideration should be given to whether it may be more efficiently deployed through the State and Private Forestry Deputy Area of the Forest Service or with explicit direction for grant work to be coordinated through State Foresters.
- Pursuing an increase in the DOD REPI budget of approximately 15% of \$12 million could be sought along with appropriations direction to focus on installation wildfire resilience and replicate successful partners established through the Sentinel Landscapes Initiative with USDA and DOI.
- Evaluating and increasing the current funding levels within NRCS programs going to wildfire resilience in western states. In California, approximately 5% of EQIP dollars were supporting wildfire risk mitigation work: the state conservationist, working with local officials, helped increase the dedication to wildfire resilient practices to 10% or more of all spending.⁷⁰ Distributing funding to priority wildfire resilience landscapes (within those approximately 51 million acres across the U.S. identified in need of wildfire resilience activities) that are identified using wildfire prioritization tools. Including direction in



A Forest Service fire ecologist monitors prescribed fires in Arizona. © Chris Crisman

a future Farm Bill for state technical committees to dedicate portions of funding for projects focused on wildfire resilience, particularly in states where wildfire is a landscape challenge. The Joint Chiefs' program, which relies on EQIP funding for the NRCS share of contributions, and RCPP, which can pair EQIP with other NRCS cost-share and land protection programs, offers avenues to deploy increased EQIP funding amounts in those targeted landscapes that can achieve wildfire resilience goals.

Securing funding at the estimated levels above would achieve approximately \$1.86 billion of the aggregate funding need. While the authors believe these funding levels could be effectively implemented in the near term, additional vetting should occur with agency officials to better understand workforce capacity and program delivery needs at these funding levels and to determine how continued significant increases beyond these funding levels to the estimated \$5 billion to \$6 billion per year needed could reasonably be achieved. Of note, not all of this \$1.86 billion can be considered new funding and would require further consideration of reprogramming impacts.

NRCS funding, alongside funds awarded to states through FEMA and the Forest Service, would constitute the federal share of funding toward work on state and private lands. There remains a significant need to bring additional state, local and private financing to the table to fulfill the nonfederal share of costs and complement federal investments. Several key opportunities have been highlighted in this report to facilitate those investments, including:

- Better integrating the Promoting Ecosystem Resilience and Fire Adapted Communities Together and Community Planning Assistance for Wildfire partnerships with the U.S. Fire Administration's support for Community Wildfire Protection Planning—helping local officials better understand needs in their communities.
- Establishing program direction in appropriate land acquisition programs to address climate resilience with a focus on wildfire and facilitating long-term management needs for prescribed fire and other treatments in priority watersheds. In tandem with enhanced local planning, these criteria can serve to create a match need that compels local and state governments to consider public finance initiatives.
- Facilitating novel financing approaches to wildfire resilience through legislative changes that a) grant authority for agencies to use private sector financing to fund fuel treatments through Wildfire Reduction Performance Contracts and b) provide funding to expand capacity of the agencies to engage with the private sector through conservation finance and partnership initiatives, including by either creating a national Conservation Finance Fund or a new line within the partnerships budget with initial funding of at least \$50 million. Research funding should accompany these initiatives to better define returns for beneficiaries of partnerships.

Using a whole-of-government approach also requires engaging agencies and departments that have not yet deployed programs to support wildfire resilience, despite having programs and constituents that are impacted by wildfire risks. These include:

- USDA Rural Development: With fire posing significant risks to community infrastructure, drinking water, economic opportunities, and health, setting aside even a small portion of RD's \$33 billion budget would provide an important building block for needed investments.
- DOD and DOE: With catastrophic fire events posing a threat to critical infrastructure necessary for national security and military readiness and causing disruptions to the electrical grid, DoD and DoE have an interest in helping to make the investments necessary to reduce fire risks.



Preparing for a multi-agency prescribed burn in Baskett Slough National Wildlife Refuge, Dallas, Oregon. © Jason Houston

Policy Vehicles:

A paradigm shift investment of approximately \$60 billion in wildfire risk reduction and resilience over 10 years could be included as part of an economic stimulus or climate change legislative package. There is a strong case to be made that this work is directly related to the down payment needed for economic and climate resilience, and providing comprehensive funding would create the certainty and stability necessary for community, business, workforce, programmatic and other investments. However, it is likely that getting to full funding of the paradigm shift will require advancing different building blocks through a variety of policy vehicles over time. In the near term, the authors recommend focusing on the following opportunities:

Economic Stimulus: In the wake of the global pandemic, significant new funding may be allocated to support economic recovery needs that also meet priorities of the administration and Congress. By some estimates, federal investments in forest restoration can generate between 15 and 20 jobs for every million dollars of investment.⁷¹ Expansion of the core funding programs outlined above could conservatively contribute to over 20 million new jobs predominantly located in rural communities.

Emphasis on Diversity, Equity and Environmental Justice: A key priority for advancing wildfire resilience is supporting investments that address needs for diversity and equity in communities that have been historically marginalized, have not traditionally enjoyed the same opportunities for economic mobility, or conversely have been negatively impacted through discrimination or underrepresentation in key decisions impacting their communities. Within the building blocks, key aligned opportunities include expansion of funding for Indian and Alaska Native Nations wildfire resilience through the RTRL program and climate initiatives, and efforts to bolster funding for job, youth and veterans conservation corps programs that can provide pathways to careers while supporting workforce needs to expand resilience. Dedicated funding to analyze public health impacts of wildfire smoke, particularly on Indian and Alaska Native and vulnerable populations already at higher risk of exposure to harmful air pollutants and certain health impacts, should also be a priority and can demonstrate how effective resilience investments can achieve meaningful reductions in impacts if implemented at sufficient scales. Funding could also be dedicated to ensuring that underrepresented communities have access to investments in resilience and community preparedness, job opportunities related to risk reduction and resilience, and other funds and programs identified in the building blocks in this paper. USDA's Socially Disadvantaged Groups Grants, for example, can provide technical assistance to socially disadvantaged groups in rural areas through cooperatives and Cooperative Development Centers. Technical assistance can include feasibility studies, business plans, strategic planning and leadership training.

Infrastructure: Past efforts to influence Congress to consider natural infrastructure investment alongside traditional funding needs may yield benefits in the next iteration of a major infrastructure package—particularly as lawmakers look to support transitions to a net zero emissions economy and build the nation's infrastructure in ways that support our climate resilience needs. Investing in lands that are resilient to fire will be a critical part of our country's overall infrastructure, and particularly natural infrastructure. Building blocks involving the EPA Drinking Water and Clean Water State Revolving Funds, USDA Rural Development Programs and the Department of Energy may provide insights into pilot or new authorities to direct agencies to support wildfire resilience needs in concert with private, state and local partners. Infrastructure resilience will require public-private partnerships and innovative financial structures, and legislation may provide venues for authorizations tied to the financing strategies outlined in Section III.

Farm Bill: The next Farm Bill again affords opportunities within and beyond the Forestry Title to advance key priorities for wildfire resilience. Within the Forestry Title, reforms to state and private forestry programs that better align funding to cohesive strategy goals and facilitate initiatives such as shared stewardship should be a top priority. Many changes could be advanced to align federal and state priorities through renewed criteria for state Forest Action Plans. The Forestry Title could also authorize significant new funding for successful programs like CFLRP. The Research Title offers opportunities to dedicate resources to Joint Fire Science and related initiatives that assess the effectiveness of wildfire resilience investments as discussed in the building blocks. The Rural Development Title affords significant opportunity, in concert with other titles in the bill, to more effectively align funding for the different stages of research, development and commercialization of new markets for hazardous fuels materials that can reduce the costs of treatments over time. It also affords the opportunity to align programs for safe drinking water and community infrastructure with investments in wildfire resilience. Finally, the Conservation Title can be used to set clearer parameters/expectations around the use of private-lands conservation programs to achieve wildfire resilience objectives.

Climate Change: Addressing the ever-increasing threat of wildfires is a key priority for the United States, being prioritized at all levels of governments and among stakeholders, partners and decision makers. Accomplishing the treatments and community preparedness work necessary to reduce fire risk and increase resilience will create jobs and improve community health and well-being while reducing GHG emissions and protecting forest and soil carbon. The whole-of-government and whole-of-society approach to addressing climate change must continue to include ways to address and bring new resources to support wildfire resilience.

The Biden-Harris Administration included wildfire and forest resilience as key efforts to address climate change, as highlighted in the January 27, 2021, Executive Order on Tackling the Climate Crisis at Home and Abroad⁷² and any related agency actions. The Executive Order touches on several areas highlighted in this report that can further wildfire resilience objectives, including initiatives to support sustainable procurement that can help guarantee market demand for innovative forest products tied to wildfire resilience; a goal of conserving at least 30% of our lands and waters by 2030 (America the Beautiful Initiative) that can align with the need to address land protection and conservation in wildfire-prone areas and facilitate future use of prescribed fire; and direction to USDA to collect input from tribes, farmers, ranchers, forest owners, conservation groups, firefighters, and other stakeholders on how to best use USDA programs, funding and financing capacities, and other authorities, and how to encourage the voluntary adoption of climate-smart agricultural and forestry practices that among other goals, “decrease wildfire risk fueled by climate change.” Related legislative vehicles, including for creating and funding a Civilian Climate Corps, can provide opportunities to advance the building blocks needed to truly reduce risks and increase wildfire resilience.

Next Steps:

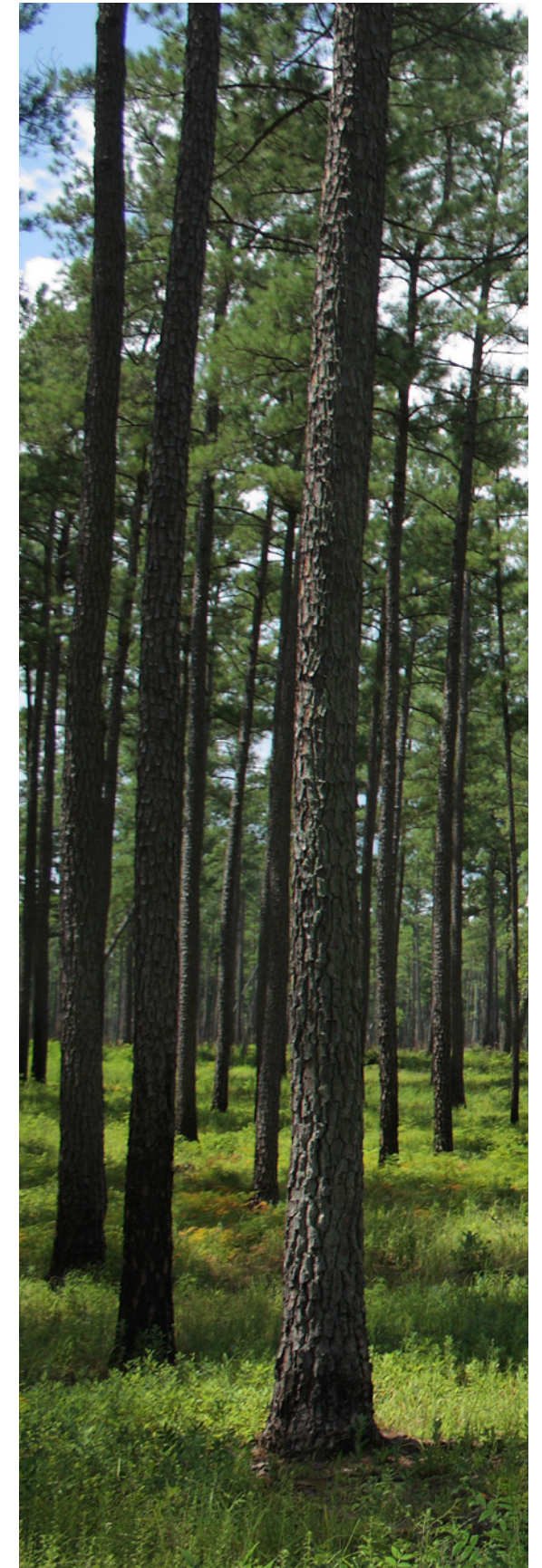
These building blocks create a menu of program options for policymakers to build toward fully funding the cost of top-priority work over the next 10 years. These programs also support the workforce expertise and infrastructure that will be needed to successfully deliver the work at the pace and scale to get ahead of this challenge while supporting the many co-benefits that will result from this work.

There is a need for urgent, bold action following the U.S. rejoining the Paris Climate Agreement, positioning the country to once again be part of the global climate solution, and in line with President Biden's Executive Order on climate, with emerging congressional actions, and as prioritized by stakeholders. A facilitated interagency process could be used to refine and vet these building blocks to support priority investment increases for current programs, direct new program set-asides and add fire resilience as a program priority for complementary programs, and determine how to evaluate the right level of funding to bring in programs that are impacted by fire but haven't yet contributed as part of the solution. This interagency process can also set clear and consistent expectations for spending prioritization and program evaluation over time.

The federal partners working with local, state and tribal governments and private and NGO partners will be critical to advance these building blocks and successfully deploy new funds to accomplish priority work, and to do so in ways that are equitable, acknowledging and addressing past inequities and racial disparities. It will also be important to invest in fire science, monitoring, and the social, economic and ecologic research needed to inform and deliver on this paradigm shift. One clear next step on the research front is to determine how to set a monetary value on avoided costs per unit of priority work to help unlock private investments that can leverage federal dollars. Federal and partner collaboration can also support work with Congress to identify ways to advance these building blocks as quickly as possible in the next year.

Working together, we can change the future trajectory for how wildfire impacts our country, our communities and our climate.

It is time to change the paradigm.



Investing in these combined building blocks can help advance wildfire resilience. © Robert B. Clontz / TNC

FIRE IN AN UNMANAGED FOREST VS. MANAGED FOREST



UNMANAGED FOREST

Fire in an unmanaged Ponderosa pine forest (where fires have been repeatedly suppressed): Overcrowding can make the forest less healthy and resilient. When such a forest burns, the fire can extend into the crowns, killing large swaths of trees.
© Erica Sloniker/TNC



MANAGED FOREST

Fire in a managed Ponderosa pine forest (using controlled burns with or without mechanical thinning): A fire burns low through the understory, maintaining gaps between some trees that help prevent future large crown fires.
© Erica Sloniker/TNC

APPENDIX

LIST OF ACRONYMS

21CSC	21st Century Conservation Service Corps
AGARDA	Agriculture Advanced Research and Development Authority
ARS	Agricultural Research Service
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRIC	Building Resilient Infrastructure and Communities Program
CAA	Clean Air Act
CCC	Civilian Conservation Centers
CCC	Commodity Credit Corporation
CDC	Centers for Disease Control
CFLRP	Collaborative Forest Landscape Restoration Program
CPAW	Community Planning Assistance for Wildfire
CWPP	Community Wildfire Protection Plans
CWRPDA	Colorado Water Resources and Power Development Authority
CWSRF	Clean Water State Revolving Fund
DEIJ	Diversity, Equity, Inclusion and Justice
DERA	Diesel Emissions Reduction Act
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DWSRF	Drinking Water State Revolving Fund
EIB	Environmental Impact Bonds
EIF	Environmental Impact Fund
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERS	Economic Research Service
ESCO	Energy Service Companies
ESG	Environmental, Social and Governance
ESPC	Energy Savings Performance Contracts
FAC Net	Fire Adapted Communities Learning Network
FEMA	Federal Emergency Management Agency
FLN	Fire Learning Network
FMAG	Fire Management Assistance Grant
FRB	Forest Resilience Bond
FWS	Fish and Wildlife Service
FY	Fiscal Year
GAO	Government Accountability Office

GNA	Good Neighbor Authority
HMGP-PF	Hazard Mitigation Grant-Post Fire
IC	Innovation Center
IPBN	Indigenous Peoples Burning Network
NASS	National Agricultural Statistics Service
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NIFA	National Institute for Food and Agriculture
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
PERFACT	Promoting Ecosystem Resilience and Fire Adapted Communities Together
R&D	Research and Development
RBS	Rural Business-Cooperative Service
RCPP	Regional Conservation Partnership Program
RD	Rural Development
REPI	Readiness and Environmental Protection Initiative
RFP	Request for Proposals
ROI	Return on Investment
RTRL	Reserved Treaty Rights Land Program
RUS	Rural Utilities Service
S&PF	State and Private Forestry
S-O-S	System-of-Systems
STAR	Science to Achieve Results
TFPA	Tribal Forest Protection Act
TNC	The Nature Conservancy
TREX	Prescribed Fire Training Exchange
TRP	Tribal Resilience Program
USDA	Department of Agriculture
USGS	U.S. Geological Survey
VETS	Veterans Employment and Training Service
VFC	Veterans Fire Corps
WRPC	Wildfire Reduction Performance Contracts
WSPP	Water Source Protection Program
WTREX	Women-in-Fire Training Exchange
WUI	Wild-Urban Interface

Endnotes

- 1 <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>
- 2 Wang, D., Guan, D., Zhu, S. et al. Economic footprint of California wildfires in 2018. Nat Sustain (2020). <https://doi.org/10.1038/s41893-020-00646-7>
- 3 <https://www.kgw.com/article/news/local/wildfire/oregon-wildfires-acreage-containment-evacuations/283-552ecf54-5d85-4ac6-a135-cf2a18c7d5b5>
- 4 <https://wildfiretoday.com>
- 5 <https://www.capradio.org/articles/2021/01/07/a-dry-winter-in-california-could-lead-to-a-repeat-of-the-2020-wildfire-season-experts-warn/>
- 6 NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2021). <https://www.ncdc.noaa.gov/billions/>, DOI: 10.25921/stkw-7w73
- 7 Agency Talking Points: A 10 Year Plan to Significantly Reduce Wildland Fire Risk
- 8 House Appropriations Subcommittee on Interior, Environment, and Related Agencies Hearing on U.S. Forest Service FY2022 Budget Request, response by USDA Forest Service Chief Victoria Christiansen, April 15, 2021.
- 9 Treatment costs per acre can vary widely based on a large number of factors such as location, treatment type, planning and implementation costs. The USDA Forest Service Forest estimates the \$1,000 per acre average from a broad set of data in their Activity Tracking System (FACTS).
- 10 Fire Adapted Communities Graphic and Facilitator's Guide: <https://fireadaptednetwork.org/resource/fire-adapted-communities-graphic-and-facilitators-guide/>
- 11 Fire Learning Network (since 2002) affiliates: the Prescribed Fire Training Exchanges (since 2008), Fire Adapted Communities Learning Network (since 2013) and Indigenous Peoples Burning Network (since 2015). <http://www.conservationgateway.org/ConservationPractices/FireLandscapes/FireLearningNetwork/Pages/fact-sheets.aspx>
- 12 Overall funding levels for core programs are relatively stagnant over the past 5-year period prior to any adjustments for inflation.
- 13 <https://www.forestsandrangelands.gov/strategy/>
- 14 [GAO-20-52](#). Federal Agencies' Efforts to Reduce Wildland Fuels and Lower Risk to Communities and Ecosystems. December 2019
- 15 [GAO-20-52](#). Federal Agencies' Efforts to Reduce Wildland Fuels and Lower Risk to Communities and Ecosystems. December 2019
- 16 [The Interagency Fuels Treatment Decision Support System](#) helps plan and model the effects of a project by studying the effectiveness of past treatments and estimating future risk reduction. The National Fire Plan Operations & Reporting System helps track the work across public and tribal lands.
- 17 Agency Talking Points: A 10 Year Plan to Significantly Reduce Wildland Fire Risk
- 18 It is not clear how the agencies plan to achieve that level of increased treatment with about the same level of funding.
- 19 Kolden, Crystal A. 2019. We're Not Doing Enough Prescribed Fire in the Western United States to Mitigate Wildfire Risk
- 20 Schultz et al 2020 Strategies for Increasing Prescribed Fire Application on Federal Lands
- 21 Collaborative Forest Landscape Restoration Program 10-year Report to Congress
- 22 ["Strategies for Success Under Forest Service Restoration Initiatives"](#) Ecosystem Workforce Program Working Paper no. 81. University of Oregon and Colorado State University. 2017
- 23 Id.
- 24 <https://www.fs.usda.gov/managing-land/shared-stewardship>
- 25 www.montanaforestactionplan.org
- 26 See Appendix II for NGO developed principles for improving the Shared Stewardship Initiative
- 27 [Cross Boundary Collaboration Between Tribes and the United States Forest Service: Success Stories from Forest Systems Using the Tribal Forest Protection Act](#), December 2018
- 28 Goldstein, B.E. and W.H. Butler. 2011. Collaborating for Transformative Resilience: Shared Identity in the US Fire Learning Network. In Collaborative Resilience: Moving from Crisis to Opportunity (pp. 339-358). Cambridge, MA: MIT Press.
- 29 Spencer, A.G., C.A. Schultz and C.M. Hoffman. 2015. Enhancing adaptive capacity for restoring fire-dependent ecosystems: The Fire Learning Network's Prescribed Fire Training Exchange. Ecology and Society 20 (3).
- 30 Schultz, C.A. and W.H. Butler. 2019. Introduction - The Changing Landscape of Collaborative Forest Restoration. In A New Era of Collaborative Forest Management (pp. 1-17). Routledge: Earthscan
- 31 <https://planningforwildfire.org>
- 32 Federal Land Management Agencies have robust invasive species management programs, coordinated through the National Invasive Species Council, that often lack dedicated funding sources. Invasive grasses and noxious weeds play a significant role in elevated fire risk in many sage-steppe ecosystems. Funding to control and eradicate invasives may be a critical and overlooked part of wildfire resilience investments. BLM has been directed to incorporate these efforts into their hazardous fuels program of work and may have experience worth expanding/replicating.
- 33 REPI United States Department of Defense: 2021 Readiness and Environmental Protection Integration Program Challenge: https://www.repi.mil/Portals/44/Documents/REPI_Challenge/2021_REPIChallenge_RFP.pdf
- 34 See A Commander's Guide to Understanding and Supporting Working Forests

35 <https://oldcc.gov/our-programs/military-installation-sustainability#:~:text=Military%20installation%20resilience%20is%20defined,potential%20to%2C%20adversely%20affect%20the>

36 https://www.rd.usda.gov/sites/default/files/RD_Recreation_Economy_USDA.pdf

37 Sham, et al. 2013. The Water Research Foundation. "Effects of Wildfire on Drinking Water Utilities and Best Practices for Wildfire Risk Reduction and Mitigation."

38 https://www.cpuc.ca.gov/environment/info/aspen/sunrise/deir/apps/a01/App%201%20ASR%20z_Atm%201A-Fire%20Report.pdf

39 See especially: Deutz, A., Heal, G. M., Niu, R., Swanson, E., Townshend, T., Zhu, L., Delmar, A., Meghji, A., Sethi, S. A., and Tobin-de la Puente, J. 2020. Financing Nature: Closing the global biodiversity financing gap. The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability. <https://www.paulsoninstitute.org/key-initiatives/financing-nature-report/>

40 Conservation Fund's Green Bonds for their Working Forest Fund. \$150 million of ten-year bonds (Moody's A3) in September 2019. <https://www.conservationfund.org/green-bonds>

41 Conservation finance in the United States has been almost exclusively focused on conservation outcomes from private lands either through acquisition of development rights through easements, outright purchase and transfer to public ownership, or through mitigation banking to offset damages.

42 For example, the Climate Bonds Initiative estimates that \$257.7bn (USD) of green bonds were issued worldwide in 2019, a 51% increase over 2018. US issuers represented about \$51bn in 2019. The first green bonds were issued in 2007. https://www.climatebonds.net/system/tdf/reports/2019_annual_highlights-final.pdf?file=1&type=node&id=46731&force=0 Still green bonds are only about 1% of the market.

43 https://www.climatebonds.net/system/tdf/reports/2019_annual_highlights-final.pdf?file=1&type=node&id=46731&force=0

44 Pacific Gas and Electric's bankruptcy due to liabilities from 2015-2018 wildfires in California is another case in point.

45 Add citation

46 Currently national forests plan their management at two levels: 1) forest level through the NFMA planning process and 2) at the project level using, for example, timber sales or Stewardship contracts.

47 SIB, while predating EIB are also relatively recent innovations.

48 Hall (2017) credits Nikola (2013) with proposing the concept of an EIB.

49 Hall (2017)—DC Water and Sewer Authority bond to use green infrastructure to manage storm water, issued 9/29/2016. <https://ojs.victoria.ac.nz/pq/article/view/4662/4146>

50 The FRB is a prototype of a bond instrument. Payors/investors have negotiated participation based on developing proof of concept and without a market rate of return or an explicit pay for performance structure.

51 The two foundations are paid a "program-related investment" return of 1%. To be program-related, the investments must significantly further the foundation's exempt activities. From the IRS: "They must be investments that would not have been made except for their relationship to the exempt purposes." Program-related investments (PRIs) are those in which: (1) The primary purpose is to accomplish one or more of the foundation's exempt purposes, (2) Production of income or appreciation of property is not a significant purpose, and (3) Influencing legislation or taking part in political campaigns on behalf of candidates is not a purpose."

52 Stewardship agreements were first authorized in 2004 and were permanently authorized by the 2014 Farm Bill. They allow for the exchange of goods (mainly timber) for services (e.g., ecological restoration activities). Timber receipts in excess of service costs are retained by the national forest to fund restoration activities. Individual projects can be defined with a stewardship contract. A Master Stewardship Agreement can be used to outline the terms of cooperative exchange, with the potential for supplemental agreements to extend implementation.

53 Note that each agreement requires a separate LLC for its transactions.

54 The grant from the NFF Innovative Finance for National Forests program is for "\$495,000 to Blue Forest Conservation (California) to refine and replicate the Forest Resilience Bond model, developed with the World Resources Institute and piloted in the Tahoe National Forest, California, primarily for watershed protection. In partnership with the USDA Forest Service, the model will be expanded to four additional National Forests focused initially in California and the Pacific Northwest. The Forest Resilience Bond is a public-private partnership that enables private capital to finance much-needed forest restoration work and is the nation's first financial product to support proactive management of the National Forest System. Blue Forest Conservation will also explore incorporating new ecosystem co-benefits into repayment revenue streams."

55 Feasibility Report at: <https://static1.squarespace.com/static/5d5b210885b4ce0001663c25/t/5d84e60cad88c13184eb6751/1568990738934/The%2Bbaileys%2BTrail%2BSystem%2BPay-For-Success%2BFeasibility%2BReport%2BFinal.compressed.pdf>

56 Feasibility Report at: <https://static1.squarespace.com/static/5d5b210885b4ce0001663c25/t/5d94e93fe6a11c31748bb183/1570040136503/SW+Colorado+Wildfire+Mitigation+EIF+Feasibility+Assessment.pdf>

57 Note that local governments are constrained by Colorado's TABOR rules.

58 Electric utilities motivated by potential reduction in liability a la PG&E

59 Not yet clear if this bond would be taxable or tax exempt under federal law.

60 The Colorado Water Resources and Power Development Authority is authorized to issue bonds, up to \$50 million, for the purposes of funding watershed protection projects and forest health projects of governmental agencies. The Authority may make and contract to make loans with the proceeds of the bonds to governmental agencies to finance the cost of watershed protection projects and forest health projects if the Authority or the governmental agency has entered into an agreement with the Colorado Clean Energy Development Authority, as it existed prior to July 1, 2012, or the Colorado State Forest Service with respect to the application of proceeds of such bonds. House Bill 13-1012 extended the Authority's authorization to fund Watershed Protection and Forest Health Projects until July 1, 2023.

61 Ultimately the adequacy of benefit estimates will be demonstrated by market demand for bonds.

62 The Agricultural Improvement Act of 2018 (Farm Bill) authorizes pilot projects to conduct vegetation treatments to protect electric utility infrastructure: SEC. 8630. UTILITY INFRASTRUCTURE RIGHTS-OF-WAY VEGETATION MANAGEMENT PILOT PROGRAM.

63 Around the country, water utilities have invested in programs to protect forest cover and stream-side buffers using conservation easements. Denver Water is the only case of direct funding of fuel treatments. See description in the WRI report: https://wriorg.s3.amazonaws.com/s3fs-public/wri13_report_4c_naturalinfrastructure_v2.pdf

64 <https://www.fs.usda.gov/sites/default/files/USFSWatershedManual20190825-508.pdf>

65 "These include Watershed Management Plans developed under the 2018 Farm Bill (Section 8404), Watershed Restoration Action Plans developed for priority watersheds under the Watershed Condition Framework (2018 Farm Bill Section 8405), Collaborative Forest Landscape Restoration plans, and Joint Chiefs' Landscape Restoration Partnership plans."

66 Initial assessments indicate that fuel breaks built through this program reduced the property damages associated with subsequent wildfire.

67 Buckley, M., N. Beck, P. Bowden, M. E. Miller, B. Hill, C. Luce, W. J. Elliot, N. Enstice, K. Podolak, E. Winford, S. L. Smith, M. Bokach, M. Reichert, D. Edelson, and J. Gaither. 2014. "Mokelumne watershed avoided cost analysis: Why Sierra fuel treatments make economic sense." A report prepared for the Sierra Nevada Conservancy, The Nature Conservancy, and U.S. Department of Agriculture, Forest Service. Sierra Nevada Conservancy. Auburn, California. Online: <http://www.sierranevadaconservancy.ca.gov/mokelumne>.

68 For purposes of this analysis we presume 1/5 of the S&PF line items identified in this report currently support wildfire resilience. This funding level is likely a high estimate.

69 For purposes of this analysis we presume 1/5 of the S&PF line items identified in this report currently support wildfire resilience. This funding level is likely a high estimate.

70 USDA NRCS Encouraging Healthy Forest Practices on Private Land in California: <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ca/newsroom/releases/?cid=NRCSEPRD1432049>

71 <https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/10776/WP24.pdf?sequence=1>

72 <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>



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