

Forest Resilience Bond

ANNUAL IMPACT REPORT 2022





About the 2022 FRB Impact Report

The 2022 Forest Resilience Bond Impact Report communicates the environmental, social, and economic impacts of Blue Forest's Forest Resilience Bonds during the 2022 calendar year. To ensure a comprehensive analysis of our efforts, Blue Forest has aligned impact monitoring and reporting with the U.N.'s Sustainable Development Goals, which outline how to achieve a better, brighter, more sustainable future for people and the planet.



Land Acknowledgment

Blue Forest is a remote organization with roots in what we now call Sacramento on the traditional, ancestral, and contemporary homelands of the Nisenan Peoples of the Central Valley, the Southern Maidu People, the Plains & Valley Miwok Peoples, the Patwin People, Wintun People, and the Wintu People.

Blue Forest acknowledges that these nations have maintained meaningful relationships with their lands, despite land cessions, Treaties, and executive orders that ceded homelands. Tribes have maintained and reclaimed lands—leading historic preservation, land stewardship, and agriculture programs—from which Blue Forest continues to learn from in advancing our commitment to resilient landscapes, ecosystems and communities.

As an organization with team members and project sites located across many lands, we tasked each team member with learning about the history of the lands they are on and the Indigenous Peoples who called the lands home now and historically, as well as to take a meaningful action to support local Tribal communities.

Blue Forest recognizes and affirms Tribal sovereignty and self-determination across all lands where we work. We are committed to continuously listening, learning, and amplifying Indigenous voices. Through our Indigenous Community Liaison and team members, we are actively transforming our project development process to facilitate meaningful partnerships with Native nations and support transitions to Indigenous land management and reclamation. We are committed to supporting Indigenous-led initiatives by directing resources, such as the Forest Resilience Bond, to Tribal land management.

We encourage you to [learn more](#) about the Indigenous lands you are living on and the Peoples who have stewarded them since time immemorial. For more information, please visit Blue Forest's [Diversity, Equity, and Inclusion statement](#) or reach out to our Indigenous Community Liaison at connect@blueforest.org.

In practice

In 2022, Blue Forest hired an Indigenous Community Liaison & Digital Strategist. This role leads partnership development with Native nations, amplifies Indigenous voices and environmental leadership, and provides strategic guidance on the inclusion of Native nations and perspectives in the development of project plans, programs, and policies. We also continued our partnership with the Nevada City Rancheria Nisenan Tribe through the North Yuba Forest Partnership (NYFP), which has effectively served to guide restoration work in the Tahoe National Forest. Moving forward, we aim to grow partnerships with Native nations through collaboratives such as the NYFP, implementation partnerships, and forest management partnerships.



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Executive Letter

Dear Blue Forest Community,

From our growth in staffing to our project pipeline, 2022 was a year of capacity building at Blue Forest. The Blue Forest team doubled in size to meet the growing demand for financial products that support ecosystem resilience and realize the full potential of the Forest Resilience Bond (FRB). With seventeen new hires during the year, the FRB development process will benefit from a wide range of new talent in our DEI, Tribal Engagement, Finance, Investment, HR, Operations, and Project Development teams.

In collaboration with new and existing partners, the Project Development team has continued to build and expand the FRB pipeline into new geographies and project types. As a result of growing traction with prominent utilities and the support of new collaborators, we formalized partnerships to explore a post-fire recovery bond in central California, a watershed resilience bond in Central America, and an FRB in southern Oregon. We also raised significant capital into two new investment vehicles: the FRB Catalyst Facility, which will lend to a portfolio of pilot FRBs across the western US; and the California Wildfire Innovation Fund through our new entity Blue Forest Asset Management (BFAM), which will support forest restoration-related businesses with debt and equity investments, including geographically near FRB projects.

As the Yuba I FRB nears completion and the implementation of the Yuba II FRB gains momentum, the FRB has evolved from a new, innovative tool to an accepted mechanism for collaborative landscape-scale restoration. In December, our team was awarded the “All Lands, Watershed and Forest Health” award at the U.S. Department of Agriculture’s Forest Service Region 5 2022 *Regional Forester & Station Director Honor Awards*, recognizing the efficacy of the FRB in accomplishing landscape-scale restoration.

With gratitude for our growing Blue Forest community and growth of the FRB model, we enter 2023 with a renewed commitment to providing financial innovation for sustainable solutions.

In partnership,
The Blue Forest Executive Team



Zach Knight
Chief Executive Officer



Nick Wobbrock, P.E.
Chief Operating Officer



Phil Saksa, PhD
Chief Scientist



Gordon Vermeer
Chief Financial Officer



We were thrilled to finally meet in person at several site visits and at our first all-team retreat in three years this past December at the Bell Valley Retreat.

Numbers at a Glance



51 Jobs Created

In 2022 (External)



24 Total Partners

For Ecosystem Resilience in the
Yuba River Watershed



\$28.5 Million

Leveraged in additional funding
through the North Yuba Forest
Partnership

Diversity, Equity, and Inclusion

Blue Forest believes a diverse, equitable, and inclusive team is strong, resilient, and best equipped to be successful.

Diversity, equity, and inclusion (DEI) is an ongoing journey of learning, growth, and action. At Blue Forest, we are committed to creating a culture of belonging and working together to create a more inclusive environment where everyone feels welcome, safe, and valued. We recognize that being a part of this journey is not easy. We are not immune to the challenges of working toward a more just world. However, we also know that together we can make progress by taking small steps, remaining committed to our mission, and applying our organizational values internally and externally.

Blue Forest recognizes that the fields of both finance and environmental conservation have histories of exclusion and discrimination based on race, ability, gender, socio-economic background, and sexual orientation. Today, Blue Forest works towards being an environmental organization actively working to dismantle discrimination and racism in our teams and environmental work.

We acknowledge that DEI work is an ongoing process we have and will continue to seek to implement throughout our organization. As we grow and develop new financial solutions to pressing environmental problems, we are aiming to amplify historically excluded voices in the burgeoning field of conservation finance.

You can learn more about our commitment to DEI on our [website](#).

In practice

To embody our mission and dedication to DEI at Blue Forest, we're excited to take actionable steps in the following areas:

- Recruitment, Hiring, and Retention
- Engagement with Native Nations
- Environmental Justice in Project Development
- Culture Alignment with Diversity, Equity, and Inclusion Principles



Financial Innovation

Building on the success of the Forest Resilience Bond (FRB) as a first-of-its-kind conservation finance mechanism, Blue Forest continues to leverage financial innovation to scale our impact. A key part of our mission is to support and expand the broader conservation finance industry, and the development and validation of new financial products allows our team to lead by example. In 2022, Blue Forest launched two new exciting strategies that will help accelerate the pace and scale of ecological restoration in distinct yet highly complementary ways.

Forest Resilience Bond Catalyst Facility

With support from The Rockefeller Foundation and Alumbra Innovations Foundation, Blue Forest developed the first pooled financing vehicle for FRBs: the FRB Catalyst Facility (the Facility). This new vehicle launched in late 2022, and is targeting \$10–15m of loan commitments from investors. This capital will then be used to finance high-impact FRB projects with revolving loans, and will catalyze Blue Forest’s expansion to new landscapes and communities across the Western United States. The Facility’s revolving structure is tailored to the seasonal financing profiles of FRBs, and it allows Blue Forest to finance multiple projects simultaneously while also cycling funds into new projects over time. Most importantly, the Facility creates significant benefits for project implementation, as well as efficiencies for investors and for Blue Forest as the Investment Manager—all of which translates to faster scaling and increased impact.

California Wildfire Innovation Fund

In 2022, Blue Forest capitalized on its collective decades of scientific and sector expertise to establish Blue Forest Asset Management (BFAM), an investment management platform connecting investors to compelling, mission-aligned private market opportunities beyond FRB projects. Blue Forest recognizes that accelerating the pace and scale of forest restoration work is only part of the solution—the development of a sustainable, community-based restoration economy is equally important. In managing the FRB, Blue Forest has encountered numerous forest restoration system bottlenecks and inefficiencies, as well as opportunities to address these challenges via investment.

BFAM’s first offering is the California Wildfire Innovation Fund (CWIF), a first-of-its-kind climate solutions strategy that seeks to generate competitive financial returns while reducing fire risk for property owners, communities, infrastructure, and ecosystems. CWIF targets investments in emerging opportunities across the forest restoration, wood utilization, and wildfire mitigation sectors, with particular emphasis on industries and projects that add system capacity, create value for non-merchantable timber and woody debris (biomass), and achieve long-term carbon storage and sequestration outcomes. Given the high level of interconnectivity across the restoration economy, Blue Forest has identified investing in every part of the forestry value chain—from harvesting to hauling, processing, and utilization—as critical to building the system capacity necessary to accomplish forest restoration and wildfire risk reduction goals. CWIF is anchored by and created in partnership with CSAA Insurance Group.

“We believed in the team and their financial innovation expertise, so rather than being prescriptive as to what the team [was] going to create, we wanted to support their process of discovery. Everyone we talked to, from Doris Duke to The Rockefeller Foundation, encouraged us to trust the Blue Forest team, and that’s what we did.”

— Chrissy Sollenberger, Senior Operations Officer at Alumbra Innovations Foundation

Yuba II Forest Resilience Bond Investor Spotlights



Inherent Foundation

Mali Locke

Managing Director

Inherent Foundation was founded in 2016 to improve access to education, protect the environment, and develop sustainable capital markets through charitable giving and impact investing. Managing Director Mali Locke’s day-to-day work empowers growth-stage nonprofits and social enterprises to accelerate social change and increase earned revenue. In 2021, the Foundation made a program-related investment (PRI) to the Yuba II FRB in response to the success of the Yuba I FRB. According to Locke, “Investing in the Yuba II FRB was a no-brainer. At their core, Blue Forest projects do exactly what we want to be doing: climate action, job creation, and generating a return.”

In the short term, Inherent Foundation wants the Yuba II FRB to improve the well-being of nearby communities. From Locke’s perspective, “The Yuba II FRB improves livelihoods by minimizing catastrophic wildland fire, improving air quality, and promoting ecosystem resilience.” In the long term, Inherent hopes the FRB will prove how finance can accelerate funding in climate change adaptation and mitigation and other social change such as housing and food security. “In 20 years, philanthropy may look drastically different and play a smaller role in society because the business world and government world will integrate social change into their business models and bring more investors into this space,” said Locke.



RSF Social Finance

Jon Webb

Manager, Strategic Financial Planning

RSF Social Finance is a financial services organization with a mission to activate capital for good. Through its three-pronged financial strategy consisting of: 1) a social investment fund, 2) a donor advised fund, and 3) providing loans to social enterprises,

RSF is revolutionizing how people relate to money and directly funding a more just, regenerative, and compassionate world.

Recent wildfires initially spawned a partnership between California-based RSF and Blue Forest. “Ever since September 2020, when the California sky was orange from wildfire smoke, I felt I had to do something. Less than a year later, I helped formalize an investment in the Yuba II FRB to reduce the risk of catastrophic wildfire” said Jon Webb, Manager of Strategic Financial Planning at RSF.

Like Blue Forest, RSF believes partnerships and collaboration are vital to creating social change. According to Webb, “it was an easy decision to invest in a project with a balance of scientific and financial expertise and leadership on the Blue Forest team and in other Blue Forest partners collaborating to fight severe wildfires before they start.” He believes their investment in Blue Forest is one way for RSF to help with a solution to a serious problem that impacts so many of us, and is very excited to see the progress.

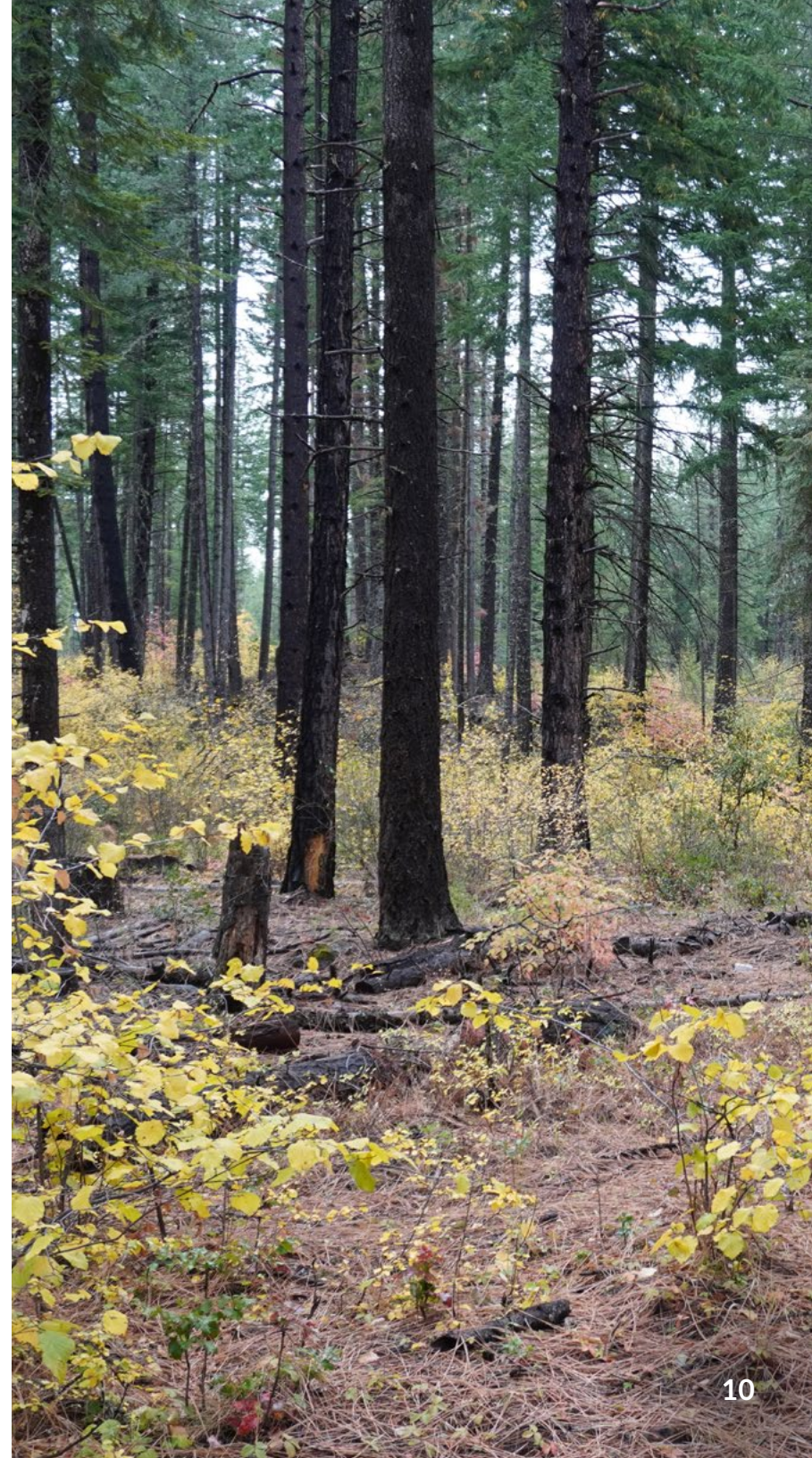
Development Spotlight

Alumbra Innovations Foundation

The Alumbra Innovations Foundation supports innovation and breakthroughs that help communities, the environment, and the economy function as an integrated and balanced system. In their land and watershed stewardship work, the Foundation pursues practical solutions for pressing human and environmental challenges. Alumbra's recent partnership with Blue Forest grew out of the Foundation's work to facilitate an active approach to forest management in Southern Oregon.

According to Chrissy Sollenberger, Senior Operations Officer at Alumbra, "for our work in Southern Oregon to be catalytic and scale, we needed a financial mechanism that would enable large-scale adoption, and that's where the Forest Resilience Bond (FRB) came in." Alumbra first provided a philanthropic grant to support the design of the next generation of the FRB, which ultimately enabled Blue Forest to develop and launch our first aggregated financing vehicle, the FRB Catalyst Facility; Alumbra then also made one of the lead investor commitments to the Catalyst Facility, too. As evidence of the applicability of the FRB model to Oregon, one of the first FRBs financed by the Catalyst Facility is likely to be in the southern part of the state.

Despite large-scale infrastructure investments from the government, demand for federal funds still outpaces their availability. Looking ahead, Sollenberger is excited to continue to "bring large-scale institutional capital to forest restoration and to other investment opportunities that organizations like Blue Forest are creating."





Measuring Impact

Sustainable Development Goals

Impact Measurement & Management is identifying desired impacts and monitoring progress each year. Blue Forest works iteratively to improve and revise this measurement approach as the FRB expands. Impact is largely defined through project outcomes: the environmental, economic, and social effects of project activities in the local ecosystems and communities in which FRB projects are implemented. To highlight the broad, multilayered impacts of the FRB in an accessible way for our community of partners, Blue Forest has chosen to align project outcomes impact reporting with the Sustainable Development Goals (SDGs).

The **Sustainable Development Goals** (SDGs) are 17 goals that outline how to achieve a better, brighter, more sustainable future for people and the planet. Announced by the United Nations in 2015 as part of their 2030 Agenda for Sustainable Development, these goals represent a call to action for all countries to end poverty and improve human well-being while tackling climate change and preserving our planet. The 17 goals are an international agenda by which individual countries can compare their progress and individual organizations can track their contributions towards these universal efforts.

Letter from Science Advisor Dr. Raha Hakimdavar



How Data from Space can Support Conservation Finance

Dr. Raha Hakimdavar
Founder & CEO of Zyon Space

As a science advisor to Blue Forest, I provide guidance and recommendations on how current and developing environmental data technologies can better enable robust conservation decision-making and investing.

There is an untapped opportunity for space-based Earth observations—remote sensing technologies that monitor the changes and condition of the atmosphere, land, and marine resources—to support data-driven decision-making in conservation finance. Earth observations can identify and assess landscapes in need of restoration, track the impacts of wildfires and other disturbances over time, and evaluate the effects of restoration activities. These data are not a stand-alone solution but an increasingly relevant tool to enable more rapid, consistent, and repeatable assessments and effectiveness monitoring.

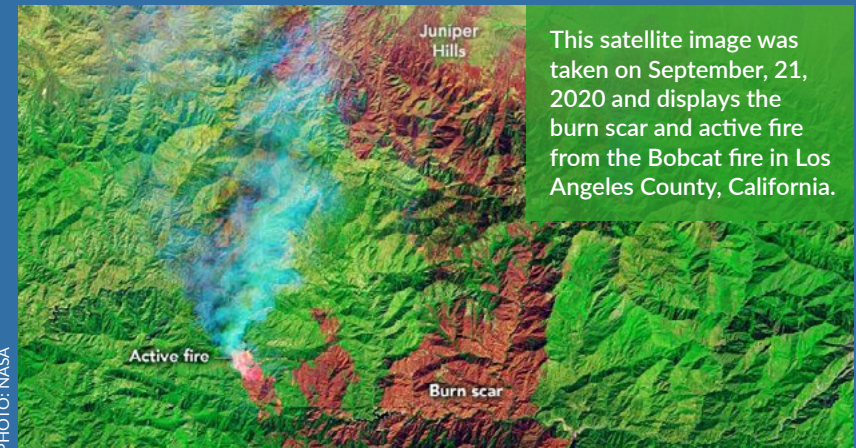
There are many ways that Earth observations can inform conservation finance projects like those managed by Blue Forest. These data can complement established land-based measurements for vegetation conditions, canopy mapping, carbon accounting, soil quality, hydrological conditions, and burn severity. Given the spatial and temporal coverage they can provide, space-based data could support the prioritization of project areas, guide restoration activities to optimize resources, and facilitate effectiveness monitoring or evaluating restoration activities post-treatment. This is especially helpful in remote and otherwise data-limited areas.

Quantifying ecosystem resilience and recovery is inherently complex and often resource intensive. Yet, it is a key aspect of conservation finance efforts, especially in the western United States. As disturbances such as wildfires become more frequent and destructive, land managers and communities are looking for more cost-effective monitoring techniques. Earth observations are an increasingly cost- and resource-effective tool for planning and response. They also allow for more seamless measurement repeatability and transparency. From a financial perspective, that makes them more appealing. From a policy perspective, that makes them more reliable and even defensible. At least in part.



This photo was taken on September 17, 2020 during the Bobcat fire in Los Angeles County, California.

PHOTO: NASA



This satellite image was taken on September 21, 2020 and displays the burn scar and active fire from the Bobcat fire in Los Angeles County, California.

PHOTO: NASA

Yuba I and II Forest Resilience Bonds

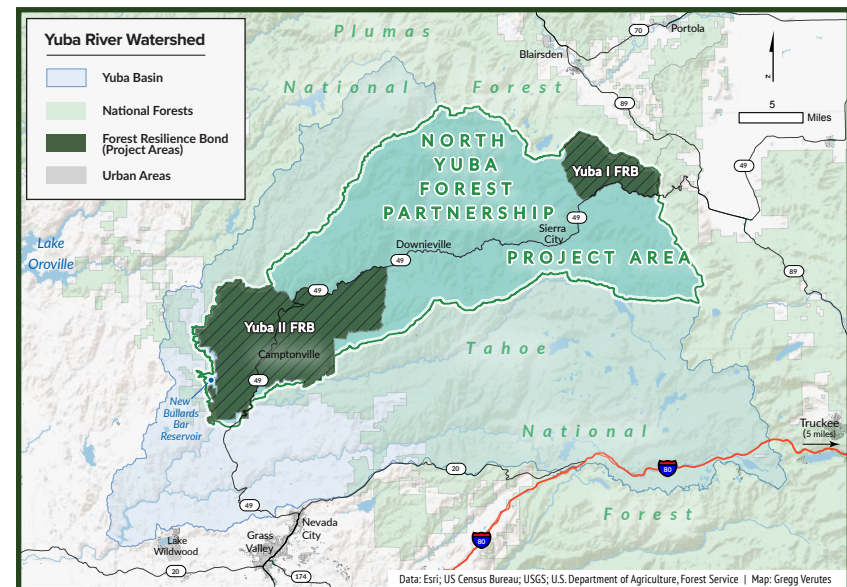
Yuba River Watershed Land Acknowledgment: The North Yuba Forest Partnership (of which Blue Forest is a founding member) recognizes that the North Yuba River watershed resides within the Ancestral and Traditional homelands of the Nisenan Tribe and includes shared boundaries with the Mountain Maidu, Konkow and Washoe Tribes. These Tribes exist today and retain their relationships with the forest. We commit to the continued inclusion of their voices in this project.

Blue Forest has launched two Forest Resilience Bond (FRB) projects on the Tahoe National Forest in the North Yuba River Watershed: the Yuba I FRB in 2018 and the Yuba II FRB in 2021. After the Yuba I FRB launch, the North Yuba Forest Partnership (NYFP) was formed as a working forest collaborative to plan, analyze, finance, and implement forest restoration across 275,000 acres of the watershed. The NYFP comprises of nine organizations, including the Tahoe National Forest, South Yuba River Citizens League, The Nature Conservancy, Yuba Water Agency, Camptonville Community Partnership, The Nisenan Tribe, National Forest Foundation, Sierra County, and Blue Forest. Building off of the Yuba I FRB, the NYFP plans to use the FRB model to finance more than \$100 million of restoration work across the North Yuba River watershed. Launched in 2021, the [Yuba II FRB](#), finances \$25 million of work to restore and protect the next 48,000 acres covered by NYFP. The North Yuba River watershed was specifically chosen for the first two FRBs as this area has high biodiversity values, proximity to communities, committed partnership opportunities, and risk of severe wildfire.

Together, the Yuba I and Yuba II FRBs protect approximately 63,000 acres from severe wildfires, with total funding of over \$28.5 million from project stakeholders. The Bipartisan Infrastructure Law and Inflation Reduction Act direct \$4.8 billion to reduce hazardous fuels and restore America's forests and grasslands. The commitment to the initial 21 landscapes, including the Tahoe National Forest, from the Wildfire Crisis Strategy totals about \$620 million, with substantially larger investments anticipated on these landscapes and others. We are

excited to see more of this funding being allocated alongside Forest Resilience Bond projects to further leverage public and private funding.

Forest health treatments implemented, underway, or planned through the FRBs in the Yuba include general fuels reduction, aspen and meadow restoration, underburning and pile burning, and biomass utilization. These treatments yield numerous benefits to the Tahoe National Forest and nearby communities by restoring overly dense forests to a resilient state, encouraging a more natural fire return interval, protecting water supply, and increasing carbon sequestration.



Forest Resilience Bond Impacts

SDG Target	Project Outcome	Unit	2022 Impact	2019-2022 Cumulative Impact
6	Clean Water & Sanitation			
	Water Supply Protected	Acre-feet	3,990	19,830
7	Affordable & Clean Energy			
	Biomass Utilization	Tons	9,780	60,940
	Renewable Energy Generated by Biomass	MWh	2,930	18,160
	Hydropower Protected	MWh	5,530	27,490
8	Decent Work & Economic Growth			
	Direct & Indirect Jobs Created	#	51	92
	Total Funds Deployed for Ecosystem Restoration	\$	2,569,000	4,674,000
11	Sustainable Cities & Communities			
	Fire Control Lines	Miles	4.5	29.5
	Communities Involved in Resilience Bonds	#	4	8
13	Climate Action			
	Avoided Wildfire Carbon Emissions	MT CO2e	3,945	19,600
	Biopower Carbon Benefits	MT CO2e	1,960	12,190
15	Life on Land			
	Animal Species Protected	Species	1	9
	Plant Species Protected	Species	7	14
	Fuels Reduction	Acres	415	1,493
	Prescribed Pile Burning	Acres	244	745
	Aspen Regeneration	Acres	45	251
	Meadow Restoration	Acres	28	190
	Invasive Plant Treatments	Acres	84	173
	Terrestrial Ecosystems Restored	Acres	572	2,107
	Terrestrial Ecosystems Protected	Acres	1,160	5,765
17	Partnerships for the Goals			
	Formal Blue Forest FRB Partners	#	6	24

2022 Impacts Explained

The Forest Resilience Bond (FRB) Impact Table details the outcomes of fieldwork completed across both the Yuba I and Yuba II FRBs. The impact metrics are organized by eight relevant Sustainable Development Goals: 3. Good Health and Wellbeing, 6. Clean Water and Sanitation, 7. Affordable and Clean Energy, 8. Decent Work and Economic Growth, 11. Sustainable Cities and Communities, 13. Climate Action, 15. Life on Land, and 17. Partnerships for the Goals. Detailed tables of metrics broken out by project as well as a summary table of relevant sustainable development goals and FRB Impact can be found in the appendix.

In 2022, opportunities to complete planned fieldwork were limited by narrow burn windows, a high number of limited operation days due to weather conditions, and an influx of time-constrained federal funding for the planning and development of new restoration projects in the Yuba River Watershed. To capitalize on this funding, much of the project partners' time was focused on planning, development, and preparation and layout. Hardwood culturing, which accounts for much of the fieldwork in 2022, was particularly labor intensive, requiring great care and attention from ground crews. Although prescribed burning in the Yuba I FRB was a priority in 2022, the project's high elevation constrained burn windows so more pile burning was ultimately completed in the Yuba II FRB project areas. Despite lower-than-expected numbers, significant progress was made in hardwood culturing, prescribed pile burning, and critical preparation and layout to support fieldwork in 2023.

Key 2022 impact metrics across both the Yuba I and Yuba II include 1,160 acres of ecosystems protected, \$2,569,000 of funding deployed, 3,990 acre-feet of water supply protected, 51 jobs created, four new communities involved, and six new formal Blue Forest partners. On the ground, invasive plant treatments were completed, along with fuels reduction, and prescribed pile burning. Numerous high-conservation value animal and plant species were protected in 2022 through the Yuba II project, including the California spotted owl and the Jeffrey pine.

While the barriers experienced in 2022 persist, changes in decision-making processes, as well as the accomplishment of significant preparation and layout, has set the stage for increased implementation to be completed in 2023.

What does the Forest Service consider an acre completed or an acre under contract?

Forest restoration involves various treatments and activities, requiring multiple measurements and terms to communicate the stages of the restoration process.

Project Footprint: the size of a specific project area by treatment type

Acres Completed: the number of acres after all prescribed treatments are completed, synonymous with acres treated

Acres Accomplished: the number of acres that have been designated for work and a crew contracted to implement the treatment

Example 1: A 10 acre unit needs to be treated with two entries, first for mechanical thinning, and then underburning. To date, only the first entry of mechanical treatments has been completed.

- *Project Footprint:* 10 – indicating thinning over the entire 10 acre area
- *Acres Completed:* 10 – the acres still need the second treatment
- *Acres Accomplished:* 20 – indicating the remaining underburn

Example 2: The same 10 acre unit from Example 1 has now been underburned.

- *Project Footprint:* 10 – indicating both the 10 acres of thinning and the 10 acres underburned
- *Acres Completed:* 20 – 10 acres of thinning and 10 acres of underburning have both been completed
- *Acres Accomplished:* 20 – the unit is complete

2022 Yuba I and Yuba II Forest Resilience Bond Impacts

Fuels Reduction

415 Acres

Prescribed Pile Burning

244 Acres

Funds Invested

\$4,674,000*

Meadow Restoration

28 Acres



Jobs Created **92***

Water Supply Protected

3,990 Acre-feet



Clean Energy Produced

8,460 MWh

Climate Action

5,905 MT CO₂e



Species Protected **23***



Formal Partners **24***

Ecosystems Protected **1,160** Acres

Communities Protected **8***

Aspen Regeneration **45** Acres



**FOREST
RESILIENCE
BOND**

*Data cumulative from 2018-2022.

Notes from the Field

National Forest Foundation on the Difficulty and Benefits of Employing Hardwood Culturing

Hardwood culturing is a fuels reduction strategy for managing tanoak, *Notholithocarpus densiflorus*, a native and common shrub found throughout California, including in the Sierra Nevada. Some conventional forest restoration treatments, such as mechanical thinning, decrease vegetation density by cutting down short, suppressed, unhealthy, or overcrowded trees. However, when a tanoak is cut down entirely, the plant resprouts multiple stems, creating a denser understory and more ladder fuels that can carry fire into the canopy.

In hardwood culturing, most tanoak stems are cut back, but two to three healthy and strong stems are left alone. Instead of resprouting multiple stems, the plant responds by putting energy into the few remaining stems. This selection method prevents the resprouting that would result if the plant was cut back entirely, decreasing the density of understory fuels closer to historic levels.

Hardwood culturing treatments were the majority of 2022 fieldwork completed in the Yuba II project area. Brad Robinson, the National Forest Foundation California Program Area Coordinator for Tahoe,

said “the Pendola Fire [1999] completely altered the pre-existing conifer and hardwood stand. Hardwood culturing was prioritized to promote post-fire habitat recovery by reducing hardwood and brush overgrowth and accelerating the re-establishment of natural stand composition and structure, and reducing wildfire danger by removing fuels and invasives.”

Hardwood culturing is some of the most expensive treatment work Blue Forest has ever financed, at roughly \$3,000 per acre. This treatment is costly because “the hardwood culture prescription requires special care and therefore more time in navigating the tracked chipper through the site so as not to harm the residual stand. Where the slope is too steep for the tracked chipper to navigate, materials have to be either dragged to the chipper or manually piled for future pile burning,” explained Robinson.

Just a few acres of hardwood culturing can have a large impact. According to Robinson, due to this treatment’s high costs, it was focused on “locations impacted most severely by fire and where the effects of the activities would enhance wildlife habitat, reduce potential wildfire intensity, and improve overall tree health.”



Project Development: From Planning to Permitting

Forest restoration involves treatments such as thinning, prescribed burns, riparian restoration, wildlife habitat enhancement, road maintenance and invasive species removal that involve detailed planning, permitting, and layout; tight windows of opportunity for implementation; and recurring maintenance treatments. As a result, restoration projects can take several years and require monitoring and evaluation at every stage to ensure compliance with state and federal regulation.

Projects that impact federal land or use federal dollars must undergo National Environmental Policy Act (NEPA) review, during which the environmental implications of alternative management actions must be considered. The time required for **planning** and NEPA review can vary, from 6 months or less to multiple years. Funding and contracting, such as the development of an FRB or raising money from federal or other public sources, occur after a **NEPA permitting** decision is issued. Although time-consuming and costly, **preparation and layout** involves activities critical to successful project implementation, including marking trees for removal or delineating treatment units within a larger landscape. Preparation and layout must be conducted before each active treatment can begin and often occurs in the year prior to initial treatment. **Implementation**, or the execution of forest restoration treatments, can be constrained by numerous barriers, including high wildfire risk, limited windows of appropriate weather and soil conditions, insufficient staff capacity, and the presence of biologically (e.g. CSO PACs) or archaeologically important sites in need of protection. Consequently, implementation can span several years and be delayed by numerous outside factors. After implementation is completed, **maintenance treatments** are often required to sustain forest resilience and protect the benefits of healthy forest ecosystems. By decreasing many of the uncertainties that delay preparation and layout and implementation, the FRB decreases project time to completion.



The role of the FRB in supporting increased federal resources

2022 was a year of significantly increased federal investment in forest restoration and resilience. The Forest Service continued to implement the [Wildfire Crisis Strategy](#), an initiative that targets work across land ownerships to reduce wildfire risk to communities, infrastructure, and natural resources at the landscape scale. The Bipartisan Infrastructure Law and Inflation Reduction Act provide about \$5 billion to put toward this work, but this represents only a small part of the total need. Other funding sources and public-private partnerships—like the FRB—are critical to achieving this ambitious goal.

The FRB provides flexible funding, enabling implementation partners to respond to changing environmental or funding conditions and conduct holistic restoration activities, without being constrained by the timelines and programmatic requirements of state or federal funding. In addition, though state and federal funding have significantly increased, the administrative barriers that lead to cash flow constraints still exist. The FRB's upfront financing enables this influx of new funding to be spent quickly, ensuring that groundwork can happen at an accelerated pace. To achieve forest restoration at the landscape scale, however, multiple funding models are needed—including both traditional grant sources as well as conservation finance sources like the FRB. A major step to landscape-scale resilience on the Tahoe National Forest was achieved in 2022 when the North Yuba Forest Partnership project area—which includes both the Yuba I and Yuba II projects—was announced as one of the ten initial Wildfire Crisis Strategy landscapes with \$25.5 million received.

Our Partners

The Yuba FRBs demonstrate the broader impacts of the Forest Resilience Bond (FRB) model. More specifically, the FRB enhances financial flexibility, forges new and stronger partnerships, reduces the administrative burden of project management for stakeholders, shifts risk away from public agencies and utilities, and incorporates monitoring of ecosystem benefits into project implementation.

DEVELOPMENT TEAM

The development and implementation of the FRB have relied on the hard work and collaboration of many stakeholders including the Forest Service, National Forest Foundation, World Resources Institute, and U.S. Endowment for Forestry and Communities.



RESEARCH PARTNERS

Researchers and academics are crucial to the quantification and valuation of forest restoration benefits over the life of the FRB. Partners include the Sierra Nevada Research Institute at the University of California Merced, California Council on Science and Technology, and Bill Lane Center for the American West.



PRO BONO LEGAL PARTNERS

A core element of the FRB is contracting with beneficiaries and other stakeholders. Blue Forest is fortunate to receive pro bono legal support from Orrick, Herrington & Sutcliffe LLP, and Brownstein Hyatt Farber Schreck, LLP.



YUBA I & II FOREST RESILIENCE BOND INVESTORS

The Yuba I and II FRBs would not have been possible without the visionary investors who participated, including CSAA Insurance Group, Calvert Impact, The Rockefeller Foundation's Zero Gap Fund. The Gordon and Betty Moore Foundation, Inherent Foundation, Hall Capital, ImpactAssets, and RSF Social Finance.





BLUE FOREST FUNDERS

The development of the FRB relies on the generous support of a number of public and private funders including Alumbra Innovations Foundation, the Caterpillar Foundation, The Great Island Foundation, Impact Assets, The J.M. Kaplan Fund, The Rockefeller Foundation, The Weyerhaeuser Foundation, and the generous support of individual donors.

Additional support has been provided by the Forest Service through a Challenge Cost Share Agreement, The CA Wildlife Conservation Board Climate Change Grant Program, and the U.S. Endowment for Forestry and Communities.

FRB PROJECT PARTNERS

The Yuba FRBs would not have been possible without the pioneering organizations who supported this innovative idea.

Project partners included the Forest Service National Partnership Office, Tahoe National Forest, The National Forest Foundation, World Resources Institute, Bonneville Environmental Foundation, Yuba Water Agency, South Yuba River Citizens League, Sierra Nevada Conservancy, CAL Fire through the California Climate Investment Program, The California Wildlife Conservation Board Stream Flow Enhancement Program, and the entire North Yuba Forest Partnership.



Expansion

Project Pipeline

Our project pipeline has grown to meet the need for ecosystem resilience, from forest restoration in California to watershed resilience in Idaho. This year we began exploring work with the Forest Service Office of International Programs in Peru and Honduras. We are also developing projects across public and private lands in the Pacific Northwest, and in recently burned regions of the Sierra Nevada to support post-fire recovery. These new projects showcase the flexibility and great potential of the FRB to accelerate and foster ecosystem resilience across diverse landscapes and project types.

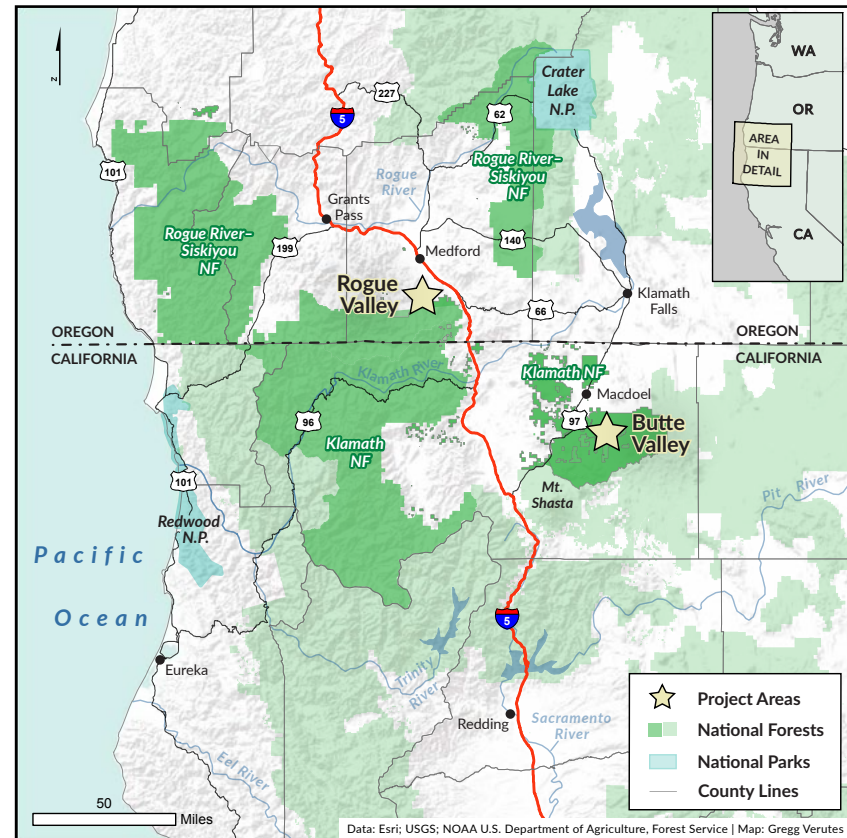


In 2022, Blue Forest advanced development on forest, watershed, and coastal resiliency projects. The icons here show projects in various stages of development, from exploration to active implementation. FRBs take 2+ years to develop and not all projects in exploration will come to fruition.

Potential FRB Opportunities

Our project development efforts have yielded multiple potential FRB opportunities that we hope will launch in 2023. The first such opportunity is in Oregon; in April 2022, Blue Forest and the Southern Oregon Forest Restoration Collective signed an MOU to pursue our mutual interest in accelerating landscape-scale restoration on public lands within the Rogue Valley and the Rogue River watershed. The potential FRB here would span 52,000 acres of federal lands and 27,000 acres of contiguous private lands, and could launch as soon as summer 2023 in partnership with the Lomakatsi Restoration Project. The Rogue Valley is located in a high wildfire risk area, and intended outcomes of this project include wildfire risk reduction, biodiversity and habitat protection, and job creation.

A second exciting FRB opportunity is in the Klamath National Forest in northern California. In October, Blue Forest signed an MOU with California Deer Association and Klamath National Forest to work together on the development of an FRB-ready project. This potential project would treat roughly 24,000 acres in high-fire-risk portions of the forest and would include fuels reduction, prescribed burning, and bald eagle habitat restoration. In addition to wildfire risk reduction, the project is designed to enhance watershed resilience and restore groundwater levels.



“It’s a fantastic solution where diverse partners with expertise in very specific areas come together and deliver immense value through a project like the Yuba II FRB. It’s a remarkable model for how to take a whole series of pilot efforts and roll them up into something bigger and more durable with higher impact.”

— Todd Reeve, CEO, *Bonneville Environmental Foundation*



Looking Ahead

2022 laid the groundwork for 2023 to be a year of development and implementation—from fieldwork to project funding. With more projects in the pipeline heading into the pilot phase, the Forest Resilience Bond (FRB) will continue to catalyze restoration in familiar and new ecosystems, land ownerships, and project types. The FRB provides a replicable, systems-level approach to solving the environmental challenges and unique restoration needs that face our forests and watersheds.

As the capacity of Blue Forest expands, we are developing additional financial solutions to alleviate some of the pinch points commonly experienced in the forest restoration process. The FRB Catalyst Facility will streamline the FRB launch process and provide revolving funds to begin critical restoration projects quickly and support our growing project pipeline. Likewise, Blue Forest Asset Management and the [California Wildfire Innovation Fund](#) will support the wood products industry and lessen the constraint on forest restoration posed by biomass utilization limits.

As we look forward to another big year, we are also committed to championing diversity, equity, and inclusion internally and externally through our hiring practices, partnership opportunities, and tribal community engagement. In 2023 and beyond, we will continue to work together to foster an equitable and inclusive work environment for our employees and partners.



“This partnership has enormous potential to impact wildlife habitat on a significant scale. Blue Forest’s innovative model of deploying private capital to address landscape-scale resource needs meshes beautifully with Pheasants Forever & Quail Forever’s strength in public-private partnerships and our organization’s emphasis on private lands conservation. Our collective efforts will benefit wildlife, private landowners, and local natural resource-based communities throughout the West.”

— Ron Leathers, Chief Conservation Officer at Pheasants Forever and Quail Forever



Acknowledgments

Blue Forest is a non-profit organization committed to creating sustainable financial solutions to pressing environmental challenges.

Blue Forest Finance, a nonprofit organization, was founded in 2015 to develop and manage debt financing for natural infrastructure projects on Forest Service managed lands to address the growing threat of wildfire in the Western US. Blue Forest's signature financial product, the Forest Resilience Bond (FRB), was developed in partnership with the World Resources Institute, the Forest Service, and the National Forest Foundation. Blue Forest acts as both FRB project sponsor and investment manager.

The FRB overcomes the funding gap for forest restoration by allowing private capital to support public forest restoration. The unique contracting structure of the FRB allows both private investment on public lands and cost-sharing among entities who benefit from the completed forest restoration work. The FRB is a sustainable and replicable solution to help scale forest restoration across millions of acres—reducing wildfire risk and impeding the spiraling effects of climate change on American forests.



To learn more about Blue Forest:

Visit our [webpage](#) or check out this [video](#) highlighting the FRB.

For comments, questions, or suggestions on the 2022 Impact Report, send us a note at connect@blueforest.org.

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Appendix

Yuba I and Yuba II Forest Resilience Bond Impacts

SDG Target	Project Outcome	Unit	2019 Yuba I	2020 Yuba I	2021 Yuba I	2022 Yuba I	2022 Yuba II	2022 Total	Cumulative Impact
6	Clean Water & Sanitation								
	Water Supply Protected	Acre-feet	7,398	6,264	2,178	1,812	2,180	3,990	19,830
7	Affordable & Clean Energy								
	Biomass Utilization	Tons	13,750	28,831	8,582	9,780	0	9,780	60,943
	Renewable Energy Generated by Biomass	MWh	3,998	8,649	2,575	2,934	0	2,934	18,156
	Hydropower Protected	MWh	10,254	8,682	3,018	2,512	3,021	5,530	27,490
8	Decent Work & Economic Growth								
	Direct & Indirect Jobs Created	#	17	8	16	18	32	51	92
	Total Funds Deployed for Ecosystem Restoration	\$	\$875,000	\$400,000	\$830,000	\$930,000	\$1,639,000	2,569,000	4,674,000
11	Sustainable Cities & Communities								
	Road Reconstruction	Miles	4	0.35	0	0	0	0	4.4
	Fire Control Lines	Miles	25	0	0	0	4.5	4.5	29.5
	NEW Communities Involved in Resilience Bonds	#	4	0	0	0	4	4	8.0
13	Climate Action								
	Avoided Wildfire Carbon Emissions	MT CO2e	7,312	6,191	2,152	1,791	2,154	3,950	19,601
	Biopower Carbon Benefits	MT CO2e	2,750	5,766	1,716	1,956	0	1,956	12,189
15	Life on Land								
	NEW Animal Species Protected	# Species	8	0	0	0	1	1	9
	NEW Plant Species Protected	# Species	7	0	0	0	7	7	14
	Fuels Reduction	Acres	625	453	0	103	312	415	1,493
	Prescribed Fire (Post Thinning)	Acres	0	0	0	0	0	0	0
	Prescribed Fire (Not Thinned)	Acres	0	0	0	0	0	0	0
	Prescribed Pile Burning	Acres	0	0	501	76	168	244	745
	Aspen Regeneration	Acres	92	114	0	45	0	45	251
	Meadow Restoration	Acres	0	0	162	28	0	28	190
	Invasive Plant Treatments	Acres	0	40	49	0	84	84	173
	Terrestrial Ecosystems Restored	Acres	717	607	211	176	396	572	2,107
	Terrestrial Ecosystems Protected	Acres	2,151	1,821	633	527	634	1,160	5,765
17	Partnerships for the Goals								
	NEW Formal Blue Forest FRB Partners	#	18	0	0	0	6	6	24

Forest Resilience Bond Impact Summary

The eight SDG targets indicated below are most directly relevant to the Forest Resilience Bond and demonstrate how the FRB contributes to social, economic, and environmental goals. By using the SDG framework, Blue Forest aligns the impact of the FRB with the impact of those working around the world for a more sustainable future. Active forest management yields not only a reduction in severe wildfire risk but many other benefits, including the following:

SDG Goal	Related Outcomes	Forest Resilience Impact
 <p>3 GOOD HEALTH AND WELL-BEING</p>	<ul style="list-style-type: none"> Reducing the risk and scale of wildfire smoke Preventing smoke-related comorbidities Reducing the emotional, physical and financial stress resulting from wildfires 	Proactive forest management can reduce wildfire smoke and associated public health risks. Studies show exposure to wildfire smoke causes respiratory and cardiac-related illnesses as well as other adverse health impacts. ¹ Health impacts associated with prescribed fire smoke are less severe than from uncontrolled wildfire. ²
 <p>6 CLEAN WATER AND SANITATION</p>	<ul style="list-style-type: none"> Protecting water infrastructure and water quality from catastrophic wildfire Securing additional water supply through forest restoration 	Water originating from the Sierra Nevada mountain range constitutes 60% of California's consumptive water supply. When fires burn through forests, they contaminate both surface and groundwater as well as inhibit snowpack retention. Large, high-severity wildfires also increase sedimentation and damage costs to reservoirs, and lead to greater flooding risks.
 <p>7 AFFORDABLE AND CLEAN ENERGY</p>	<ul style="list-style-type: none"> Generating renewable energy from biomass utilization Augmenting existing hydropower in the watershed 	Source water supply from the Yuba I FRB is used to generate hydropower that helps power local communities with cleaner, more reliable, renewable, non-fossil-fuel emitting energy.
 <p>8 DECENT WORK AND ECONOMIC GROWTH</p>	<ul style="list-style-type: none"> Investing funds in ecosystem restoration Creating jobs in rural communities 	Every \$1M dedicated to forest restoration in Blue Forest's FRB model creates 20 direct or indirect jobs. The Yuba I FRB has supported a total of 42 direct and indirect jobs that support local economies. As we scale to larger projects, employment from these local communities will also scale.
 <p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	<ul style="list-style-type: none"> Protecting people & infrastructure by reducing the risk of high severity wildfires 	The road work done as part of these projects reduce the adverse effects of wildfire by providing safe escape corridors through regions of high wildfire risk. It also helps make these areas more easily navigable, allowing local communities to benefit from increased tourism and public access.
 <p>13 CLIMATE ACTION</p>	<ul style="list-style-type: none"> Stabilizing forest carbon stocks by reducing wildfire risk Enhancing the carbon sequestration capacity of meadows and restored forests 	Fires in 2020 alone emitted 4x the amount of carbon dioxide as all other pollutants within the state—combined. The greenhouse gas emissions resulting from these fires were equivalent to driving 24.2 million cars for an entire year, ³ not far from the 26.1 million automobiles registered by the DMV in 2019. ⁴ Forest restoration activities, such as thinning, decrease the amount of live trees, but ensure the remaining carbon on the landscape is more resilient to disturbances like fire, insects and drought.
 <p>15 LIFE ON LAND</p>	<ul style="list-style-type: none"> Restoring forest ecosystems to a more natural density and condition Protecting sensitive or endangered species Promoting biodiversity through fortifying and restoring high priority ecosystems 	When these wild habitats are restored, a part of the national heritage is too. This work ensures that these national public lands remain places that future generations can continue to enjoy. The Yuba I FRB includes invasive species removal, meadow restoration, and aspen generation which all contribute to the critical role our forests serve to protect biodiversity.
 <p>17 PARTNERSHIPS FOR THE GOALS</p>	<ul style="list-style-type: none"> Partnering with organizations that share our vision to achieve these goals 	The FRB takes the crucial step of lowering the hurdle to participating in forest resilience efforts. By design, the FRB can only function through strong partnerships and collaboration. By knitting together several partners with aligned goals, the FRB promotes an essential shared vision for a climate-resilient future.

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