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A Resilience Strategy for Yuba Forests

A regional shared vision for landscape-scale forest resilience
presented by the Yuba Forest Network

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I. INTRODUCTION

The Yuba Forest Network

The Yuba Forest Network (YFN) is a forest health collaborative comprised of non-profit organizations, regional, state, and federal agencies, private businesses, academic groups, special districts and municipalities, and Tribes of whom all work within the Yuba and Bear River watersheds. The YFN aims to address the need for increased collaboration by connecting stakeholders, projects, and resources to accelerate the pace and scale of forest health projects across Yuba forests. A regionally focused, living Resilience Strategy for Yuba Forests, with collaboratively defined desired outcomes and strategic actions is one way the YFN is working towards its purpose.

Mission, Vision, and Goals

Over 40 different organizations are actively involved with the YFN in some capacity, each with their own mission statement and goals. The mission, vision, and goals of the YFN emphasizes cross-boundary collaboration between organizations for the health and resiliency of the Yuba forests. The goals of the YFN are meant to adapt with the progress, needs, and priorities of the region and organizations that shape the YFN.

Mission: The Yuba Forest Network aims to connect stewards of the Yuba watershed by uniting and building skills and efforts to create a resilient landscape.

Vision: The Yuba Forest Network is envisioned as a central networking hub that promotes a united regional identity around the forests of the Yuba watershed and uplifts and connects the voices of active stewards of the landscape.

Goals:

- Create a community of collaboration among practitioners
- Develop a consolidated resource-sharing and networking platform
- Identify areas of greatest need for forest health work
- Increase forest health and resilience across the Yuba watershed

Background

The Yuba Forest Network formed in 2020 out of an identified need for collaboration and unification among local organizations, agencies, and forest landowners to address the forest restoration needs across the Yuba River Watershed. Stakeholders across the region expressed a robust energy and capacity for forest health projects but lacked a large-scale cohesive strategy that could promote collaboration and accelerate the pace and scale of forest restoration.

Quarterly meetings that draw dozens of diverse stakeholders from across the Yuba Watershed have aimed at sharing resources and projects updates, while encouraging networking among participants. Additional subgroups meet regularly to develop resources or address specific issues. This Resilience Strategy is a product of the Strategy Development Subgroup and is intended as a tool for forest planners and practitioners to align projects with a unified, shared approach to forest restoration. This is a living document that is expected to evolve over time and with changing conditions related to climate, fire, drought, and community needs.

Geography

The Yuba and Bear River watersheds combined encompass over 1,700 square miles across Yuba, Nevada, Sierra, Placer, and Plumas counties in Northern California. The Yuba and Bear Rivers flow from the peaks of the Sierra Nevada through vast expanses of conifer forests and oak woodlands to their confluence with the Feather River amongst the irrigated farmlands of the Sacramento Valley (Appendix Map 1). Due to the range of elevations and latitudinal extent, the watersheds are made up of diverse forest types that include old growth conifer forests, early seral stage forests, hardwood forests, dense chaparral, foothill woodlands, and other mixed forest types. These ecosystems, like many across California and the Western United States, have evolved alongside fire and have historically been adapted to thrive in its presence. Fire is an essential ecological process that helps to maintain a healthy forest by reducing overcrowding and disease, stimulating growth in many species, and developing an ecosystem resilient to complex disturbances. Removal of Indigenous land management, combined with a century of fire suppression policies in this fire-adapted forest ecosystem and widespread logging of larger fire resilient trees has led to unhealthy forest conditions, with overwhelming fuel loads. Although forests in the Yuba and Bear River watersheds have been minimally impacted by bark beetle infestations and high-severity fires in recent years, the region is prone to catastrophic events that have plagued much of the Sierra Nevada. Additionally, every community in the Bear and Yuba River watersheds are listed as High or Very High Fire Severity Zones by the California Department of Forestry and Fire Protection.

The small, rural communities dotted across the Sierra Nevada mountains have long been dependent upon the natural resources and ecosystems that they call home. For thousands of years, the Yuba and Bear River watersheds supported thriving indigenous populations who actively managed forests, grasslands, and meadows with fire ¹. With the arrival of Euro-American settlement, came the removal of anthropogenic fire from the ecosystem leading to changes in species composition and increased fire hazards ². Since the mid-1800s, the communities of the Yuba and Bear River watersheds have been sustained by the surrounding forests through a booming wood products industry. A combination of overzealous timber harvesting practices, litigation by environmental groups, public concern, and fire suppression led to the degradation of the forest ecosystem and the collapse of the timber industry in the region. Current efforts promoting ecologically based forest management have the potential to reduce the risk of uncharacteristic high-intensity wildfire while also protecting and restoring watershed health and native biodiversity and promoting forest conditions that are more resilient to drought, climate change, and other disturbances. These efforts can lead to the redevelopment of a wood products industry and a restoration-based economy that supports the local communities.

One of the many challenges to restoring the region's forests lies in land ownership patterns. Due to historic railroad land grants, dating back to the mid-19th century, public and private parcels are often side by side, creating a "checkerboard" of ownership with varied land management approaches. This unique ownership pattern makes cross-boundary collaboration essential to effectively increase the pace and scale of forest restoration across the watershed. While Tahoe and Plumas National Forest make up nearly fifty percent of the land area in the watershed. The two National Forests have dozens of sporadic tracts ranging in size. The remaining fifty percent is composed of a checkerboarding of public agencies, private landowners, and industry. Multiple partnerships and collaborations already exist in the region, such as local fire safe councils, fire wise communities, and the North Yuba Forest Partnership, but a larger network specifically focused on restoration goals and increased communication is needed to effectively leverage resources toward a unified strategy.

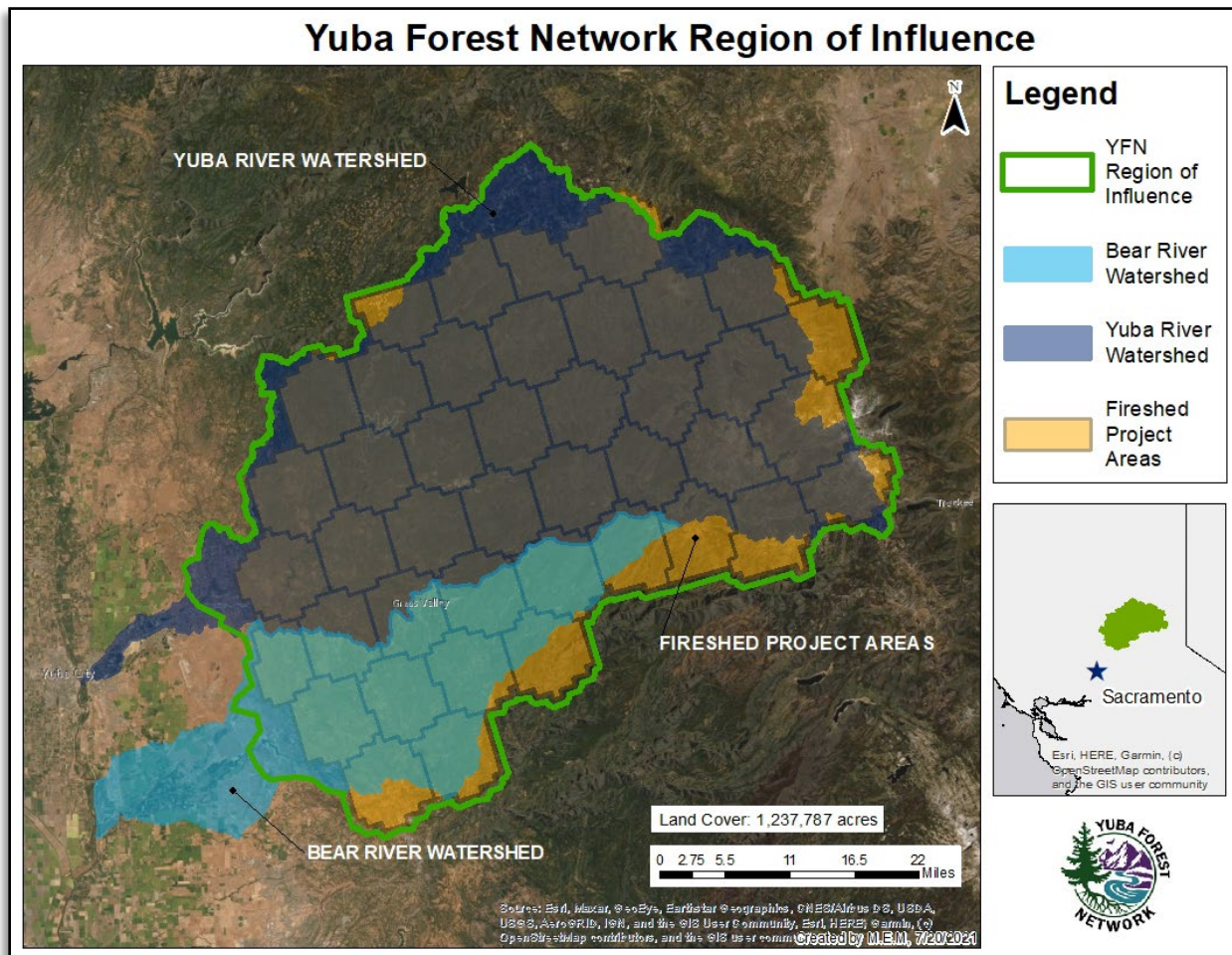
¹ Anderson, *Tending the Wild*.

² Wagtendonk et al., *Fire in California's Ecosystems*.

Region of Influence

The YFN began with a focus on the forests of the Yuba watershed. However, participating organizations implement projects beyond the boundary of the Yuba River watershed, extending into the Bear River watershed, eastern Nevada county, with some organizations implementing work as wide ranging as Sierra-wide. The YFN Region of Influence is a collaboratively defined boundary that represents where forest health work is currently being done and where there is opportunity and need for landscape-scale forest health projects. The Region of Influence is informed by several ecological and social sources (Table 1) and encompasses forested land of the Bear and Yuba watersheds, the western and southern portions of Nevada county, and several Fireshed Project Areas (Map 2).

Map 2. The Yuba Forest Network Region of Influence Boundary.



The YFN Region of Influence overlaps with and borders several other landscape-scale collaboratives, both larger and smaller in scale (Appendix Map 2). However, at approximately 1.2 million acres, the YFN Region of Influence serves by defining a large enough region that (1) allows for achieving multiple socio-ecological objectives that might otherwise be incompatible at smaller scale and (2) represents a large enough area at which large-scale socio-ecological processes operate and at which

their benefits are realized ³. Disturbances such as drought-induced tree mortality and uncharacteristically high-intensity wildfire affect upwards of 100,000 acres in the Sierra Nevada, thus forest restoration efforts must match the scale in order to have impact.

Table 1. Sources and short descriptions of the layers informing the YFN Region of Influence.

Layer	Source	Description
Region of Influence	Created in collaboration with the YFN Strategy Subgroup. Based on the below sources.	This layer was drawn to represent where forest health work is currently being done and where there is opportunity and need for landscape-scale forest health projects.
Forested Land of the Bear & Yuba Watersheds	USFS Existing Vegetation Mid Region 5 North Sierra, CA Wildlife Habitat Relationship Type	This layer is available through the USFS National Datasets. The data source imagery is from 2000-2014 and includes vegetation cover type data.
Bear and Yuba Watersheds	USGS National Hydrography Watershed Boundary Dataset	This layer depicts the 8-digit Hydrological Units for the Yuba and Bear River watersheds. This unit encompasses all sub-basins.
Fireshed Project Areas	USFS Fireshed Registry Fireshed and Project areas	The Fireshed Registry (2020) is a national dataset that maps the source of fire risk to communities at the Fireshed area (250,000 ac) scale and Project area (25,000 ac) scales. This layer depicts the Project areas that lie majority within the Region of Influence.

Tahoe-Central Sierra Initiative Resilience Framework

In August of 2020, the Tahoe-Central Sierra Initiative (TCSI) published a Framework for Promoting Socio-ecological Resilience Across Forested Landscapes in the Sierra Nevada (Resilience Framework). The Resilience Framework describes 10 pillars of socio-ecological resilience as organizing features to be used to describe and plan for resilience across large landscapes. The 10 pillars are meant to represent “desired landscape outcomes that explicitly recognize the interdependence of ecological and social systems” ⁴. The pillars are Forest Resilience, Fire Dynamics, Carbon Sequestration, Biodiversity Conservation, Wetland Integrity, Air Quality, Water Security, Fire-Adapted Communities, Economic Diversity, and Social & Cultural Well-Being. The YFN Strategy Development subgroup has carefully and collaboratively described shared visions and desired outcomes organized and modeled after TCSI’s pillars of resilience to inform a larger Strategy for Forest Resilience document.

³ Manley, Wilson, and Povak, “Framework for Promoting Socio-Ecological Resilience Across Forested Landscapes in the Sierra Nevada.”

⁴ Manley, Wilson, and Povak.

Purpose of Document

Modeled after TCSI’s Resilience Framework, the purpose of this document is to describe a shared vision of forest health and resilience and desired outcomes for the region across stakeholders of the YFN. By describing a shared vision and desired outcomes, this document sets up the YFN to take steps towards project identification, planning, and implementation. This document is meant to be “living”, meaning it will be adapted as stakeholder needs and actions develop and as the conditions of the region change with ongoing climatic, fire, drought, and social and cultural well-being changes.

Definitions of Key Terms

Active Stewardship

Stewardship is a term selected with the intention of describing care for the land while incorporating ecological, economic, social, and cultural elements. The YFN includes “active” to express the required process of engagement, compromise, and decision making which must occur on a continuous basis to meet and adapt to the changing needs of regional forests.

Active Stewardship is the unending and committed care for the land in a way that addresses social and ecological dynamics.

Forest Health

The YFN Strategic Development Subgroup launched with the creation of a shared definition of forest health. This definition works to reflect the YFN’s view that both social and ecological process influence forest health and that active stewardship is integral for long-term integrity of the forest.

Forest Health is a dynamic process of ecosystem function and active stewardship that restores and sustains the ecological and social integrity of a forested landscape.

While the focus of forest health is on forested landscapes, the YFN recognizes that a forest is not only land with trees, but also diverse habitats and communities, including but not limited to wetlands, meadows, diverse wildlife, diverse plant species, pre-historic and historic sites, riparian zones, and rural communities.

Yuba Forests

The term Yuba Forests is used throughout the document as means to describe the forested landscape of the Bear and Yuba Rivers watersheds. It is meant to be specific to the region and encompassing of the diverse social and ecological communities of forested landscapes.

Yuba Forests refer to the forested landscape of the Bear River and Yuba River watersheds as well as the social and ecological communities of the landscape.

II. DESIRED OUTCOMES BY RESILIENCE PILLARS

The YFN Strategy Development subgroup has carefully and collaboratively described desired outcomes, organized by, and modeled after the Tahoe-Central Sierra Initiative's resilience pillars as defined in the Framework for Promoting Socio-ecological Resilience across Forested Landscapes in the Sierra Nevada (Manley, Wilson, & Povak, 2020). These desired outcomes and shared vision for each resilience pillar have been developed from direct input from active YFN partner organizations. The Key Terms, defined on page 7, are used throughout the desired outcomes and shared vision of each pillar. Additionally, the term "ecological integrity" is used throughout this section. The YFN follows the US Forest Service 2012 Planning Rule definition of ecological integrity: "The quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence."⁵ The intention of describing a shared vision of forest health and resilience and desired outcomes for the region across stakeholders of the YFN is to then move towards strategic action through project identification, planning, and implementation.

Forest Resilience

Introduction and Shared Vision. Forest resilience is defined as "the ability of a forest to absorb disturbances and re-organize under change to maintain similar functioning and structure"⁶. In the YFN region, where the majority of the landscape is forested, forest resilience is a critical ecological function in need of restoration, especially facing increased frequencies and severities of disturbances. The YFN collaboratively describes the desired outcome of Forest Resilience oriented actions as follows:

Forest ecosystems are able to recover from disturbance and maintain function and structure, achieved via active stewardship with the health and resilience of the forest itself as a priority.

Significance. Restoring and enhancing forest resilience in the face of increasing frequency and severity of disturbances linked to climate change combined with over a century of fire suppression management methods in a fire-adapted ecosystem requires intervention in the form of active stewardship. Forest management objectives of restoring forest resilience for the forest itself will guide prioritization of the restoration of desired forest disturbance dynamics and landscape conditions. The YFN region includes an abundance of stewards, and a diversity of management objectives is inevitable. It is a desire that these numerous land managers will collaborate with diverse stakeholders across boundaries to achieve forest resilience for the forest through active stewardship. The specific inclusion of active stewardship in this desired outcome points to the necessity of long-term, adaptive, and holistic care of the land.

Homogeneity in forest composition, structure, and disturbance can lead to heightened vulnerability to natural disturbances⁷. Managing for heterogeneity in an ecosystem or specific components of an ecosystem, such as species diversity, tree density, or clump/gap structure can

⁵ USDA, "National Forest System Land Management Planning."

⁶ Scheffer, *Critical Transitions in Nature and Society*.

⁷ Safford and Stevens, "Natural Range of Variation for Yellow Pine and Mixed-Conifer Forests in the Sierra Nevada, Southern Cascades, and Modoc and Inyo National Forests, California, USA."

increase overall forest resilience to natural disturbances⁸. Within the YFN region, management objectives that target forest resilience may include managing for desired vegetation composition species diversity, complex forest structure, fire regimes, or managing for forest resilience against increased frequency and duration of drought, catastrophic wildfire, and bark beetle infestation⁹.

Desired Outcomes. The following are further examples of desired outcomes and shared visions for the landscape pertaining to Forest Resilience as described by partners of the YFN.

- *Forest vegetation composition, structure, and disturbance regimes occur in a complex mosaic based on Historical Range of Variation (HRV), topography, soil type, and other landscape conditions and in a way that is adapted to increasing climate stressors and disturbances.*
- *Invasive plant species cover is reduced.*
- *Low- to moderate-severity natural wildfire, prescribed fire, and cultural burning are a part of the natural disturbance regime.*
- *High severity wildfire occurs at patch sizes consistent with HRV.*
- *Natural disturbances, including insect and pathogen mortality and fire return interval, are within the HRV.*
- *Erosion and sediment regimes do not increase noticeably or significantly.*
- *Forest restoration projects prioritize preserving remaining large-diameter trees.*
- *Landowners, community members, and non-profit organizations contribute to forest resilience by planning and participating in forest restoration projects including prescribed fire.*

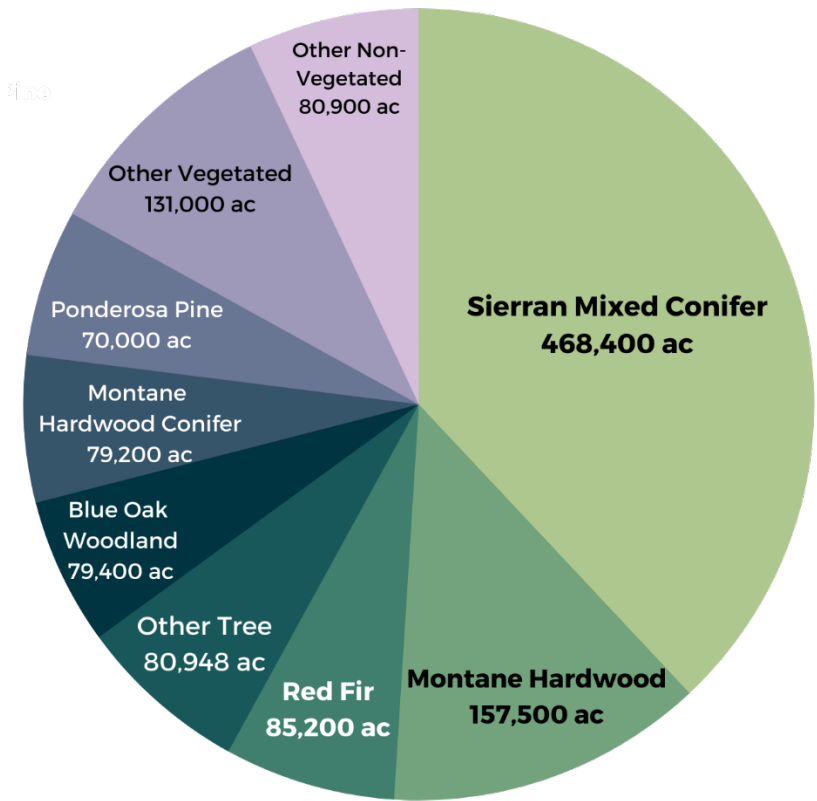
⁸ Manley, Wilson, and Povak, “Framework for Promoting Socio-Ecological Resilience Across Forested Landscapes in the Sierra Nevada.”

⁹ Stephens et al., “Drought, Tree Mortality, and Wildfire in Forests Adapted to Frequent Fire.”

Forest Structure and Composition within the YFN Region of Influence

Within the approximate 1,237,800 acres of the YFN Region of Influence, 468,340 acres, or 38% of the region, consists of Sierran Mixed Conifer. Sierran Mixed Conifer is characterized by a multilayered forest consisting mainly of white fir, Douglas-fir, ponderosa pine, sugar pine, incense-cedar, and California black oak, with red fir being associated at higher elevations. In Figure 1, “Other Vegetated” refers to shrub and herbaceous dominated vegetative cover and “Other Non-Vegetated” refers to developed and aquatic dominated cover. The breakdown of vegetation type is derived from California Wildlife Habitat Relation (CWHR) Type geodatabase. For a complete breakdown of percent CWHR Type and acres within the Region of Influence, see Appendix Table 3.

Figure 1. Breakdown of Vegetation Type within the YFN



Fire Dynamics

Introduction and Shared Vision. Fire Dynamics refers to the range of characteristics of fire such as prescribed fire, prescribed natural fire, and wildfire, or as described in the Resilience Framework, intentional fire, or unintentional fire (TCSI). In the Sierra Nevada, much of the forest landscape evolved with fire, including within the YFN region. Resilient elements of Fire Dynamics are integral to the overall resilience of the YFN regional landscape. The YFN collaboratively describes the desired outcome of Fire Dynamics oriented actions as follows:

Fire is restored to the landscape as a primary disturbance agent in forests and in an ecologically beneficial manner, with mixed severities in a mosaic pattern over large landscapes, occurring every few decades.

Significance. Prior to Euro-American settlement in the Sierra Nevada, mixed-conifer forests experienced frequent, low- to moderate-severity fire on a return interval of zero to 35 years via lightning-ignited fire and cultural burning done by Indigenous peoples¹⁰. This frequent fire regime limited fuel

¹⁰ Safford and Stevens, “Natural Range of Variation for Yellow Pine and Mixed-Conifer Forests in the Sierra Nevada, Southern Cascades, and Modoc and Inyo National Forests, California, USA.”

accumulation in the understory, creating a more fire-resilient forest ¹¹. Euro-American settlement brought fear and ignorance of the natural role that fire plays in the landscape, leading to a century of fire suppression management. The blanket fire suppression approach left forests previously adapted to frequent, low- to moderate-severity fires now vulnerable to the negative effects of fire and other tree mortality effects, such as widespread bark beetle infestation ¹².

The yellow pine and mixed-conifer forests of the Sierra Nevada today reflects conditions more characteristic of fire regimes on return intervals of 35 to 200 years at moderate to high severities ¹³. Restoring frequent, low- to moderate-severity fire to the landscape as a primary disturbance agent will require significant fuel reduction efforts, education and engagement efforts, and community support. To restore fire's historic role on the YFN landscape, fire must also be restored as a cultural tool to Indigenous peoples of the region, namely the Konkow, Maidu, Miwok, Nisenan, and Washoe people.

Desired Outcomes. The following are further examples of desired outcomes and shared visions for the landscape pertaining to Fire Dynamics as described by partners of the YFN.

- *Where ecologically appropriate, fire is utilized as an ongoing land stewardship activity according to Traditional Ecological Knowledge (TEK), in collaboration with regional Indigenous People.*
- *Prescribed fire is utilized as a restoration tool in forest health and resilience projects.*
- *Natural, lightning-caused fire is managed under safe and appropriate conditions to achieve ecological and fuel reduction benefits.*
- *Fire regimes, including fire return intervals, are within the historical range of variation, including a mix of severities across the landscape.*
- *TEK is acknowledged, Indigenous voices are uplifted, and access to Traditional resources is promoted regarding the practice of and education around cultural burning, including acknowledging the different practices, different traditions, and different levels of connectivity to Traditional Ecological Knowledge.*
- *The best-available science regarding fire-related data is available, accessible, and utilized for regional strategy purposes.*

Carbon Sequestration

Introduction and Shared Vision. Carbon Sequestration is described as the process by which atmospheric carbon dioxide is taken up by trees and other vegetation via photosynthesis and stored as carbon in woody biomass, foliage, roots, and soils (USFS). In the YFN region and other forested areas, one of the greatest threats to carbon sequestration goals is large-area, high severity wildfire (TCSI). This type of wildfire results in loss of carbon stored in biomass and emits large amounts of carbon to the atmosphere. The YFN collaboratively describes the desired outcome of Carbon Sequestration oriented actions as follows:

Carbon sequestration is enhanced in the watershed complimentary to diverse ecosystem health goals, state goals, and global climate goals.

¹¹ Stephens et al., "Drought, Tree Mortality, and Wildfire in Forests Adapted to Frequent Fire."

¹² Stephens et al.

¹³ Safford and Stevens, "Natural Range of Variation for Yellow Pine and Mixed-Conifer Forests in the Sierra Nevada, Southern Cascades, and Modoc and Inyo National Forests, California, USA."

Significance. Achieving the global climate goal of limiting global warming to below 2° Celsius as outlined by the Paris Agreement and California’s statewide goal of reaching carbon neutrality by 2045 requires significant reduction in carbon emissions via pollution. However, reduction of atmospheric carbon by sequestration will contribute still significantly to these goals. This is especially true within the YFN region, as a majority of the landscape is forested, thus there is great opportunity for carbon sequestration in forests as well as other natural landscapes (i.e., wetlands, meadows, shrublands). With forests being the largest terrestrial carbon stock of the region there is a high risk of losing stored carbon to high severity fire ¹⁴. High-severity fire has the potential to destabilize forest carbon, decrease net ecosystem exchange (the net exchange of carbon between an ecosystem and the atmosphere) and ultimately to reduce the ability of forests to regulate climate through carbon sequestration ¹⁵.

When planning for protected and enhanced carbon sequestration through forest restoration, it is crucial to incorporate flexibility and adaptive management in the face of a changing climate as well as long-term goals ¹⁶. For example, the effectiveness of fuel treatments on forest carbon is complex to quantify and is often tied to “wildfire-contingent benefits”; i.e., the increased resistance of live tree carbon to wildfire as a result of forest treatments ¹⁷. Actions related to protecting and enhancing carbon sequestration in the region should be adaptable to a changing climate, unpredictable wildfire events, long-term goals, and relation to restorative return on investments from forest restoration overall.

Desired Outcomes. The following are further examples of desired outcomes and shared visions for the landscape pertaining to carbon sequestration as described by partners of the YFN.

- *The ability of the forest to sequester carbon and mitigate climate change is protected by reducing the risk of stand-replacing, catastrophic wildfire events.*
- *Current belowground carbon sources in the form of soil carbon are identified, protected, and in the case of states of degradation, restored.*
- *Major natural carbon sources (fire, respiration, decomposition) and sinks (sequestration via soil, photosynthesis, and wetlands) of the region exist in a state of stability and balance.*
- *Carbon sequestration technologies and methods, such as biochar, soil amendments, and meadow/wetland restoration, are utilized to sequester carbon and restore soils.*
- *Carbon credits for forest and soil health provide financial support for restoration work.*
- *Large-scale type conversion of forests to shrublands following high-severity fire is avoided.*

Wetland Integrity

Introduction and Shared Vision. Wetland ecosystems, although not necessarily forested, are crucial parts of the larger forested landscape and provide essential ecosystem services, including but not limited to forest resilience, water filtration, water storage, carbon sequestration, and habitat for diverse floral and faunal species ¹⁸. YFN collaboratively describes the desired outcome of Wetland Integrity oriented actions as follows:

¹⁴ Foster et al., “Potential Wildfire and Carbon Stability in Frequent-Fire Forests in the Sierra Nevada.”

¹⁵ Krofcheck et al., “Restoring Surface Fire Stabilizes Forest Carbon under Extreme Fire Weather in the Sierra Nevada.”

¹⁶ Millar, Stephenson, and Stephens, “CLIMATE CHANGE AND FORESTS OF THE FUTURE.”

¹⁷ Foster et al., “Potential Wildfire and Carbon Stability in Frequent-Fire Forests in the Sierra Nevada.”

¹⁸ Blackburn, Oliphant, and Davis, “Carbon and Water Exchanges in a Mountain Meadow Ecosystem, Sierra Nevada, California”; Hammersmark, Rains, and Mount, “Quantifying the Hydrological Effects of

Wetland ecosystems function with hydrological integrity and habitat quality.

Significance. Wetland ecosystems make up a fraction of the landscape but contribute outsized ecological function. Wetland ecosystems, when functioning with high integrity, offer prime habitat for floral and faunal species, many of which can be indicators for overall wetland ecosystem health ¹⁹. Similar to the forested landscape, a combination of resource extraction and increasing natural stresses (drought, increasing temperatures) has led to wetland ecosystem degradation, often present in the form of disconnected and incised channel. Restoring the hydrological function and reconnecting stream channels of wetland ecosystems, such as montane meadows, has shown to increase water availability and streamflow even during record-setting drought conditions ²⁰. Landscape scale forest restoration must include restoration of wetland ecosystems, and ideally should restore hydrologic function with objectives including long-term water storage, filtration, carbon sequestration, and biodiversity conservation especially with increased stressors from climate change.

Desired Outcomes. The following are further examples of specific desired outcomes and shared visions for the landscape pertaining to Wetland Integrity as described by partners of the YFN.

- *Wetland ecosystems are viewed as an integral part of the forest ecosystem, reflected in restoration and management priorities.*
- *Meadow, riparian, and other wetland ecosystems are restored, managed, and monitored for essential ecosystem services, including but not limited to water storage, flow regulation, sediment capture, stream bank stability, carbon sequestration, and biodiversity.*
- *A diverse set of management tools based on the best available science or regional knowledge are considered and, when appropriate, implemented for wetland ecosystem restoration and management, such as TEK, process-based restoration, removal of encroaching plant species, cattle exclusion, prescribed fire, aspen restoration, and more.*

Biodiversity Conservation

Introduction and Shared Vision. Biodiversity supports resilient ecosystems as well as economic diversity and cultural resources. Biodiversity conservation can occur on varying scales, from genetic to species to ecosystem diversity and is a necessary objective when it comes to planning for forest resilience. The YFN collaboratively describes the desired outcome of Biodiversity Conservation oriented actions as follows:

Stream Restoration in a Montane Meadow, Northern California, USA”; Silverman et al., “Low-Tech Riparian and Wet Meadow Restoration Increases Vegetation Productivity and Resilience across Semi-arid Rangelands”; Stapanian et al., “Rapid Assessment Indicator of Wetland Integrity as an Unintended Predictor of Avian Diversity.”

¹⁹ Hammersmark et al., “Simulated Effects of Stream Restoration on the Distribution of Wet-Meadow Vegetation”; Hammersmark et al., “Vegetation and Water-Table Relationships in a Hydrologically Restored Riparian Meadow”; Stapanian et al., “Rapid Assessment Indicator of Wetland Integrity as an Unintended Predictor of Avian Diversity.”

²⁰ Hunt, Fair, and Odland, “Meadow Restoration Increases Baseflow and Groundwater Storage in the Sierra Nevada Mountains of California.”

Land management and other natural resource practices aim to improve and perpetually sustain biological and cultural diversity of native plant and animal species and communities as a primary or complementary component of planning and implementation.

Significance. Biodiversity conservation is a concern from the local to the global scale. The earth is experiencing an ongoing mass extinction event, with scientists confidently pointing to human impacts through climate change, introduction of invasive species, and habitat fragmentation as a driving influence ²¹. This loss in biodiversity has cascading negative social and ecological impacts, including loss in ecosystem function, natural resources, and cultural resources. In forested ecosystems like the YFN region, a less diverse and more homogenous forest tree species composition can lead to higher vulnerability to fatal insect infestation, for one example ²². In the YFN region, certain invasive species, such as scotch broom (*Cystisus scoparius*) can negatively affect fire dynamics by increasing the forest understory fuel load.

With landscape scale forest restoration becoming more urgent, it will be critical to manage disturbance from restoration activities that may introduce invasive species, promote shrub expansion, and overall reduce forest resilience ²³. For example, forest overstory and understory structure and composition must influence the type of treatment activity based on long-term biodiversity conservation objectives. Biodiversity conservation also requires knowledge of regional biodiversity data, including but not limited to historical populations and ranges of species, TEK of culturally significant species particular to regional Indigenous peoples, and adaptive responses on the genetic, species, or ecosystem scale to climatic stressors.

Desired Outcomes. The following are further examples of specific desired outcomes and shared visions for the landscape pertaining to Biodiversity Conservation as described by partners of the YFN.

- *Pre- and post-fire restoration practices focus on creating habitat heterogeneity, maintaining genetic diversity, and creating conditions that promote native species regeneration and resiliency and are not inviting invasive species.*
- *Biodiversity hotspots and populations of endemic, endangered, threatened, rare, and uncommon plant and animal species are protected and enhanced.*
- *Culturally important species are protected and enhanced, ensuring Tribal leadership or consultation occurs from project conception while ensuring culturally sensitive data is handled in a respectful and, when necessary, private manner.*
- *Invasive plant species occurrences and invasive animal species populations are reduced.*
- *The proportion of local forests with old forest structure that supports biodiversity is increased.*
- *The home range use and migration of native animal species are supported by land management activities and supplemented by adaptations to infrastructure, as necessary.*
- *Gaps in local biodiversity data are reduced, ensuring more robust datasets that can support regional biodiversity-focused restoration projects.*
- *Biodiversity is resilient in the face of fire.*

²¹ Ceballos, Ehrlich, and Dirzo, “Biological Annihilation via the Ongoing Sixth Mass Extinction Signaled by Vertebrate Population Losses and Declines.”

²² Stephens et al., “Drought, Tree Mortality, and Wildfire in Forests Adapted to Frequent Fire.”

²³ Dudley et al., “Overstory Removal and Biological Legacies Influence Long-Term Forest Management Outcomes on Introduced Species and Native Shrubs.”

Water Security

Introduction and Shared Vision. Water security refers to the essential social and ecosystem services that water provides. California is currently facing and will continue to face increased intensity and duration of drought, putting an urgent need to conserve, protect, and enhance water security state-wide. Goals surrounding Water Security must be built around long-term ecological and social needs. The YFN collaboratively describes the desired outcome of Water Security oriented actions as follows:

The region's watersheds function with ecological integrity, health, and resilience, with support of active stewards of the region in the face of increased intensities and fluctuations of disturbances, such as drought, wildfire, precipitation, and flooding.

Significance. TCSI's Resilience Framework (2020) describes Water Security as being essential for numerous factors present within the YFN region: forest health, forest resilience, terrestrial and aquatic biodiversity, recreation, industry, and human consumption. Forests, farmers, and communities depend on the annual snowmelt from the Sierra Nevada, which feed watersheds' supply for ecosystems as well as human uses in the form of irrigation and drinking water. Varying stakeholder objectives for this precious resource coupled with ecological need and climatic stresses on water quantity, quality, and storage and timing, make managing for Water Security both complex and pivotal. Approaching Water Security on the watershed scale, fostering high levels of engagement from stakeholders, and managing for resilience will be essential.

Desired Outcomes. The following are further examples of desired outcomes and shared visions for the landscape pertaining to Water Security as described by partners of the YFN.

- *Water quality in rivers, lakes and all waterways promote the restoration of aquatic species and enables them to thrive, including anadromous fish and benthic macroinvertebrates.*
- *Water quality, quantity, storage, and timing provides for both human consumption and ecological function.*
- *The community is educated and aware of their water usage, potential for humans and ecosystem to survive disturbances such as drought, and practices to minimize water impacts and maximize water security, ranging from residential water use to agriculture, utilities, and forest management practices.*
- *Water quality and quantity impacts from legacy mining are minimized by reducing erosion and sedimentation from mine features such as hydraulic mines and debris control dams.*
- *Watershed-wide restoration efforts are increased regionally, not only as a way of increasing the scale of restoration projects but also as a way of addressing the needs of a landscape within an encompassing and integrated ecosystem.*

Air Quality

Introduction and Shared Vision. Air quality, consisting of particulate matter, visibility, and greenhouse gases, influences both ecological and social systems. Forests play a significant role in the status of air quality via the capture of particulate matter in tree biomass, removing it from the atmosphere or via contributing hazardous levels of particulate matter in the event of a wildfire. In fire adapted forests like the mixed conifer of the YFN region, certain levels of poor air quality may be necessary for the long-term restoration of these ecosystems and potential avoidance of catastrophic wildfire. The YFN collaboratively describes the desired outcome of Air Quality oriented actions as follows:

Human health is protected from toxic fire emissions through careful planning of beneficial fire and reduction of wildfire, as public health and ecological health must be considered as integral to each other.

Significance. Poor air quality can have significant effects on public health on both the short- and long-term scales, causing or worsening diseases including but not limited to asthma, cardiovascular diseases, reproductive and central nervous system dysfunctions, and cancer ²⁴. Millions of California residents experienced months of unhealthy to hazardous air quality just in the year 2020 because of the multiple wildfires that impacted the western states. Although it may seem counterintuitive, one way to work towards reducing these hazardous air quality events is the use of prescribed fire and managed wildfire fire as tools for fuel reduction. The idea is that long-term ecological and public health impacts of continued fire suppression are much more severe than the impacts of using prescribed fire or managed wildfire on the landscape ²⁵. Prescribed fire is already required to be planned in a way that minimizes smoke impacts to communities. The widespread understanding of this tradeoff will be essential to seeing significant increases in the pace and scale of forest restoration for resilience.

Desired Outcomes. The following are further examples of desired outcomes and shared visions for the landscape pertaining to Air Quality as described by partners of the YFN.

- *Emissions, including smoke and greenhouse gases, from wildfires are significantly reduced due to lowered severity of wildfires locally and across the state.*
- *Emissions from prescribed fires are limited due to careful adherence to best management practices like burning during periods of good smoke dispersal.*
- *Local forests improve air quality by capturing pollutants and oxygenating atmosphere.*
- *Local efforts to support improved air quality are replicated and advocated for across the state, recognizing that local air quality is affected on a large scale and that ecosystem and community resilience are interconnected.*
- *There is widespread knowledge of impacts of hazardous air quality to human health and knowledge of accessible and actionable steps community members can take to prepare for hazardous air quality events.*
- *During hazardous air quality events, the public and especially vulnerable communities have access to public cleaner air spaces and shelters.*
- *Smoke emissions modeling data is made widely available and accessible to the public to improve preparedness for hazardous air quality events and to improve scientific literacy on air quality.*
- *Frequent communication between land managers and air regulators lead to a collaborative environment that supports fire restoration and public health.*

Fire-Adapted Communities

Introduction and Shared Vision. Communities within the fire-adapted ecosystems of California are increasingly at risk from catastrophic wildfires and associated impacts. Wildfire preparedness and prevention are essential for residents of these communities, as is the knowledge of the benefits of certain fire and how to safely utilize it to improve ecological function, maintain cultural resources, and

²⁴ Manisalidis et al., “Environmental and Health Impacts of Air Pollution.”

²⁵ Adams and Charnley, “Environmental Justice and U.S. Forest Service Hazardous Fuels Reduction”; Stephens et al., “U.S. Federal Fire and Forest Policy.”

protect the community from high-severity wildfire Definition, relation to region. The YFN collaboratively describes the desired outcome of Fire-Adapted Communities oriented actions as follows:

Communities understand the risk of living in the wildland-urban interface and are empowered through education, opportunities, resources, and widespread support to advocate for and carry out actions that enhance fire adaptedness.

Significance. The forests of the Sierra Nevada evolved alongside fire for centuries and have historically been adapted to thrive in its presence. For a safe and healthy livelihood, community members must be aware of the risks of living in a place that is ecologically predisposed to fire. Perhaps more importantly, communities must be aware of the responsibilities they face by living here, including maintaining defensible space around structures, refraining from activities such as mowing and campfires during certain seasons and conditions, and maintaining individual- and community-level wildfire emergency strategies such as go-bags and clear egress routes ²⁶. While local agency prevention practices and emergency preparedness are critical to community well-being, the responsibility of protecting homes and ecosystems also lies within every single member of the community.

Communities and individuals play a critical role in protecting themselves and their surrounding environment from the impacts of fire. Key practices include individual home improvements that harden the exterior against potential wildfire, defensible space clearing around individual homes, community planning for neighborhood-scale fuels reduction and maintenance, and ongoing land stewardship at the community scale. It is important for local organizations, agencies, policymakers, and others to recognize community capacity for these often expensive and labor-intensive efforts. Additionally, it is critical that programs are offered that promote community engagement in wildfire risk reduction across the socioeconomic spectrum, including Disadvantaged, unhoused, and non-English-speaking Communities. Tailoring of programs that support specific local needs of Fire-Adapted Communities are likely to be more effective ²⁷.

Desired Outcomes. The following are further examples of desired outcomes and shared visions for the landscape pertaining to Fire-Adapted Communities as described by partners of the YFN.

- *Major evacuation routes through WUI zones are defined, mapped, managed, and maintained as shaded fuel breaks, slowing, or reducing fire behavior and allowing for safe evacuation of residents and use by fire personnel during potential wildfire events.*
- *Communities are educated on the risks and responsibilities of living within fire-adapted ecosystems, including being knowledgeable about extreme fire weather events and are prepared to take appropriate action when these events occur.*
- *Community members take an active role in wildfire risk reduction efforts, such as individual home hardening, community planning for fuels reduction, and land stewardship.*
- *There is widespread community understanding of and support for beneficial fire including cultural burning.*
- *Private landowners and community members have the skills, community support, capacity, and knowledge needed to carry out prescribed fire.*

²⁶ Toman et al., "Social Science at the Wildland-Urban Interface."

²⁷ Paveglio, Abrams, and Ellison, "Developing Fire Adapted Communities"; Paveglio et al., "Exploring the Influence of Local Social Context on Strategies for Achieving Fire Adapted Communities."

- *Emergency services, education, and preparedness is tailored to meet specific community needs, such as home hardening, egress and ingress route planning, access to transportation and shelter, and offered in Spanish and other languages spoken by the community.*

Economic Diversity

Introduction and Shared Vision. TCSI describes the four elements of Economic Diversity that are of particular focus as the wood product industry, recreation industry, water industry, and overall economic health. It is imperative that these elements are planned for in a manner that supports long-term sustainable use of natural resources. There are several potential disturbances that could negatively affect a natural resource based diverse economy: catastrophic wildfire, hazardous air quality, and drought, to name a few. These are realities of the YFN region already, with high likelihood of affecting the region more in years to come. The YFN collaboratively describes the desired outcome of Economic Diversity oriented actions as follows:

Resource stewardship activities occur in a way that supports long-term, sustainable, resource-based, local, and diverse economies.

Significance. The YFN region encompasses organizations that lead these industries from the local to the state-wide. The presence of these organizations committed to industries provide an opportunity for even more improved economic health and diversity. Workforce development efforts should prioritize long-term, sustainable jobs for communities as well as tailor to the specific needs of these organizations. Such targeted efforts could provide the skills and tools needed for a more diverse workforce (i.e., skill-wise) and thus a more diverse economy. This will also allow for increased collaboration, needed for increased pace and scale of forest restoration projects.

Desired Outcomes. The following are further examples of desired outcomes and shared visions for the landscape pertaining to Economic Diversity as described by partners of the YFN.

- *Local economies uplift stewardship activities and directly address inequities in restoration work, including but not limited to the following interconnected factors: Tribal inclusion and consultation, socio-economic disparities, and access to workforce development and training opportunities.*
- *Local market demand fuels the sustainable utilization of forest restoration products and byproducts, such as woody biomass, biochar, timber, carbon offsets, and more.*
- *Recreational tourism is structured in a way that supports the local economy while sustaining the ecological integrity of public lands, considering popular regional recreation areas occur in census delineated Disadvantaged Communities.*
- *The region is competitive and able to participate in innovative funding opportunities, such as from the Forest Resilience Bond²⁸, for locally led and organized restoration projects through the quantification of ecosystem services.*
- *Funding is redirected from reactive, stopgap conservation and restoration projects to long-term, stewardship-oriented projects that reflect an investment into forest and watershed health projects for generations to come.*

²⁸ Leigh Madeira, *How the Forest Resilience Bond Works*.

- *Regional forest and watershed health projects collaborate with the water industry and its beneficiaries, including regional irrigation districts, agricultural professionals, and downstream water users.*

Social and Cultural Well-Being

Introduction and Shared Vision. Social and Cultural Well-Being in this socio-ecological context refers to the cultural and societal benefits in relation to the connection between forested landscapes and quality of life attributes ²⁹. The YFN prides itself on diverse stakeholder engagement and a community that identifies strongly with the regions landscape. Forest restoration that includes long-term objectives for Social and Cultural Well-Being is restoration that is considers every aspect of landscape-scale resiliency. The YFN collaboratively describes the desired outcome of Social and Cultural Well-Being oriented actions as follows:

Forest restoration strengthens the social and cultural well-being of the region and the connection between forested landscapes and quality of life for its inhabitants.

Significance. It is not uncommon for members of the public to feel without influence in environmental management decisions, despite impacts to social and cultural well-being ³⁰. Although when working with a multitude of stakeholders, not all management objectives or values can be met, there can still be improvements in the overall effect on Social and Cultural Well-Being. The Resilience Framework (2020) points to public health, public engagement, recreation quality, and equitable opportunity as key elements of Social and Cultural Well-Being. All these elements and associated social and cultural values will vary greatly depending on the place-based community; thus, it is necessary to collaborate with the social and cultural groups whose well-being will be impacted ³¹. Ideally, this collaboration will begin at project conception and continue in a manner that empowers the people who will be impacted.

Desired Outcomes. The following are further examples of desired outcomes and shared visions for the landscape pertaining to Social and Cultural Well-Being as described by partners of the YFN.

- *A culture of active stewardship is promoted throughout the watershed.*
- *Regional Indigenous voices and values are present in every step of forest management decision, starting with project conception.*
- *Diverse communities have a voice in decision-making and strategy building to ensure equitable and inclusive objectives.*
- *A multitude of opportunities exist for local communities to participate in and continually learn of stewardship activities and best management practices for public and private lands.*
- *Forest management approaches include both recreational, aesthetic, and cultural objectives in addition to ecological health objectives.*
- *Safe and clean recreational opportunities are available and accessible to community members, addressing specific barriers to entry including but not limited to site access, parking, bathrooms, and waste disposal.*

²⁹ Manley, Wilson, and Povak, "Framework for Promoting Socio-Ecological Resilience Across Forested Landscapes in the Sierra Nevada."

³⁰ Breslow et al., "Evaluating Indicators of Human Well-Being for Ecosystem-Based Management."

³¹ Breslow et al.

- *Air and water quality are often prioritized in all forest health management activities, and always prioritized in forest health management activities with immediate impact to human and wildlife communities.*
- *Socio-environmental justice is at the forefront of planning and management decisions, with analysis of environmental justice and social justice impacts completed for all forest health projects.*
- *The public has adequate opportunities to comment on and participate in planning processes for forest restoration projects.*

III. ACTIONS TOWARDS RESILIENCE IN YUBA FORESTS

The actions in the table below (Table 2) are examples of direct steps towards the YFN’s Desired Outcomes. These actions were developed from priorities that arose from YFN Strategic Development Subgroup meetings and YFN Quarterly Meetings. The table is organized to demonstrate the connection between TCSI’s Resilience Pillars, YFN’s Desired Outcomes, and strategic action. The actions described are recommended steps for regional organizations to take towards forest resilience.

Alignment with CA’s Wildfire and Forest Resilience Action Plan Goals

Table 2, describes actions to work towards more resilience in Yuba Forests. Also included is a column that names the specific relevant goals from California’s Wildfire and Forest Resilience Action Plan³² that align with the YFN’s actions, and a column that specifies key partners in the Yuba Forest. The Wildfire and Forest Resilience Action Plan is the result of a coordinated effort by the California Governor’s Forest Management Task Force and is created to accelerate efforts to restore California forest health and resilience, improve community fire safety, and support the economies of rural forested areas. The Plan is organized by four general goals, each with their own subgoals and specific actions³³. The four goals are:

1. Increase the Pace and Scale of Forest Health Projects
2. Strengthen Protection of Communities
3. Manage Forests to Achieve the State’s Economic and Environmental Goals
4. Drive Innovation and Measure Progress

Key Players

Table 2 includes a column of key players necessary to implement the described actions. This list is not exhaustive and is not meant to include or exclude any one group. Rather, it attempts to specify strategic partners within Yuba Forests and the larger region that may be instrumental in taking actions towards forest health and resilience. Additionally, this highlights the need for collaboration among key players to implement strategic and effective actions.

The YFN actions described in Table 2 are specific to Yuba Forests and highlight where they align with the broader state-wide goals described in the Wildfire and Forest Resilience Action Plan. This table therefore serves as a guide for how the YFN’s goals align with those of the State.

³² “California’s Wildfire and Forest Resilience Action Plan: Recommendations of the Governor’s Forest Management Task Force.”

³³ “California’s Wildfire and Forest Resilience Action Plan: Recommendations of the Governor’s Forest Management Task Force.”

Table 2. Strategic Actions towards Resilience in Yuba Forests.

Actions for Resilience in Yuba Forests	Alignment with CA’s Wildfire & Forest Resilience Action Plan Goals ³⁴	Key Players
<p><i>YFN Desired Outcome: Forest ecosystems are able to recover from disturbance, achieved via active stewardship with the health and resilience of the forest itself as a priority.</i></p>		
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">FOREST RESILIENCE</p> <ul style="list-style-type: none"> ➤ Implement cross ownership boundary forest health projects within Yuba Forests, targeting resilience to fire, drought, and other disturbances. Projects should cover at least 1,000 acres with an intention to scale up over time. Such projects should also incorporate regional skill and capacity, apply adaptive management, and include long-term monitoring. ➤ Consolidate regional planning and monitoring efforts to build a standardized approach with clear directives and resources from state agencies such as CA Department of Fish and Wildlife, Wildlife Conservation Board, Department of Conservation, and Tahoe Central-Sierra Initiative. 	<p>Goal 1: Increase the Pace and Scale of Forest Health Projects</p> <ul style="list-style-type: none"> • Accelerate Restoration Across All Lands • Mobilize Regional Action Plans • Improve Regulatory Efficiency <p>Goal 4: Drive Innovation and Measure Progress</p> <ul style="list-style-type: none"> • Expand and Improve Monitoring, Reporting, and Decision-Support Tools 	<p>Landowners in Yuba Forests (<i>i.e.</i>, USFS, BLM, CA State, NID, BYLT, Independent Private Landowners)</p> <p>Land Managers in Yuba Forests (<i>i.e.</i>, USFS, BLM, CA State, NID, local non-profits, local Tribes, Independent Private Landowners)</p> <p>Regional Funders/Coordinators (<i>i.e.</i>, CAL FIRE, CDFW, DOC, TCSI, SNC, WCB)</p>

³⁴ “California’s Wildfire and Forest Resilience Action Plan: Recommendations of the Governor’s Forest Management Task Force.”

Actions for Resilience in Yuba Forests

Alignment with CA’s Wildfire & Forest Resilience Action Plan Goals

Key Players

***YFN Desired Outcome:** Fire is restored to the landscape as a primary disturbance agent in forests and in an ecologically beneficial manner, with low- to moderate-severities in a mosaic pattern over large landscapes, occurring every few decades.*

FIRE DYNAMICS

- Staff all counties within Yuba Forests with fire science experts (i.e., UCCE Specialists). Specialists provide educational and other relevant resources to land managers, landowners, and the public on subjects including but not limited to forestry, wildfire recovery, industrial forests and technology, prescribed fire, fire-resistant homes, and defensible space.
- Conduct an analysis to show the ecological viability of prescribed fire on public and private lands based on low- and moderate- severity fire conditions during burn windows (Nov. & Apr.) with the intention to maximize prescribed fire where possible and confront realities for urban populations in the WUI.

Goal 1: Increase the Pace and Scale of Forest Health Projects

- Increase Prescribed Fire

Goal 2: Strengthening Protection of Communities

- Support Community Risk Reduction and Adaptation Planning

Goal 4: Drive Innovation and Measure Progress

- Utilize Best Available Science and Accelerate Applied Research

Local & Regional

Coordinators (i.e., UC Cooperate Extension, CAL FIRE, Nevada, Sierra, Yuba, and Placer Counties, County Fire Safe Councils, local Firewise Communities, Yuba-Bear Burn Cooperative)

Local & Regional

Scientists/Analysts (i.e., local non-profit or private organizations with GIS analysis capabilities, CAL FIRE, USFS, local and regional academic institutions)

Actions for Resilience in Yuba Forests

Alignment with CA’s Wildfire & Forest Resilience Action Plan Goals

Key Players

Desired Outcome: Wetland ecosystems are viewed as an integral part of the forest ecosystem, reflected in restoration and management priorities.

WETLAND INTEGRITY

- Restore meadows and wetlands as part of headwater restoration work with objectives of sustaining water quality, wetland integrity, and carbon sequestration as well as monitor effectiveness of meadows and other wetland ecosystems as natural fuel breaks with increased risk of high severity wildfire.

Goal 3: Manage Forests to Achieve the State’s Economic and Environmental Goals

- Integrate Forest Management into State Climate and Biodiversity Strategies

Landowners & Land Managers in Yuba Forests (i.e., USFS, BLM, local Water Agencies, local non-profits, Tribes, Sierra Meadows Partnership)

Desired Outcomes: Resource stewardship activities occur in a way that supports long-term, sustainable, resource-based, local, and diverse economies.

ECONOMIC DIVERSITY

- Build up and support a sustainable wood products market, including but not limited to sawmills that can process large logs and biomass facilities.
- Support tailored workforce development programs that develop curriculum around practical skill-building, tribal engagement, and regional workforce needs at regional educational institutions.

Goal 1: Increase the Pace and Scale of Forest Health Projects

- Mobilize Regional Action Plans

Goal 3: Manage Forests to Achieve the State’s Economic and Environmental Goals

- Create a Sustainable Wood Products Market in California

Specialized Coordinators in Yuba Forests (i.e., USFS, LWDA, County Fire Safe Councils, Camptonville Biomass Business Center)

Academic Institutions in Yuba Forests (i.e., Yuba College, Sierra College)

Actions for Resilience in Yuba Forests

Alignment with CA's Wildfire & Forest Resilience Action Plan Goals

Key Players

Desired Outcome: In restoration work for forest resilience, the social and cultural well-being is planned for as a restoration objective that strengthens the connection between forested landscapes and quality of life.

SOCIAL/CULTURAL WELL-BEING

- Increase tribal engagement across organizations that emphasizes collaboration with the Konkow, Maidu, Miwok, Nisenan, and Washoe peoples from project conception through long-term monitoring and stewardship actions. This may include but is not limited to returning cultural burning to the land, restoring culturally useful native plant and native animal species, and increasing Tribal recognition and support within the region.
- Recognize that housing is one of the largest challenges in workforce development. Support initiatives that increase affordable housing for forestry and natural resources-based jobs.

Goal 1: Increase the Pace and Scale of Forest Health Projects

- Accelerate Restoration Across All Lands
- Increase Prescribed Fire
- Conserve Working Forests

Local Tribal

Organizations (*i.e.*, Enterprise Rancheria, Nevada City Rancheria Nisenan, United Auburn Indian Community, Washoe Tribe of Nevada and California)

Local & Regional

Coordinators (*i.e.*, Sierra Business Council, university partners, North State Planning & Development Collective)

IV. STRATEGIC ACTIONS BY KEY PARTNERS

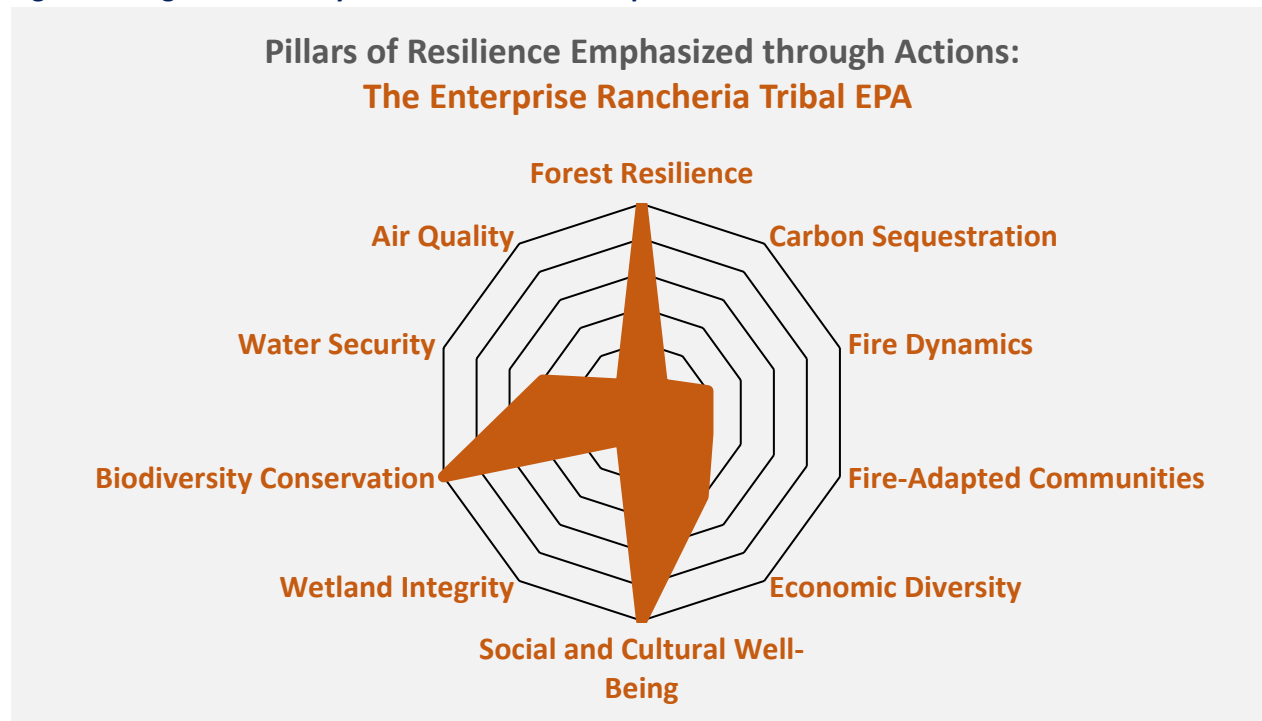
Partner organizations of the YFN are currently taking actions and planning for actions towards forest health and resilience within the region. This section describes specific examples of those actions and the pillars in which they emphasize. Specific actions were provided voluntarily by YFN partner organizations.

Enterprise Rancheria Tribal EPA

The Enterprise Rancheria Tribal Environmental Protection Agency (EPA) is a departmental program of the Estom Yumeka Maidu Tribe, a federally recognized tribe. The Enterprise Rancheria is headquartered in Oroville, CA. The EPA Department works to keep the tribal community informed on environmental issues and to keep the relationship between the land and the Native community strong. Stewardship to the land, water, and all living things is central to the identity of the Maidu people. Thus, the health of the land is inseparable from the health of the community. Through their work, The Enterprise Rancheria Tribal EPA is taking, and plans to continue taking actions towards forest and cultural resilience (Fig 2). These actions target multiple resilience pillars and include:

- **Removing Invasive Plants.** The Enterprise Rancheria EPA program aims to remove invasive plant species after the first rain of the year by method of visual identification within 40 acres of tribal trust land for the next four years. Invasive plant removal can reduce surface and ladder fuels for fires and create openings for native plant species that have higher cultural, economic, and ecological values.
- **Restoring Native Plants.** The Enterprise Rancheria EPA program plans to document culturally useful plants with emphasis on those that are drought resistant and replant native plant species on and around tribal trust lands for the next four years. Documenting and restoring native plants that are both drought resistant and culturally significant will positively influence water security, social and cultural well-being, and overall forest resilience.

Figure 2. Targeted Pillars by Actions from the Enterprise Rancheria.

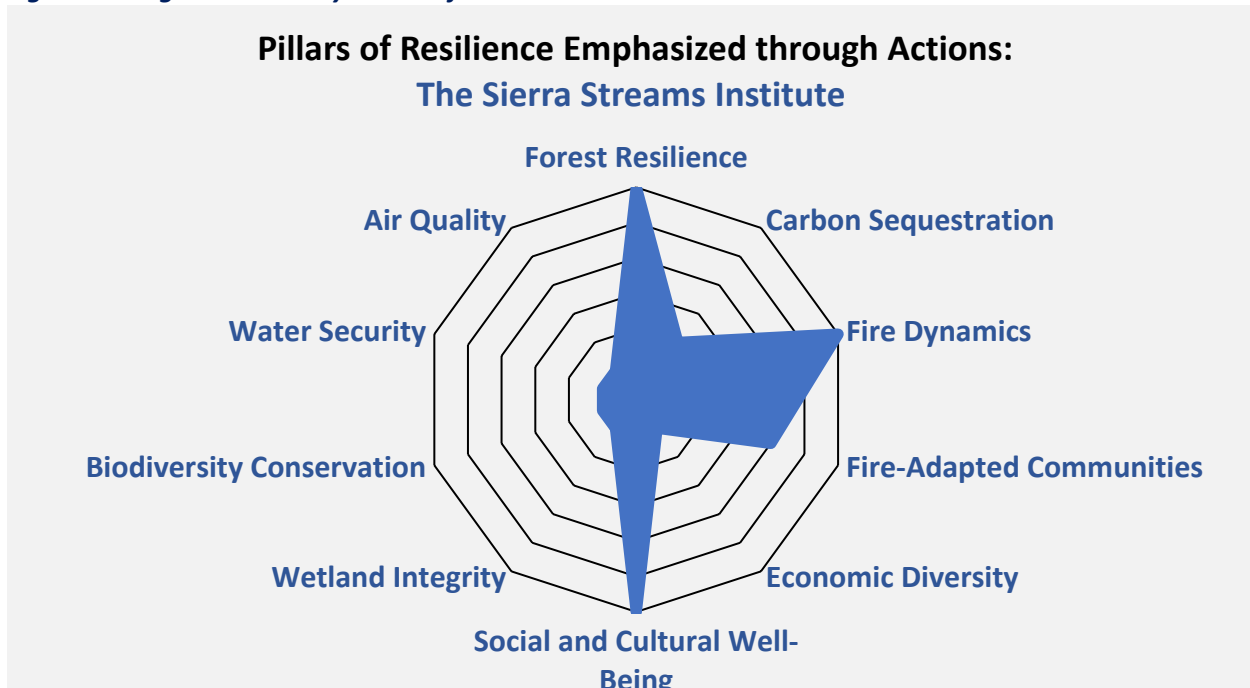


Sierra Streams Institute

The Sierra Streams Institute (SSI) is a non-profit located in Nevada City, CA with project areas located within Nevada County. SSI's work focuses on watershed monitoring, research, and restoration with a focus on Deer Creek, a tributary of the Yuba River. SSI engages with the community through numerous citizen science programs, community outreach efforts, and educational programs for youth. SSI began as a group committed to monitoring the water quality of Deer Creek and has since grown to implement creek habitat restoration projects and now plan for forest resilience in the wildland urban interface. Through their work, SSI is taking and plans to continue taking actions towards forest health and resilience (Fig 3). These actions target several resilience pillars and include:

- **Planning for Climate-Smart Forest Management.** SSI has begun the work of developing shovel ready forest management plans for 625 acres of private lands in the wildland urban interface (WUI). This planning project aims to improve climate adaptation and resilience within privately owned lands within Nevada County. Targeting privately owned-lands at the WUI can help to create fire resilience connectivity in landscape-scale restoration and fuel reduction.
- **Empowering WUI Landowners.** SSI is developing a climate-smart forest management handbook to provide private landowners living in the wildland urban interface. These handbooks will provide landowners with background context, relevant data, networking support, and resources to help them make informed decisions about treatments for their land. This handbook will also demonstrate how private landowner treatments in the WUI will integrate with public land treatments at the landscape scale. Decisions for privately owned land depend on the landowner, thus it is crucial that landowners have all the information, context, and resources needed to make decisions informed by the best-available science and the regional needs.
- **Educating Youth.** In their educational programs, SSI plans to educate local youth about forest health, fire history, and fire ecology as it relates to the region. These programs will also cover different types of forest-related data sets that inform responsible and science-based forest management decisions. The objective of such programs is to increase forest ecology scientific literacy and understanding of the interaction of forest health and fire in the region.
- **Managing for Multiple Objectives.** SSI cooperatively manages forested land on 753 acres of Bureau of Land Management land in the Upper Deer Creek and Lower Steephollow watersheds. Through this cooperative forest management, SSI plans to emphasize reducing the likelihood of fire transmission while increasing forest heterogeneity and health on these lands.
- **Developing Mapping Resources.** SSI plans to develop high-resolution mapping resources for the local community, leveraging available LiDAR and modeled forest structure data to increase local organizational and public access to modern forest databases that can inform management decisions on the landscape scale.

Figure 3. Targeted Pillars by Actions from the Sierra Streams Institute.



South Yuba River Citizens League

The South Yuba River Citizens League (SYRCL) is a non-profit located in Nevada City, CA with project areas located throughout the Yuba River watershed. SYRCL works to restore the Yuba River watershed through restoration projects, water quality monitoring, educational programs, and activism . Specific to forest health, SYRCL serves as the facilitator for the Yuba Forest Network and serves as a partner in the North Yuba Forest Partnership (NYFP). The NYFP is a nine-entity partnership of diverse organizations working to plan, analyze, finance, and implement forest restoration across 275,000 acres of the North Yuba River watershed. Through their work in the YFN and the NYFP, SYRCL is taking and plans to continue taking actions towards forest health and resilience (Fig 4). These actions target several resilience pillars and include:

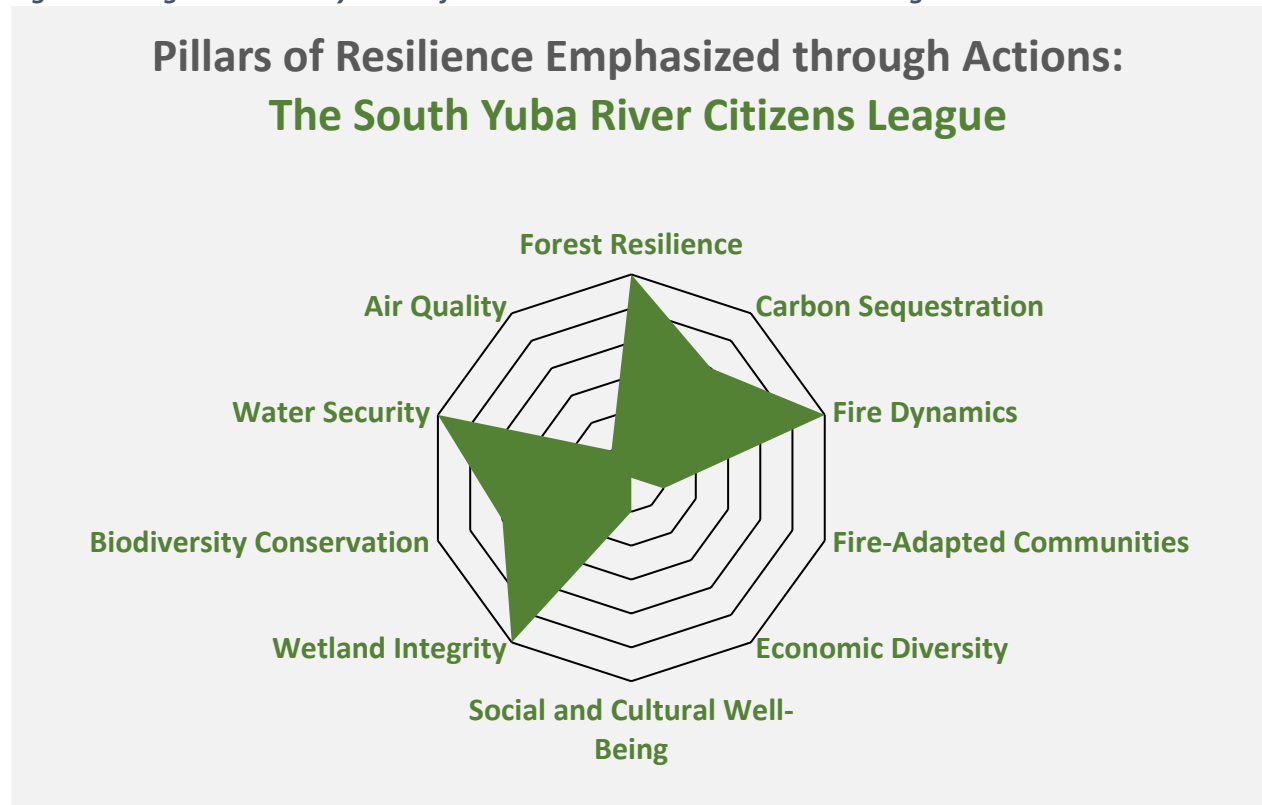
- **Increasing Pace and Scale of Forest Health Treatments.** As a partner of the NYFP, SYRCL contributed to the North Yuba Landscape Resilience Project: Purpose and Need & Proposed Action, which outlines specific actions in detail³⁵. SYRCL is committed to continued partnership with the NYFP, planning for 270,000 acres and addressing forest health for biodiversity, habitat, clean and abundant water, carbon storage, fire protection, and recreational opportunities.
- **Removing Invasive Weeds.** In 2019, 2020, and 2021 SYRCL has partnered with NFF to remove at least 49 acres of invasive scotch broom on Tahoe National Forest land within the Yuba River watershed. SYRCL plans to continue this invasive weeds removal program for the next five years.
- **Restoring Headwater Habitat.** SYRCL works to restore approximately 900 acres of wet meadows within the headwaters of the Yuba River watershed. The meadow restoration efforts span from intensive restoration efforts, including filling channels and removing encroaching conifers, to

³⁵ "North Yuba Landscape Resilience Project: Purpose and Need and Proposed Action."

“low-tech” actions, such as installing beaver damn analogs and post-assisted log structures, depending on need³⁶ and site context.

- **Restoring Lower Yuba Habitat.** SYRCL’s work on the Lower Yuba River promotes improved riparian floodplain habitat for Chinook salmon and steelhead trout via restoration actions. Partnering with organizations like Teichert Materials, cbec eco-engineering, Western Aggregates, and Cramer Fish Sciences, SYRCL assists with and leads planning, implementation, and monitoring in several Lower Yuba restoration projects and plans to continue this work for years to come.
- **Restoring Aspen Habitat.** SYRCL is currently involved in aspen restoration work through a watershed-wide aspen assessment. The assessment will contribute a robust baseline database of location and health of aspen stands within the Yuba River watershed. This database will then inform planning and prioritization for restoration of aspen habitat. Additionally, SYRCL installs fencing around meadow-fringe aspen stands where the meadows are grazed by cattle. This protects vulnerable suckers from being over-browsed by cattle.
- **Engaging the Community.** SYRCL involves the community directly in their restoration work by hosting volunteer opportunities, educational programs, and through newsletters that communicate project updates. Furthermore, SYRCL helps host public interest meetings to engage with communities that are impacted by their projects and to elicit feedback.

Figure 4. Targeted Pillars by Action from the South Yuba River Citizens League



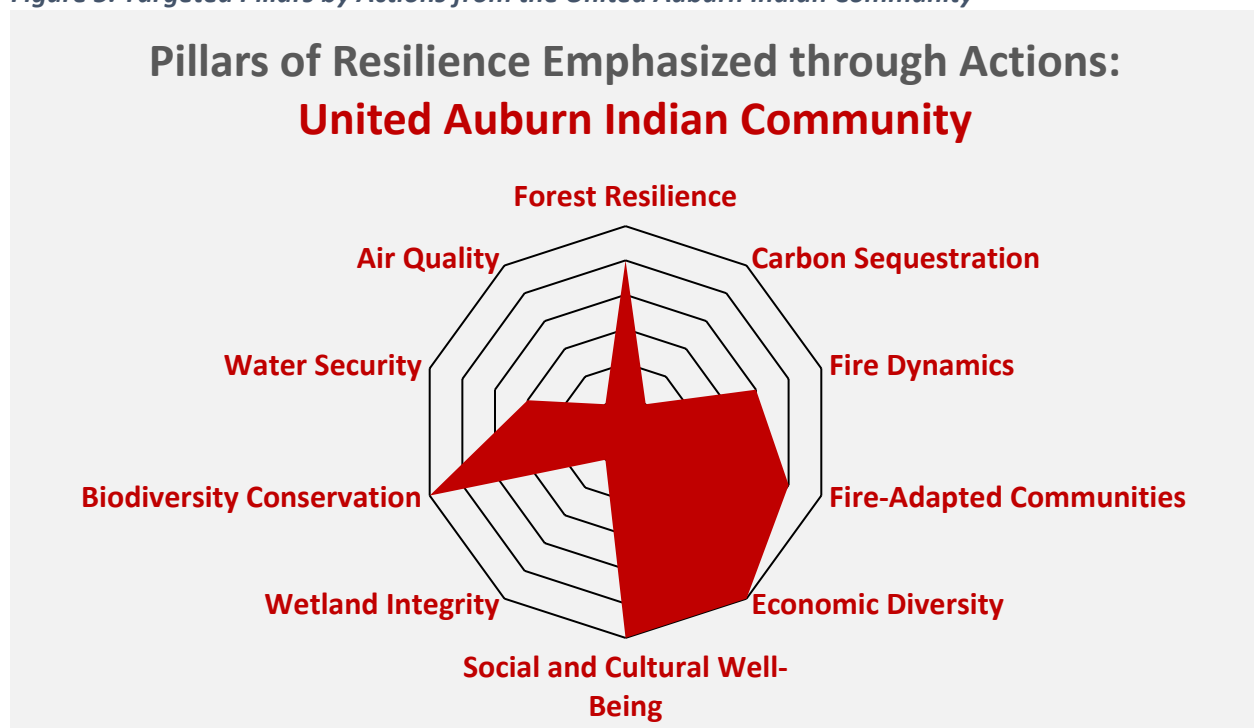
³⁶ Silverman et al., “Low-Tech Riparian and Wet Meadow Restoration Increases Vegetation Productivity and Resilience across Semiarid Rangelands.”

United Auburn Indian Community

The United Auburn Indian Community (UAIC) is comprised of Miwok and Nisenan (Southern Maidu) peoples and is a federally recognized tribe. The UAIC's tribal government engages in land stewardship and education that serves the tribe's members and the general community. Through their work, the UAIC is taking and planning actions towards forest and cultural resilience. This work promotes social and cultural well-being (Fig 5). Working with landowners, fire fighters, cultural traditionalists, and anthropologists, UAIC supports these multiple resilience pillars:

- **Restoring Native Plant Species.** UAIC is consulting with agencies to create mitigation measures that address vegetation composition and structure and to create prescribed native plant lists that are drought and fire resistant. UAIC plans to create nurseries that can conserve and propagate native plant species.
- **Restoring Traditional Burning Practices.** UAIC is partnering with federal, state, and local agencies in coordinating efforts for getting red cards for Tribal Monitoring, planning traditional burns, and creating community-based fire-related film festivals to facilitate discussion and public education on the benefits of prescribed fire.
- **Developing Tribal Workforce.** UAIC is working to support and create training opportunities for Tribal Monitors and working to establish paid Tribal Monitor jobs with agency partners.
- **Expanding Traditional Ecological Knowledge Activities.** Throughout all of their actions, UAIC is coordinating with federally and non-federally recognized Tribes to promote native land stewardship. Indigenous ecological knowledge is at its heart a collaborative approach that emphasizes a reciprocal and continuous relationship to the land.
- **Coordinating Emergency Services.** UAIC is taking action to address emergency services as well as Tribal property maintenance and upkeep, land access, and fire safety issues.

Figure 5. Targeted Pillars by Actions from the United Auburn Indian Community

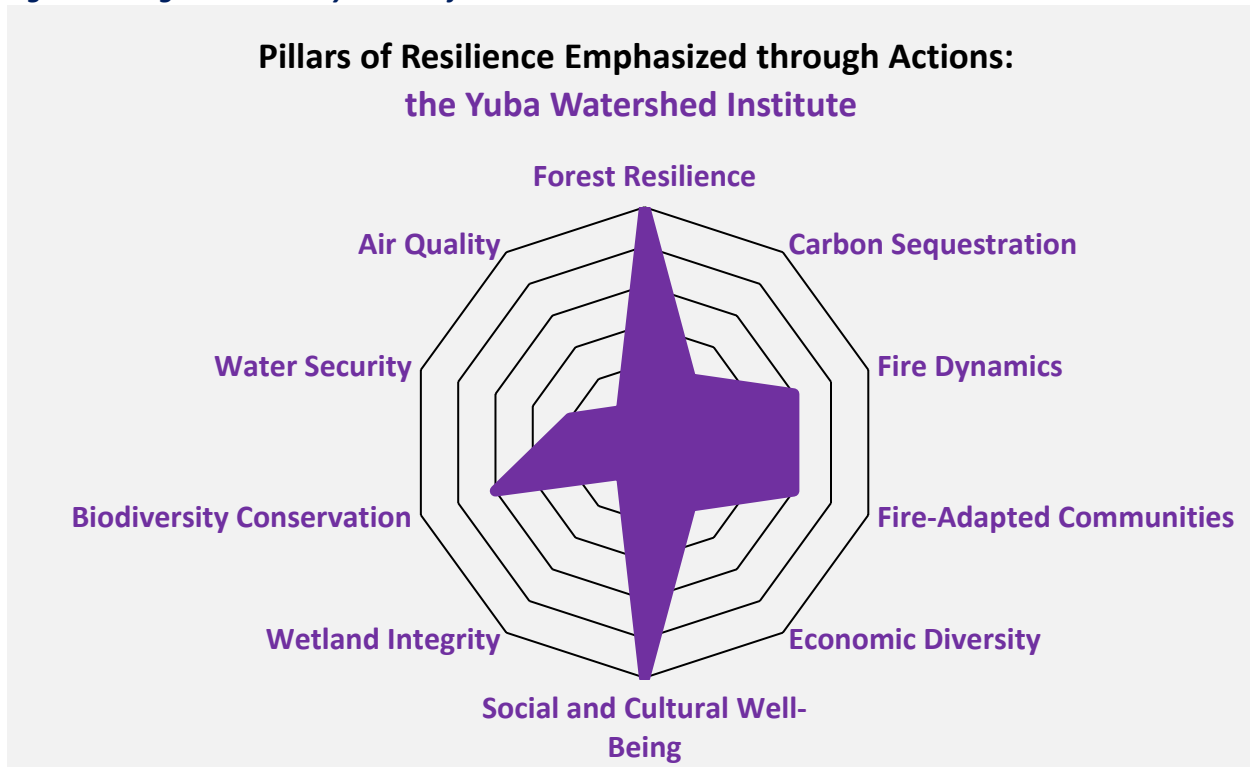


Yuba Watershed Institute

The Yuba Watershed Institute (YWI) is a non-profit located in Nevada City, CA with project areas located within Nevada County. YWI's work focuses on forest management, biological diversity, and sustainable use of natural resources within the Yuba River watershed. YWI partners with community organizations, private landowners, other non-profits, and with public land management agencies, such as the Bureau of Land Management to achieve its goals. Through their work on the 'Inimim Forest Restoration Project, a 2,000-acre forest management project, and their other projects YWI is taking and plans to take actions towards forest health and resilience (Fig 6). These actions target several resilience pillars and include:

- **Prioritizing Wildlife Habitat.** The YWI partners with wildlife biologist to select areas of desirable wildlife habitat and features that may need protection prior to fuel reduction implementation. Areas selected as suitable wildlife habitat are protected from any treatment or identified for handwork with reduced intensity of treatment as to not disturb sensitive wildlife species.
- **Reducing Fuel Loading.** The YWI has selected 314 acres within key forested tributaries of the South Yuba River for understory thinning. The objective of an understory thinning treatment is to reduce the risk of stand replacing fires that would prevent forests from serving their role in water quality protection.
- **Developing Strategic Fuel Breaks.** In partnership with California Department of Forestry and Fire Protection (CAL FIRE) and many local Firewise Communities, the YWI will be aiding in the development of the South Yuba River Fuel Break. When completed, the Fuel Break could stretch 20 miles from Bridgeport to the Malakoff Diggins. The project would be a series of strategically placed fuel breaks that could potentially change the fire effects of a northern wind-driven fire as well as fires starting in the South Yuba canyon. Additionally, the YWI has implemented approximately 136 acres of shaded fuel breaks that are located throughout the Ridge, a community within Nevada County north of the South Yuba canyon.
- **Engaging the Community.** In all the YWI projects, care is taken to hold community meetings to solicit input and desires. During both project development and implementation, the YWI aims to hold field tours, create information to be distributed, and reach out to individuals regarding fuel reduction and forest health work.
- **Increasing Local Workforce.** The YWI and the Nevada County Firesafe Council (NCFSC) aspire to join forces on multiple projects where the YWI would coordinate project management, overseeing environmental compliance, while the NCFSC would provide a locally trained fuel reduction crew. The support and development of this crew would directly create jobs for the community of Nevada County.
- **Diversifying Fuel Reduction Treatments.** The YWI is looking to develop more diverse fuel reduction treatments that would maintain a certain level of heterogeneity in the understory rather than create park-like forests. Related actions include the YWI's Forest Health Project Manager identifying areas prior to the start of implementation that would be suitable for reduced levels of treatment that would have little to no ground disturbance. Additionally, the YWI wants to develop a prescription that is less intensive than the often-utilized CalFire Shaded Fuel Break Prescription and develop a method of teaching this alternative prescription to the contractors who are often migrant laborers.

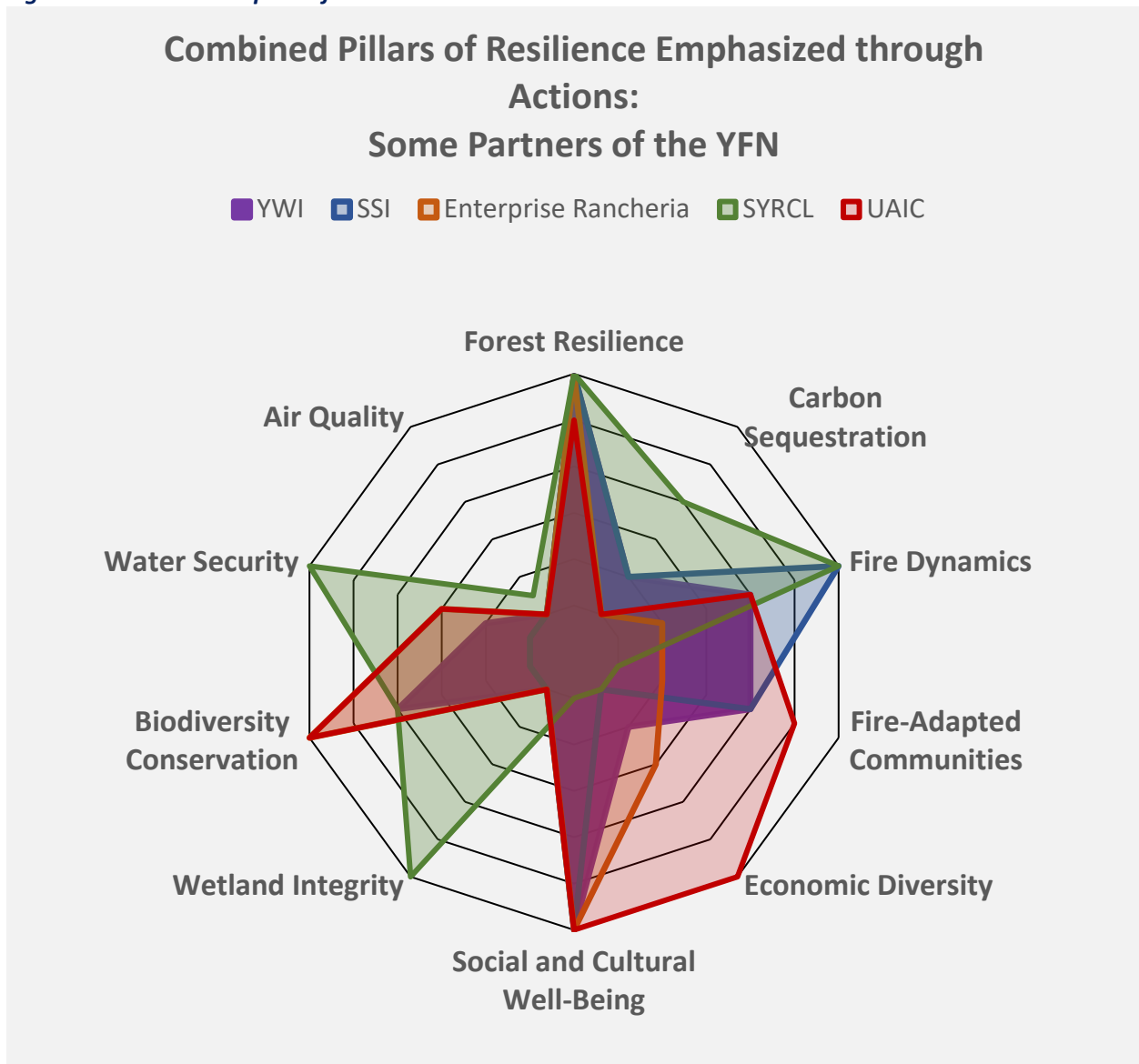
Figure 6. Targeted Pillars by Actions from the Yuba Watershed Institute.



Need for Collaboration

Individual stakeholders within the YFN Region of Influence ultimately have different objectives for forest health and resilience, as well as different expertise, skills, and capacity. However, by collaborating amongst organizations and across ownership boundaries, there is increased likelihood that multiple objectives can be met. Collaboration also increases opportunity for skill and resource sharing. No single organization or stakeholder will be able to reach the described desired outcomes alone. It will take strategic collaboration in order to meet objectives and see positive impacts on forest resilience for the region. Figure 7 demonstrates how collaboration amongst organizations can reach more resilience pillars. It also demonstrates areas that are not being addressed to the same extent as the other pillars (i.e., carbon sequestration, air quality, economic diversity) perhaps due to a lack of expertise, resources, combination, or another reason. Through the process of describing current and planned actions of organizations and how they emphasize certain pillars, the YFN can then identify areas of greatest need. Identifying such areas of needs amongst organizations, the YFN can work to fill gaps in resources and overcome barriers to implementation of landscape-scale forest health projects.

Figure 7. Combined Impact of Actions on Resilience Pillars



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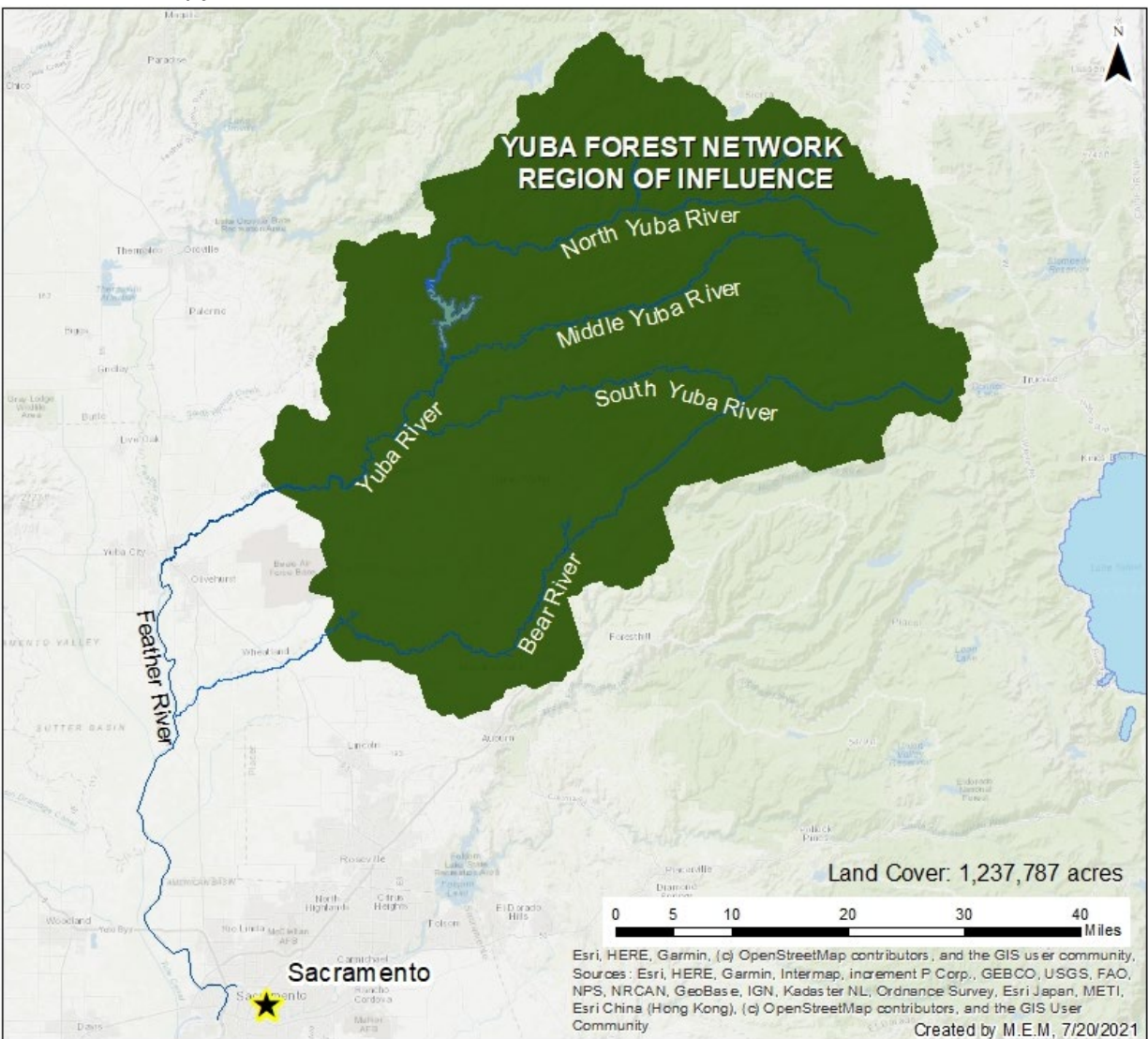
Appendix

Acronyms

BLM – Bureau of Land Management
BYLT – Bear Yuba Land Trust
CAL FIRE – California Department of Forestry and Fire Protection
CDFW – California Department of Fish and Wildlife
CWHR – California Wildlife Habitat Relationship
DOC – Department of Conservation
GIS – Geographic Information System
HRV – Historic Range of Variability
LWDA – Labor and Workforce Development Agency
NID – Nevada Irrigation District
SNC – Sierra Nevada Conservancy
SSI – Sierra Streams Institute
SYRCL – South Yuba River Citizens League
TEK – Traditional Ecological Knowledge
TCSI – Tahoe Central Sierra Initiative
UAIC – United Auburn Indian Community
UCCE – University of California Cooperative Extension
USFS – United States Forest Service
WCB – Wildlife Conservation Board
WUI – Wildland Urban Interface
YFN – Yuba Forest Network
YWI – Yuba Watershed Institute

Maps

Map 1. Main rivers within the YFN Region of Influence. The three forks of the Yuba River and the Bear River all eventually join with the Feather River.



Figures

Table 3. Breakdown of CWHR Type within the Yuba Forest Network Region of Influence. Total acres refer to the sum of acres of the CWHR type that fall within the YFN Region of Influence boundary. Percent cover refers to the percent of the YFN Region of Influence land cover that the CWHR type covers.

CWHR Type	Total Acres	Percent Cover	Dominant Habitat
Sierran Mixed Conifer	468340	37.84	Tree
Montane Hardwood	157483	12.72	Tree
Red Fir	85170	6.88	Tree
Blue Oak Woodland	79349	6.41	Tree
Montane Hardwood Conifer	79182	6.40	Tree
Ponderosa Pine	69993	5.65	Tree
Annual Grass	62948	5.09	Herbaceous
Montane Chaparral	52020	4.20	Shrub
White Fir	45652	3.69	Tree
Barren	39079	3.16	Non-vegetated
Lacustrine	18507	1.50	Aquatic
Urban	17126	1.38	Developed
Mixed Chaparral	15861	1.28	Shrub
Blue Oak-Foothill Pine	12584	1.02	Tree
Lodgepole Pine	8455	0.68	Tree
Cropland	5872	0.47	Developed
Montane Riparian	4143	0.33	Tree
Valley Oak Woodland	3424	0.28	Tree
Jeffrey Pine	2783	0.22	Tree
Perennial Grass	2728	0.22	Herbaceous
Wet Meadow	2640	0.21	Herbaceous
Subalpine Conifer	1899	0.15	Tree
Eastside Pine	1096	0.09	Tree
Closed-Cone Pine-Cypress	453	0.04	Tree
Riverine	360	0.03	Aquatic
Douglas Fir	228	0.02	Tree
Aspen	164	0.01	Tree
Sagebrush	159	0.01	Shrub
Valley Foothill Riparian	67	0.01	Tree
Fresh Emergent Wetland	45	0.00	Herbaceous

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