



# State of California

National  
Disaster  
Resilience  
Competition

Phase II  
October 27, 2015

Exhibit D:  
Factor 2 - Need/Extent  
of the Problem  
[ExhibitDNeedExtentofProblem.pdf](#)



## **EXHIBIT D: NEED/EXTENT OF THE PROBLEM**

### **UNMET RECOVERY NEED AND TARGET GEOGRAPHY**

The target geography correlates to the footprint of the Rim Fire and the communities in the mandatory evacuation areas and the evacuation warning areas, displayed in the Maps, Graphics, and Visuals folder. The census tracts in the MID-URN area are: 06109002200, 06109004100, 06109003100, 06109003200, 06109004200.

The State's forested upper watersheds form the critical green infrastructure backbone of California's complex and drought-stricken water system. Restoration investments in these watersheds build resilience in communities, economies, and people by increasing the resilience of watersheds to disturbances such as fire, pests, and drought. The Rim Fire is one in a series of wildfires to break records for intensity and size. These fires can trigger positive feedback loops that have cascading effects on forests, water resources and communities long after the fire is out. The cumulative effects of sequential events can be devastating and widespread. A comprehensive landscape approach to mitigating the effects of these events necessitates enhancing the health and resilience of upper watersheds, forests, and rural communities.

*Unmet Recovery Need in the MID-URN Area* Per Exhibit B, the target area for California's NDRC application includes the area of the [2013 Rim Fire and the evacuation areas](#). As described in Exhibit B, the Rim Fire did significant damage to the environment and public infrastructure. Rim Fire impacts decimated large tracts of already drought stressed forests, and has led to erosion and sedimentation into streams and reservoirs, reducing water quality and reservoir capacity, affecting the local community and downstream users. Erosion has exacerbated road



damage caused by the fire and limited access to forest roads. The Fire also caused [extensive damage](#) to the San Francisco Public Utility Commission's hydroelectric infrastructure in the area.

[Earth Economics](#) estimated that in the first year following the Rim Fire, environmental damage measured between \$100 and \$736 million. These estimates rely on an analysis of ecosystem services provided by a healthy forest and watershed. Furthermore, the U.S. Department of Agriculture Forest Service (USFS) estimated over \$40 million in lost recreational uses and visitor fees. This estimate is indicative of the impact on the local communities whose economies connect to the forest through tourism, recreation, associated services, timber, and other wood products, such as fence posts, animal bedding, or biochar.

Addressing these unmet needs requires investment to address immediate risks, but also to restore long-term ecosystem services. In the near-term, investments are needed to support sustainable forest management practices on a scale that ensure healthy landscapes and support timber and wood product industries. These activities include thinning overstocked forests, reforestation of the burned areas, removal of dead wood and establishment of firebreaks to protect reforested areas and critical infrastructure.

The fire also highlighted the need for community infrastructure improvements to increase resilience, but that are not included in the NDRC. This includes vulnerabilities in communications, transportation, and water infrastructure. Access to communities – both for evacuation and staging of emergency equipment was challenging. Water infrastructure also proved to be vulnerable and, in some cases, inadequate. A 15.7-mile long wooden flume, the [Main Tuolumne Canal](#), brings water from the Lyons Reservoir to local communities. Above ground and [constructed of wood](#), the flume carries water through a steep canyon, which is itself



at high risk of fire. In some housing developments near the burn area, fire hydrants and fire suppression infrastructure were also unable to support fire-fighting activities.

***Impacted and Distressed Characteristics in the MID-URN Area*** Economic and environmental factors already affecting the region accentuated the damage from the Rim Fire. Tuolumne County is an economically fragile area. Unemployment in the Target Area is currently at 15.4 percent, which is 158.4 percent of the national average. The region's workforce and economy, closely tied to the forest through timber and wood products, tourism, recreation, and associated service industries, increases in vulnerability when these forest-based industries and services are impacted by disaster. In 2009, recreation, retail, or accommodation and food services represented over [20 percent of the workforce](#) employment. The workforce is also highly seasonal. Averaged over the 2000-2011 period, the size of the workforce peaks between July and October. The Rim fire began right before Labor Day weekend, forcing the cancellation of hotel and campground reservations and closure of portions of Yosemite National Park, Stanislaus National Forest, and other attractions – at a peak time for tourism, recreation, and employment. Local residents suffered not only from these economic impacts, but also from extensive evacuations, exposure to smoke, and disruptions to work, school, and other activities. These impacts were especially challenging for the elderly, the young, and residents reliant on employment in resource-dependent sectors.

Since the Rim Fire, residents in Tuolumne County have had difficulty obtaining and maintaining homeowner's insurance. In February 2015, the Tuolumne County Board of Supervisors launched a [community survey](#) to measure the difficulty for County residents obtaining and maintaining affordable homeowner insurance due to fire loss concerns by



insurance companies. Access to insurance remains a challenge common to communities impacted by wildfire, including [the recent Butte and Valley fires](#).

As discussed in Exhibit B, in addition to the region's fragile economy, [current drought conditions](#), [tree mortality](#), and the [past history of severe wildfires](#) accentuated the impact of fire throughout the region.

***Impacts Beyond the MID-URN Area*** Building resilience in the upper watershed will have statewide benefits. Roughly [sixty percent of California's developed water supply originates](#) in the Sierra Nevada region. When forests burn, impacts on water supply and quality occur due to soil erosion and sedimentation in reservoirs and downstream water conveyance systems (Minear and Kondolf 2009). For example, the impacts from the Rim Fire extend to Don Pedro Reservoir, which provides drinking and irrigation water to the Central Valley, California's agricultural hub. Loss of reservoir capacity due to sedimentation is often permanent (Poff and Hart 2002). The fire also damaged infrastructure in the San Francisco Public Utility Commission's water and power systems, which originate in Tuolumne County.

Investment in resilience in the State's watersheds will also reduce air pollution and greenhouse gas (GHG) emissions. Healthy forests play an important role in mitigating climate change due to their ability to store carbon. Forests absorb carbon dioxide from the atmosphere through photosynthesis and store large amounts of carbon in living woody tissue. GHG emissions from a single large, destructive fire like the Rim Fire can rival the annual emissions from large cities. The Rim Fire released millions of tons of smoke over hundreds of miles ([Air Quality Update-August 8, 2013](#), [NOAA News Clip-Smoke](#)) and over 11 million metric tons of GHG emissions, roughly the equivalent of the annual GHG emissions from 2.3 million motor vehicles ([Sierra Nevada Conservancy - Rim Fire Fact Sheet](#)). Dead and dying trees, like those



remaining after the fire, can release even more GHG emissions than the event itself, and these releases occur for many years as the trees decompose ([National Park Service Impacts of Fire Report](#) – pg. 20, 21). Carbon storage will continue to be degraded due to vast treeless landscapes, which impugn both air quality and critical carbon storage ([Quantitative Evidence for the Increasing Forest Fire Severity](#) – page 13/Report page 29, highlighted).

## **RESILIENCE NEEDS WITHIN RECOVERY NEEDS**

### **Value of Enhanced Resilience**

The impacts of the Rim Fire, given its vast scale and reach, are difficult to establish in precise monetary terms. However, the analysis performed by Earth Economics in the 2013 Rim Fire Report indicated that the top end of environmental benefit losses approached \$736 million. Further, the direct emergency response to the Rim Fire was \$127 million. FEMA PA funds totaled over \$23 million, largely reimbursements for emergency response and debris clean-up. The total known costs or lost benefits thus approaches \$1 billion. Recent extreme fires such as the Valley and Butte fires, with significant loss of homes, each exceed the \$1 billion price tag.

The three pillars of the Community and Watershed Resilience Program (CWRP) are designed to reduce the risk, size, and intensity of wildfires; provide economic development opportunities; and support community and ecosystem resilience.

Thinning overstocked forests results in less intense and damaging fires when they occur, and increases the odds of being able to control wildfires at a smaller size. Biomass removal and fuel breaks are designed to reduce the size and intensity of wildfire and to protect communities.

[Analysis of a neighboring watershed](#) estimated the economic value of undertaking forest and watershed activities like those proposed in the Community and Watershed Resilience Program. This avoided cost study shows that fuel treatments (e.g., thinning) can reduce the size and



intensity of wildfires and that the cost savings of these treatment can be up to three times the cost. The beneficiaries of these savings include state and federal governments, residents, timber companies, non-industrial private forest landowners, and utilities. Increased resources to remove biomass (i.e., thinning) creates jobs and can generate revenue through bioenergy and wood products.

The Community Resilience Centers will provide a safe shelter and common point for members of the community and their pets and livestock, concentrating them in safe places, and allowing first responders to navigate and fight the fire with fewer constraints. Further, throughout the year these CRCs will serve as a platform to enhance community connectivity and social cohesion through needed programs and community workshops – imperative for fostering social resilience in rural communities. Some uses will include workforce training, community workshops, meals on wheels, college courses, and a Head Start program.

### **General Amount of Needed Investment in Resilience**

The costs proposed in the CWRP represent the core needs for implementing this pilot project, which totals approximately \$117 million. Through the community engagement process, numerous other resilience needs were identified throughout the County, but NDRC limitations prevented their inclusion in final CWRP design. Some of these items include installation of fire hydrants, communications systems for first responders, forest access roads, community development programming, rebuilding or repairing recreational amenities such as campsites and boat launches, a day care center, fire trucks, replacing water transmission lines, water source development, and more. The total funds that would be needed to address these additional resilience needs exceed \$800 million.

### **Describe Vulnerable Populations and Quantify Disaster Impacts**



Low- and moderate-income people (LMI) and vulnerable populations in Tuolumne County were disproportionately impacted by the Rim Fire. As noted above, a large share of employment is associated with tourism and recreation. The LMI population in the County was thus impacted by severe reductions in employment opportunities, given that tourism levels declined immediately following the Rim Fire. There is a significant elderly population in Tuolumne County, as many Californians have chosen to retire to the area due to its rural character and the lower cost of living. In addition, while no studies have been done on health impacts among the elderly, it is likely that the effects of the Rim Fire have presented additional health impairments.

### **Describe Factors That Enhance or Inhibit Resilience**

California has experienced several major fires since the 2013 Rim Fire – a situation California Governor Edmund G. Brown has referred to as the “new normal.” Response and recovery require unprecedented levels of coordination across local, state, and federal partners. The Office of Emergency Services (OES), OPR, HCD, FEMA and other agencies have made a concentrated effort to take proactive steps to learn from these fires. CAL FIRE, in cooperation with Cal OES, has concluded Post-Fire Watershed Emergency Response surveys of the recent Butte and Valley fires, and will continue to coordinate and track the implementation of emergency protective measures for identified life safety hazards, and subsequent resource protection measures.

Challenges to achieving resilient communities and watersheds include: inadequate resources and trained personnel to remove biomass from the forest, both in burned and adjacent areas; lack of facilities to process biomass that is removed; and lack of community resources to support education, training, and economic diversification. Rehabilitation and prevention of wildfires are usually limited by budgets, the availability of a trained work force, and adequate infrastructure





such as sawmills and bioenergy plants. Our program is capitalizing on ongoing work and building new partnerships to overcome these barriers.

The USFS and other landowners are challenged by [limited budgets](#) and markets for biomass. Especially during active fire seasons, funding for forest management and fire prevention may be limiting, thus delaying or preventing forest health activities. As these activities are delayed, more fuel builds up and the risk of severe fire increases. Lack of nearby biomass energy or wood products facilities further weakens the demand for thinning. This accumulation of biomass becomes fuel for fires and increases susceptibility to pest invasions, inherently decreasing forest resilience in the face of climate change and under threat of extreme wildfire.

Tuolumne County faces many challenges common to rural communities. Tuolumne County is rural in nature, spanning 2,274 square miles (1,455,360 acres), with a population base that is distributed in remote and sometimes isolated areas of the county. The large area and low population densities make it challenging to get services to all residents who need them, including food and health care services for elderly residents, but also education opportunities to younger residents. The development of community resilience centers designed around these needs and the structure of the community will help address these challenges. These challenges are not unique to Tuolumne County, but are replicated throughout forested mountain communities in the West. Therefore, there is ample opportunity for replicating this pilot program.

Tuolumne County has a number of organizations in place that are working to boost the resilience of the region from wildfires and the resulting infrastructure and economic damage that came with these disasters. This includes two FireSafe Councils, which work with homeowners and businesses to develop fire resilience strategies. The [Southwest Interface Team](#) (SWIFT) is a bi-county collaboration that has worked to develop and maintain a set of strategic fuel breaks to



protect communities, timber resources, and other vital assets in the region. In the Rim Fire recovery effort, new methodologies for the restoration of forests are underway, which include a departure from traditional methods. Not knowing what future climates and growing conditions will materialize, a diversity of seedlings are being strategically planted with new spacing patterns to promote soil retention and water quality— a strategy that will promote long-term resilience. CAL FIRE continues to implement fuels reduction projects in cooperation with private landowners to reduce fire impacts near high-risk residential communities.

## **APPROPRIATE APPROACHES**

### **General Description of Optimal, Eligible Program Type(s)**

The optimal, eligible program type that best addresses resilience needs is one that not only accounts for the needs of the community, but that establishes a mechanism for the community to work in concert with the natural environment. The Community and Watershed Resilience Program (CWRP) is based on investments in forests and public facilities to support the development of an interconnected system of community, economic, and forest ecosystem resilience. The CWRP relies on a comprehensive risk approach informed by historical data and future risk. The risks considered include the risks of wildfire and other disturbances under historic and future conditions. In developing our program for watershed and community resilience, we systematically considered three interdependent risks: risks of current and future forest conditions, risks to local communities, and risks to the State’s water system.

***Current and Future Forest Conditions*** Fire is a natural process in California forests (Collins and Skinner 2013). Historically, frequent, low-intensity fires maintained relatively open, patchy stands composed primarily of large, fire-resistant trees across much of the landscape. However, over a century of fire suppression coupled with reduced timber



harvesting, notably on federal lands, have shifted forest structure and composition. This shift has resulted in increased density of trees (i.e., trees per acre), smaller average tree diameters, higher proportions of shade-tolerant tree species, and elevated surface fuel loads relative to historic conditions. Alongside these changes, the proportion of high-severity fire increased in mixed-conifer forests in the Sierra Nevada from 1984 to 2010 (Collins et al 2011; van Wagtenonk and Fites-Kaufman 2006; and Perry et al 2011). Fire sizes and annual burn area increased during the same period. These trends are linked to stand- and landscape-scale changes in forest structure and a warming climate.

The State's historic drought conditions have also contributed to unprecedented tree mortality. As noted in Exhibit B, these dead trees present represent breeding grounds for expanding bark beetle populations and provide dry fuel that will further exacerbate the threat of large wildfire.

The state's series of climate change assessments (described in Phase 1, Exhibit C) have characterized many of the future risks to the MID-URN area and the state, as a result of a changing climate. Future risks include: [increasing temperatures](#); shifts in vegetation and ecosystem composition; increase in the frequency and severity of extreme events, including heat waves, extreme storms, and [wildfire](#); and reductions in snowpack at higher elevations. Drought and climate change are expected to increase fire intensity and areas susceptible to fire.

***Risks to the Local Community*** Wildfire poses significant public health risks, especially to the elderly, children, and the infirm. Wildfires also pose risks to homes, businesses, and infrastructure and lead to economic disruptions. The economic impacts disproportionately affect workers in tourism, recreation, and service industries, as well as the timber and wood products



industries. The Rim Fire burn area also included tribal lands, historic, sites, and other areas of cultural significance.

***Risks to the State's Water System*** The impacts of wildfire are as diverse as they are severe, affecting not only the communities and the natural and built environment in the immediate vicinity, but further the “downstream” watershed communities and cities, who are also end-users of this water supply. The [Tuolumne watershed is extensive](#). It supplies the needs of 2.4 million people in the Bay Area and 550,000 people within the watershed, irrigates more than 300,000 acres of prime agricultural land, and powers two hydropower systems ([Mount 2010](#)). Given that California is currently in a prolonged severe drought, [with 5,433 residents without water in the Central Valley](#), the potential for catastrophe across the Tuolumne watershed is increasingly heightened.

These threats, hazards, and vulnerabilities are common in communities and watersheds across the Sierra Nevada region. Future risks from the threats, hazards, or vulnerabilities include the cumulative effects of repeated large, high intensity wildfires on local rural economies. Over time and large areas, impacts can include the elimination of resource-based companies such as sawmills and contractors. Capacity for resilience and adaptation is strongly influenced by the size and diversity of a community's economic base.

### **General Description of Optimal, Ineligible Program Type(s)**

An optimal, ineligible program type would include satisfying the full menu of community, ecosystem, and regional resilience needs discussed, representing substantial, numerous and valid needs, which fall outside the parameters of the NDRC. A description of such activities is included above, but include emergency response and communications equipment, infrastructure investments, and business development programs.

