Recommendations for Comprehensive Sierra Nevada Ecological Restoration

Submitted by the Forest Health and Resilience Working Group of the Governor's Tree Mortality Task Force
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Executive Summary

The Sierra Nevada and southern Cascade Range are one of California's most environmentally and economically important natural resources. They are the source of at least 60% of California's developed water supply, are equally critical to greenhouse gas (GHG) emission reduction goals, wildlife habitat, and as a source of raw materials and economic opportunity. Whatever we particularly value or benefit from these ecosystems is dependent upon healthy and resilient forests.

There is growing scientific documentation that these forests are at risk of not providing the same ecological goods and services that we have come to expect. An historic drought in a warming climate has amplified the cumulative consequences of 150 years of post-European settlement activities and management policies, including: aggressive fire suppression, widespread harvesting of old growth fire resilient trees, the legacy of past mining, and insufficient forest management treatments. The unintended consequences of these activities are particularly evident in the increase in uncontrollable wildfires, with their vast emissions of GHG; greater susceptibility to bark beetles and other pests; and increasing numbers of threatened and endangered wildlife species.

As California continues its global leadership role in reducing GHG emissions, the stark reality is that our laudable GHG reduction targets are probably not achievable if we fail to address the major contributors to this growing trend of forest mega-disturbances. According to most research, these types of events will likely worsen in coming decades due to increased temperatures during periods of future droughts.

The capacity of Sierra forests to capture carbon dioxide from the atmosphere and sequester it is rapidly declining. The rapid growth in size and severity of wildfires is already offsetting GHG reductions occurring in other sectors. For example, the 2013 Rim Fire is estimated by the USFS to have emitted 12.06 million metric tons CO_2e, which was more than 3 times the year-on-year GHG reductions achieved in all other sectors that year.

State and federal partnerships for ecosystem restoration already exist in other states and it is time for such a partnership for California's Sierra Nevada. We recommend robust implementation of programs such as the Watershed Improvement Program (WIP), the Fire Adapted 50 Project, the Cohesive Strategy, and the California Headwaters Partnership to help protect one of our most important natural resources.

Problem Statement

The Governor's Tree Mortality Task Force (TMTF) has focused on addressing public safety risks created by the mortality of an unprecedented number of trees in California. The tree mortality event has been most pervasive in California's Sierra Nevada region. Unfortunately, little can be done to halt the current bark beetle epidemic. A second and equally important dimension of the TMTF is a focus on the health and resiliency of private, state, and federal forests. There is much that needs to be done to restore and maintain forest health and resiliency.

Action is needed commensurate with the risk to the environmental and economic value of the Sierra Nevada region to the State of California. The Sierra Nevada and southern Cascade Range are one of California's most environmentally and economically important natural resources. As the Chairman of the Tuolumne County Bark Beetle Task Force succinctly described the current situation in the Central and Southern Sierra, "We are experiencing an unprecedented ecosystem-wide change event."

The TMTF's Forest Health and Resilience Working Group (FHRWG) recognizes that whatever we particularly value or benefit from, the Sierra ecosystem is dependent upon healthy and resilient forests. However, natural variability throughout the Sierra precludes a "one-size-fits-all" solution. Instead, watershed, or even sub-watershed restoration plans will need to be developed and implemented.

The FHRWG believes that Sierra Nevada forests are substantially unhealthy and in urgent need of treatment. For Sierra-wide ecological restoration, we recommend immediate implementation of collaborative, multi-landowner programs such as the WIP, Fire Adapted 50 and Cohesive Strategy projects. Programs like these should be supplemented by enhanced efforts, including funding, from relevant state and federal agencies, particularly the California Department of Forestry and Fire Protection (CAL FIRE), Bureau of Land Management (BLM), California Air Resources Board (CARB), California Public Utilities Commission (PUC), California Energy Commission (CEC), and the California Department of Fish and Wildlife (CDFW).

State and federal partnerships for ecosystem restoration exist for the Florida Everglades and the Chesapeake Bay Region. We believe it is time for such a partnership for California's Sierra Nevada, which will effectively link public and private interests that are beneficiaries of the Sierra's ecological and economic wealth.

Rationale for the Recommendation

The west slope of the Sierra and southern Cascades are the source of at least 60% of California's developed water supply, and equally critical to Greenhouse Gas (GHG) reduction goals, wildlife habitat, and as a source of raw materials and economic opportunity. The FHRWG believes that the Sierra Nevada forests are at risk of not providing the same ecological goods and services that we have come to expect from these forests.

The current drought and unprecedented bark beetle epidemic is responsible for killing over 102 million trees in California since 2010, mostly in the central and southern Sierra, including more than 62 million in 2016 alone. Today's crisis reflects a continuing historic drought in a warming climate that has amplified the cumulative consequence of 150 years of post-European settlement activities and management policies, including: aggressive fire suppression, widespread harvesting of old growth fire resilient trees, the legacy of past mining, and insufficient forest management treatments. The unintended consequences of these activities are particularly evident in diminished forest health and resiliency, and increasing numbers of threatened and endangered wildlife species.

A large percentage of recently unburned federal, state, and private forests within the Sierra contain dense, overstocked stands with heavy fuel loading and excessive ladder fuels that exacerbate the risk of these forests burning at excessively high intensity. The majority of forest research conducted in California indicates that wildfires have been increasing in number, size and severity (e.g., Miller and Safford 2012). The explosive fire behavior that occurred during the 2014 King and 2013 Rim Fires are prime examples of extreme fire behavior, leading several prominent research scientists to conclude that we have entered an era of "megafires" (Stephens et al. 2014). Fuel reduction treatments are generally effective for increasing the resilience of forests to moderate and high-severity wildfire, and are typically accomplished with few unintended consequences to the ecology of these systems (Stephens et al. 2012).

The cost of fighting megafires is immense. Between 1985 and 1999, the annual cost for federal firefighting exceeded $600 million only twice. Between 2012 and 2015, federal agencies spent no less than $1.6 billion each year on firefighting, and in 2015 costs surpassed $2 billion for the first time (NIFC 2015). The U.S. Forest Service, which accounts for approximately 70% of these costs, spent 16% of its 1995 appropriated budget on firefighting; in 2015 it accounted for more than 50% (USFS 2015). Fire suppression has increasingly come at the expense of other programs, including fuel and vegetation management, and forest restoration.

As California continues its global leadership role in reducing GHG emissions, the stark reality is that California's GHG reduction targets may not be achievable if we fail to address the major contributors to the growing trend of mega-disturbances, notably uncontrollable wildfires and bark beetle epidemics. According to most research, these types of events will likely worsen in coming decades due to increased temperatures during periods of future droughts (Millar and Stephenson 2015).

Sierra forests' capacity to sequester carbon is rapidly declining. The rapid growth in size and severity of wildfires has the potential to offset the GHG reductions being achieved through our investments in reducing emissions in other sectors. For example, the 2013 Rim Fire is estimated to have emitted 12.06 million metric tons of CO_2e (Garcia et al. 2017), which was more than 3 times the year-on-year GHG reductions achieved in all other sectors statewide in 2013 (CARB 2016). Additionally, the USFS and the Sierra Nevada Conservancy estimate that dead and decomposing vegetation from the Rim Fire will emit four times as much GHG in the coming decades (Joint testimony of USFS and SNC before CARB, August 2015). An additional concern is that despite broad agreement on reforesting lands burned, lack of funding and staff have made reforestation very difficult, except on private industrial timberland where it is completed. This is a common challenge as wildfire acres and fire suppression costs have increased.

There is broad consensus that a significantly greater pace and scale of forest health treatments is urgently needed to protect and improve the remaining green forest areas on state, federal and private lands, with the overarching goal of moving forests to a more resilient condition (North et al. 2009, North 2012, North et al. 2012, SNC 2014, Coppoletta et al. 2016).

Supporting Facts

- California has the largest population (11.3 million) living in the wildland-urban interface (WUI) of any state. This is the area where development is adjacent and interspersed with wildlands, including forests and grasslands, and where homes and lives are more at risk from wildfire (Kenward et al. 2016).

- Over the last five years, California has seen an average of 94,000 more acres annually burn in large wildfires on U.S. Forest Service land than was typical in the 1970s. Of greater significance is the increased percentage of high severity area burnt, and the fact that the wildfire season is now an average of 75 days longer in the Sierra Nevada than it was in the 1970s (Kenward et al. 2016, Westerling 2016).

- There are an estimated 20 million acres of forestland in California with high wildfire threat that may benefit from fuels reduction treatment, which would serve to both reduce the risk of wildfire (and the resulting carbon loss, and black carbon and GHG emissions) and improve ecosystem health. For example, it is estimated that less than 20 percent of forests in the Sierra Nevada region receive needed fuel treatments, leaving remaining forests in a degraded state with higher risk to losses from severe wildfires (Draft California Forest Carbon Plan, FCAT 2017).

The Sierra Nevada Conservancy succinctly reported that:

> Overgrown forests are more susceptible to insect attack and drought because there are too many trees competing for limited water and nutrients. Reducing competition by doing more restoration, such as ecologically-sound thinning, and using prescribed or managed fire, can help protect our still-green forests from future drought, insects, and disease (North 2012, Hood et al. 2015, Fettig and Hilszczański 2015, Boisramé,et al. 2016, Coppoletta et al. 2016)

The U.S. Forest Service's Pacific Southwest Region (Region 5) has identified a major source of our current challenge stating:

> With the increasing size and costs of suppressing wildfires due to climate change and other factors, the very efforts that would protect watersheds and restore forests to make them more resilient to fire in the future are being squeezed out of the budget. In 2015, fire management alone consumed 52 percent of the Forest Service's national budget (USFS 2015).

These statements reflect the reality that without implementation of robust and sustained restoration programs, forests within the Sierra Nevada will continue their ecological decline, simultaneously reducing their contributions to the various economic, biological, physical, and social components of California society.

Ecological Restoration Goals

Over the last decade, the U.S. Forest Service, in partnership with state agencies, academic researchers, and Non-Governmental Organizations (NGOs) have invested in scientific studies focused on learning more about how to respond to high severity wildfire risk while sustaining at-risk wildlife species within the national forests of the region. Two Forest Service publications, *An Ecosystem Management Strategy for Sierra Mixed-Conifer Forests* (North et al. 2009) and *Managing Sierra Nevada Forests* (North 2012), are examples of a shift in forest management thinking towards managing forest structure to emulate the natural heterogeneity of mixed conifer forests as a viable approach to restore resiliency to disturbance (e.g., fire), and to also manage for the variety of wildlife habitats characteristically found in these forests. Sierra Nevada forests provide habitat to hundreds of wildlife species, and a number of these species merit special protection and management considerations. The Sierra Nevada forests also are the primary catchment area and delivery system for at least 60% of the State's drinking water. The ecological restoration goals should include retention and/or improvement of old forest characteristics, while managing tree densities such that forests are healthy, reflect the diversity of habitats found across the varied environments of the Sierra, and are made resilient to wildfire. Collaborative multi-landowner programs are in a position to pursue these goals consistent with existing state and federal statutes and regulations, and consistent with *An Ecosystem Management Strategy for Sierra Mixed-Conifer Forest* (North et al. 2009). In addition they could implement the concepts stated by North et al. (2009) and North (2012) through collaboration with interested stakeholders, working on cooperative efforts at the landscape level, using planning tools such as Habitat Conservation Plans (HCPs) and other appropriate planning documents.

Elements of a Sierra Ecological Restoration Program

The dedication and cooperation of diverse interests has demonstrated that federal, state, and local partnerships for ecological restoration in the Sierra Nevada is a feasible goal. The following elements are required to broadly implement the principles discussed above and are consistent with the most current scientific research.

A. *Reintroduction of fire on the landscape*

There is an imperative to reduce mega-disturbances, such as massive wildfires and large-scale insect outbreaks, by re-introducing beneficial fire, both prescribed and managed natural ignitions, as an on-going means of restoring and maintaining Sierra ecological health. We now have a mechanism to do that through rapidly implementing the recently signed, broadly supported Fire MOU Partnership. Allocating resources and staff is essential to implement it at an ecologically meaningful scale throughout the Sierra and beyond. A key part to successfully expanding a prescribed fire program is to share National Wildfire Coordinating Group (NWCG) qualified or CAL FIRE prescribed burn personnel and resources with federal and state agencies who provide financial assistance to private landowners to plan and implement prescribed fire. Public agencies that have programs and funding for prescribed burning often do not have highly qualified people for projects and must rely upon others that have qualified staffs. For example, expanding cooperation and assistance from CAL FIRE through use of their Vegetation Management Program (VMP) program with landowners being funded by FIRE MOU Partners would greatly contribute to increasing the number of projects. Another key component is increased technical capability to forecast air quality conditions, which would support the increased pace and scale of prescribed fire.

B. *Mechanical Thinning Treatments*

Along with increased fire use, we need to increase strategic mechanical forest treatments in an ecologically sound manner. Properly planned and implemented, ecological-based thinning can simultaneously increase fire resiliency, reduce susceptibility to insect epidemics, protect and enhance wildlife habitat, create jobs, support rural communities, and enable beneficial fire to be restored to the portion of the forest requiring thinning.

C. *Rebuild California's Forest Products Industry*

It is also critical to recognize that until reliable sources of additional raw material are available it will not be feasible to construct new forest products infrastructure. If the scope and scale of work necessary to restore the ecological health of the Sierra is undertaken, then additional manufacturing capacity is essential. Incentivizing new markets and building construction methods could provide synergy with California's climate goals. One such action would be to incentivize the construction of commercial buildings using Cross Laminated Timbers (CLT) – Mass Wood technology, which would lead to substantial CO_2 sequestration by substituting wood for more highly energy embodied building materials such as steel and cement. Community scale biomass utilization and smaller diameter (<5") wood utilization for biofuels or nanofiber products could be developed with financial assistance. Some additional technological advancements are necessary for biofuels or nanofiber products to become feasible utilization sources. Wood products industry representatives and state and federal agencies should collaboratively forecast and develop a realistic program of production levels expected to be generated from forest projects as a by-product of mechanical treatments. This can help the wood products industry to plan for long-term infrastructure investments.

D. *Improve Forest Structure for Wildlife Habitat*

Projects should aim to conserve and enhance wildlife habitat and values, including retention and enhancement of particular individual trees (e.g., large, damaged or diseased trees) and large tree clumps in the scientifically-based individual tree, clump and opening (ICO) strategy that provides habitat diversity indicative of historic conditions (North et al. 2009 and North 2012).

E. *Ecological Restoration*

It is important to identify and implement additional ecological restoration actions within treatment areas. The goal of these actions will be to rehabilitate special aquatic features, restore degraded riparian areas and meadows, and restore areas suffering from erosion, toxic mining legacies, and excessive sediment discharge.

F. *Legislative and Administrative Reforms*

A regulatory framework is required to reduce the burdensome cost associated with infrequent small harvests by the non-industrial landowners within the state while ensuring environmental protection. Legislative and administrative reforms are required to enable private landowners to participate in use of prescribed fire with the support and assistance of state and federal agencies. Additionally, CEQA and NEPA compliance is often implemented in an overly cumbersome and repetitive manner. Efficiency could be achieved by combining NEPA and CEQA efforts where possible, as well as undertaking larger scale restoration planning utilizing state-of-the art environmental assessment technology.

G. *Biomass Removal*

A particularly challenging impediment to ecological restoration is the high cost of removing the excessive volume of shrubs and smaller trees that currently lack an economic market. Without needed biomass removal, there will be much less progress on restoration goals. In turn, forest susceptibility to megafires and insect epidemics will grow, as will the conversion from biologically diverse and economically important forests to lower value shrubs and grasslands. Currently, the most viable option is to keep our bioenergy plants open and functioning, as they significantly reduce GHG and pollutant emissions compared to open burning and enable forest restoration work to proceed in a predictable manner.

H. *Adequate Funding for Restoration*

Restoring Sierra ecosystem health requires a significant investment. Neither the Congress, nor the State Legislature, major water purveyors, nor other current beneficiaries are making adequate investments despite receiving sustained and substantial benefits. The full range of beneficiaries should contribute to restoring Sierra ecological health. Through such an appropriate cost-share approach, the impact can be fairly shared and minimized for all.

I. *Monitoring and Adaptive Management*

Adaptive management must incorporate a program of research, periodic monitoring, and reporting to ensure the success of ecological restoration. The periodic census taking of desired-effects versus actual-effects should be done using a comprehensive forest inventory that can, with certainty, measure if the desired objectives are being met and help redirect a restoration program if it is not meeting the desired objectives.

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