

## **Prioritizing Fuels Reduction Projects in Headwater Forests to Protect California's Rivers and Clean Water Supply**

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### **Objectives:**

- Develop a prioritization methodology to identify locations for fuels reduction to maximize benefits to river ecosystems and clean water supply.
- Use the prioritization methodology to identify 3-5 priority locations for prescribed fire in the Cosumnes, American, Bear, and Yuba (CABY) region.
- Create educational materials to inform stakeholders about the benefits of targeted fuels management for river health and clean water supply.

### **Significance:**

California's upper watersheds are a critical piece of its natural water infrastructure, as the watersheds in the Sierra Nevada are the source of 60% of California's water supply. Headwater forests contribute to reliable water supply and improved water quality by capturing, storing, and filtering water. However, a legacy of over 50 years of fire suppression policy has resulted in headwater forests that are overgrown, resulting in greatly increased risk of wildfire, especially when combined with the effects of climate change and continued development in the wildland-urban interface. Over a million acres burned in California in both 2017 and 2018, the two worst fire years in state history<sup>1</sup>. Wildfires, especially catastrophic wildfires, pose a significant threat to river ecosystems and clean water supply because they can disrupt aquatic ecosystems and result in dramatic sediment influxes that inhibit water supply infrastructure functionality.

Fuel treatments, including prescribed fire and thinning, can reduce wildfire risk and improve forest health, but limited funding, staff capacity, public opinion, and arduous permitting make implementing fuel treatments a challenge<sup>2,3</sup>. Research suggests that fuels reduction in less than 10% of a watershed can be sufficient to significantly reduce wildfire risk to water supply<sup>4</sup>. Therefore, identifying high priority areas for prescribed fire will allow forest managers to focus their limited resources on project areas that will yield the greatest benefits. While fuels treatments to protect water supply have been prioritized for some watersheds in Colorado, to our knowledge, no such prioritization has yet been done for Sierra Nevada watersheds.

### **Background:**

High intensity wildfire threatens river health, water supply, and water quality. When the forest canopy burns, the previously cool, shady riparian zone is exposed to sunlight. This results in increased stream temperatures, which can reduce dissolved oxygen, shrink or fragment the habitats

of native fish, and change the species composition of a stream<sup>5,6</sup>. Wildfires also cause increased erosion and sediment delivery to rivers and streams, which degrades water quality, reduces suitable spawning habitat for fish, and can suffocate fish, amphibians, and aquatic insects<sup>7-9</sup>. In the aftermath of a fire, increased sediment yield can interfere with drinking water treatment, even temporarily shutting down treatment plants by clogging filters and intakes<sup>10</sup>. Suspended sediment in the water hinders detection of viruses and bacteria and limits effective disinfection<sup>11</sup>. Sediment from wildfires also reduces reservoir storage capacity and damages hydropower equipment.

Forest management over the last century has resulted in less resilient forest ecosystems. A federal and state policy of extinguishing all forest fires has created a forest mosaic that is highly prone to crown fires<sup>12</sup>. Climate change has also increased the risk of forest fires, as warmer and drier conditions increase fuel load and the risk of catastrophic fires destroying riparian habitats<sup>12-14</sup>. Drought and increasing wildland urban interface in California further exacerbate the risk of wildfire<sup>15,16</sup>.

California has taken steps to increase the pace and scale of forest management projects, but it is not enough. Despite calls for increased forest management, the extent of prescribed burning has remained steady or decreased from 1998 to 2018<sup>5</sup>. In September 2018, the legislature passed four laws pertaining to forest health and wildfire. One of these laws, SB2901, allocates \$200 million per year over a five-year period to the Department of Forestry and Fire Protection (Cal Fire) for forest health projects, including \$35 million per year earmarked specifically for fuels reduction. Another of the laws, SB1260, reduces restrictions to prescribed burning. While these changes may help increase pace and scale of forest health projects, prioritization is needed to ensure that future projects yield benefits to water resources.

The Cosumnes, American, Bear, and Yuba River watersheds make up only 2.4% of California's land area, but supply nearly 25% of the flow into the Sacramento River. Like much of the Sierra Nevada, the CABY region is highly susceptible to wildfire. Cal Fire classifies most of the CABY region as having a high or very high fire threat<sup>17</sup>. The 2014 CABY Integrated Regional Watershed Management Plan calls for increased fuels management projects to protect critical water sources<sup>18</sup>. Prioritization of fuels reduction projects in CABY watersheds will support ongoing forest health and fuels management projects in the region.

American Rivers is a national river-focused non-profit with a California regional office. Recognizing the significant threat posed to California's rivers by wildfire, American Rivers has begun to engage in fuels reduction efforts in the Sierra Nevada. American Rivers helped launch meadow restoration in the region by developing a rapid assessment method that helped land managers like the USFS prioritize sites for restoration. We recognize the need for a parallel means to prioritize fuels reduction to protect California's rivers and water supply. American Rivers will use this tool to identify and vet strategic projects with the most benefit to rivers and water supply with diverse land managers and stakeholders.

**Equity:**

American Rivers is committed to diversity, equity, and inclusion in all aspects of its work. Studies have shown that communities of color are unequally vulnerable to wildfires compared to white populations<sup>19</sup>. Prescribed fire and thinning reduce the risk these communities face from fire itself, while also helping to protect their drinking water supply from wildfire impacts<sup>19</sup>.

**Available data:**

Watershed and sediment flow data:

- A similar study was conducted in Colorado which used the [NHDPlus](#) and [USGS Digital Elevation Model](#) spatial data sets for fuel planning treatment areas and sediment flow through watersheds<sup>4</sup>. Both data sets are available for the Sierra Nevada region.

Prescribed fire data

- [Cal Fire](#) has datasets available on fire threat level, fire perimeters, prescribed burn and other treatment layers, priority landscapes, and pest kill areas.
- The [MTBS](#) dataset from the USGS monitors the severity of burns in the United States from 1984 onward and can be used to assess trends in wildfires overtime.

Precipitation Data

- [PRISM](#) datasets can be used to gather monthly and annual data related to precipitation, temperature, and vapor pressure, which are important for identifying priority areas.
- The [National Drought Mitigation Center](#) has tools and datasets available that show historical and current drought conditions that can be used to assess fuel loads in burn areas.

Estimating Fires

- [LANDFIRE](#) is a tool developed by the USGS to provide 20+ different geo-spatial layers that tracks disturbances, vegetation, fuel, and fire regimes to predict wildfire burns.

**Possible approaches:**

- Conduct a literature review to identify factors affecting wildfire impacts to rivers and water infrastructure.
- Identify and compile spatial datasets related to priority watershed features to identify priority sites for fuels reduction to benefit rivers and water supply.
- Use fire modeling, existing prescribed fire prioritization tools, and GIS analysis to explore fire behavior across the CABY watersheds and identify a set of 3-5 priority sites for fuels reduction in each.
- Engage land managers and stakeholders in prioritization process in order to collaboratively identify priority fuel reduction projects.

**Deliverables:**

- Processed spatial datasets, prioritization methodology, and output report
- Online map or interactive tool showing priority fuels reduction areas
- At least two stakeholder meetings/webinars to gather community input and share results

## Citations

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January 24, 2020

Group Project Committee  
Bren School of Environmental Science & Management  
2400 Bren Hall,  
University of California, Santa Barbara CA 93106

**RE: Group Project Proposal - Prioritizing Fuels Reduction Projects in Headwater Forests to Protect California's Rivers and Clean Water Supply**

Dear Group Project Committee,

I am writing to express American Rivers' support for and commitment to the Group Project Proposal: *Prioritizing Fuels Reduction Projects in Headwater Forests to Protect California's Rivers and Clean Water Supply*. The project aims to prioritize fuels reduction projects to protect river ecosystems and water supply and directly supports American Rivers mission to protect wild rivers, restore damaged rivers and conserve clean water for people and nature, as well as the goal of our California Headwaters Program to improve the management of headwaters lands to benefit rivers. American Rivers commits to support the project through mentoring the project participants, including at least one summer internship, providing data, and additional funding and resources as applicable. We will help formulate the project including developing the workplan, schedule and outcomes/deliverables and provide support through regular communication.

**Internships:** The American Rivers CA Regional Office has a strong track record of managing and mentoring interns, as we have successfully hosted AmeriCorps members for the past 12 years. We take managing, mentoring and launching future conservation and resource management leaders seriously, and would take this approach in engaging with the Bren School graduate student project team. We are happy to offer one or two summer internships to the lead or co-leads for the project (depending on most appropriate dynamic). At present, American Rivers policy is to offer only unpaid internships, but with the offer of a transit subsidy of \$5 per day (maximum total of \$500 per year), as applicable. As the American Rivers California Headwaters Program is located in the small town of Nevada City, CA, we understand it is unlikely that it will be feasible for the intern to travel to our office and are prepared to manage the intern(s) remotely. The interns will work closely with the Director of Headwaters Conservation, who will help the intern(s) set concrete deadlines, work through sticking points and help them appropriately engage with diverse stakeholders to solicit and incorporate feedback that will result in robust and vetted prioritization outputs. We will develop a regular communication schedule, including discussions at least once weekly.

**Funding:** As the project is focused on processing of existing datasets and GIS analyses, we do not anticipate the need for significant additional funding beyond the costs for American Rivers staff time to engage with the project team and mentor the intern(s), which we will contribute as in-kind funding. If additional costs arise, possibly related to acquiring specific software or engaging stakeholders, American Rivers can provide up to \$1500 in unrestricted funding to the project.

Data: As currently proposed, the project plans to use publically available datasets to develop the fuels reduction prioritization. American Rivers will reach out to partners within the CABY region to help identify and acquire additional datasets that may belong to agencies or other entities that would help refine the analysis, such as data from local water agencies. We do not anticipate any restrictions to use, but can help Bren students navigate this issue if it arises.

The proposed project will result in a highly useful and relevant prioritization methodology with applicability to state and federal fuels and water supply initiatives. American Rivers has the experience to guide this process and translate the outputs to on-the-ground projects. We are also excited to work with and launch Bren School students. We urge the Bren School to support this important and relevant project.

Sincerely,

A handwritten signature in cursive script that reads "Julie Fair".

Julie Fair  
American Rivers